Traffic Calming

Introduction

Traffic Management and Calming - Context

The main objective of traffic management is to manage the road environment and the road users within that environment. The aim is to produce a road network that is driven calmly, smoothly and safely by drivers and at speeds that are appropriate to the local environment and other road users. When done correctly the end product offers advantages to vulnerable road users, encourages modal choice and helps manage travel demand.

The visual appearance of any street should make it clear to a driver what is expected of them and what speed is deemed reasonable. The design features and processes used to achieve this are *traffic management and traffic calming*.

Before any choice can be made about the suitability of Traffic Management or even the type of measure to be used, it is important to determine the purpose for which the technique is intended.

In a busy urban environment there is a need to take account of the daily needs of the community living in the area balanced against those involved in commerce and those journeying through and to the area. In rural areas whilst the situation might appear less complex the feelings of the community might be equally intense. For example there will inevitably be those who stand by "their right to drive" and who wish to use their own judgements about what speed is appropriate where. In residential areas the perceptions of family safety and school journeys will be strong particularly where drivers are taking short cuts to save time.

Traffic calming and management features can be combined together as a package but fall broadly into the following groups;

- Vertical Features
- Horizontal Features
- Traffic management and control
- Traffic signs and road markings
- Zonal treatments

These measures will lead to;

- Crash and casualty reduction
- Traffic speed and volume reductions
- The promotion of alternative modes of travel, especially walking and cycling
- Improved urban design
- Improved urban environment
- Economic regeneration
- Perceptions of improved personal safety and less risk
- Lower traffic noise and pollution.

Once the designer understands the purpose of the scheme and the characteristics of the location in question then the types of measure for consideration can be developed. This is the point at which it is often invaluable to involve the local community.

Objective

Objective

To control or influence traffic speeds and / or volumes so as to improve the road safety, reduce actual and perceived risk to vulnerable road users to encourage their uptake as a mode of travel and to improve the local environment.

By altering travel speeds, travel times and by controlling ease of access other modes can be made more attractive.

Benefits

Benefits

Traffic Management, speed management and traffic calming are widely used through out the TDM but tend to be seen as other stand alone features. For example the provision of an on road cycle lane has wider benefits and effects than providing a cycling facility. For example the remaining road is narrower and will thus be slower than previously positively affecting safety while adversely affecting travel times to the positive advantage of cycling. Similarly parking management will discourage people driving their cars into a given area, thus reducing congestion etc.

- Crash and casualty reduction
- Traffic speed and volume reductions
- The promotion of alternative modes of travel, especially walking and cycling
- Improved urban design
- Improved urban environment
- Economic regeneration
- Perceptions of improved personal safety and less risk
- Lower traffic noise and pollution.

Residents in neighborhoods with suitable street environments tend to walk and bicycle more, ride transit more, and drive less than comparable households in other areas. One study found that residents in a pedestrian friendly community walked, bicycled, or rode transit for 49% of work trips and 15% of their non-work trips, 18- and 11-percentage points more than residents of a comparable automobile oriented community

Traffic Calming Tools

Vertical Features

Road Humps

The term "road hump" is generic. Road humps are constructed to different sizes and shapes to cater for different locations and situations. Indeed any traffic calming scheme can contain a variety of hump types. Humps can be rounded and flat topped or be used to raise the level of a road at an intersection to the height of the footway (intersection plateau). Flat topped humps and intersection plateaux are also good at offering pedestrians useful facilities. Sinusoidal approach ramps offer comfort advantages to buses, cyclists and emergency services. **Also see Section 1 – Walking and Section 2 Cycling**

Humps are rarely used individually but tend to form a series of humps on a street or across an area wide treatment to maintain uniform speeds.

Speed Cushion

Small Rectangular humps, resembling a seat cushion in shape, approximately the width of a car and usually places in rows of 2 or 3 across the road width. Cushions are rarely used individually but tend to form a series of features on a street or across an area wide treatment to maintain uniform speeds. Cushions are particularly good at offering traffic calming benefits without significantly adversely affecting buses on bus routes or the access of Emergency services.

Horizontal Features

Road Narrowing

Reducing the available road space for drivers can have the effect of lowering traffic speeds. Narrowing the road can be in conjunction with providing for pedestrians and / or cyclists. This is re-allocating road space to reduce the dominance and reliance on the motor vehicle.

Traffic Islands

Islands reduce traffic space and slow traffic. Pedestrian refuges, splitter islands etc all achieve this and have other positive benefits in segregating other modes from the car or offering a crossing facility.

Footway Build out	Footway Build outs can improve conditions for pedestrians by narrowing crossing widths, narrowing roads reducing traffic speeds and offering better visibility. However build outs may have adverse affects for cyclists by creating pinch points.
Pinch Points	When build outs are established opposite each other these pinch road widths. Pedestrian crossing widths are far less and traffic speeds lowered, however unless traffic speeds are </= 30kph then cycling facilities should be considered.
Chicanes	Placing build outs on either side of the road, but offset creates a chicane. The width between build outs, the stagger length and the amount of traffic deflection will determine what size of vehicle and at what speeds traffic might be expected. Vertical features can be incorporated into chicanes (eg speed cushions) when accommodating larger vehicles (eg buses) might undermine some of the speed management aspects for cars. Again cyclist's needs should be considered during design.
On road Cycle lanes	Providing on road cycle lanes is not just about providing a facility for cyclists. Cycle lanes also visually narrow the road and they narrow from the edges of the road also meaning that motorised vehicles get closer to each other rather than further apart (if narrowing by a flush median). Both of these aspects can result in lower traffic speeds.
Mini Roundabout	These are small roundabouts, often only painted intersection controls. Central islands can be flat or raised. Where these are used to act as a means to slow traffic before reaching other traffic calming features the amount of deflection will determine the speed reduction gained.
Rumble Strips	These are typically used at the entry to a slower speed environment to alert drivers (visual and audible) to the need to travel slower. Rumble strips can be a series of closely spaced individual bars or patches. Cyclists in particular should be considered in the design and the rumble strips will normally be of a contrasting colour to the surrounding road.
Rumble Wave	In a similar style to Rumble strips the surface pattern can be varied using a sinusoidal profile to generate horizontal vibration in the vehicle but very little external noise. The profile of the pattern can be varied to match the desired speed.

Traffic Restriction and Control

Parking Management

Advisory and regulatory parking control of on-street parking can offer practical traffic and speed management. Controlling parking helps Travel Demand Management by restricting parking availability but it also helps manage the road environment. Well positioned parking can reduce conflict between pedestrians, other vulnerable road users and motor vehicles. In urban areas where the parking demand is high waiting and loading restrictions combined with controls on parking duration and the cost of parking may be appropriate.

One Way systems

One way systems have pros and cons, however they can be a useful tool in promoting exemptions for some users while making other traffic take a longer journey (time and distance). One way systems can rationalise the number of side road accesses, improve capacity and parking and maintain safety in narrow streets. However they may need traffic calming to manage speeds and confuse vulnerable road users.

Vehicle restrictions and access

Restricting access to particular vehicle types has the affect of changing the design needs and criteria beyond that restriction, often allowing tighter corner radii, narrower streets etc. Conversely, promoting access to an area by particular vehicle types (eg buses in a CBD or cyclists in a pedestrian area) promoted those modes by offering greater penetration and time / distance savings. Restrictions can be both lanes on the road or urban zones. Access to these lanes or areas can be established legally and with the associated signs etc or by width constraints or by rising bollards controlled by permitted vehicles.

"Bus gates" are a restriction or section of road permitting access only to buses. Usually these give buses an advantage, for example in having priority access to traffic signals via a short road parallel road in congested areas. Access to the bus gate being controlled by loops, bus transponders and rising bollards. Transponders and loops then give priority signal phases at the traffic signals near by.

Signs and Road Markings

Signs

Road signs are widely used to manage and control traffic. Permitted signs are detailed in Land Transport Rule; Traffic Control Devices 2004 (TCD) and Manual of Traffic Signs and Markings Pt1 2007 (MoTSAM). Signs often supplement other traffic management and calming features. Signs alone rarely have an affect on changing driver behaviour and need to be supported by physical measures.

Electronic Signs

The use of electronic signs that give feedback to drivers is becoming increasingly common, especially in trying to influence drivers to driver at more appropriate speeds for the environment. Signs usually make either drivers aware of the excess speed in relation to the speed limit or inform drivers of an approaching hazard in relation to an inappropriate approach speed. Electronic signs supplement standard signs and do not replace them. Warning signs are targeted at locations were in appropriate speed is a contributor factor in a poor safety record eg a bend or intersection. Normally such signs follow unsuccessful other attempts to address the issue. Driver speed feedback signs (displaying vehicle speeds to drivers) are used to influence driver behaviour and these have more of a value when sited after gateway and threshold treatments where there is a need to maintain lower speeds.

Road

Road Markings are used to forewarn drivers of hazards in on the highway and to

Markings

separate traffic streams. Permitted signs are detailed in Land Transport Rule; Traffic Control Devices 2004 (TCD) and Manual of Traffic Signs and Markings Pt2 2008 (MoTSAM).

Visually narrowing the road can be achieved or supported by road markings. It can occur at the margins of the road (cycle lane, parking area, shoulder, flush median) or in the centre of the road (central flush median). Narrowing by adding features to the centre of the can adversely affect cyclists and reduce the comfort level pedestrians' experience. Narrower traffic lanes will generally see lower traffic speeds, but this should not be done such that cyclists' are left vulnerable.

Conversely there are some instances where removing road markings can create a "calmer" road environment. In some rural village locations where traffic volumes are low the delineation and segregation that centrelines offer can encourage high speeds.

As with road signs road markings have a significant role to play in many traffic management / calming projects however they primarily support and are combined with other features as road markings alone will have little speed management / calming affect.

Gateways and Thresholds

Gateways and thresholds draw the drivers' attention to a significant change in road environment ahead. Gateways and thresholds can bring together a number of techniques to have a greater impact on driver behaviour. For example, signs, markings, road narrowings, cycle lanes and coloured surfacing all combine to visually impact on the driver. Some details relating to thresholds are contained in Land Transport Rule; Traffic Control Devices 2004 (TCD) and Manual of Traffic Signs and Markings Pt2 2008 (MoTSAM).

Colour and surfacing

Colour, usually red or green has been used to indicate a point of change or to raise awareness in all road users minds of a more risky location. Markings placed on coloured patches also seem to carry more visual significance. Colour should however be used sparingly so that it retains its value at the locations where the most effect is desired. Often colour can be added to existing features to extend the life of existing features.

Surfacing types can also me varied to reinforce a combined environment for different users (eg a block paved flat topped hump to reinforce its informal use as a pedestrian facility to both pedestrians and drivers).

Zonal Treatments

Pedestrian Zones

Pedestrian areas can be established by limiting access by vehicles to a street or series of streets. The dilemma can be what if any access should there be for cycles, public transport, service vehicles etc. Very few areas are exclusively pedestrian and here good urban design is the secret to success in implying that vehicles are the quests in a pedestrian dominated environment.

Lower Speed zones

Establishing lower speed zones can have significant benefits for road safety, the environmental, public space and wellbeing and the promotion of alternative modes. For example a CBD 30km/h zone supported by traffic calming, public transport facilities and good urban design can enhance the economy and attractiveness of any urban environment. The traffic calming and good urban design in itself should "enforce" the speed limit rather than relying police activity.

Where to apply these tools

Feature	Centre	Urban	Suburban	Rural
Road Humps	★★	★★★	★★★	★
Speed Cushions	★★	★★★	★★★	★
Road Narrowing	★★★	★★★	★★★	★★
Traffic Islands	★★★	★★★	★★★	★
Footway Build outs	★★★	★★★	★★★	★★
Pinch Points	★★★	★★★	★★★	★
Chicanes	★★	★★★	★★	-
On Road Cycle lanes	★★★	★★★	★★	★
Mini Roundabouts	★★★	★★★	★★	★
Rumble Strips	★★★	★★	★★	★★★
Rumble Wave	★★★	★★	★★	★★★
Parking Management	★★★	★★★	★★	★
One Way Systems	★★★	★★★	★★	★
Vehicle Restrictions	★★★	★★★	★	-
Signs	★★★	★★★	★★★	★★★
Electronic Signs	★★★	★★★	★★★	★★★
Road Markings	★★★	★★★	★★★	★★★
Gateways & Thresholds	★★★	★★★	★★	★
Colour and Surfacing	★★★	★★★	★★	★
Pedestrian Zones	★★★	★★★	★★	★
Lower Speed Zones	★★★	★★★	★★	★★

This table provides an indication of appropriate location only.

Case Study

Case study 1 – New Zealand

Brynley St Traffic Calming Proposal - Christchurch City Council

Christchurch City Council consulted residents and service providers in 2008 regarding proposals to calm traffic in Brynley St, Hornby. Plans included build-outs and speed humps, as well as planting and improved street lighting.

Although two roundabouts were constructed in the street in 2002/03, excessive traffic speed continued to cause concern. Since street renewal was unlikely to occur for many years, interim traffic calming measures were considered necessary.

Project objectives

- To reduce the speed and number of vehicles on Brynley St, particularly at the intersection of Trevor St and Okehampton St.
- To maintain or improve safety for all users.
- To meet Network accepted standards and engineering best practice.
- Introduce traffic calming to break up the long straight roads
- To construct the project in 2008/9.

Project proposals

- Eight speed humps placed approximately 120m apart in order reduce speed and traffic volumes and to complement the existing two roundabouts
- Speed humps attached to kerb build-outs on each side of the road. The build-outs are a semi-circle 3 metres wide.
- Each of the build-out contains an Upright Hornbeam Tree. As well as enhancing the streets, the trees make the road appear narrower at these locations.
- A 1 metre space between the kerb and dish channel and the build-out to allow kerb sweeping and maintenance.
- Street lighting to be upgraded at the road humps
- Low level planting (up to 500mm high) at the roundabouts to improve landscaping and to raise the profile of the roundabouts.

Consultation

- Leaflets describing and illustrating the project delivered to households and available on the City Council's website.
- Free post return feedback attached to the consultation leaflet.
- Project drop in sessions held at a local Plunket on two days with staff attending late afternoon / early evening on those days.
- Consultation response and project decision presented to the Community Board Transport and Roading Committee.

Contact Jennie Hamilton,
Consultation Leader,
Capital Programme Group,
Christchurch City Council,
PO Box 237,
Christchurch.

Tel (03) 941 5207 or 027 225 0671
Email – jennie.hamilton@ccc.govt.nz

(The project is now in construction.)

Case study 2 – New Zealand

SaferRoads - Newtown and Berhampore – Wellington City Council

SaferRoads is a philosophy recently adopted by Wellington City Council in 2003 to reduce speeds on residential and side roads to support an ongoing drive to make roads safer. This is being promoted through a combination of lower speed limits and traffic calming on the residential and side roads. On arterials roads sometimes lower speeds are appropriate but traffic management used new and existing traffic signals is commonplace recognising the wider traffic role arterial roads have in the City.

The City has been divided into 23 Community areas and over the coming years the SaferRoads will address each area separately.

In each area, the programme follows the four stages listed below. Each stage will be accompanied by a report document.

Stage 1: Community Workshops

Inform the local community of the programme objectives, gather information about road safety issues and trends in the area, and develop a framework for crash reduction. The summary of Community Participation - covers the information obtained in the workshops.

Stage 2: Safety Improvements

Consult with schools in the area, approve concept plans and specify local road safety improvements, enforcement strategies and education campaigns. From this results a Technical Report (includes background, a workshop summary, progress with school consultations, initial concept plans, costs, priorities and photos of suggested road safety improvements) that sets the way forward in design terms.

.Stage 3: Public Input

Obtain feedback on the proposed work and amend suggested improvements as appropriate. A proposal report that summarises the Technical Report to help people provide feedback easily.

Stage 4: Implementation

Specify final road safety improvements for the area, develop detailed designs, formalise enforcement strategies and begin construction.

Consultation Feedback and Implementation Plan help determine the final road safety improvements, and enforcement and education information.

The Council has spent $6 million on the overall SaferRoads programme so far. The overall total project cost is $21 million.

Since 2003, SaferRoads has been implemented in Tawa, Ngaio, Khandallah, Northland, Wilton, Wadestown, Thorndon and Karori. Crash statistics are showing early success in Tawa, Ngaio and Khandallah. It is too early to draw any conclusions on the other four suburbs; however feedback from the community has, on the whole, been positive.

In November 2005, the **Newtown and Berhampore** communities were invited to workshops on road safety issues. They identified speed, intersections, pedestrians, cycles, parking and general roading issues such as lighting and road width as key areas that need to be addressed. The analysis of crash numbers and types showed that intersection, parking, pedestrian and loss of control crashes are prevalent in Newtown and Berhampore, correlating with the community feedback. The primary objective of SaferRoads is to reduce crashes by at least one third, and the best way

to achieve this is to decrease vehicle speeds.

The majority of crashes in Newtown and Berhampore occur on the main routes through the suburbs. About three-quarters of the reported injury crashes since 2002 have occurred on Riddiford Street, Adelaide Road, Rintoul Street and Constable Street. For this reason, the proposed changes were mainly focused on these roads as the greatest benefits can be gained here. However, priority has also been given to providing appropriate measures for residential streets to make these areas safer for residents. Here Wellington City have designed with traffic management, implicit road network hierarchy and speeds in mind.

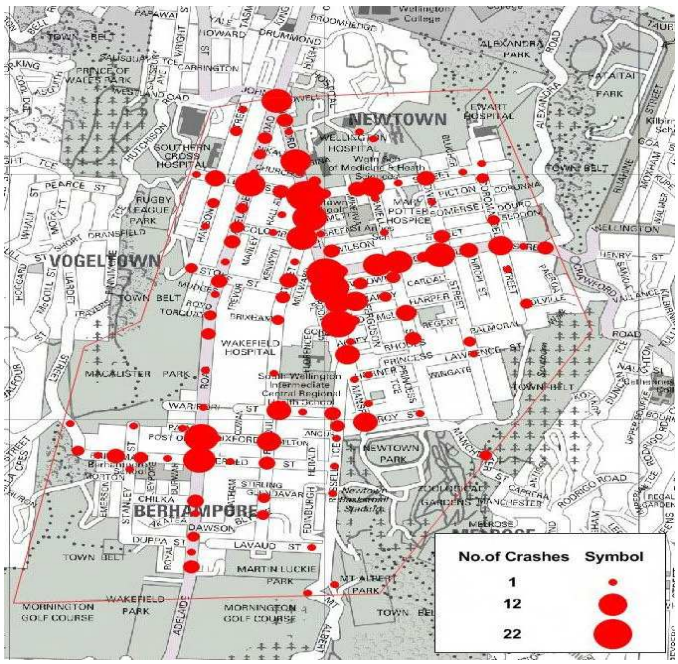
During the consultation phase, workshop participants provided useful information about the issues and concerns in the area. The key issues related to intersections, speed, parking, night-time, pedestrians and schools/kindergartens/crèches. Participants provided their ideas about potential solutions which have been included in the design of the road safety measures proposed here.

At the end of the consultation phase, schemes were developed and concept plans were prepared for each of the sites identified as needing attention. The implementation schedule and concept plans provide the framework for the SaferRoads programme.

The framework includes

- Traffic signals on arterial routes (new and existing installations),
- Kerb extensions, median islands, speed humps, rationalising intersection controls, parking management in the area,
- Lower speed limits (40km/h across the area) with supporting traffic calming in residential areas,
- Identifying arterial routes and improving the road markings for all roads in Newtown and Berhampore.
- Education and enforcement programmes are also an important part of improving safety and reducing injury crashes.

These proposed works and these programmes have an estimated cost of $1.64 million.
Traffic calming installation and speed limit changes were implemented in 2008/9 with traffic signal upgrades and installation due in 2009/10.



Stuart Bullen
Transport Safety Engineer
Wellington City Council,
City Hall,
101 Wakefield Street
Wellington 6011
Email - saferroads@wcc.govt.nz

Stuart Bullen
Tel - (04) 803 8242
Email - Stuart.bullen@wcc.govt.nz

Case study 3 – New Zealand

River Road Traffic Calming Proposal - Hamilton City Council

River Road is an arterial road of importance in the north-east of Hamilton and is a key feeder to Hamilton's ring road system. The Council is in the process of finalising the plans for the upgrade of River Road from Sylvester Road to Te Huia Drive to urban standards.

Consultation was carried out on both the form and function of the corridor through the designation process in 2005. Since then Council has successfully worked with property owners and developers to purchase the land required for the project. Consultation involved the traditional leaflets and use of the Council website but also a focus group to try to involve the community in developing a "self explaining road". This group considered both the engineering designs to manage speeds but also driver behaviour and education.

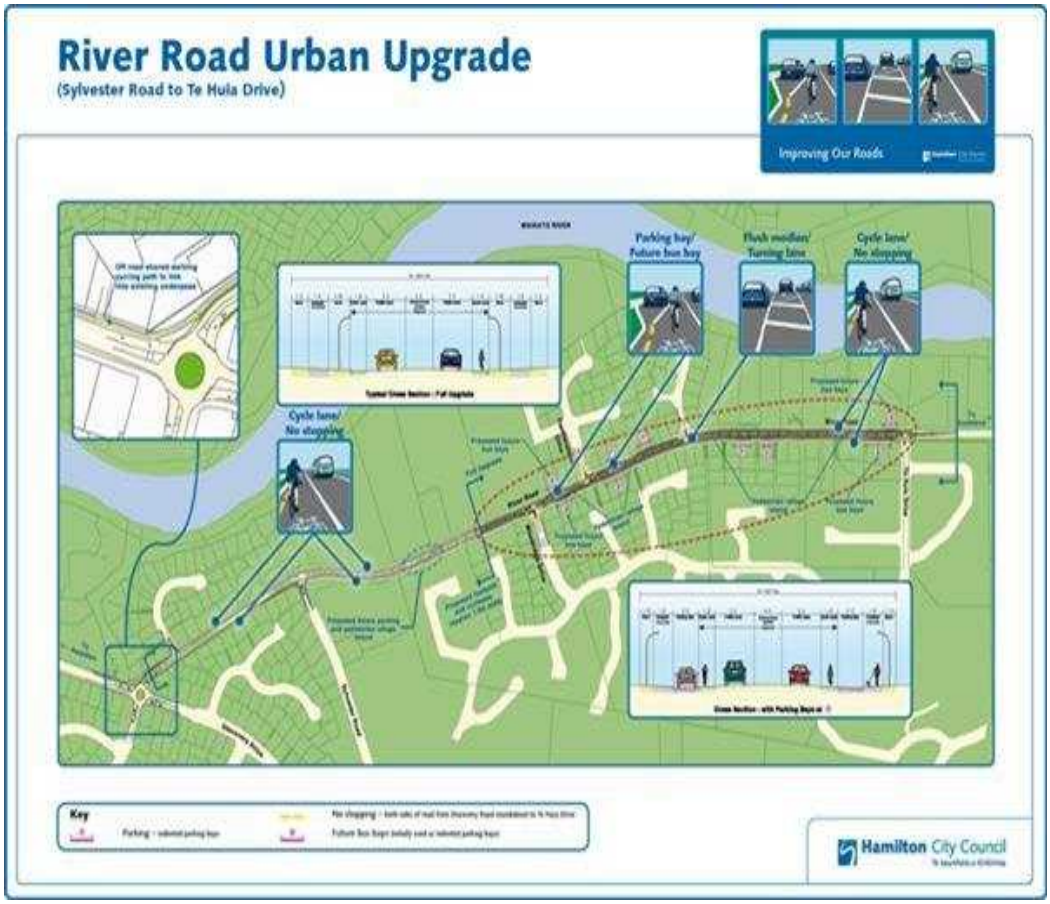
Project Objectives

The upgrade of this section of River Road to urban standards will provide for vehicle traffic, public transport, cycling and walking facilities, and a more attractive complete environment.

This urban upgrade involved:

- Widened road carriageway
- Provision of parking at key locations through new indented parking bays and future bus bays along the road (see upgrade feature icons on map)
- To accommodate for safe on road cycle lanes on street parking will only be available in indented parking bays – from the Discovery Drive roundabout to Te Huia Drive – (see upgrade feature icons on map)
- Installation of kerb and channel
- New concrete footpaths linking to the existing footpaths on River Road
- A short off road shared walking/cycle path linking the Discovery Drive Underpass to the new River Road on road cycle lane (see map insert)
- Pedestrian refuge islands at key locations to improve pedestrian safety across the road
- Tactile pads to be installed to assist visually impaired pedestrians at the crossing points
- Final road surfacing will be reinstated in chipseal and a central painted flush median to enable safer right turns for vehicles at intersections and into properties (see upgrade feature icons on map)

The contract is expected to be completed during the 2009/10 summer.
The Council and contractor issued monthly updates to the community on progress on the project, from planning for the project to construction.



General enquiries about this project

Transportation Unit
Level 5, Council Offices
Garden Place
Hamilton City Council
Private Bag 3010
Hamilton 3240
Phone: 838 6868
Fax: 838 6440

Dave Heatley
Hamilton City Council
Phone: 838 6900, Mobile: 021 791 934
Email: **dave.heatley@hcc.govt.nz**

Case study 4 – New Zealand

State Highway one Wellington Region Te Horo

Much of the State Highway road network acts as a means of moving longer distance travellers and freight. Occasionally the State Highway network runs through communities in rural settings where traffic speeds are higher than is appropriate for "traditional" traffic calming techniques.

In such speed environments (>70km/h) the techniques employed are based around visually changing the road's appearance to reinforce the slightly lower speeds in these communities. This will involve road markings, threshold signing, warning signs and possibly electronic signs.

State Highway one runs through a number of rural communities one such is Te Horo just South of Otaki.

Here Te Horo sits in a rural 100km/h area and the residents and businesses sought a lower speed for their community. An 80km/h speed limit was introduced supported by visual changes to the road layout.

These included;

- Central road markings to narrow the road and provide for right turn vehicles
- Consistent and adequate shoulder widths to narrow the road but also to cater for cyclists
- Gated threshold signs at the entry to Te Horo
- Warning signs motorists advising of pedestrians
- Footway provision where appropriate.

For Information

Mark Edwards
Senior Advisor Integrated Planning
DDI 04 894 6456
M 021 984 637
E mark.edwards@nzta.govt.nz

NZ Transport Agency
National Office - Chews Lane
Level 3
Victoria Arcade
44 Victoria St
Private Bag 6995
Wellington 6141
New Zealand
F 64 4 894 6100

International Case study 1

Project for Public Spaces – North America

Project for Public Spaces is a non-profit organization dedicated to helping people create and sustain public spaces that build stronger communities. Founded in 1975, PPS embraces the insights of William (Holly) Whyte, a pioneer in understanding the way people use public spaces. Today, PPS has become an internationally recognized centre for best-practices, information, and resources about urban design.

PPS have pulled best practice together as a toolkit for traffic calming in North America. It is founded on the idea that streets should help create and preserve a sense of place that their purpose is for people to walk, stroll, look, gaze, meet, play, shop and even work alongside cars - but not dominated by them. The tools of traffic calming take a different approach from treating the street only as a conduit for vehicles passing through at the greatest possible speed. They include techniques designed to lessen the impact of motor vehicle traffic by slowing it down, or literally "calming" it. This helps build human-scale places and an environment friendly to people on foot.

Besides its power to improve the livability of a place, the beauty of traffic calming is that it can be applied inexpensively and flexibly. The strategies outlined below in The Traffic Calming Toolbox can be employed by painting lines, colors and patterns; using planters, bollards and other removable barriers; eliminating or adding parking; or installing sidewalk extensions or similar structures with temporary materials.

Features covered include

- Diagonal Parking
- Changing One-Way Streets to Two-Way
- Widening Sidewalks/Narrowing Streets and Traffic Lanes
- Bulbs - Chokers - Neckdowns
- Chicanes
- Roundabouts
- Traffic Circles
- Raised Medians
- Tight Corner Curbs
- Diverters
- Road Humps, Speed Tables, and Cushions
- Rumble Strips and Other Surface Treatments

Before Traffic Calming: Major Considerations

- Transit and Traffic Calming
- Liabilities

http://www.pps.org/
http://www.pps.org/info/placemakingtools/casesforplaces/livememtraffic

International Case study 2

Traffic Calming Techniques Experience and Practical Advice with 80 Case Studies – England (Institution of Highways and Transportation and County Surveyors Society)

An updated review of an earlier guidance book on traffic calming that reviews previous projects and discusses results, best practice and the future of traffic calming. This has in many ways become the definitive UK design guide for traffic calming.

Chapter 1 Introduction
Chapter 2 Traffic Calming the Context
Chapter 3 The Design and Implementation of Traffic Calming Measures
Chapter 4 Techniques in Traffic Calming
Chapter 5 Lessons Learned from Experience
Chapter 6 Traffic Calming the Future
Chapter 7 Earlier Schemes Reviewed
Chapter 8 More Recent Schemes

Institute of Transportation Engineers (UK)
http://www.ite.org/trasffic/tcstate.htm

International Case study 3

Traffic Calming *Roadway Design to Reduce Traffic Speeds and Volumes* *from* Victoria Transport Policy Institute TDM Encyclopedia.

Road Diets

Road Diets and Environmentally Adopted Through Roads refers to Traffic Calming applied to higher-volume arterial roads. The theory and practice in "road diets" involves for example converting four traffic lanes to three traffic lanes, with a center turn lane and bicycle lanes, and various pedestrian and aesthetic improvements. This is typically suitable for roads with up to 20,000 average motor vehicles per day. Stout, et al (2006) found that conversion of four-lane undivided roadways to three-lane cross-sections in typical Iowa towns reduced crash frequency by 25% and crash injuries by 34%. Where Road Diets include the addition of cycling lanes, bicycle travel typically increases 20-30%. The table below summarises crash reduction benefits for some recent projects of this type.

Table 1 **Road Diet Crash Reduction Impacts** (Seattle DOT)

Roadway Location	Date Change	ATD Before	ADT After	Collision Reduction
Greenwood Ave N, N 80th St to N 50th	April 1995	11,872	12,427	24 to 10 (58%)
N 45th Street, Wallingford Area	December 1972	19,421	20,274	45 to 23 (49%)
8th Ave NW, Ballard Area	January 1994	10,549	11,858	18 to 7 (61%)
Martin Luther King Jr Way, North of I 90	January 1994	12,336	13,161	15 to 6 (60%)
Dexter Ave N, Queen Ann Area	June 1991	13,606	14,949	19 to 16 (59%)
24th Ave NW, NW 85th to NW 65th	October 1995	9,727	9,754	14 to 10 (28%)

This table summaries the crash reduction effects of road diets on major arterials in Seattle, Washington. (ATD = Average Daily Traffic)

Traffic Calming

Traffic Calming should see reductions in vehicle traffic speeds and sometimes volumes. The table below summarises the traffic speed impacts of various Traffic Calming devices. Even where speed reductions are small, Traffic Calming tends to reduce the highest traffic speeds (i.e., the fastest 5-15% of vehicles), this in turn provides greater safety and noise reduction benefits than indicated by average reductions.

Traffic studies have determined in general that for every 1 metre increase in street width the 85th percentile vehicle traffic speed increases 1.6 kph, and the number of vehicles traveling 8 to 16 kph or more above the speed limit increases exponentially. It might be expected that as residential street traffic speeds increase, neighborhood livability ratings decline.

Table 2 **Speed Impacts of Traffic Calming Measures** (Ewing, 1999)

	Sample Size	Avg. Speed Afterward (mph)	Avg. Speed Change	Avg. % Change
12' Humps	179	27.4	-7.6	-22
14' Humps	15	25.6	-7.7	-23
22' Tables	58	30.1	-6.6	-18

Longer Tables	10	31.6	-3.2	-9
Raised Intersections	3	34.3	-0.3	-1
Circles	45	30.2	-3.9	-11
Narrowings	7	32.3	-2.6	-4
One-Lane Slow Points	5	28.6	-4.8	-14
Half Closures	16	26.3	-6.0	-19
Diagonal Diverters	7	27.9	-1.4	-0.5

From www.trafficcalming.org.

As mentioned earlier traffic calming can have positive effects upon travel volumes, this is often related to travel times (speed management) and perceived safety. Below the likely positive travel impacts of traffic calming are summarised.

Table 3 **Travel Impact Summary**

Objective	Rating	Comments
Reduces total traffic.	2	Discourages automobile traffic and increases travel alternatives.
Shifts automobile travel to alternative modes.	2	Improves walking and cycling conditions and discourages automobile use.
Improves access, reduces the need for travel.	1	Encourages higher-density, mixed land use.
Increased public transit.	1	Improves access to transit.
Increased cycling.	2	Improves cycling conditions.
Increased walking.	3	Improves walking conditions.

Rating from 3 (very beneficial) to -3 (very harmful). A 0 indicates no impact or mixed impacts.

Traffic Calming / Speed Management Benefits And Costs

Traffic Calming benefits and costs are summarized in the table below.

Table 4 **Traffic Calming Impacts** (Litman, 1999)

	Description
Benefits	
Increased Road Safety.	Reduced traffic accident frequency and severity, particularly for crashes involving pedestrians and cyclists.
Increased comfort and mobility for non-motorized travel.	Increased comfort and mobility for pedestrians and cyclists.
Reduced automobile impacts.	Increased non-motorized travel substitutes for automobile trips, reducing congestion, expenses and pollution.
Increased Community Livability	Reduced noise and air pollution, and improved aesthetics.
Increased neighborhood interaction.	More hospitable streets encourage street activities and community interaction.
Increased property values.	Reduced traffic speed and volumes increase residential property values.
Public Health	More opportunities for walking and other physical activity.
Costs	
Project expenses.	Financial costs associated with implementing and maintaining Traffic Calming facilities.
Liability claims	Increased liability claims caused by Traffic Calming.

Vehicle delay.	Reduced traffic speeds. Motorists either increase their travel time or reduce travel distance.
Traffic spillover on other streets.	Traffic Calming on one street can shift traffic to other streets.
Problems for emergency and service vehicles.	Delay to fire trucks, and problems for buses, garbage trucks and snow plows.
Increased drivers' effort and frustration.	Increased effort required for driving on traffic calmed roads and the resulting frustration.
Problems for bicyclists and visually impaired pedestrians.	Some Traffic Calming strategies cause problems to bicyclists or visually impaired pedestrians.

As can be seen above there are pros and cons to traffic calming and speed management but there are noticeable benefits beyond those that might be expected in the form of traffic safety, travel choices, reduced traffic speeds and volumes. Beyond these more obvious benefits Health improves, the local retail economy can be stimulated, property and retail values can increase and the attractiveness and personal security in and area can improve.

Complementary measures

Many features used to provide for specific road users are actually also forms of traffic management or traffic calming. For example providing pedestrian facility in the form of a central pedestrian refuge island also represents a road narrowing and traffic calming device. With this in mind it can sometimes be advantageous to "sell" a feature like a bus or cycle lane as a speed management tool through road narrowing rather than a means of providing for a minority road user group.

- Walking and Cycling Facilities
- Urban Design and Land Use Planning
- Public Transport
- Parking Management
- Urban Renewal

What other policies may this address

Travel Demand -
Walking and cycling
Public Transport
Priority Lanes
Parking Management
Land Use

Other External Policies
2010 Road Safety Targets
2020 Road Safety Vision and Targets
Health
Environment
Economic
Crime
Equity and Equality
Treaty of Waitangi

Further info and Relevant Research

Institution of Highways and Transportation (UK)
http://www.iht.org/
Institute of Transportation Engineers (UK)
http://www.ite.org/trasffic/tcstate.htm
Traffic Calming.org (USA)
http://www.trafficcalming.org/
San Francisco (USA)
www.sfgov.org/site/dpt.index.asp?id=13563
Project for Public Spaces (USA)
http://www.pps.org/
http://www.pps.org/info/placemakingtools/casesforplaces/livememtraffic
Department of Transport (UK)
traffic advisory leaflets
http://www.dft.gov.uk/pgr/roads/tpm/tal/
Manual For Streets
http://www.dft.gov.uk/pgr/sustainable/manforstreets/
Local Transport Note 1/07 Traffic Calming
http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/pdfltn0107trafficcalm.pdf
Local Transport Note 2/08 – Cycling Infrastructure Design
http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/ltn208.pdf

Local Transport Note 1/08 – Traffic Management and Streetscape
http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/ltn108.pdf
Local Transport Note 1/04 and 2/04 – Policy, Planning and Design for Walking and Cycling (public consultation drafts)
Cycle England (UK)
http://www.dft.gov.uk/cyclingengland/
CTC Benchmarking (UK) – Best Practice Case Studies
http://www.ctc.org.uk/DesktopDefault.aspx?TabID=4384
Transport for London (UK) – Cycle Design Guidance
http://www.tfl.gov.uk/businessandpartners/publications/2766.aspx
Transport for London (UK) – Cycle Planning
http://www.tfl.gov.uk/roadusers/cycling/11598.aspx
County Surveyors Society (UK)
http://www.cssnet.org.uk/

Road and Traffic Standards Series (LTSA)

- RTS 1 - Guidelines for the implementation of traffic controls at crossroads (1990) (PDF, 86 KB, 22 pages)
- RTS 4 - Guidelines for flush medians (1991) (PDF, 416 KB, 20 pages)
- RTS 5 - Guidelines for rural road markings and delineation (1992) (PDF, 915 KB, 48 pages)
- RTS 8 - Guidelines for safe kerbline protection (1993) (PDF, 155 KB, 20 pages)
- RTS 14 - Guidelines for facilities for blind and vision-impaired pedestrians (2003) (PDF, 483 KB, 55 pages)
- RTS 15 - Guidelines for urban-rural speed thresholds (PDF, 1.05 MB, 22 pages)

Traffic Notes (LTSA)

No1 Pedestrian crossings (PDF, 45 KB, 2 pages) – Requirements - 2006
No2 Platforms as crossing points (PDF, 17 KB, 2 pages) – Guidelines - 2004
No 6 Agreement of lane-use signs and road markings (PDF, 15 KB, 2 pages) – Requirements - 2004
No7 Guide to heavy vehicle management (RTS16) publish (PDF, 29 KB, 1 page) – Information - 2006
No10 Trials of traffic control devices (PDF, 12 KB, 5 pages) – Information – 2004
No14 Approved trials of traffic control devices (PDF, 29 KB, 1 page)

- Appendix 1: Ramp metering signal trial
- Gazette notice: Ramp metering signal trial (PDF, 17 KB, 1 page)
- Appendix 2: Pedestrian crossing zigzag marking trial
- Gazette notice: Pedestrian crossing zigzag marking trial (PDF, 9 KB, 1 page)
- Appendix 3: Active warning signs trial
- Gazette notice: Active warning signs trial (PDF, 36 KB, 2 pages)
- Appendix 4: Pedestrian crossing warning lights

Gazette notice: Pedestrian crossing warning lights trial (PDF, 24 KB, 1 page) – Information – 2006
No23 Speed indicator devices (PDF, 28 KB, 4 pages) – Guidance - 2000
No28 Pedestrian crossings and school crossing points on roads with speed limits of 60km/h or more (PDF, 14 KB, 2 pages) Requirements – 2004

No35 Guidelines for urban-rural thresholds (PDF, 14 KB, 2 pages) – Information – 2004
No36 Land Transport Rule: Traffic Control Devices 2004 (PDF, 65 KB, 6 pages) - Information – 2004
No37 40km/h variable speed limits in school zones (PDF, 87 KB, 9 pages) – Guidelines – 2005
No40 Revision of Guidelines for facilities for blind and vision-impaired pedestrians (PDF, 102 KB, 2 pages) – Information – 2003
No 43 Speed limits less than 50 km/h (PDF, 23 KB, 3 pages) – Guidelines 2004
No 49 Limit line and Give Way markings (PDF, 36 KB, 3 pages) - Guidelines 2004
No 50 Marking and signing of roundabouts (PDF, 26 KB, 2 pages) - Information – 2005
No51 Parking signs and marking (PDF, 33 KB, 3 pages) - Information – 2004
No56 Active school warning signs (PDF, 200 KB, 13 pages)
Gazette notice (PDF, 23 KB, 2 pages) - Guidelines 2008
No57 Active warning signs (not at schools) (PDF, 133 KB, 8 pages)
Gazette notice (PDF, 23 KB, 2 pages) - Guidelines 2008

Signs and Markings

Land Transport Rule; Traffic Control Devices 2004 (TCD),
Manual of Traffic Signs and Markings Pt1 and PT2 2008 (MoTSAM).

Complementary measures

- *Public Transport*
- *Cycling*
- *Walking*
- *Accessibility*
- *Urban Design*
- *Priority Lanes*
- *Land-use*
- *Parking*

Other policies addressed

- *Congestion*
- *Economic Efficiency*
- *Public Health*
- *Land use*

Further information