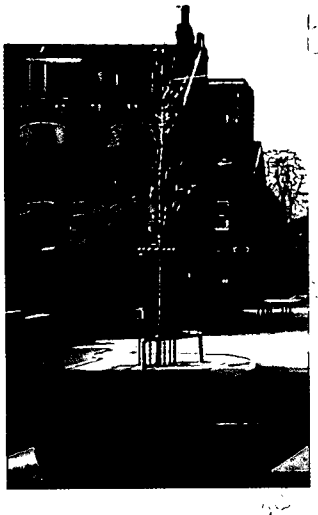
Traffic Calming Techniques



Experience and practical advice with 80 case studies

THE INSTITUTION OF HIGHWAYS & TRANSPORTATION

County Surveyors' Society

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Traffic Calming Techniques

Joint Foreword by the Presidents of the County Surveyors' Society and The Institution of Highways & Transportation

Road traffic is part of every day life and traffic problems regularly top the list of concerns raised by local communities in surveys. Open any local paper and you will find articles and letters on local traffic and transport issues.

Street management services, in their widest sense, represent the public face of a local authority. Most people experience some aspect of the highway and street scene on a daily basis, although the same cannot be said of most other areas of public service. Local authority reputations can rise or fall on public perception and satisfaction about the safety, amenity and enjoyment offered by the streets and highways under their control.

Reducing the unwanted effects of road traffic, and improving the quality of the environment in which we live and work, is a high public service priority. Traffic calming is one practical policy intervention that can have a major role to play in the economic, social and environmental well being of our villages, towns and cities. Traffic calming needs to be seen in context, as part of a bigger picture, and it also needs to provide a balance between a range of often conflicting accessibility and safety interests.

Much has happened since *Traffic Calming in Practice*, the predecessor to this book, was published some years ago. Experience has developed and traffic calming has become more commonplace. There is much more to do, new skills to learn and share and new and much wider agendas to embrace with growing public aspirations for a better environment. This new volume builds on earlier success, brings the traffic calming story up to date and scans the horizon for potential developments.

Traffic Calming Techniques advocates an objective-led and holistic approach. Solving problems concerned with the built and natural environments is a multi-disciplinary process. Integrated solutions require a balance between sometimes conflicting aspirations, and yet aim to achieve support from the majority of stakeholders. This book reflects the view that traffic calming is primarily about creating safer and sustainable communities and a street environment for people to enjoy. It recognises the interactions between all the various elements and policy interventions that combine to make better places: traffic and travel reduction, parking, walking and cycling, public transport improvement, safer routes to school, road and footway maintenance, hard and soft landscaping and community safety are all part of this picture.

Successful traffic calming requires an ability to think laterally and engage communities when tackling complex problems that cross traditional institutional and professional boundaries. This book does not claim to offer a solution to suit every circumstance. Rather, it sets out a framework for thinking through problems, constraints and opportunities, within the guidelines and policies set for the area under consideration. In so doing it will help to develop unique solutions, tailored to the needs of local communities, making use of experience gained in other places.

We would like to thank all those involved with the production of this book for their commitment, dedication and hard work. In particular we wish to thank the Department for Transport, Faber Maunsell, Mouchel Parkman and our colleagues in the County Surveyors' Society, IHT and TAG (the Technical Advisers Group), for their support.

On behalf of the County Surveyors' Society and IHT we wholeheartedly commend *Traffic Calming Techniques* to all with an interest in creating safer, more successful and enjoyable communities and those who manage movement within our streets.

Alastair Jefford
County Surveyors' Society President

Mike Sharpe
IHT President

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Traffic Calming Techniques

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We are grateful to the many people who have contributed to this book and particularly to the following people who drafted certain parts of it. Many other people have assisted in various ways: by commenting on drafts, providing illustrative material; and providing the many Case Studies included in Chapters 7 and 8. The names and contact details for the latter are included with each Case Study so that further information can be sought, if necessary.

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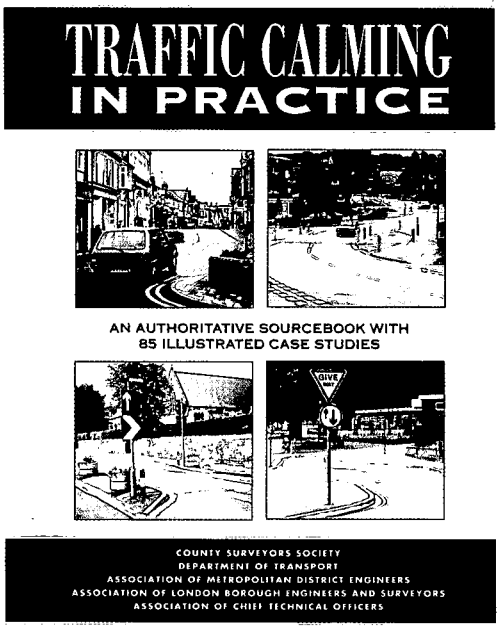
CHAPTER 1
An Introduction to this book

It is now ten years since the County Surveyors' Society, brought out the publication entitled *Traffic Calming in Practice*, (Ref. 1) in co-operation with a number of other organisations such as: the Department of Transport, the Association of Metropolitan District Engineers, the Association of London Borough Engineers and the Association of Chief Technical Officers. It is interesting to note how with the passing of even such a relatively short period of time none of those organisations now exist in that form. This provides just one indication of the organisational changes that have taken place in the world of traffic and transport during this period.

National transport policy has also, inevitably, developed and changed in its direction and emphasis during that time. Notably, transport issues have now risen to the top of public consciousness, a fact frequently demonstrated by public opinion polls taken in various parts of the country. Accompanying this public concern has been a raft of changes to the ways in which local authorities in England, who are responsible for well over 90% of the nations' roads, are required to prepare their policies and deliver them through the mechanisms of Local Transport Plans introduced in 2000 (Ref. 2). Some difference in legislation exists in Scotland, Wales and Northern Ireland following devolution and the creation of new National Assemblies, and this book is primarily concerned with practice in England, though its principles and content are of wide application elsewhere.

But despite all these changes to administrations, procedures and financial arrangements, one matter remains at least as prominent as it was ten years ago. Concerns remain about the speed of vehicles, the volume of traffic and the environmental impacts caused by the passage of motor vehicles past the places in which people live and work; and alongside the footways on which they walk.

In 1994, the term "traffic calming" was relatively new and not widely understood outside professional circles. Today it is much better known and is now accompanied by many other terms such as Urban Safety Management, Area Safety Zones, Quiet Lanes, Home Zones and other ways of describing either the objectives of traffic control, or the measures used to achieve them. During the last decade traffic calming measures have made a very large contribution to the national drop in casualties of 30%.



Cover of *Traffic Calming in Practice*.

The emphasis today has moved strongly towards consideration of the total road (or street) environment and the way it can accommodate and assist the varying needs of people in safe and attractive ways. *Traffic Calming in Practice* (TCiP) was produced by experienced practitioners in response to what was then seen as a demand for a publication which described the basic techniques and illustrated them, using more than 80 case studies, to show how they were being used in real-life situations. The case studies were supported by a commentary on how effective they were in practice. In the event the first edition of TCiP sold out quickly and a subsequent reprint was also sold out, indicating the wide demand for such a book.

With all the changes that have taken place since that time the CSS, the IHT and others, recognised that it is now time to produce a new publication aiming to reflect and explain the development of "traffic calming" as a result of its wider use; and the development of new area wide approaches and a wider range of techniques.

The contents of this book

This book updates the work started in TCiP and extends it to demonstrate how traffic calming techniques have changed. Chapter 2 deals with the context within which traffic calming measures

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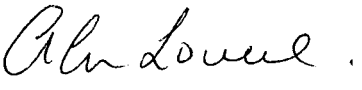
should be considered and Chapter 3 provides guidance on design and implementation. Chapter 4 describes a wide range of techniques currently used whilst Chapter 5 describes many of the practical lessons that have been learned from years of experience. Chapter 6 considers how the use of traffic calming techniques might develop in the future.

Chapters 7 and 8 return to the case study approach used in the earlier book with Chapter 7 taking a longer term view of some of the schemes introduced many years ago, to see how they have stood the test of time and changing circumstances. Chapter 8 provides a collection of more recently introduced schemes.

Annex 1 provides a list of the references and legislation used in this book together with other useful publications for further reading. It is perhaps a good indication of the amount of work and development that has taken place that the Department for Transport's own traffic calming bibliography lists six "Circular Roads", more than 50 "Traffic Advisory Leaflets" and a host of other Transport Research Laboratory (TRL) reports, Departmental publications, and other publications, all related to traffic calming.

What remains as clear today as it was years ago is that there can be no single recipe for providing a successful traffic calming scheme. The characteristics of the road itself, the volume and type of traffic upon it and the nature of the area through which it passes will all affect the approach to be taken. Ultimately, the success of the measures used in terms of their objectives (to reduce traffic flow, speeds and casualties) and their acceptability and perception as a success or failure to the local community, will be individual to each scheme. Each situation will be different and require its own careful analysis, preparation and perhaps above all, its own dialogue with the local community and its elected representatives.

Productions like this one can only be achieved if the people who are actually responsible for this kind of work provide the necessary material to share their experiences with others. We are therefore extremely grateful to all of those authorities and individuals who submitted material for this book; and in particular to the members of the Steering Group and the technical authors listed in the preceding pages as well as to many other people, and their authorities, who have contributed "case study" schemes.



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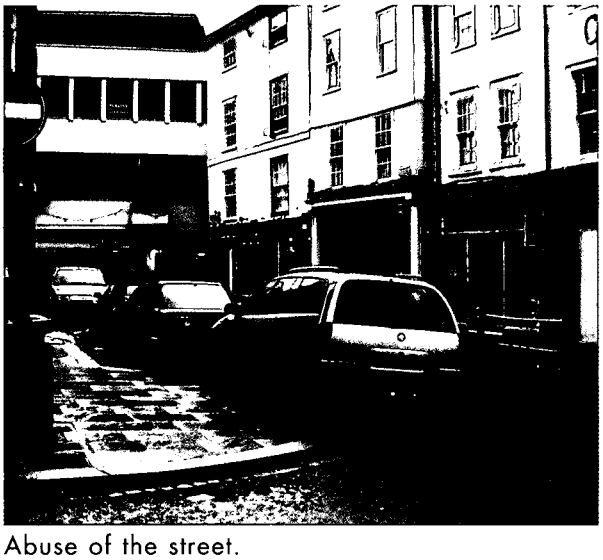
CHAPTER 2
Traffic Calming in Context

The demand for traffic calming

The technique we now know as traffic calming is relatively modern in the UK, though similar techniques have been used in some other European countries for a much longer period. Until the late 1980's the highway design manuals used in the UK defined the standards for road layouts which were appropriate for the safe use of the highway network at different speeds. The road alignments, widths and other features were defined with "standard led" safe layouts, which would be suitable for all classes of vehicle. This approach was based on the assumption that drivers would generally proceed at a safe and reasonable speed, taking due note of any warning signs. Furthermore, it was assumed that the carriageway was available for the unimpeded use of vehicles, except where signed accordingly. As numbers of vehicles have steadily increased year by year, this approach has led to an ever greater dominance of many of our streets by motor traffic to the detriment of pedestrians and other vulnerable road users, adversely affecting their safety and freedom of movement. These problems are most obvious in town centres and dense residential areas, but they can also be encountered in a variety of other situations.

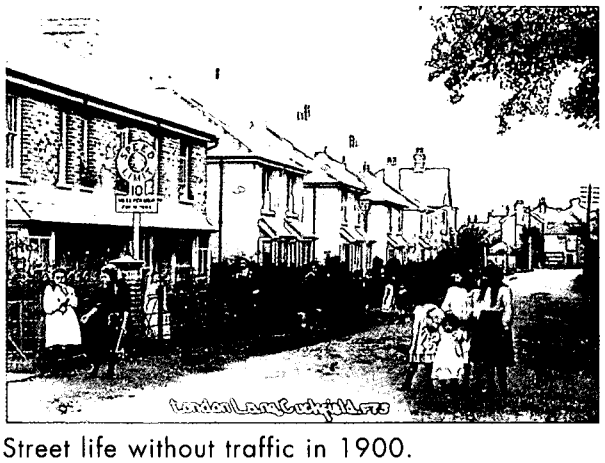
Modern vehicles on the road today have ever improving standards of performance and safety features for their occupants. They are able to accelerate much more quickly, have considerably higher top speeds and can also brake much more sharply. Driver response times have, however, not improved and may have deteriorated due to the distracting temptations of roadside advertisements, mobile telephones and in-car entertainment systems. The result has been increasing concern by the public about inappropriate vehicle speeds in urban centres, residential and rural areas, with calls for action by the relevant authorities; usually the police and the local highway authority.



Abuse of the street.
Note: parking on footway facing wrong way in one-way street.

The issue of "road safety" is a very important one and injury reduction is a major factor behind most of the work carried out on the highway network. Whilst the overall level of injuries arising from road accidents has been falling for a number of years, there are still approximately 3,600 people killed on the roads in the UK every year.

The use of traffic management techniques to restrict entry to certain roads or to reduce vehicle speeds, has been the practice for many years; but demands for greater action brought about the introduction of new style control measures and the term "traffic calming" came into common use in about 1990. It was also around this time that speed limits below 30mph were first allowed in the UK, but only when suitable traffic calming measures had been installed to ensure that vehicle speeds were reduced to make the new "20mph zones" self-enforcing (ie, physical measures to prevent vehicles travelling much faster than the posted speed limit).



Street life without traffic in 1900.

Traffic calming measures initially employed purely physical measures, which usually involved some form of vertical or horizontal deflection of the normal traffic path, with the intention of compelling the driver to reduce speed in order to safely negotiate the new feature. Whilst these kinds of measures are still in wide use and take many different forms, the term "traffic calming" now

covers a far wider range of techniques (see Chapter 4). These include measures which aim to change the driver's perception of the area through which he or she may be travelling, as well as the careful use of urban design so that the measures blend appropriately with their surroundings.

The philosophy of "traffic calming"

The main objective of traffic calming is to produce a road network that is driven calmly, smoothly and safely by drivers, at a speed that is appropriate to the local environment and other road users. The visual appearance of a street should make it clear to any reasonable driver that the design speed for that street, be it 10, 20, 30 or even 40mph, is the correct and reasonable speed so that the driver then reacts and drives accordingly. The design features used to achieve this are often termed traffic calming measures and include any legal measure in the street that makes it appear to drivers that the design speed is the correct maximum speed. This book describes (in Chapter 4) a range of techniques which can contribute to a calmed street environment.

Sensitive traffic calming.

Good traffic calming should not appear excessively onerous to drivers, forcing them to drive at a slower speed than appears to be reasonable – this would result in frustration and poor driver attitude both within the area and on leaving it. The result should be that all the visual and physical messages given to the driver are in harmony with one another. In the ideal situation, features that demand a vehicle speed of, say 20mph, should be matched with a narrow road width and limited forward visibility that discourages higher speeds. A wide straight road with road humps gives conflicting visual messages and drivers will be reluctant to travel at a speed lower than that which seems appropriate to the character of the road.

The choice of design speed for a road is at the heart of the concept. The initial assessment of the problems and the likely solutions should result in the choice of a suitable design speed that people would happily accept in their neighbourhood. This assessment should include the needs of all non-car occupants including pedestrians, bus users, cyclists and motorcyclists, the disabled, emergency services and indeed residents and other road users who may have to drive over and through many features on a return trip. The design speed limit needs, ideally, to be self-enforcing, from which follows a choice of zone type and the traffic calming features to be used.

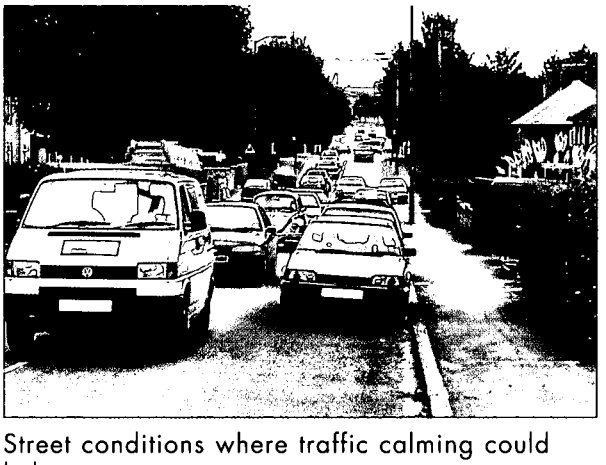
Understanding the problem

Before any choice can be made about the suitability of traffic calming, or even the type of calming measures which might be suitable for a particular location, it is important to determine the purpose for which the scheme is intended.

Traffic calming measures are usually considered when there is:

- ◇ a demonstrable safety problem with a record of accidents and excessive speed;
- ◇ a perceived safety problem where people feel threatened by the speed, proximity, volume or size of traffic;
- ◇ considered to be too much traffic passing along a particular street, or through an area considered unsuitable for it;
- ◇ unacceptable disturbance from traffic in terms of visual intrusion, noise or air pollution;
- ◇ inappropriate domination of street space by vehicles, thereby diminishing the quality of life of residents, shoppers and traders.

Any one of these factors, or a combination of them, can lead to consideration of the use of traffic calming measures but the location and purpose of any treatment needs to be fully understood from the outset.



Street conditions where traffic calming could help.

In understanding the problem, and its possible solution, consideration should also be given at the earliest stage, to the physical extent of the area (eg, it may be a linear problem on one road, or perhaps a much wider area); and the type of road (eg, Trunk, Principal, Unclassified, High Street, etc.), each with its own type of traffic flow and make up. In addition, the nature and characteristics of the surrounding area (eg, city centre, residential area, business district, rural village, rural area, conservation area) will also affect the approach to the selection and design of the measures to be used.

The designer must understand both the purpose of the scheme and the characteristics of the location before moving on to the next stage of considering what type of measure might be both effective and appropriate. This is the point at which it is often valuable to engage the local community so that their views are known from the earliest stage.

From the above considerations, conclusions need to be drawn on the purpose of installing any traffic calming measures. Consideration has to be given to the existing (legal) speed limit, the current actual traffic speeds and the appropriate design speed, following any changes. In addition consideration must be given to the balance of uses of the street space; and how better balance can be achieved: for example what is the desired ambience of the street, should it be calm, resident or shopper friendly, allow vehicle access, include parking?

Thus there are many questions to be answered before attempting to set down any alternative street layouts for consideration in a public consultation: for example, the differences between urban and rural schemes are significant. In Chapters 7 and 8 examples are given of a number of schemes that have been implemented in various locations. They have been categorised under the three headings: Town Centres, Rural and Residential.

In busy urban locations there is a need to take full account of the daily needs of the community living in the area and those involved in commerce, journeying to and from work and school, and other activities. This will include those people shopping, visiting or simply using the locality to gather and socialise. This is a very complex environment which therefore poses difficult challenges to the designer. The objective is to minimise the impact of traffic, particularly that which has no real purpose in the area, and to establish a system of traffic flow which is carried out at safe speeds and which does not endanger or intimidate people on foot or on two wheels. At the same time accessibility must be maintained for those people with impaired mobility, and for traders who require access to conduct or service their businesses.

The overall aim will be to achieve these outcomes within a scheme which is visually attractive and actually enhances rather than detracts from the existing built environment. In these circumstances the proposals may well include a combination of many different types of measure ranging from physical restrictions to speed limits, traffic control systems, traffic signing and educational measures developed with the community, so that the scheme is understood and is used properly. An enforcement strategy, developed with the police and other enforcement agencies, will also help ensure that the desired outcome is achieved.

In rural areas, whilst the situation may be less complex, the feelings of the local community may be equally intense. Almost inevitably there will be those people who feel it is their "right" to drive everywhere and make their own judgements about what speed is appropriate for the conditions. Other people will be more concerned with retaining a more peaceful way of life, as free as possible from the intrusion, noise and pollution caused by motor vehicles. They too may claim this as their "right" and the reason for choosing a rural existence. The challenge for the designer in this case is to try to meet the needs of both groups. This will never be easy and compromises are likely to be necessary.

It was in residential areas that traffic calming was first used to try and calm "through" traffic to prevent it from endangering the lives of people living in the properties fronting roads which may have become busy traffic thoroughfares. Nowadays such schemes are often linked with area-wide road safety schemes because the distribution of accidents may well be such that single-site treatment is not appropriate or effective. Thus area-wide schemes, such as "20mph Zones", that combine traffic calming measures with other accident reduction features, and perhaps environmental improvements, may well be appropriate. Careful design of hard and soft landscaping can result in considerable improvements to the appearance of the area and its acceptability to the local community. In some circumstances the community itself may be prepared to contribute towards the costs.

National Policy Background

Much of the recent legislation in the UK demonstrates a will to include the community in both determining priorities and in developing the appropriate measures to deal with them.

Evidence from public opinion polls has frequently shown that traffic matters, particularly speed management and enforcement, feature highly as priorities within the community in comparison with other areas of service.

In 1998 national government produced the White Paper – *A New Deal for Transport - Better for Everyone* (Ref. 3), and various other strategy papers addressing different aspects of transport and its place in society. The overall context for traffic calming is provided within *Transport 2010: The 10 Year Plan* produced in July 2000 (Ref. 4 - currently under review). This plan set out the policy framework for the nation's transport systems and provided additional funding for a broad range of road and rail measures, including significant increases to the funding available to highway authorities through their newly introduced "Local Transport Plans".

At the same time, government reviews of speed policy and road safety led to the publication, in March 2000, of a new *Road Safety Strategy* (Ref. 5) which identified the need to:

- develop new hierarchies of rural and urban roads defined by their function and quality;
- provide better information to help drivers, including more effective speed limit signing;
- target enforcement to improve compliance with speed limits and safety;
- simplify the process of making speed limit orders;
- introduce 20mph zones and speed limits in residential areas, especially in areas with large numbers of children.

New casualty reduction targets were also set for the year 2010 (Ref. 5) namely:

- a 40% reduction (from the average of the 1994 to 1998 figures) in the number of people killed or seriously injured from 47,656 to 28,594;
- a 50% reduction in the number of children killed or seriously injured (recently updated to emphasise socially disadvantaged users);
- a 10% reduction in the slight casualty rate.

Government guidance to local authorities in preparing their Local Transport Plans (Ref. 2) included the words:

"local safety strategies should include speed management to achieve safe vehicle speeds on all roads and ensure that speed limits set are appropriate, consistent and enforceable...and traffic calming measures should be employed to encourage both speed reduction and compliance with limits..."

Thus there is now a renewed emphasis on casualty reduction and traffic calming is seen, along with other measures, as playing a significant role in making our roads safer.

Other more recent legislation affecting speed management, the priority to be given to it and community issues is provided in:

- the Crime and Disorder Act 1998 (Ref. L1), which promotes public consultation aimed at establishing priorities for action;
- the Local Government Act 1999 (Best Value) (Ref. L2), under which local authorities must consult with local people to determine their needs and priorities; and
- the Local Government Act 2000 (Ref. L3), which encourages local authorities to prepare community strategies and work in partnership with other service providers.

A driver's view inviting higher speed.

Alternative types of measures

A successful design is more likely to be achieved by adopting an overall "package" approach, rather than by using a scattering of different measures. This will help avoid one of the most common sources of objection to traffic calming schemes, that they appear to be ill thought out and the result of a formulaic approach. Chapter 3 on "design and implementation" covers the sequence of design questions and the methodology in some detail, whilst Chapter 4 provides details of a wide range of individual measures.

Within Chapter 4 traffic calming measures are grouped under the following broad categories:

A. Vertical and Horizontal Deflections
B. Traffic Management and Control
C. Traffic Signs, Road Markings and Lighting
D. Zone (or Area-Wide) Treatments
E. Enforcement Activity
F. Community Involvement
G. Needs of Special User Groups

In many cases combinations of these different types of measures may be necessary in order to provide a strategy which suits the type of problem, its location and most importantly, the local community.

(NB A comprehensive listing of the Topics is provided on pages 5 to 7 of the Contents and User's Guide.)

CHAPTER 3
The Design and Implementation of Traffic Calming Measures

The development and introduction of a traffic calming scheme can be a relatively complex process. It usually involves the following stages:

- identifying a particular problem or issue requiring attention;
- consideration of its priority (or urgency) for a solution;
- investigation of possible alternative types of solution in the context of the wider policy frameworks for the highway authority;
- first stage involvement of the public into problems and possible solutions;
- initial design alternatives;
- further consultation with the public and other bodies;
- detailed design;
- scheme approval to proceed;
- processing any necessary traffic orders;
- letting the construction contract;
- constructing the scheme;
- post scheme monitoring and review;
- possible scheme modification.

All of these matters are explained in more detail in this chapter and a process flow chart showing the main stages of a traffic calming scheme is shown below as Fig. 1.

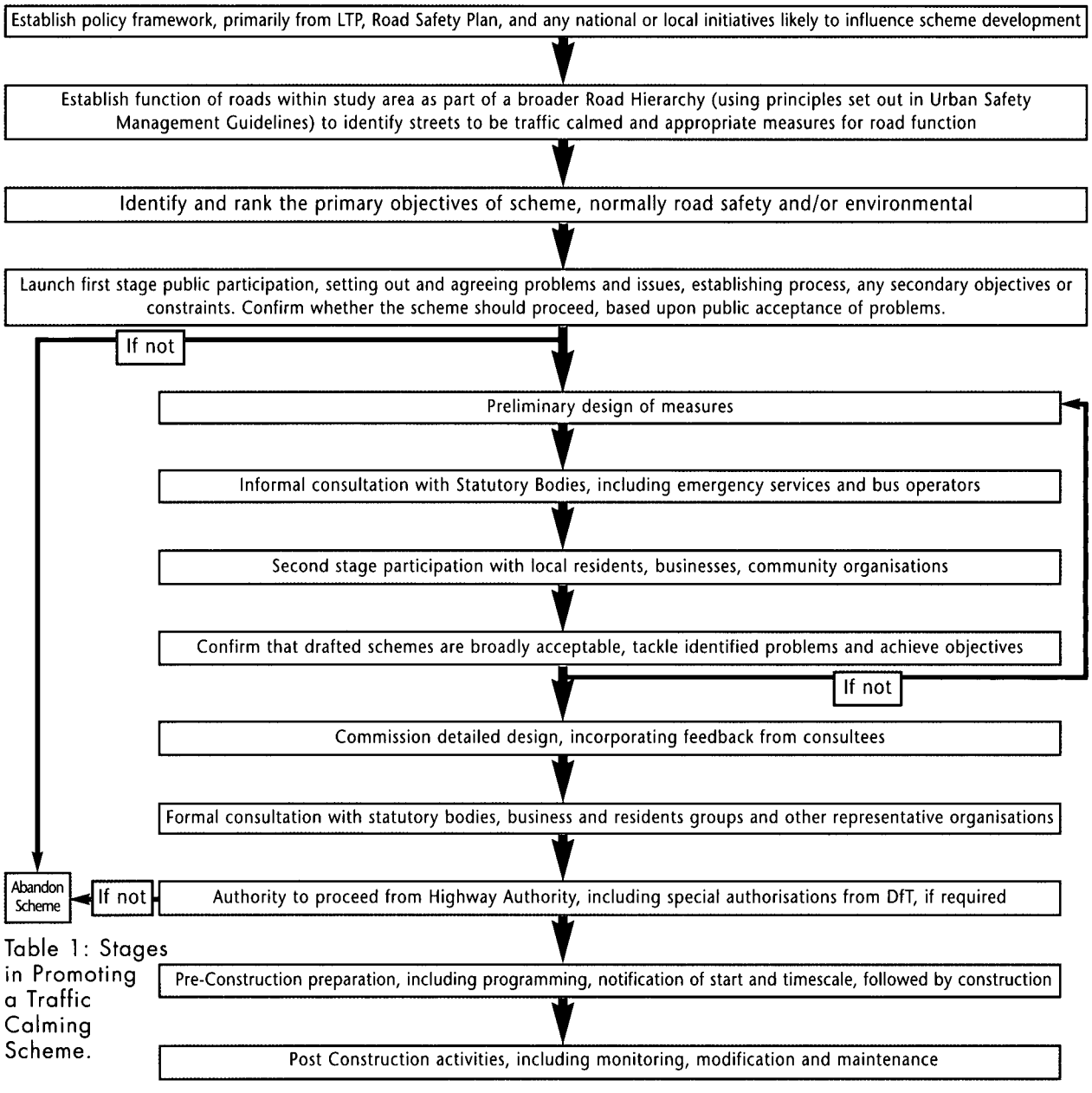


Table 1: Stages in Promoting a Traffic Calming Scheme.

The Process of Public Consultation and Participation

For various reasons, traffic calming schemes can prove unpopular and there are many examples of measures being modified, or even removed, following implementation. The most successful and acceptable schemes are likely to be those developed by multi-disciplinary teams of professionals working closely with the local community.

It is important to differentiate between the two types of consultation associated with traffic calming schemes. Some measures, including changes to speed limits, require by law consultation prior to their implementation, (eg, with the Police), and this is written into the appropriate legislation (see below). In addition, consultation for 20mph zones requires consultation with the emergency services and (where appropriate) bus operators. The Highways (Road Humps) Regulations 1999 (Ref. 6) have more extensive consultation requirements with all interested representative organisations.

Statutory consultation must be meaningful with all objections clearly recorded and considered and any decisions made, documented and supported by objective analysis. The concerns of individuals or organisations such as the emergency services and bus operators must be seen to be carefully balanced against the anticipated benefits arising from the traffic calming scheme itself. The cumulative impact of speed reducing features on the response times of an emergency fire or ambulance service vehicle can be significant and designers may need to incorporate features to minimise impact on these vehicles, and perhaps public transport (buses), bicycles and essential servicing vehicles (see also Group G in Chapter 4).

The second form of consultation (referred to in Traffic Advisory Leaflet 7/96 - Ref. 7) is related to the process of seeking the views of those members of the public likely to be affected by the traffic calming. If a scheme is to be accepted by the local population and their political representatives, local community involvement is essential. There is a clear distinction to be drawn between consultation and participation in the preparation stages of a scheme. It is strongly recommended that the latter approach (ie, participation) is adopted, involving the public in the identification of problems and their solution, through to the formulation of a comprehensive package of traffic calming measures, should this prove to be the appropriate approach.

Traditionally, public consultation has often taken place following the preliminary design of measures, where engineers present their proposals. The views of visitors to exhibitions, and of those people affected by the measures, are then reported to elected members and can result in amendments to scheme details. As far as the public is concerned, this type of consultation is sometimes perceived as telling local people what the local authority has already decided to do and can lead to accusations that the consultation process is purely cosmetic.

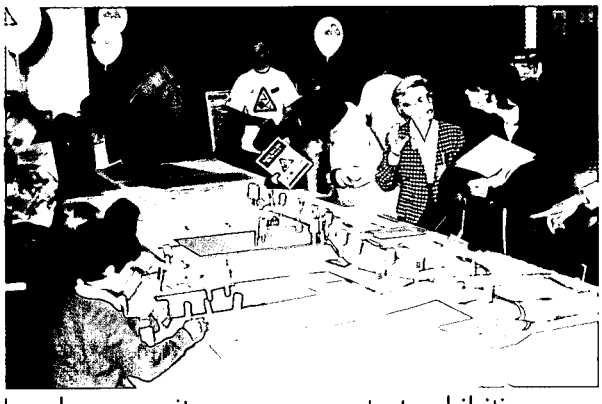
A better approach is to involve the public in a true participation exercise, in which they feel involved throughout the process. Typical participation stages may include:

- ◇ confirmation of problems – to secure public recognition that a problem exists which could be resolved through the use of traffic calming measures;
- ◇ identification of options – agreeing any limitations regarding the use of specific techniques or measures (eg, no speed humps);
- ◇ presentation and consideration of proposals – publicising the draft final scheme with construction details, materials to be used and likely impacts, including how the identified problems will be resolved;
- ◇ adoption of the finalised scheme, including any last minute modifications.

Practitioners usually find that a well-informed public gain a better understanding of the issues and also develop a greater trust in the professionals advising them. The first stage in the process is very important as people can be very resistant to change. Unless there is widespread recognition amongst the local population that a problem exists, it will be difficult to justify taking any action at all. If this public recognition is not established with the community, the local authority may be well advised to divert its limited resources elsewhere.

Plans and technical drawings presented for public consideration and comment can be difficult for non-technical consultees to understand. More use of illustrations, three dimensional models and photo-montage techniques can help explain proposals

Taking proposals to the community.
Courtesy Plymouth City Council.



Local community can comment at exhibitions.

more effectively. It will also be helpful to have friendly and informed staff available to answer questions and explain details.

Many Local Authorities now use formal market research or independent survey techniques to help gauge public reaction and this can help prevent a vocal minority from unduly influencing scheme development by measuring a more representative public reaction to traffic calming proposals. The use of "focus groups" or a "citizens jury or panel", "task forces" or "joint steering groups" is also increasingly common. Such techniques involve taking a representative sample of the local population and examining, in much greater detail than is practical through traditional consultation, the problems to be solved and the options for improvement, including technical issues.

Organisations or groups who may have an input to scheme formulation include:

- ◇ emergency services – Police, fire, ambulance;
- ◇ other affected local authorities, including district, town and parish councils (covering councillors and relevant departments including as appropriate, refuse disposal, schools, sheltered accommodation and planning);
- ◇ the Highways Agency (when DfT owned roads are involved);
- ◇ statutory undertakers (eg, gas, water, electricity, cable companies);
- ◇ road maintenance organisations (including street cleansing);
- ◇ bus operators;
- ◇ taxi drivers;
- ◇ civic societies and local groups;
- ◇ residents, especially frontagers and others from the surrounding community who may have an interest in the scheme;
- ◇ special interest groups (ie, those representing cyclists, bus users, equestrians, pedestrians, farmers, the elderly, disabled people and others);
- ◇ other statutory bodies;
- ◇ maintaining agents and contractors (including those responsible for winter maintenance);
- ◇ haulage and motoring associations;
- ◇ members of parliament;
- ◇ local businesses/industry (eg, Chambers of Commerce), and
- ◇ post offices/shops.

Whilst this is a very long list of potential consultees, experience suggests it is better to approach bodies with a possible interest at an early stage rather than find out later that they are opposed to the proposals.

The Relevant Legislation

The designers of traffic calming features must appreciate that there is legislation which governs their use and ensures that they comply with it, or seek dispensation or special authorisation as appropriate. For many practitioners this is achieved through reference to the appropriate Technical Standards, Guidance or Advice Notes. The Department for Transport regularly publishes a bibliography of current guidance and advice (see Ref. 8).

No work can be carried out on a Public Highway unless it is permitted by law. Highway Authorities in the United Kingdom undertake their work through a number of enabling Acts of Parliament. These range from general powers to do work, through various Local Government Acts such as the Local Government Act (1985) (Ref. L4), the Highways Act (1980) (Ref. L5) and the Road Traffic Regulation Act (1984) (Ref. L7). In addition, more specific legislation has been introduced to deal with the provision of traffic calming measures. These powers are explained below.

Background to Legislation

Research and experimentation with traffic calming devices and techniques commenced in the late '70s/early '80s. At that time there were no specific traffic calming regulations. Practitioners were obliged to obtain special authorisations from the Secretary of State; or on the liberal interpretation of existing highway law (particularly the Highways Act) by legal advisors to the highway authorities' engineers. Many of the early traffic calming techniques were tested off the public highway before their eventual introduction, with considerable experimentation and modification.

The interest of Local Authorities in traffic calming techniques resulted in a large increase in requests for individual scheme authorisations by the Secretary of State. In recognition of this situation, regulations were initially introduced (the Highways (Road Humps) Regulations 1983) to permit the installation of measures without the need for

specific authorisation. These were very prescriptive on what could, or could not, be used. Greatly simplified requirements were later formulated by Government and are currently set out in the Highways (Road Humps) Regulations 1999 (Ref. 6).

Current Legislation

The Highways Act 1980

The Highways Act (1980) (Ref. L5) (with amendments) is the primary piece of legislation covering maintenance, use and improvement of the public highway. Relevant powers for highway authorities in the Highways Act include Section 64 (covering roundabouts), Section 68 (pedestrian refuges), Section 75 (variations to widths of carriageways and footways), Section 77 (alteration of carriageway level), and Section 90 (road humps).

The Transport Act 1981

This act (Ref. L19) included regulations which added sections 90A to F to the 1980 Highways Act to include:

- ◇ permission to install road humps, but only where speed limits are 30mph or less (Sections 90A and B);
- ◇ requirements to advertise and consult the Police (Section 90C); and,
- ◇ a confirmation that road humps installed in accordance with regulations, installed prior to adoption or specially authorised, are not highway obstructions.

This latter point is important as it is very clear that a road hump which does not fall into the three categories listed above is an obstruction in the highway and could lead to prosecution or civil claims for damages.

The Road Traffic Regulation Act 1984

Highway authorities are able to determine the usage of sections of the public highway network, using powers in the Road Traffic Regulation Act 1984 (Ref. L7) to control access, by vehicle type or time of day for example. In practice these powers are widely used.

The Traffic Calming Act 1992

The powers to construct traffic calming measures were contained in the Traffic Calming Act (1992), (Ref. L8) which added Sections 90G, H and I to the Highways Act permitting works:

"...for the purposes of promoting safety or preserving or improving the environment through which the highway runs".

The Highways (Traffic Calming) Regulations 1993

These regulations are described in Traffic Advisory Leaflet 7/93 (Ref. 9 produced by DfT) and the available traffic calming techniques (at that time) are listed. Amended legislation saw the introduction of the Highways (Traffic Calming) Regulations 1999 (Ref.10) which provide powers for highway authorities to install other measures such as build-outs, chicanes, pinch-points, gateways, islands, overrun areas and rumble devices (these techniques are all explained in Chapter 4).

Traffic Calming Regulations are available for a wide range of traffic calming measures used on public roads. However, legislation, or the application of it, may differ in England, Scotland, Wales and Northern Ireland. It is, therefore, important that reference is made to the relevant legislation for the particular country concerned. [For Scotland refer to "Roads (Scotland) Act 1984" (Ref. L9), "Road (Traffic Calming) (Scotland) Regulations 1994" (Ref. L10) and "Road Hump (Scotland) Regulations 1998" (Ref. L11). For Northern Ireland refer to "Traffic Calming Regulations (Northern Ireland) 1995" and "Road Hump Regulations (Northern Ireland) 1999" (Refs. L12 and L13)].

The Highways (Road Humps) Regulations 1999

The current 1999 Road Humps Regulations (Ref. 6) are flexible in terms of the design and location of road humps. The Regulations do, however, require consultation with the Ambulance and Fire services, as well as other organisations or groups representing people who use the road, including bus operators and frontagers (ie, local businesses and residents). Changes included in the 1999 regulations allow variations in the height, location and spacing of humps. For example, the maximum suggested height for road humps is 75mm, instead of the traditional 100mm previously adopted by many highway authorities. Research has shown that the lower humps can have the same speed reducing effects without the same level of discomfort to vehicle occupants; and they reduce the risk of grounding of vehicles. Profiles were also amended, using shallower gradients; and the regulations also permit the use of sinusoidal ramp profiles (see Topic 1 - Chapter 4).

The current regulations also include lighting requirements and provisions concerning road humps in 20mph zones. They enable highway authorities to adopt a more flexible approach to the design of road humps, though it should be emphasised that designers must exercise a "duty of care" and should ensure that innovative designs do not compromise safety.

Road humps cannot be installed on roads with speed limits greater than 30 mph without special authorisation, and so far no road hump design has been approved for use on roads with speed limits greater than 30 mph.

Requirements for 20 mph Limits and Zones (see also Topic 18)

Legislation covering speed limits included changes in 1999 to permit local authorities to introduce 20mph speed limits without the consent of the Secretary of State. The changes also permit the introduction of 20mph speed limits, indicated by terminal and repeater signs alone, and 20mph zones, using terminal signs together with traffic calming devices intended to keep speeds low. All speed limit proposals have to be advertised in accordance with Regulation 6 of the Local Authorities' Traffic Orders (Procedure) (England and Wales) Regulations 1996 (Ref. 11).

For 20mph limits, speed limit signs indicating the end of the speed restriction are placed on both sides of the road and, when on trunk and principal roads and within 50m of a street lamp, these must be illuminated. Repeater signs are also used.

For 20mph zones, terminal signs must be placed on either side of the road but do not need to be illuminated. Furthermore, traffic calming features within the 20mph zone no longer need to have signs warning of their presence.

Details of these signs are included in the revised Traffic Signs Regulations and General Directions (2002) (Ref. 12).

Special Authorisation (of Innovative Features and/or Signs)

The Secretary of State retains the right to authorise measures that are not prescribed in current regulations (see Ref. 13 – TAL 3/93). However, the purposes for which signs are prescribed in the Traffic Signs Regulations and General Directions cannot be changed by special authorisation. If, however, innovative features are introduced for which there is no prescribed warning or information sign, applications can be considered for a special authorisation, provided sufficient justification can be supplied. This process can take time and is often tackled by seeking authorisation on a trial basis, with a view to formal authorisation following a successful implementation and demonstration period.

At an early stage designers should seek advice from Department for Transport on whether a special authorisation is likely to be needed and whether it is likely to be given. If this situation is envisaged then the scheme programme should allow sufficient time for the authorisation process to be completed, when this is necessary.

The Role of Standards, Guidance and Advice Notes

Standards, guidance and advice notes are not legislative documents. Their purpose is to help practitioners to interpret the legislation and offer practical suggestions to designers. Advice notes often include examples of good practice and they help ensure an element of consistency across the country when a specific measure is introduced.

In practice, the advice given has sometimes been used as a design template and copied precisely, with little further thought being applied to the particular problems to be solved. This can lead to poor designs and undesirable impacts on the surroundings. Each situation should, therefore, be considered individually and care should be taken when using standard details, checking that they are appropriate for a particular circumstance prior to implementation.

As the range of potential traffic calming solutions increases, designers need to establish the correct circumstances for their use, particularly when associated with or combined with other measures. Traffic Advisory Leaflet 7/96 (Ref. 7) includes a number of statements emphasising this, including:

"...authorities will need to ensure that an adequate duty of care is exercised" and,
"...it is for local highway authorities to ensure that designs do not compromise safety."

Technical advice notes and standards, and the provision of advisory leaflets, have helped promote good practice and allowed engineers to point to solutions applied to the trunk road network, (the Secretary of State's roads), and show compliance at a local road level. They do not, however, absolve a highway authority of any of its legal obligations.

Design Considerations

A traffic calming scheme should not be designed in isolation but as part of an overall strategy for the area in which it is situated. Traffic calming schemes can, for example, assist the promotion of sustainable modes of transport together with environmental and safety improvements. In the past there has been a tendency to treat relatively small areas, normally because of budgetary constraints, and this can greatly reduce the potential benefits of a scheme. There is also a risk of migration of the problems, accident or environmental, to other adjacent areas, if a traffic calming scheme is very

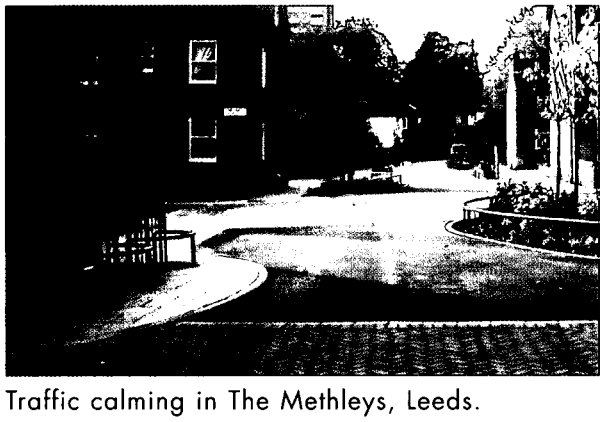
localised. A strategic plan for traffic calming throughout an area, providing a comprehensive framework for the introduction of area-wide measures, will, if necessary, permit introduction in stages to reflect limited budgets.

The *Guidelines for Urban Safety Management*, produced by the IHT (Ref. 14), contain advice on how to establish this policy framework in a structured way. The approach is based upon the formulation of a "road hierarchy" and helps inform traffic management and control policies as well as traffic calming.

The development of a road hierarchy for an area is, therefore, an important part of a successful design process. For this to work well the function of each road, in terms of the needs of all road users and not just vehicular traffic, must be understood. Current and future land uses are important factors in this process. Once established, the road hierarchy can also be used as a basis for future development control and will influence the design of new estate roads and accesses.

Design principles may need to be varied to suit local circumstance. For example, in a large urban area, traffic calming will try to help drivers distinguish between highways with a different emphasis or function, making it clear that the driver is entering into a residential or environmentally sensitive zone. For schemes in small towns or villages, the measures to be adopted may seek to remind drivers that they are now sharing the road with other local users, having driven previously for many miles on inter-urban or rural routes with little local frontage activity.

As well as the traffic and safety aspects of design, it is also important that traffic calming schemes are seen as a piece of urban or rural design, so that they can make a positive contribution to the streetscene. Well designed and executed traffic calming schemes can add dramatically to the quality of the public realm – as seen below in The Methleys, Leeds. But poorly designed and executed traffic calming measures can severely damage the character and quality of a place.



Traffic calming in The Methleys, Leeds.

Government policy (ODPM, 1999) now requires a stronger focus on good urban design, the creation of better places to live. Traffic calming schemes can provide the opportunity to create places that people can enjoy so it is important that the opportunities are seized to create the sort of environment and design feature that people want. This may mean working in an inter-disciplinary way so that the appropriate civic design skills are available to the design team.

Useful further advice is published by CABE (the Commission for Architecture and the Built Environment) in *The Councillors' Guide to Urban Design*, (2004) (Ref. 15) and *Better Civic Buildings and Spaces* (2002) (Ref. 16 – see also Refs. 17 to 19 and the list of other useful sources of reference in Annex 1).

Scheme Objectives

The design process must start with a thorough understanding of the objectives of the scheme. It is possible to drift away from the original design intent if the proposals are changed and details are modified and, in some cases, the original objectives can be amended, or even completely changed, at consultation/participation stage. In most cases, it should be possible for the initial objectives to be formulated and agreed following the problem identification stage.

The potential contribution of traffic calming schemes to accident and casualty reduction should not be underestimated. As shown in the table opposite, the more significant the speed reducing effects resulting from a particular design, the greater the likely benefit. The stated objectives may include a specific accident saving target.

Research studies have also demonstrated that, as a general rule, where significant numbers of accidents are occurring, a one mile an hour reduction in mean speed will result in a 5% reduction in all-injury accidents and a 10% reduction in KSI accidents. Whilst this research acts as a good general indicator the actual casualty savings achieved by any scheme

Much admired Dutch traffic calming.

will depend on local circumstances and the measures employed, including such matters as local speeds, and the type of road.

% Changes in Injury Accident Frequency by 85th Percentile Speed Reduction

Speed Reduction	Change in Accidents All Severities
0-2 mph	- 10%
3-4 mph	- 14%
5-6 mph	- 32%
7mph or over	- 47%

Table 2: This table illustrates the relationship between speed reduction and accident frequency.

Source: Traffic Advisory Leaflet 11/00 (Ref. 20).

Environmental Considerations

The perceived success of a traffic calming scheme is often linked to the environmental enhancement or economic regeneration of an area. An improved environment can also create the secondary effects of encouraging walking and cycling activity, and perhaps reducing car use for local trips. More importantly, the public acceptability of a scheme is often based upon its environmental impact.

Traffic calming schemes should be designed to be sympathetic to the local environment. The design should take into account the needs of all classes of road user and of those people who live and work near the road. A multi-disciplinary team working in association with local residents and businesses, may offer the best approach to successful scheme development.

Cost is normally a constraint. Road safety benefits are often achievable at relatively low cost, but the environmental impact of a minimalist scheme may be unacceptable. More imaginative use of other alternative (non-highway) budgets may help provide additional resources.

Design Procedures and Quality

Many technical departments and consultancies operate recognised quality systems and will need to follow established procedures covering the development of design work. In all cases, documentation and record keeping are important to demonstrate "due care and diligence" during design.

A "Design File" can be opened, ensuring that the key decisions and assumptions are recorded as the scheme progresses and providing an audit trail for any future project review. Designers will need to consider and audit the whole lifecycle of the scheme, particularly in terms of its safety and cost; and satisfy the requirements of the relevant Health and Safety legislation relating to Construction Design and Management, ensuring measures can be safely installed and subsequently maintained.

Cycle route in pedestrianised area.

Design Parameters

The designer will require the collection of information or data relating to the highway and its principal uses, to ensure that the suggested designs are adequate and will meet local need. Typically, the process will include the assessment of:

- ◇ Accidents – existing numbers, types and causes as well as actual and perceived risk (particularly for vulnerable user groups).
- ◇ Proposed road hierarchy – existing and intended road function, including local distributors, public transport corridors, abnormal or hazardous goods routes, routes followed by emergency service vehicles, and networks for cycling and walking.
- ◇ Traffic – flow (throughout the day and night), composition and speed for all classes of road user.
- ◇ Physical characteristics – road and footway width and alignment and visual condition, street lighting (must be checked during darkness), existing road markings and signing, location of bus stops, requirements for kerbside parking at different times of the day, loading and unloading. Identification of special features for those on foot, using a cycle or with a disability. Where physical changes are envisaged, location and type of underground chambers, drainage gullies and street furniture, should all be established.
- ◇ Environment – traffic noise and ambient noise, and any notable visual characteristics. (eg, vegetation, buildings, surfacing, lighting).
- ◇ Uses for the street – consideration to the different kinds of activities that may take place.

Despite advances in new technologies, with ever more sophisticated recording of information on

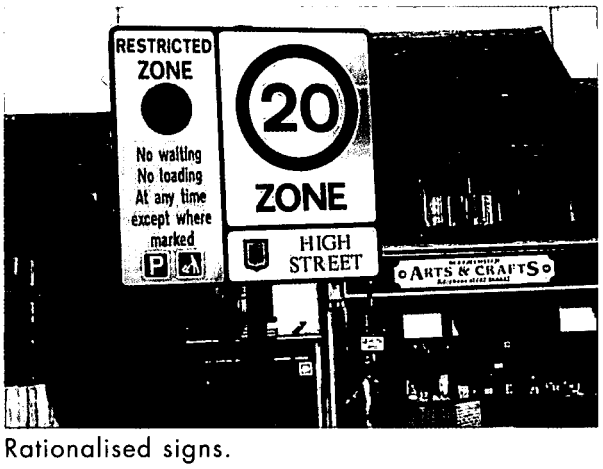
Geographical Information Systems (GIS), there is no substitute for spending time on site at various times of day or night. A "desktop" preliminary design should be checked against actual site conditions. For example, a 75mm height speed table or road hump is unlikely to perform as intended if the existing kerb height is only 50mm, leaving the new feature higher than the surrounding footway. If a flat top road hump is to be installed flush with the surrounding footway, it cannot be simply constructed to the existing footway height. An existing 125mm high kerb would result in a hump design that exceeds the maximum permitted height and falls outside the scope of the Regulations – the footway will normally need to be dropped to be flush with a traffic calming feature. The maximum permitted height for a raised junction is 100mm, bringing it closer to the kerb height but requiring special consideration to ensure an acceptable ramp gradient.

Design Considerations

The design requirements for traffic calming features are contained in the applicable legislation, or detailed in Traffic Advisory Leaflets (Ref. 8) or similar design guidance. There are, however, several design issues worth highlighting:

Signing, road markings and lighting

Traffic calming features generally need supporting by traffic signs (except within 20mph zones where the regulations allow local authorities to omit the signs if requirements related to spacing of features are met). Signing and lighting are subject to the requirements of the regulations and advice, which aim to ensure that traffic calming features are clearly visible to approaching drivers at all times. Street "clutter" can be a problem, particularly in historic areas, and rationalisation of signs and the use of sympathetic lighting systems, such as white high-pressure sodium lamps, is recommended. The design of the lamps themselves needs to be in keeping with the surroundings. (see also Topics 13, 14 and 15 and 16 in Chapter 4).



Rationalised signs.

Signing and carriageway markings should comply with the Traffic Signs Regulations and General Directions (Ref. 12) and any signs that are not prescribed in the Traffic Signs Regulations and General Directions must be authorised by the Secretary of State, as discussed earlier. *The Traffic Signs Manual* (Ref. 21) provides further advice.

As well as using signing, markings and lighting to meet the requirements of the regulations, they can also be used to provide information to ensure that appropriate warning of traffic calming features is given to approaching drivers at all times. Traffic calming measures need to be visible both day and night and in adverse weather conditions. If coloured markings are used, it is important that the type of road lighting allows the coloured markings to be differentiated at night. Drivers tend to drive faster at night so it is important that the full speed reducing/controlling effects of the traffic calming measures are obtained during the hours of darkness.

Surfacing materials

The choice of surfacing materials can be important to the success of a traffic calming scheme. In the UK, coloured surfacings are often used to provide contrast and highlight a particular feature, but different colours have no prescribed meaning and it is important that no implied legal priority is given by the use of these surfacings. Most local authorities attempt to standardise, by consistently using the same colour surfacing for, say, cycle lanes. Contrast may also be provided by changing the type of surface, perhaps switching from a bituminous surface to concrete block paving though these can be prone to "polishing" and are not suitable where a good skid resistance is required. In other locations, specialist surfacing materials may be chosen to provide increased skidding resistance at hazardous sites. Where environmental considerations are strong, natural materials such as granite setts are often used, but it is important to ensure that whatever the material used, it is sufficiently durable and appropriate for the use to which it is put and does not result in a high maintenance liability. An example of this might be where heavy goods vehicles or buses are channelled and hence may cause tracking or rutting of the carriageway.

Drainage and gradients

Modifying the structure of the highway can have a significant impact on its performance. Drainage is an important issue to address as poorly designed traffic calming features may obstruct drainage channels or change carriageway crossfall or camber. Where "dropped kerbs" are used, the highway may start to drain onto the footway; or cause ponding at

Block paved speed cushions.

newly created low points which could result in problems for pedestrians and cyclists. A kerb "build-out" may prevent a footway from draining towards the carriageway and might also disrupt the flow of water along a carriageway channel, giving an opportunity for ponding or icing up in adverse weather.

There may be a need to install new drainage gullies at low points in the highway or the footway, or to change the highway profile to take account of new geometry. Kerb build-outs (see Topic 2) may need to incorporate features to ensure continuation of drainage channels through or beneath the new area of construction.

On routes with significant gradients, the difficulties arising for slowing or stopping vehicles may influence the choice of traffic calming measure, or affect the allocation of priority (eg, for vehicles travelling uphill or downhill). Ramp gradients may also need to be adjusted.

Environmental considerations

The degree to which environmental considerations should be provided for will vary depending on the scale and complexity of the project. The detailed methodology for environmental assessment for new road schemes is set out in Volume 11 of the Department for Transport's *Design Manual for Roads and Bridges* (Ref. 22). Consideration should be given to the potential for partnership with others, the character of the area and any distinctive features, the quality and range of paving materials and street furniture, improvements to existing lighting, noise and air quality implications, planting (including off-site planting), and maintenance implications.

Care also needs to be taken when selecting measures to ensure that the possibility of adverse environmental effects is minimised. Disturbance caused by noise and ground borne vibration can be generated by some measures, particularly where vertical deflection may be involved (Ref. 23). These problems can be exacerbated on roads where there is a high proportion of heavy goods vehicles.

Scheme evaluation

Scheme evaluation or assessment involves comparison of the proposed scheme with the previously defined objectives. There are many techniques in use to do this, both qualitative and quantitative.

An example is the use of a "Goals Achievement Matrix", requiring a scheme to be assessed according to its contribution towards delivery of specific goals: which are normally a mix of transport and environmental objectives.

It should, however, also be remembered that there are many other potential benefits such as: environmental improvement, regeneration effects, reduced crime and fear of crime.

Traffic calming schemes have been shown to be very effective in reducing accidents and the community costs associated with them. Calculated rates of return (equating scheme costs against benefits arising from fewer casualties at a particular junction or across an area) for traffic calming schemes are usually high. Typically, benefits exceed scheme costs within a short period, rather than over many years as for other transport schemes, but this is dependent on the overall scale of the scheme and the amount spent on environmental enhancements which can be considerable. Allocation of Local Transport Plan funding to traffic calming can be a very effective use of resources.

Safety Audit

Many local authorities do not undertake a safety audit of traffic calming schemes, believing it to be sufficient that their highway safety experts are normally involved when tackling existing road safety problems. This may not be the case for environmentally led traffic calming initiatives and so scheme designers or project leaders should ensure that adequate independent checking or review procedures are in place.

Particular care is needed when innovative schemes are implemented. A safety audit may not be relevant when there are no similar schemes with an accident history on which to base safety assessments. In these cases it may be more appropriate to consider comparative risk assessment procedures as an alternative. Risk assessment involves the identification of hazards, the potential consequences and the likelihood or frequency of that hazard occurring. In this way, designs can be amended to include features designed to reduce the severity of an event (consequence), the likelihood that the event will occur (risk), or both. But care should be taken not to undermine the purpose of the scheme.

Design Considerations for Special User Groups

These issues are dealt with in more detail in Group G of Chapter 4.

Pedestrians and cyclists

The needs of cyclists have been successfully incorporated into the design of many traffic calming features, and the effects of measures on their particular mode of travel has been well researched. However, there has been less technical examination of issues affecting those who walk. Scheme proposals should be examined from a pedestrian perspective, to identify any potential obstacles or the opportunity for confusion, particularly for the young and elderly. Traffic calming is intended to deliver safer and more amenable streets to vulnerable road users (by reducing accidents and improving the environment) and potential adverse effects should be considered from a pedestrian's perspective possibly through a "street audit". Traffic Advisory Leaflet 7/96 (Ref. 7) addresses the needs of two wheelers and suggests solutions to potential problems. The same approaches should be adopted for all vulnerable road users.

The needs of the mobility impaired

Many traffic calming features can be particularly difficult for people with disabilities to negotiate or even to comprehend, and some consideration of their needs should be included in the design process. The range of "disabilities" includes those with learning difficulties as well as those with visual, hearing or mobility problems. The Institution of Highways & Transportation provides general design guidance (Ref. 24 *Guidelines for Providing for the Mobility Impaired*), to be used during scheme development; or alternatively the DfT's Mobility Unit can provide advice and guidance. (For example, *Inclusive Mobility*, a guide to best practice on access to pedestrians and transport infrastructure Ref. 25.)

The needs of equestrians and farmers

In certain areas it will be necessary to take account of how traffic calming proposals might impact upon the equestrian community, or on the needs of farmers in moving unusual farm machinery along a particular length of road. Where these needs are identified, particular care will be necessary at the design stage and specific consultation with representatives of these groups should be undertaken.

Bus services

There can be a conflict between initiatives to introduce traffic calming to secure a reduction in road accidents and the desirability to enhance and improve bus journey times and reliability as part of a drive towards sustainable transport. A balanced approach should be adopted, with installation of measures designed to minimise impacts on bus services. Research into the effects of physical traffic calming devices on buses and bus passengers has led to the development of alternatives to the traditional road hump and these are dealt with in Chapter 4.

Effects on emergency services

Representatives of the emergency services will no doubt express their concern if traffic calming schemes adversely affect their response times. Advice is available through Traffic Advisory Leaflet 3/94 (Ref. 26), which is a code of practice agreed at a national level. It is important to establish a policy of identifying key routes through traffic calmed areas where special provision for emergency services can be provided. For 20mph zones, it is recommended that "before and after" monitoring of emergency vehicle response times is adopted to evaluate the effects of the scheme. This approach can be applied to all area-wide or route based traffic calming schemes.

Effects on parking and servicing

The need for parking and servicing in an area, which can actually be useful in keeping speeds low, should not be overlooked during design as this can become very contentious with the local community. (See also Topic 6, Chapter 4.) Where on-street parking is to be provided for, it should be integrated into the overall design.

Pre-Construction Activities

Public information

Good practice requires that businesses and residents affected by proposed highway works should be kept fully informed and involved in consideration of the problems and alternative solutions. It may also be worth discussing the nature and duration of the works with the local community and any key contacts should be included in the information issued to the local community. Despite these preparations there will often be many frontagers who insist that their first knowledge of proposed highway works is when plant and materials arrive on site, and this situation should be avoided as far as possible.

Procurement of equipment and materials

Many local authorities have entered into term (and/or partnering) contract arrangements with

selected contractors, covering small elements of civil engineering work. The designer should, therefore, consider procurement methods at an early stage and adopt appropriate design and the associated details and specifications, to suit local circumstances.

Particular problems can arise through the use of non-standard materials, for environmental or other reasons. There are many examples of high quality but expensive materials being used for construction that may subsequently be almost impossible to maintain or replace. For example, a feature built from expensive, imported stone may look impressive when first installed but, unless replacement material is set aside for maintenance, may quickly become an unsightly patchwork as a variety of alternative materials are used to repair damage or wear. Readily available materials will help assure longevity of the scheme and continued good appearance.

Pre-cast units being placed.

The Construction Process

Differences in procurement practices will affect the construction process. However, the designer's intentions and assumptions should be passed on to those responsible for construction through the scheme design file. There are several issues to consider during the construction phase if the scheme is to be installed as intended and with a minimum of disruption. These include:

- ◇ Compliance with Health and Safety Plan – A Health and Safety Plan will consider the construction and operation of the traffic calming scheme, including formal risk assessments where necessary. Working methods will include consideration of the guarding and lighting of the working zone, in accordance with the requirements of Chapter 8 of the *Traffic Signs Manual* (Ref. 21).
- ◇ Temporary Traffic Regulation Orders – temporary orders, including one-way restrictions, road closures or the removal of large vehicles, may be necessary and should be identified at preliminary design stage and promoted through consultation as an integral part of the scheme, taking due account of the time that this may involve.
- ◇ Minimising nuisance – most traffic calming will be constructed in residential areas. Consideration of environmental impacts (normally noise, dust, fumes) on local people may result in agreement that working hours should be limited. Complaints can best be avoided by keeping residents and frontage businesses informed, however, it is prudent to provide a well publicised point of contact for all enquiries and complaints.
- ◇ Suspending parking activity – in some cases it may be necessary to suspend normal parking facilities and/or access to properties during the construction period. When this occurs proper contact should be made well in advance with those affected, both to minimise inconvenience and to keep the affected people well informed.

Post Construction Activities

Monitoring

Post implementation monitoring of traffic calming schemes is essential to ensure the extent to which objectives for a scheme have been achieved and that the problems originally identified have been addressed satisfactorily. The effectiveness of a scheme should be assessed in a realistic way commensurate with its scale and nature. As a minimum for any scheme, data on flows, accidents and speed should be consistently monitored. For more complex or innovative schemes, in order to monitor the performance fully, surveys of vehicle and pedestrian flows, accidents, speed, noise, and, not least, public perception should be carried out "after" as well as "before" implementation. Careful consideration needs to be given to the extent of any "before" data as, in most instances, this cannot be collected retrospectively. If there is any doubt as to the need for a particular element of "before" data then it may be wise to collect the information even if the expense of analysing it is deferred until it is certain that it is needed.

For any traffic calming scheme, consideration should also be given to publicising the results of monitoring, so that local residents and road users are made aware of the scheme's performance and consulted on their views. This will also help build trust for the future.

Record keeping

Following construction, it is important to keep an accurate record of the implemented scheme. Production of "as-built" drawings should be a requirement for all construction projects. For traffic calming schemes, the standard specification for as-built drawings can be modified to collect key information such as the height or width of a feature, ramp lengths and gradients, where applicable.

As-built drawings are important for two reasons:

- they confirm that measures have been installed to tolerance or within prescribed limits established in the relevant legislation; and
- it is not uncommon for post-construction correspondence to focus on the height of vertical speed reducing features or the precise width of a narrowing. In these circumstances it is not sufficient to rely on the dimensions of a standard detail drawing and local authority staff are often dispatched to re-measure and confirm dimensions.

It is also common to have to vary from design drawings during construction, particularly when installing new sign posts in footways where underground equipment can require their relocation. Recording the precise location, fixing details, circuit connections etc (for lighting, signing and road markings) is important for maintenance purposes but in practice it is seldom done. Feedback to designers may also influence future design work, ironing out any problems encountered.

Modification

Many traffic calming schemes include measures that are innovative and, possibly, controversial. It is not unusual for "teething" problems to occur following construction, identified through monitoring or feedback from local people. Good practice suggests that scheme budgets should be established with a contingency sum for such post implementation modification or fine-tuning. Without this provision, difficulties can continue for a considerable period until a new budget allocation can be found, often to the annoyance or inconvenience of residents. This can result in a poor perception of traffic calming schemes in general and the authority itself, and spoil a generally good result.

Maintenance

Many traffic calming schemes are initiated as "capital" or developer funded schemes and are subsequently poorly maintained, often due to limited revenue funds. This situation should be considered during the design stage, with an emphasis on schemes that have low maintenance needs. Maintenance of measures should concentrate on:

- maintaining their physical integrity and safety;
- meeting legal requirements, particularly in the provision and maintenance of road markings and road signs;
- allowing for street cleansing requirements to be undertaken cost effectively;

Poor maintenance.

- maintaining the appearance and structural condition of the scheme. This is particularly important when environmental enhancements have been included.

The maintenance requirements and whole life costs should be included in the design file, with recommendations for maintenance frequency and a note of any assumptions made by the design team. As previously mentioned, some traffic calming schemes make use of premium materials to enhance the streetscape or minimise adverse environmental impact. Non-standard materials should be avoided if possible because of the potential difficulties and high costs associated with replacement. However, where non-standard materials are used it is essential that additional stocks are taken in to store, to ensure that a match can be achieved where statutory undertakers work is reinstated, or when accident damage is repaired. Not all materials can be readily "patched" and this should be a consideration in the final design.

As well as capital maintenance, consideration needs to be given to routine maintenance requirements. For example, gullies should be located away from any narrowing of the carriageway so that they can be emptied without obstructing the flow of traffic, and the design of physical features should not prevent mechanical street sweeping. Winter maintenance requirements such as snow clearance will also need to be considered. All maintenance activities are more difficult when road humps or road narrowings are part of a calming scheme.

Consideration should also be given to other street activities, such as refuse collection. Most authorities have design and practice requirements limiting "carry" and reversing distances, so refuse vehicles may have quite specific access needs. Furthermore, a significant proportion of householders are obliged to place their refuse bins at the kerbside and the layout of the traffic calming scheme must accommodate this without causing a hazard. Early contact with the waste collection authority is therefore advised to determine their needs.

CHAPTER 4
Techniques for Traffic Calming

The previous chapters of this book have explained how traffic calming techniques can be used to address problems of safety or environmental intrusion caused by traffic in a variety of differing locations. This chapter describes a wide range of techniques, or topics, in current use, divided into groups as follows:

Group A. Vertical and Horizontal Deflections (Topics 1-5)
Group B. Traffic Management and Control (Topics 6-12)
Group C. Traffic Signs, Road Markings and Lighting (Topics 13-16)
Group D. "Zone" (or Area-Wide) Treatments (Topics 17-20)
Group E. Enforcement Activity (Topics 21-23)
Group F. Community Involvement (Topics 24-28)
Group G. The Needs of Special User Groups.

Whilst each of these techniques (or topics) may be used in isolation, it is often the case that combinations of different measures will be more effective. This can be seen in Chapters 7 and 8 in which there are many examples of schemes which have been implemented using different techniques in a variety of situations and locations. Even when the same measures are used, the results may vary as different factors affect different locations. Thus the "before" speeds, type of traffic and the local environment can all have a bearing on the eventual outcome. There is considerable skill in choosing the measures that will be most appropriate to the location and provide the most effective solution.

Group A: Vertical and Horizontal Deflections

The first group of techniques covers changes to the vertical or horizontal alignment of a road. These measures will remove the appearance of a clear flat road space in front of the driver, which often encourages an increase in speed.

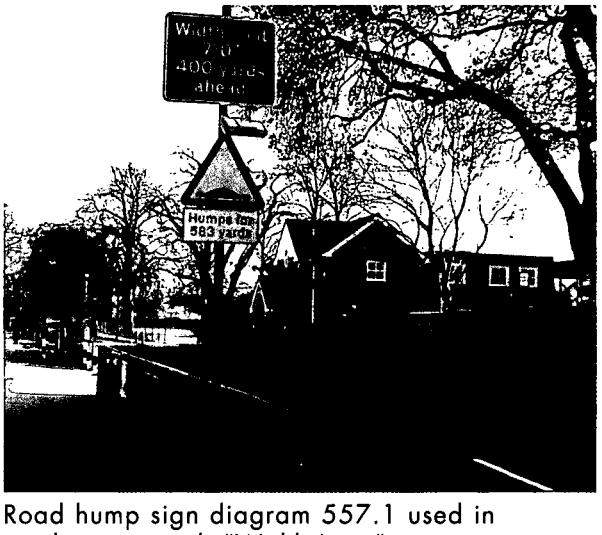
The measures are designed to be uncomfortable to navigate at high speeds and they encourage drivers to maintain a reasonable speed. They are, therefore, regarded as self-enforcing measures.

Topic 1 – Road Humps

The generic term "Road Hump" is used to describe a range of measures which are legal obstructions on the surface of the highway, constructed to control the speed of vehicles in built-up areas. They are all covered by the *Traffic Calming (Road Humps) Regulations* (1999) – (Ref. 6).

Road humps are constructed in a variety of shapes and sizes, to cater for different situations and location, and a traffic calming scheme could include a combination of different types of humps. However, a mix of round and flat top humps could create difficulties for drivers, due to the different acceptable speeds of approach to each type of hump. Traffic calming is normally intended to result in a smooth, controlled flow of moving traffic and the types of feature need to complement one another.

Road humps can only be used on roads with a speed limit of 30mph or less. Whilst not a legal necessity, it is strongly recommended that they are preceded by a speed reducing feature, so that vehicles approach the first hump at a reasonable speed. One of the most common speed reducing features used is a mini roundabout, (see Topic 4), but it could also be a nearby junction requiring traffic to turn or slow down, a sharp bend of more than 70°, a "pinchpoint" with a give-way line, or a junction with a give-way line.



Road hump sign diagram 557.1 used in combination with "Width Limit" sign.

Type of Road Hump	Brief description	Suitability	Achievable mean speeds	Dimensions/ Spacing	Benefits	Disbenefits
Round top hump (Also known as "sleeping policemen")	A simple speed reducing feature, with a curved top surface. (Can be the width of the road but it is more usual to leave a channel for drainage.)	Slow residential areas. Of little benefit to pedestrians crossing the street, except in reducing overall traffic speeds.	13–15mph	◆ 50–100mm in height, 75mm is recommended ◆ spacing less than 100m between humps ◆ typically 3.5–4m long	◆ low cost, approx, £500 each ◆ highly effective ◆ a range of target speeds can be achieved ◆ minimal impact on surface water drainage ◆ small impact on kerbside parking ◆ easy to fit into existing street layout	◆ potential discomfort to occupants of passing vehicles ◆ impact on emergency vehicles and buses ◆ humps may cause vibration, noise and claims of damage to vehicles.
Speed cushions	Small rectangular humps, approximately the width of a car. Usually placed in rows of 2 or 3 across the road.	Most suited to roads that are used by bus routes or for strategic emergency routes. May be accompanied by build-outs or parking restrictions to enable larger vehicles to straddle the cushions.	20–25mph	◆ 60–90mm high ◆ spacing less than 75m between humps ◆ typically 1.6m (W) x 3.1m (L) ◆ on/off ramps not steeper than 1 in 8 ◆ side ramps not steeper than 1 in 4	◆ wider track vehicles such as emergency vehicles and buses experience less vertical deflection (minimising discomfort to bus passengers) ◆ friendlier to cyclists ◆ can be constructed using pre-formed materials	◆ sometimes difficult to achieve an effective layout ◆ relatively less severe deflection therefore reductions in traffic flow can be minimal ◆ if made from pre-formed materials heavy traffic loading can cause damage ◆ may need to control on-street parking ◆ in some cases humps cause vibration, noise and claims of damage to vehicles ◆ no effect on motorcycles
Flat top hump	Normally full width of the road with a short, flat area on top at least 1m long.	Assisting pedestrians crossing the road, especially if hump is the same level as the pavement (footway).	As low as 14mph (using 100mm high humps), but typically 20mph.	◆ 50–100mm in height (no higher than 75mm on a bus route) ◆ Spacing between 70–100m ◆ Typically 1.5–4m long ◆ Ramp gradients 1 in 10 to 1 in 20	◆ a variety of profiles can be achieved ◆ useful pedestrian crossing points ◆ a range of target speeds can be achieved ◆ drainage can be incorporated into design to avoid expensive gully alterations ◆ a range of materials can be used to minimise the negative impact on the local environment	◆ may not be suitable for buses ◆ in some cases humps cause vibration, noise and claims of damage to vehicles ◆ usually more expensive than round top humps

Type of Road Hump	Brief description	Suitability	Achievable mean speeds	Dimensions/ Spacing	Benefits	Disbenefits
Speed tables	Similar to flat top humps but 6m long on top to cater for easier movement of long vehicles especially buses.	Usually used in 20mph zones especially town centres and shopping areas. Similar to flat top hump but greater length and very useful for pedestrians crossing the road.	As low as 14mph (using 100mm high humps), typically 20mph	◆ 50–100mm in height (no higher than 75mm on a bus route) ◆ Spacing between 70–100m ◆ Typically 4–10m long ◆ Ramp gradients 1 in 10 to 1 in 20	◆ a variety of profiles can be achieved ◆ useful pedestrian crossing point ◆ a range of target speeds can be achieved ◆ drainage can be incorporated into design to avoid expensive gully alterations ◆ can be friendly to buses	◆ the most acceptable to buses, but this means reduced speed control for light vehicles ◆ moderately expensive
Junction Plateau	As flat top but covers the full length and breadth of a road junction.	Used at junctions in 20mph zones and as part of gateway features.	As low as 14mph (using 100mm high humps), typically 20mph	◆ 50-100mm high ◆ plan area to cover the whole junction including radii. ◆ Ramp gradients 1 in 10 to 1 in 20	◆ a variety of profiles can be achieved ◆ can create useful crossing points ◆ can be "friendly" to buses ◆ accentuates presence of junction	◆ only good for pedestrians if long enough to include pedestrian crossing route ◆ expensive ◆ should be long enough to allow motorcyclists to mount ramp before turning
"S" and "H" humps	As flat top humps but with an "S" or "H" shape in plan to assist movement of buses. Abrupt vertical deflection for narrower vehicles.	Most suited to roads that are used as bus or emergency vehicle routes.	16–20mph		◆ suitable for wider track vehicles such as emergency vehicles and buses as they can use the flatter gradients	◆ difficult to construct (although preformed ramps are now becoming available) ◆ expensive
Sinusoidal	Round or flat top hump, sinusoidal in longitudinal section for smooth driving.	Slow residential areas.	16–20mph	◆ 75mm high	◆ slightly less discomfort for cyclists than a round top hump	◆ difficult to construct ◆ expensive
"Thumps"	Low round top hump. Usually pre-formed construction.	Suitable for areas where only limited speed control required.	23–25mph	◆ 40–50mm high ◆ 50–75m spacing	◆ inexpensive	◆ can be noisy and give discomfort to bus passengers

Table.3: A comparison of different types of road humps.

There are many road hump shapes available. Within these different shapes the designer also has a choice of dimensions (for height, length, width), spacing and materials. Types of road hump currently in use include:

- Round top humps
- Speed cushions
- Flat top humps – which include:
  - Normal flat top humps
  - Speed tables (long flat top humps)
  - Junction plateaus (raised areas at junctions)
  - "H" humps
  - "S" humps
- Sinusoidal humps (may be round or flat top)
- Thumps and also
- Mechanical humps (see Chapter 6 on Traffic Calming in the Future)

These measures all consist of a physical raising of the carriageway surface to cause a vertical deflection (or change of level) for passing vehicles. Each type of hump has different qualities, benefits and disbenefits so the choice of traffic calming feature and its actual design must be made carefully. The table on pages 30-31 shows some of the different qualities of each feature, including the varying amount of speed reduction that can be anticipated, the type of area for which each is suitable and the benefits/disbenefits.

Where road humps are constructed in an existing street, they can appear to be an alien feature that has been superimposed on the streetscape. There can be a conflict between the restrictive visual message given by the humps and that of the overall street environment. This can lead to driver frustration and an unwillingness to accept their presence. Designing them into a new street will often be more acceptable, especially when horizontal design features are also used, thus minimising the need for road humps.

Vertical features have a greater impact on the more vulnerable types of vehicle (such as cycles and motorcycles) and a hump that can be driven over at 25mph in a car may require a bus to be driven at walking pace in order that passengers do not suffer too much discomfort. The family of flat top humps has grown in order to overcome this problem, with large vehicles obtaining a smoother ride than smaller ones on "H" and "S" shaped humps as well as at cushions.

Road humps should be used to maintain low speed as traffic approaching the hump (or the first in a series) should already be travelling at a speed below 30mph. This is a crucial point and the first hump, or cushion, encountered in any road should be within a reasonable distance (say not more than 60m) of the initial speed reducing feature.

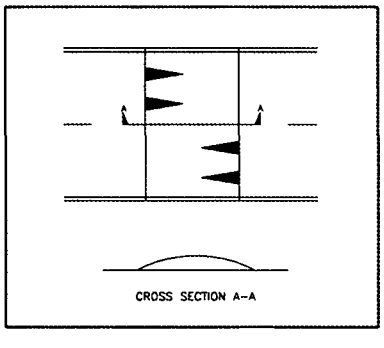
Characteristics and suitability of road humps and speed cushions

Round top humps

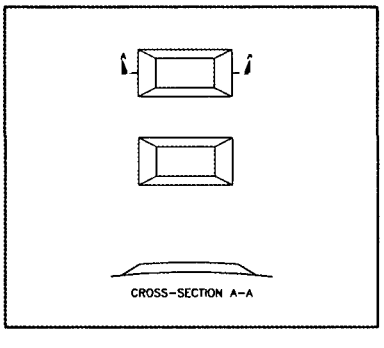
Typical round top hump in Warrington.

These are a low cost, highly effective method of speed control. Historically, the "round top" hump has been the most widely used form of road hump and is generally more effective in reducing speeds than various other means that have been tried. It does, however, have the disadvantage of causing discomfort to vehicle occupants as well as potential noise disturbance to nearby residents.

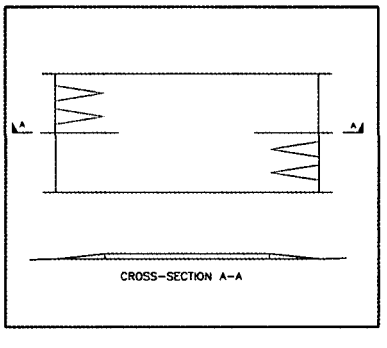
The use of round top humps need not have any great effect on kerbside parking and, because of



Cross section round top hump.



Cross section cushion.



Cross section flat top hump.

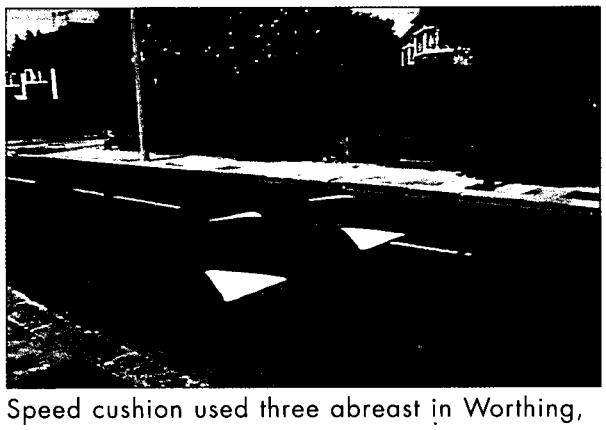
their short length, they are relatively easy to fit into the existing street layout. The construction cost of a single round top road hump can be as low as £500, however, scheme estimates would need to include the associated signing and road markings that have to accompany road humps. The use of special surfacings or the inclusion of drainage features would also increase costs.

Round top humps can produce serious noise and vibration problems caused by passing HGV's and are more suitable for residential roads with few HGV's, buses and emergency service vehicles. However, in recent years the unpopularity of road humps has led to the increasing use of other types of calming devices.

Speed Cushions

Speed cushion in Southwater, West Sussex.

The "speed cushion" was initially developed to enable vehicles with a wider track width (such as emergency service and public service vehicles) to traverse it with less vertical deflection than narrower private cars. Although the fine line between success and failure in achieving this is hard to find, the intention is to channel vehicle flow across a speed cushion to bring about speed control and road safety benefits. A speed cushion is essentially a short, narrow, flat top hump that has to be replicated across the full width of the road, to prevent drivers taking dangerous avoiding action by travelling on the opposite sides of the carriageway into on-coming traffic.



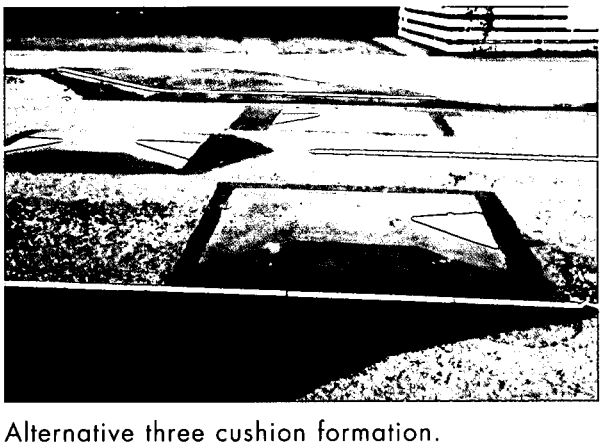
Speed cushion used three abreast in Worthing, West Sussex.

The size and shape of speed cushions needs to take account of the target traffic speed. The layout of cushions is also crucial, particularly where there is on-street parking. Consideration should be given to installing kerb "build outs" (see Topic 2) or to siting cushions three abreast, to ensure that adequate traffic calming exists even when there are no parked vehicles.

In some cases parking restrictions may be required to ensure that buses and emergency vehicles are able to straddle the cushions and therefore minimise discomfort to passengers. On bus routes the distance between a junction and the first cushion should be sufficient to enable the driver to align the bus so that it can straddle the cushion and therefore minimise discomfort to passengers. This may require a site trial with the local bus operator.

On routes used by emergency services it is advisable to use cushions no wider than 1600mm (see Ref: 27). The height should be no greater than 75mm (or less if the cushions are particularly short or narrow) and the width between cushions, or cushion to kerb, should not generally exceed 1000mm with 1200mm as the maximum, and 750mm the minimum. The longitudinal spacing between sets of cushions should normally be 75m maximum, less in a 20mph zone/area.

Cushions can be invisible to pedestrians crossing the road and cause them to trip, so it is useful to mark them with a white thermoplastic edge marking.



Alternative three cushion formation.

Flat top humps

The use of "flat top" humps has a less severe impact on traffic than "round top" humps, but will enable pedestrians to cross the road more easily. There are a number of different profiles in use and each will affect traffic speeds in different ways, depending on the height, shape and length of the hump as well as the speed characteristics of the road. The flat top road hump creates a surface that is level with the footway and can incorporate a zebra or signal controlled crossing, as well as constraining vehicle

A typical flat top hump in use in Crawley, West Sussex.

speeds at that point (Ref. 29). Care should be taken when constructing kerb-to-kerb flat top humps to ensure they do not exceed the maximum regulated height of 100mm.

Flat top humps are often used in streets where there is a high frequency of conflicting movements between vulnerable road users and motorised vehicles, such as in residential and shopping areas. They are very effective at providing smooth and easy crossing places for pedestrians. Combined with the provision of central islands, this can change the overall look of an area to being much more pedestrian friendly and less like a main road for vehicle use only.

"H" and "S" shaped, flat top humps are a variation of the flat top humps designed to reduce the physical impact on buses and emergency services, while remaining effective in controlling the speeds of smaller vehicles.

Thumps

"Thumps" were first used as a low cost alternative to round top humps, but they can be very uncomfortable for vehicle occupants. They are normally 37mm high and 900mm long. Thumps have limited speed reducing capability and would need to be combined with other traffic calming measures in a 20mph zone (see Ref. 7).

Effectiveness of humps and cushions

Casualty reduction

Although casualty reduction is dependent primarily on the frequency of casualties prior to treatment, reductions of 50% to 75% have been achieved. In addition, the severity of the casualties that do occur is often reduced due to the reduction in vehicle speeds.

Traffic Flows

The extent to which traffic flows can be reduced is largely dependent on the availability of, and the difference in journey times between, alternative routes. However, it may not be acceptable for there to be a transfer of traffic (and sometimes causes road safety problems) to neighbouring streets, so the design features may need to be designed to avoid this happening. Reductions in traffic flow of up to 50% have been achieved, but in practice results are very variable and an average of nearer 20% is more typical. Studies have indicated that not all traffic reduction can be explained by transfer onto surrounding streets, as some may result from reduction in trips or modal shift following scheme implementation. Reduction in off-peak traffic levels can, however, be greater, particularly where there are suitable alternative routes.

As speed cushions are less severe than other vertical deflections, reductions in traffic flow can be minimal, although this is dependent on the layout of the roads and the ease of use of alternate routes. Reductions in traffic noise are usually associated with a reduction in traffic flow so speed cushions may not be as effective as some other devices.

Speed

Mean traffic speeds in the region of 13 to 15mph can be achieved using 75mm high round top humps. When positioned at less than 70m apart, flat top humps can result in average speeds of less than 20mph and the average speed for vehicles traversing a 100mm high hump can be as slow as 14mph. Cushions spaced less than 70 metres apart can result in average speeds of 20 to 25mph dependant on their height and width.

It should also be noted that a reduction of average speeds to 20–30mph is usually insufficient to encourage alternative use of the highway, (eg, by pedestrians and children), although perceptions of safety may be improved.

In practice, removal of extraneous traffic, particularly commercial vehicles, and reducing the top speeds of the fastest drivers certainly contributes to improved perceptions of safety, but the effect of displaced traffic on the surrounding road network should also be considered at an early stage. The reduction in overall vehicle speed will be dependent on the "before" speed and the height and spacing of the humps. The spacing between humps is also a factor and on roads where average speeds were previously in excess of 30mph, a hump spacing of less than 100m may be necessary in order to encourage traffic to divert to an alternative route.

Design and construction

The permissible dimensions of humps are given in the *Highways (Road Humps) Regulations* (1999) (Ref. 6), with further guidance provided in Traffic Advisory Leaflets (see the list of References in Annex 1). This guidance includes advice on the appropriate warning signs and road markings that should accompany the road humps. The need for illuminated signs at road humps has recently been removed in the 2002 revision of the *Traffic Signs Regulations and General Directions* (Ref. 12) and this will result in a significant reduction in construction costs.

In 20mph zones the signing requirements are further reduced (see Topic 18 for details). However, steps still need to be taken to ensure that the hump is clearly visible to drivers and this is normally taken to mean that the white triangle should be marked on the approaching face of the hump.

A spacing between features of 50m to 150m allows the designer to fit them into the streetscape, but 75m is considered to be the optimum spacing to avoid drivers adopting an aggressive style of driving, with heavy braking and acceleration between humps.

The transverse profile of humps is not prescribed, but those which are not the full width of the road should provide a kerbside channel of not more than 200mm with side ramps of 150–300mm in width.

The cost of individual road humps will vary considerably, depending on their design and the materials used. A single hump may cost only £500 to £1,000 whereas a raised junction could cost £10,000, even without using high quality materials such as natural stone or blockwork.

Typically, road humps implemented for permanent use are constructed from flexible bituminous materials. A fairly dense mix (eg, hot rolled asphalt) gives stability against deformation. Pre-formed units in concrete or rubber are also available and require positive fixing to the carriageway, usually by means of bolts. However, even when fixed to a concrete carriageway these materials can be susceptible to movement over time.

When they were first introduced, the smaller dimensions of cushions made it attractive to use pre-formed materials (with specially shaped blocks forming ramps and side slopes). However, it has proved difficult to make these devices secure under heavy traffic loading, and they can need substantial repair or replacement after only relatively short periods. As an alternative it has been found possible to install cushions using bituminous surfacing materials. Use of the more dense materials reduces the tendency to deform under traffic loads and renders them more durable. Where appearance is important tables can be "imprinted" with a coloured and patterned surface.

Humps constructed from flexible bituminous surfacing have proved to be the most resistant to deformation or deterioration under traffic loads. The use of block paving (or other small element paving) on ramps can result in high maintenance costs and a potentially dangerous road surface where the paving has worked loose. In some circumstances however, the use of coloured surfacing and specialist materials can add to the visual impact of the feature and contribute to the visual quality of the street scene.

Thermoplastic humps (sometimes known as "thumps") are generally 900mm long and 37mm high and are usually constructed in yellow (or white) thermoplastic material. They are known to cause considerable discomfort to vehicle occupants due to their steep approach gradients and may therefore be unsuitable for many applications.

There should be a smooth transition between the road surface and the leading edge of the hump. If there is any step at this joint it should be less than 6mm to comply with the regulations.

When humps are added to an existing road surface, tapered edges can be used to leave narrow drainage channels, thus avoiding expensive gully alterations. However, this will restrict easy use by pedestrians, especially those with prams or wheelchairs, wanting to cross the road. On newly constructed highways, drainage design can be incorporated with the proposed hump, in which case humps can be built full-height to the edge of the kerb to provide a continuously level footway, except where this would lead to a hump height of more than 100mm.

Adverse effects and concerns

Emergency services and bus operators (see Group G) have been amongst the most concerned about the introduction of any form of vertical deflection, particularly where they are introduced on frequently used routes. Even a "minimalist" round top hump can cause concern and changing to flat top humps or cushions can allay this to some extent. The less severe nature of speed cushions can make them a more acceptable solution on busier routes, particularly those used by buses and emergency vehicles. S- and H-humps have a similar effect to speed cushions but are more effective at controlling the speed of cars.

The use of round top humps should be carefully considered and they are not usually felt to be

suitable for use on roads that serve as a through route or as a local distributor road to a large number of properties. Due to concerns expressed by emergency services and bus operators, flat top hump heights should be no greater than 75mm on the designated routes. Use of longer flat tops (not less than five metres long) will also reduce the adverse impact on these types of vehicle but may make them less effective.

Ambulance during hump trials.

Experience of authorities that have installed humps has shown that road humps of all kinds cause discomfort if traversed at inappropriate speeds, as this is the mechanism by which they encourage drivers to slow down. However for some vehicle occupants, especially disabled people and others suffering from health problems, discomfort may be experienced even at low speeds. Flat topped road humps with a height of 75mm and a ramp gradient of no more than 1:15 are, generally, more acceptable to these users.

Noise levels vary with traffic speed, traffic volume and the proportion of commercial vehicles. It is generally true that where there is a reduction in speed and flow there will also be a reduction in the measured noise levels, unless there is a high proportion of heavy commercial vehicles (say 10%). Notwithstanding this, national surveys and the evidence of highway authority postbags confirms that the perception of noise can be quite different from that which is actually measured. A round top hump acting as a distinct sound source can cause concern to residents, even if the overall noise level arising from traffic passing along the street was greater before installation of the hump. The character of the noise can also change following installation of humps, due to an aggressive driving style or vehicle body noise (due to body rattle, the suspension or unladen commercial vehicles).

In addition to these points, complaints are sometimes made about vibration, discomfort to vehicle occupants, and damage to vehicles caused by the hump itself. Ground borne vibration has been known to be an issue with road humps in some areas, due to the combination of soil type and heavy use by commercial vehicles (Refs. 23 and 30). There is no specific evidence that such ground borne vibrations would cause structural damage to adjacent properties, but the possibility of disturbance should be considered at the time of the design.

With regard to air quality, concerns are sometimes expressed about the possible effects of traffic calming on exhaust emissions. The TRL Report 482 in 2001 (Ref. 31) confirmed that localised emission levels can increase, especially in the case of road humps. However, as humps are most often installed on residential roads with low flow, the increased emissions would be highly unlikely to result in poor air quality or break the National Air Quality Standards.

Drivers need to be more alert when traversing a cushion, and this can lead to complaints about their design and layout. With typically smaller speed reductions than other types of hump the perception may be that they are not very effective. Due to the ability of drivers to "straddle" a cushion, reports of vehicles "grounding" can arise, particularly with sports cars and other low clearance vehicles. The careful specification of cushion height, width and side slope gradient can help avoid these problems.

Topic 2 –
Road Narrowings, Footway Build–Outs and Chicanes

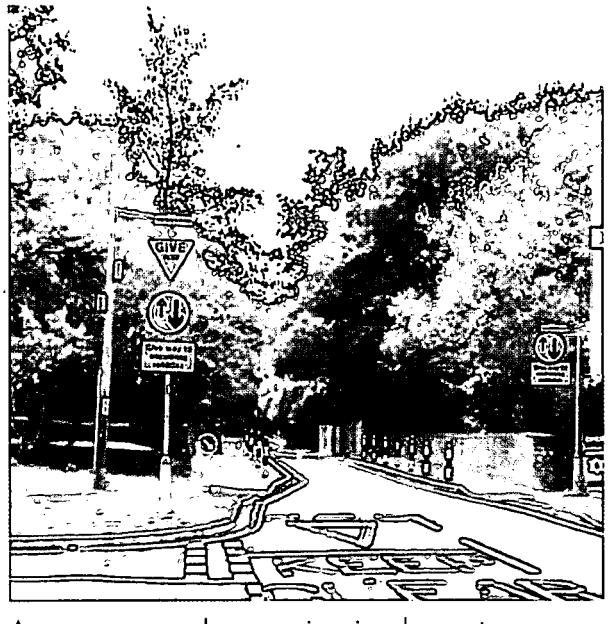
Reducing the available road space for drivers by constructing road narrowing features alters the appearance of the street and has the effect of lowering the speed at which drivers feel safe to drive. Road narrowings are a form of horizontal traffic calming, as distinct from the vertical traffic calming (described in Topic 1). Narrowing the carriageway can be carried out in conjunction with improvements for pedestrians and cyclists, changes to parking, or simply improving the local environment.

This re-allocation of street space can improve the quality of life for residents and reduce the dominance of motor vehicles.

Carriageway narrowing can take the form of:

- ◇ a gateway feature which retains two-way flow of traffic;
- ◇ a pinch point where traffic can only pass through the feature in one direction at a time (known as priority one-way working);
- ◇ central islands to prevent overtaking;
- ◇ chicanes to force traffic to deviate from a straight through path;
- ◇ reduced width over a length of road (while still being suitable for two-way hgv traffic);
- ◇ reduced width over a length of road with the use of advisory cycle lanes to visually narrow the street;
- ◇ reduced width over a length of road such that light vehicles can pass each other but larger vehicles have to give way.

A combination of one or more of the above features can be used and overrun areas can also be provided to allow longer vehicles to pass whilst retaining the visual effect of a narrow street.



A one way road narrowing in place at Rudgwick, West Sussex.

Characteristics and suitability

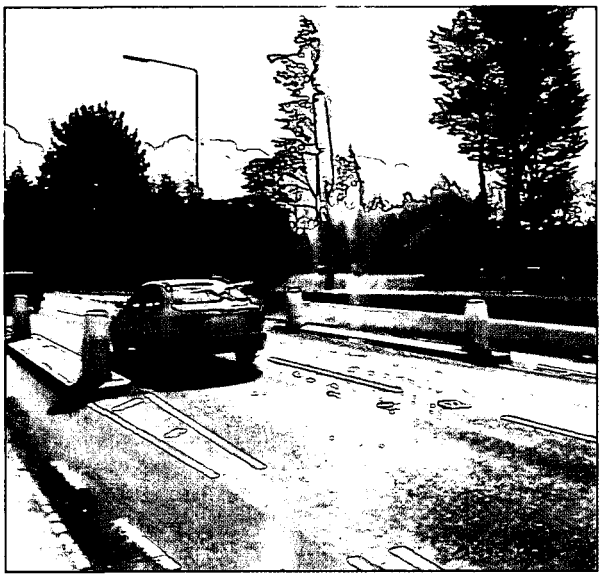
Traffic Islands

Traffic islands can serve a variety of purposes. They can be used as pedestrian refuges to assist people wishing to cross the road, they can be used to obstruct through traffic or to segregate traffic flows (splitter islands). A common example of the latter is where the splitter island segregates cyclists from other traffic thereby allowing cyclists to bypass a traffic calming feature intended to control the speed of motor vehicles only. An understanding of pedestrian desire lines will assist designers in locating pedestrian refuge islands in the most useful places.

Build-outs and pinch points

Footway build-outs and pinch points can improve conditions for pedestrians by giving them more room and distance from passing traffic. They can also be used to reduce the width of the carriageway and to facilitate the introduction of improved cycling facilities.

Footway build-outs are widely used to form speed controlling features which limit traffic flows to one direction at a time, thus forming an obstruction or channelling feature at the introduction of priority, or one way working schemes.



Two way road carriageway narrowing with cycle bypass splitter island at Southbourne, West Sussex.

Public attitude surveys suggest that some people prefer road humps to pinch points, a thorough consultation process will help ensure that the best solution is adopted to suit local circumstances and opinions (see Chapter 3 on scheme design and implementation).

One way road narrowing achieved by a footway build-out at Shoreham, West Sussex.

The volume of traffic is important when considering a throttle/pinch point. Too little traffic can mean that the width restriction will have little effect while if there is too much traffic the narrowing may give rise to congestion and queuing of vehicles. Experience has shown that a reasonably balanced two-way flow in the range 4,000 to 9,000 vehicles per day works best with this type of measure (see Refs. 32 and 33).

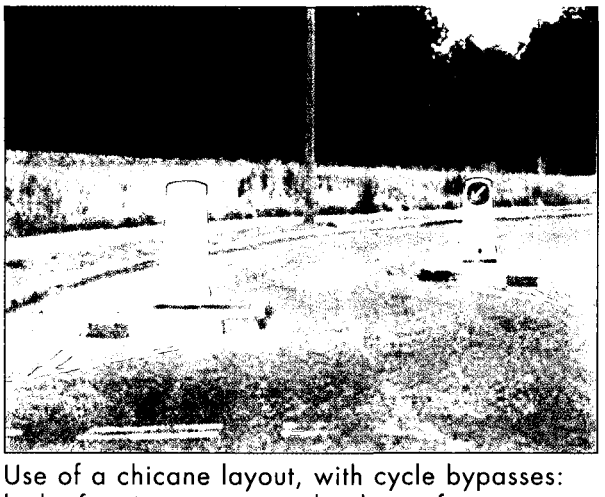
Chicanes

Placing build-outs on either side of the road (but not opposite each other) creates a chicane. The free width (the width between the build-outs if they were placed opposite each other), stagger length (the length between build-outs) and path angle (the angle through which traffic is deflected) will determine the size of vehicles which can pass along the road and the speeds at which they can travel comfortably. Where large vehicles need to be accommodated, the free width and stagger length may be too great to have a calming effect on smaller vehicles. In this case overrun areas for large vehicles can be used to create the deflection required for small vehicles. Alternatively, speed cushions can be placed on the chicane approach to keep cars on the correct alignment (Ref. 27).

Effectiveness

Narrowing the road with islands can reduce vehicle speeds by several mph. Enhanced results can be achieved by using islands with near-side or footway build-outs to form chicanes. Average speed reductions of five miles per hour or more have been recorded at these features. However, vehicles can still be driven at high speeds, even on narrow roads, if there is no opposing traffic flow or physical obstruction.

Using traffic islands to reduce traffic speeds can improve conditions for pedestrians and cyclists (where provision is made for them) in addition to the positive effect they have on road safety. Significant accident reduction can be obtained, depending on the scale of the problem and the types of accidents that were occurring prior to installation.



Use of a chicane layout, with cycle bypasses: lack of maintenance can lead to safety problems.

Chicanes can lower traffic speeds to around 20mph but this will depend greatly on the path angle created.

Design and construction

Bus operators and representatives of the emergency services usually prefer narrowings and build-outs to traffic calming by vertical deflection, particularly on strategic access routes.

Where the traffic island is used as a pedestrian refuge, it needs to be wide enough to accommodate prams or cycles. Where cyclists are expected to cross on a regular basis, a two metre wide island will be required. The island should be no narrower than about 1.3m as this allows for an illuminated bollard to be accommodated with the required clearance to the front face of the kerb of 0.5m.

Traffic Lane Width and Cyclists

Risks to cyclists increase if the lane width is insufficiently narrow to prevent overtaking or wide enough to allow it to occur safely. Lane width depends on the speed and flow of traffic together with the vehicle types expected. Where speeds are around 30mph, a minimum lane width of 3.25m is recommended (see TAL 1/97. Ref. 34). This is the minimum dimension for cars to safely overtake cyclists. Lane widths between 2.75m and 3.25m should be avoided because in this range, car drivers will attempt to overtake cyclists despite the fact the there is insufficient room to do so safely.

Any width below 2.75m is considered to be relatively safe for cyclists because car drivers will not then attempt to overtake them. However, such narrow lanes cannot easily accommodate larger vehicles hence the recommended minimum of 3.25m, although this is not sufficiently wide to enable HGVs to safely pass cyclists. If HGV flow is significant, a minimum width of 4m should be used but at this point the calming effect is minimal. Higher speed roads may require these recommended minimum dimensions to be increased.

If because of local circumstances a less than ideal lane width has to be adopted, it would be best to allow cyclists to bypass the restriction through the installation of a cycle lane segregated from other traffic by splitter islands. Cycle lanes should

generally be a minimum of 1.5m wide but this can be reduced over short distances. The splitter island needs to be wide enough to accommodate the necessary signing with the required lateral clearance to traffic.

If the restriction is only meant to operate in one direction at a time, the traffic lane width should not exceed 4.5m (widths in excess of this may encourage drivers to treat the lane as two-way).

Construction Details

Traffic islands must be clearly visible to approaching drivers at all times and any street furniture should be set back at least 0.5m from the kerb edge. A series of islands will prevent overtaking where it is felt to be dangerous.

A range of materials can be used for kerbing and infill. The designer should balance the need for aesthetics (using materials to suit the surroundings) and safety (making the feature sufficiently conspicuous).

Soft landscaping can be an attractive option for traffic islands, but safety problems can arise if unsuitable planting is used (quick and high growth), or if there is insufficient maintenance in future years. As a general rule vegetation (or any other visual obstruction) between 0.6m and two metres in height should be avoided as it may obscure sight lines. This does not apply when a visual barrier is required as part of the scheme. Immovable planting tubs or raised planting beds can be very unforgiving if hit by a vehicle, so care should be taken in deciding where such obstructions are located, in order to avoid their becoming a potential hazard in themselves.

Bolted down rubber or concrete kerbs are available, but there can be long term maintenance implications if the fixings themselves or the surfaces to which the kerbs are fixed prove to be inadequate.

Other Points to Note

Concern has been expressed by some Safety Auditors about the use of footway build-outs for the introduction of priority one-way working, where these features are used to give pedestrians a shorter route across the carriageway. They consider that drivers may be distracted from watching for pedestrians because of the complexity of the road layout. This is also the case where islands create a horizontal deflection so careful consideration needs to be given to these issues during the design process.

Chicanes have been used successfully in traffic calming schemes but drivers sometimes have difficulty in negotiating them, usually through inappropriate speed. This can lead to contact with the kerb or even damage the vehicle or tyres (Ref. 35 - TRL Report 313 in 1998 and Ref. 33 - TAL 12/97). It is therefore important that chicanes are carefully designed and adequately signed and illuminated.

Adverse effects and concerns

Conspicuity of features built within the carriageway is important. Poorly designed features can cause accidents, result in high maintenance costs and irritate drivers. If traffic speeds remain high (averages greater than 30mph) pedestrians and cyclists can still feel vulnerable using the features created for them.

Where narrowings or footway build-outs are constructed to form chicanes, the necessity for the design to accommodate larger vehicles may reduce the effectiveness of the scheme. Conversely, layouts which are too confined can lead to drivers overrunning the kerbs.

Designers should also be aware of the potential for some drivers to race to get through a chicane or build-out ahead of oncoming traffic which may have the signed priority.

Topic 3 – Width Restrictions

A tight physical restriction on the width of the road, at any point along it, will control the size (ie, the width) of vehicles, which can physically move along that section of road. In many residential areas, commercial vehicles, especially the heavier ones, are the main source of noise and disturbance and can engender fear due to their size and the visual intrusion they cause. By installing a width restriction these vehicles can be prevented from entering a particular road and can therefore be prevented from using a particular route.

In order to ensure compliance with the legal traffic order for a width restriction, there is usually a need to install physical measures to prevent abuse. These can take the form of high kerbs, steel posts, traffic signs or a combination of these features.

Effectiveness

Width restrictions formed by signing and kerbing are a very effective deterrent due to the fact that vehicles larger than the restriction cannot physically pass the point. Some highway authorities measure the width of the restriction between kerb faces, but this makes them less effective as the fixed bollard (usually a steel post set in concrete) is set back from the kerb face by 100 to 150mm and this widens the restriction by up to 300mm. Providing the restriction is clearly signed well in advance of the point of the restriction there should be no problems with vehicles that are too wide reaching the point of the restriction and being unable to turn around and becoming stuck.

Design

The most common width restrictions are 6'6" (1.98m), which restricts vehicles above three tonnes and seven feet in width. This restriction therefore includes all vehicles above 7.5tonnes gvw (gross vehicle weight), which are easily identified by the yellow and black chevron bands they carry on the back. In most cases width restrictions are implemented using steel posts and kerbing. Trief kerbs (a proprietary concrete kerb with a high vertical profile to prevent vehicle overrun) may also be used where regular damage to the installation from vehicles occurs, to physically restrict the passage of vehicles that are wider than the restriction.

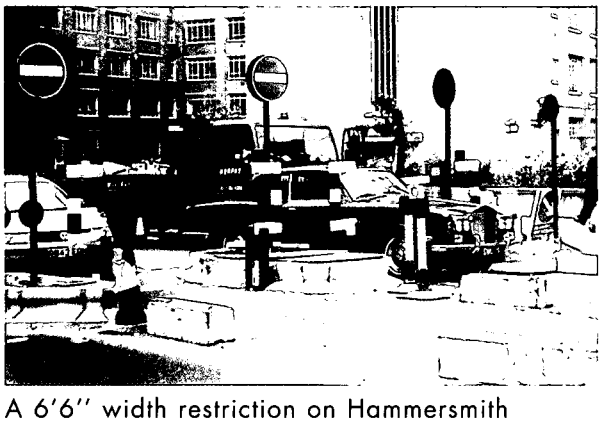
Other Points to Note

- ◇ It is worth repeating that a width restriction must be clearly signed well in advance, and an opportunity provided for oversize vehicles to take an alternative route, or to turn around safely.
- ◈ In most cases access through the restriction will still be required for emergency service vehicles and this is usually provided in the form of a "fire path", which can be a gate or a removable bollard that remains locked until required by the emergency services.
- ◇ Legislation: A width restriction is a designed physical restriction, which must be introduced using a legal order. These orders are prepared under the Road Traffic Regulation Act 1984 (Ref. L7) and are usually introduced on one of two grounds, namely: to protect the highway and its infrastructure, or on amenity grounds to improve the local environment.

Adverse effects and concerns

One problem that can arise following the implementation of a width restriction is that some larger saloon cars and 4 wheel drive vehicles cannot pass through a 6'6" restriction. As width restrictions are generally implemented to prevent HGV's, the scheme can become too restrictive.

Advance signing must be comprehensive to provide a defence against claims and litigation and an alternative route has to be provided for commercial access and service vehicles.



A 6'6" width restriction on Hammersmith Bridge, Olympia, London.

A 7'0" width restriction in Hammersmith and Fulham.

Topic 4 – Mini-Roundabouts

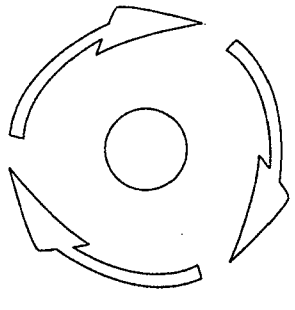
So called "mini-roundabouts" have been widely introduced on a variety of roads around the UK and this type of junction treatment is often included within traffic calming proposals. They were initially developed as a retrofit method of improving existing junctions but are now increasingly included as part of new development proposals.

Mini-roundabouts are often considered as an alternative to another junction type due to constrained highway space, or simply because they are easy to install and are perceived to be less costly. Early examples were used as an alternative to traffic signals at very constrained sites, where an alternative method of control was needed.

A mini-roundabout is a type or form of junction control at which vehicles circulate around a white, reflectorised, central circular road marking (central island) of between one and four metres in diameter, as shown in traffic sign diagram 1003.4 (see Ref. 12). When negotiating a mini roundabout drivers, other than those in large vehicles, must pass round the central road marking. Vehicles entering the junction must cede priority to vehicles approaching from the right, circulating the central island.

The central road marking is either flush or slightly raised (no more than 125mm) as a dome, in order that it can be driven over by larger vehicles that are physically incapable of manoeuvring around it. The dome is also raised to suggest that vehicles should not drive over the central island. Three white arrows are painted on the carriageway, within the gyratory area, around the central road marking, showing the direction of circulation.

An illuminated blue mini roundabout sign, to diagram 611.1 (TSRGD), precedes the mini roundabout on each approach. This sign is usually accompanied by the transverse give way marking shown in diagram 1003.3. However, the mandatory give way marking (1003), and associated road sign (602), may be used in addition to sign 611.1 where appropriate.



TSRGD (Ref. 12) Diagram 1003.4.

Mini roundabouts are generally used within traffic calming schemes to maintain low speeds. More contentious is the use of mini roundabouts to reduce traffic speeds as this approach has produced somewhat mixed results. Inadequate physical deflection of the approaching traffic can lead to undesirable side effects, with no speed reduction at some sites, or drivers driving across, or even on the wrong side, of the central road marking. Positive deflection can be achieved by changing the alignment of the kerb together with complementary road markings and/or offsetting the centre island.

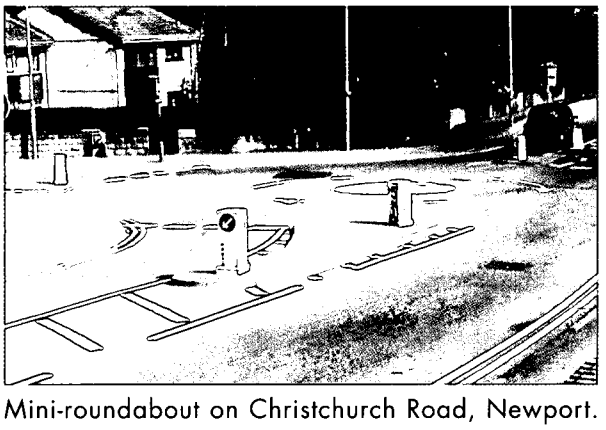
Design and Construction

In practice it can be seen that there are considerable variations in construction of the roundabout central island. It should be noted that the central island of a mini roundabout does not conform to the Traffic Sign Regulations and General Directions (traffic sign to diagram 1003.4) if:

- ◇ the centre island has a diameter less than 1m or greater than 4m;
- ◇ it cannot be driven over;
- ◇ it has a surface colouring other than white;
- ◇ it is constructed of granite setts, block paving or other textured material (unless coloured white);
- ◇ it contains street furniture;
- ◇ it has a raised kerb (more than 6mm);
- ◇ it has non-prescribed road markings such as concentric rings;
- ◇ it incorporates road studs.

Designers should take care to ensure that mini roundabout installations are in full compliance with the TSRGD.

Within area-wide traffic calming schemes mini-roundabouts can help retain a low speed regime when used in conjunction with other physical measures such as road humps, road narrowings and other forms of restriction.



Mini-roundabout on Christchurch Road, Newport.

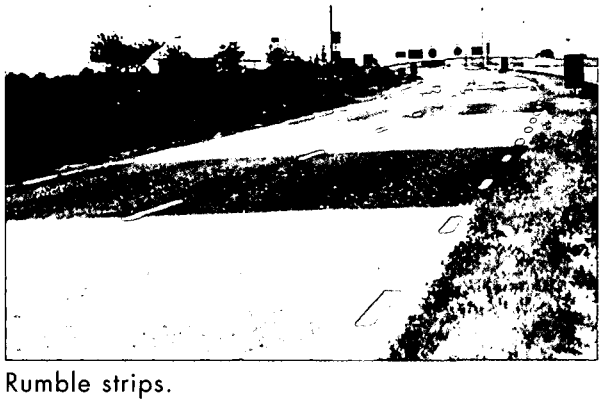
Topic 5 -
Alerting Measures (rumble devices and surface features)

These take the form of an AUDIBLE effect such as rumble devices, strips, areas or a wavy surface; or a VISUAL effect from a coloured area of surfacing. Some devices take both forms. They are used to give advance warning to drivers that they are approaching a section of highway requiring a change in driving style, usually a reduction in speed and greater attention to the surroundings. Unfortunately the noise and vibration generated to attract the driver's attention can also be annoying to adjacent householders and the location of such devices has, therefore, to be chosen with great care. Some authorities do not use rumble strips within 200m of a residential property.

Areas of material applied to the carriageway surface which contrast by texture and by colour are known as "rumble strips" or "patches", depending on the general layout adopted. These measures are intended to warn drivers of a particular hazard, traffic sign or change of road environment, by causing a noise and vibration inside the vehicle. Those which rely solely on visual messages are much less effective.

Surface treatments should not be so harsh as to threaten cyclists' safety, or cause them undue discomfort. Surfaces should be skid resistant in wet and dry weather and the height of the surface treatment should not exceed 15mm, with no vertical faces above 6mm.

Rumble strips



Rumble strips.

Rumble strips can be formed from blocks or setts built into the carriageway surface and protruding a few millimetres above it. Alternatively, and more simply and cheaply, strips of road marking material or anti-skid surfacing laid transversely across the carriageway can perform a similar function. Patterns vary but a number of discrete areas formed from lines of parallel strips are the most common form of this device. To avoid confusion with road markings, rumble strips must not be white but they should be clearly visible at night. Maintenance is important as they may have a relatively short life before needing renewal.

Rumble Areas

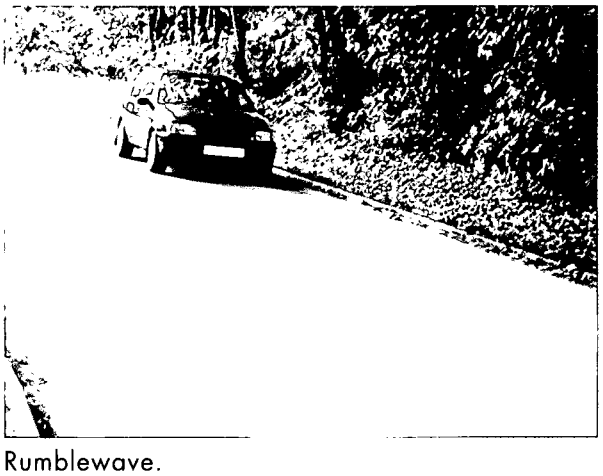
Rumble area at a junction.

"Rumble areas" are usually formed from rectangular areas of embedded stone chippings, often of a contrasting colour, which are applied to the surface of the carriageway.

Rumblewave surfacing

A new product known as "Rumblewave Surfacing" has been developed with the intention of providing an optimised, sinusoidal profiled surface which generates significant horizontal vibrations in a passing vehicle but minimal external noise.

Modern vehicle suspensions have components to dampen the vertical movement and vibrations from



Rumblewave.

the wheels but little to dampen horizontal movement, thus, the horizontal vibrations and noise caused by the undulating surface can be transported into the driver's cabin.

The material is laid as a simple overlay on concrete or asphalt surfaces and the profile has been developed by TRL Ltd on behalf of the Department for Transport. Site trials have been carried out in Hampshire and elsewhere and the results so far have been encouraging in terms of accident reduction but with only slight reduction in traffic speed.

The dimensions of the profile

The optimised profile dimensions are a wavelength of 350mm from peak to peak to trough amplitude of 6.5mm. In the diagram below, the vertical scale is exaggerated to show the sinusoidal nature of the profile.

No special authorisation is required to install Rumblewave surfacing as it falls within the *Highways (Traffic Calming) Regulations 1999* (Ref. 10) restrictions on the construction of rumble devices, namely:

- ◇ it has a maximum height above the carriageway surface of 15mm;
- ◇ at no point is there a vertical face of over 6mm.

Effectiveness

The effect on speed largely relates to the coarseness of the rumble strips, although actual speed reduction is difficult to predict and can be fairly negligible. There is some evidence to suggest that in some cases, by speeding up, some drivers seek to minimise the effect of the rumble strip pattern. Used in isolation, therefore, rumble strips have limited use as a speed reduction feature and have the serious disadvantage of causing noise and disturbance to their surroundings. This factor has made them largely unsuitable for locations near to residential dwellings and there have been a number of occasions when rumble strips have had to be removed because of the unwanted side effects of noise.

Rumble strips are usually used in rural areas, to alert drivers to a hazard such as a bend or junction and should be placed at least 50m in advance of the hazard. They do have a useful function in terms of attracting drivers' attention and for this reason further development work is currently underway to produce a flexible material that has all the advantages but without the disadvantages of excessive exterior noise.

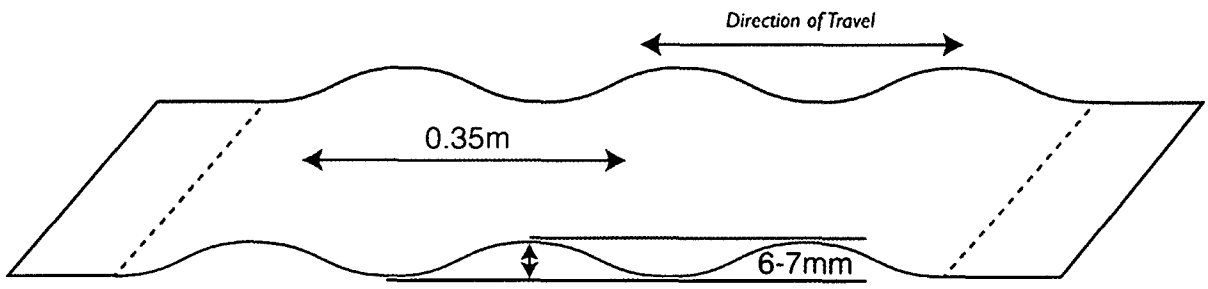
Experimental installations using "Rumblewave" have shown significant increases in noise and vibration within the vehicle with little increase in external noise. At all of the test sites there were reductions in mean speed of between 0.2 and 1.9mph. Further advice on the use of Rumblewave can be obtained from TRL Report No. 545 (Ref.36).

Vibrations have been reported within residential buildings near to some Rumblewave pads, but the reasons for this are not yet fully understood. TRL are doing some further testing in order to develop a model to predict such problems, the results of which will be published.

Coloured surface patches

Colour patch with "20" and "SLOW".

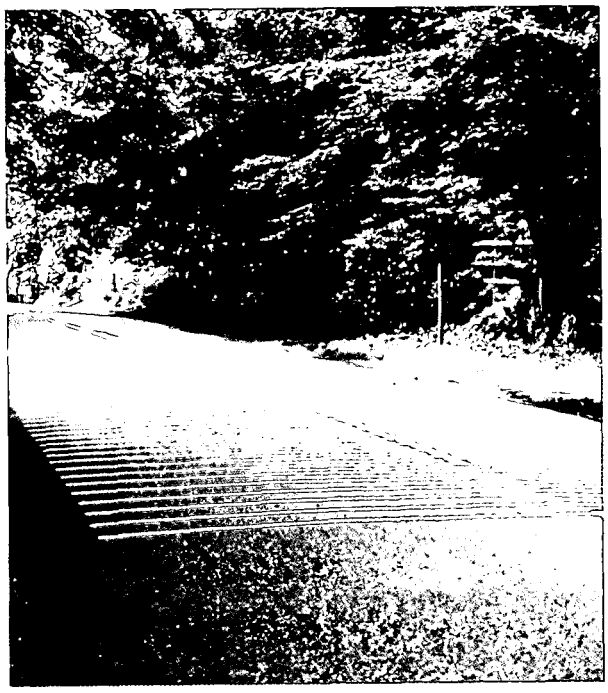
Coloured patches have been laid on some roads as a visual indication of a change ahead, but these are viewed as very intrusive by some people. Red and buff colours have become particularly popular and



Dimensions of the profile, (not to scale).

yellow or green have also been used. Patches do not normally suffer from the same noise disadvantages as the raised strips, but rely on their visual impact.

Used in conjunction with "SLOW" carriageway markings or with speed limit roundels they can emphasise rural traffic calming and support speed limit schemes by drawing attention to the commencement of the controlled zone. However, there is little hard evidence to demonstrate their effectiveness and they can deteriorate quickly.



Colour patch.

Group B:
Traffic Management and Control

Topic 6 – Parking Management and Control

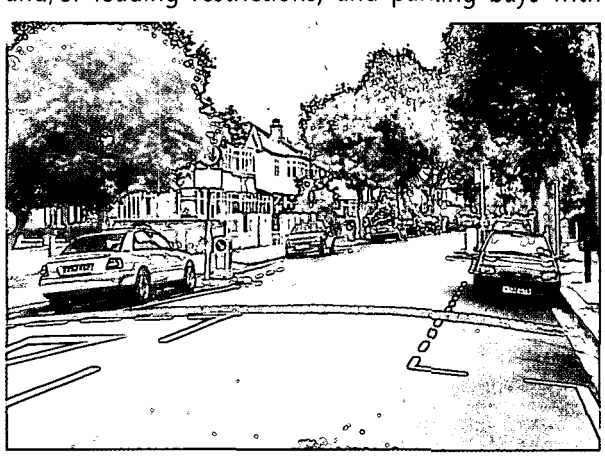
Advisory or regulatory markings to control on-street parking can also be used in traffic calming schemes when it is either desirable or essential to include safe parking places within the scheme. However, the control of on-street parking to specific locations can also be used as a form of informal traffic calming with the narrow traffic lanes or chicanes that parking on alternate sides can create, contributing to reducing the speed of passing traffic.

In areas adversely affected by indiscriminate and obstructive parking, parking management may be essential to indicate to drivers defined areas in which to park. The effective positioning of parked vehicles through good parking management can also reduce the conflict between pedestrians, other vulnerable road users and motor vehicles.

Effectiveness

Introducing waiting and loading restrictions can remove obstructive parking from a particular location by regulating where drivers cannot stop. This can be particularly important in ensuring that the advice given in the Highway Code on clearing obstructions at junctions and adjacent to traffic islands or other calming devices, is adhered to. In these circumstances the areas where parking is to be allowed may be left unrestricted. Alternatively, designated parking bays may be used to indicate areas where vehicles can park with, or without, associated controls on the duration and/or cost of parking.

In urban areas where there is high parking demand, parking management which includes both waiting and/or loading restrictions, and parking bays with controls on the duration and/or cost of parking, may be more appropriate.

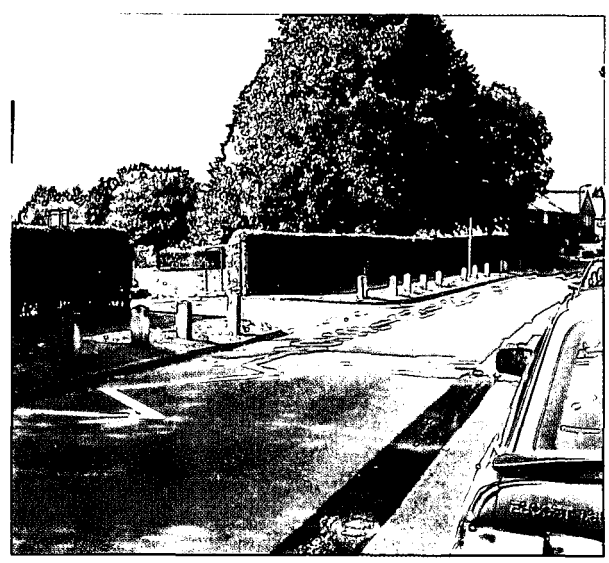


A 20mph zone including CPZ parking management in Emlyn Road, Hammersmith & Fulham.

The use of parking management schemes is often the pre-cursor to a full regulatory waiting and loading scheme; or the introduction of a Controlled Parking Zone (CPZ). The major deciding factors in implementing regulatory parking management are usually the parking stress levels encountered, driver behaviour and available enforcement measures.

The effectiveness of parking management schemes depends to a great extent on the willingness of the local community to comply with the scheme and the effectiveness of the enforcement by the police and/or parking enforcement officers, employed directly or indirectly by the local authority. Where schemes have been designed in conjunction with the community so that the need for the measures is well understood, transgressions can be expected to be less frequent than for a scheme, which might be seen as an unnecessary infringement on local "rights". This is particularly the case with parking restrictions in residential areas where there is little off-road parking available, which can be very sensitive.

Other Points to Note



School "Keep Clear".

In the vicinity of school entrances, so called "zig-zag" and "School Keep Clear" markings can be provided to indicate to drivers the appropriate areas in which not to stop or park. In most locations these markings are intended as a reminder not to park at the school entrance, whether the driver has business at the school or is merely seeking a parking space.

However, the use of the zig-zag markings with associated clearway orders has become more widespread in recent years. These orders usually include a "no waiting" and "no loading" order attached to them, which means that enforcement action can be taken more easily.

Keep clear, "H" markings (white) are also an approved marking to indicate to drivers the extent of carriageway to be kept clear of parked vehicles. These are commonly used in areas where there is a lack of waiting/loading restrictions (yellow) to indicate the presence of a private entrance/driveway. Since it is only an advisory marking it can only be enforced by the police under obstruction laws.

Double white line centreline systems can, in certain circumstances, also be used to manage not only "no overtaking" around a bend but also "no parking" within the limits of the system. However, the required sight line criteria for double white lines must still be adhered to.

Apart from the more conventional uses of parking management described above, the introduction of either regulated on-street parking spaces, or waiting and loading restrictions, or both, can be used to create a pattern of carriageway uses which effectively delineates the route available for passing traffic. This technique can be used on its own, or in conjunction with other traffic calming measures where a more comprehensive approach is thought desirable.

Legislation

The Road Traffic Regulation Act (1984) (Ref. L7 - as amended in 2003) is used for all regulatory markings; including parking restrictions that require an associated traffic regulation order.

The implementation of a double centreline marking system does not require a traffic regulation order but formal approval from the Commissioner of Police or Chief Constable, as appropriate, must be obtained whenever they are proposed.

Those markings that are purely advisory such as the "keep clear" marking do not require any formal consultation or order making, but they are best implemented in consultation with the local community and the police.

Adverse effects

With these types of schemes increased enforcement activity is often required, particularly during the early stages following implementation (eg, for residents' parking).

The cost of enforcement of designated parking places is usually borne by the local authority, sometimes using their own "parking attendant" force under "decriminalised" procedures.

An increased workload arising from monitoring and amendments to parking schemes is often created as parking stress increases residents expectations and demands for priority grow year on year.

Topic 7 – One-Way Traffic Management

One-way streets in urban areas were widely introduced between the 1960's and 1980's as traffic improvement schemes. They were implemented for many reasons, including:

- ◇ on principal roads and major distributors within constrained networks, to maximise traffic capacity, often in the form of one-way gyratory systems;
- ◇ to rationalise the number of accesses or junctions with major routes, increasing capacity or improving journey times;
- ◇ to maintain safe traffic flow on narrow streets or where parking has reduced the available width;
- ◇ as part of an area-wide traffic management scheme, to limit access and reduce "through" or "rat-running" traffic. Breaking up streets into shorter sections reduces continuity and creates indirect routes for through traffic movements.

They are now seldom introduced and in some places there are pressures to remove existing one-way systems and revert to two way traffic, to reduce some of the adverse impacts, which can include:

- ◇ confusion for vulnerable road users, particularly pedestrians, when they encounter traffic travelling in the "wrong" direction;
- ◇ problems for cyclists, who can struggle to safely negotiate multi-lane gyratory systems, or may choose to travel the wrong way down lightly trafficked streets rather than be substantially diverted;
- ◇ community severance, whether actual or perceived;
- ◇ higher traffic speeds and associated impacts on accident rates and severity;
- ◇ adverse environmental impacts.

One-way traffic management – before.

One-way traffic management – after.

In view of these drawbacks many one-way systems have been amended to permit contraflow movements by cyclists and, increasingly, buses. In some European cities, cyclists enjoy general exemption from one-way restrictions.

Despite the apparent problems, the use of one-way traffic orders can still provide a worthwhile option for practitioners seeking to develop traffic calming proposals. Within a residential area, one-way streets can still be used to reduce traffic flows or to overcome problems associated with restricted highway width as this approach can provide an opportunity to use carriageway space to create more parking or footway space; or to introduce landscaping and produce deviations to the vehicle path thus removing the "straight" through appearance which can lead to speeding.

In such cases it is important to develop a "whole street" approach to design and this can be expensive. The use of one-way streets often leads to consideration of the wider street network so that a complementary one-way street can be provided to maintain access.

Design Issues

If one-way restrictions are considered to be an appropriate option there are a number of design issues to address at an early stage. These include:

- ◇ signing – one way traffic regulation orders require signs to diagrams 652 and 616 (Ref. 12) and signing of intermediate road junctions along the one-way length. A proliferation of signs may not be desirable and road markings may also be needed to reinforce the signs;
- ◇ local access – accessibility to properties on the affected streets will need to be considered. Direction signs may be needed to explain access arrangements for drivers having to re-route. There may also be implications for access on buses and vehicles used by the emergency services;
- ◇ contra-flow facilities – it may be possible to allow cyclists to use the street in both directions to prevent inconvenience.

Topic 8 – Vehicle Restrictions

Placing a restriction on the size or type of vehicle that can gain access to an area will allow a reduction in the standards of highway design; such as tighter corner radii, narrower traffic lanes etc.

This may allow some re-allocation of road space to other highway users, such as pedestrians and for parking/loading. The kerblines can then be modified to create a different streetscape with wider footways, allocated parking and perhaps new environmental features.

The imposed restriction could apply to a number of different types of vehicles (eg, HGV's or cars) and could apply to a whole street or just to certain parts of it; for example, to allow the allocation of specific loading areas, not necessarily outside every premise. In certain circumstances it might even be felt preferable that HGV's should have to block a street to unload, rather than take up valuable pedestrian space near the shop fronts. This approach would also discourage non-essential vehicular traffic from using the street.

In town centres, the need to allow for full turning movements by the largest of delivery vehicles can sterilise large areas of the streets from use, even if deliveries are infrequent. As an approach to dealing with this situation the prevention of, say, the left hand turn at a junction, by diverting vehicles and allowing straight ahead moves only, could open up significant areas of the street for other uses and at the same time give the street a traffic calmed, pedestrian friendly feeling.

It might also enable seats or café areas etc to be provided, as well as helping pedestrians and slowing down all traffic. A means of access will need to be provided for refuse collections, emergencies and occasional large delivery vehicles, but this can still permit a re-distribution of the available street space.

An extreme example of such a street might be a pedestrian zone (see Topic 17) where vehicles are only permitted at certain times, preferably through the use of shared street space and no priority for vehicles. There are many other forms of limited vehicular access, perhaps for businesses, which have no rear access and it is important that each case needs to be carefully considered on its own merits.

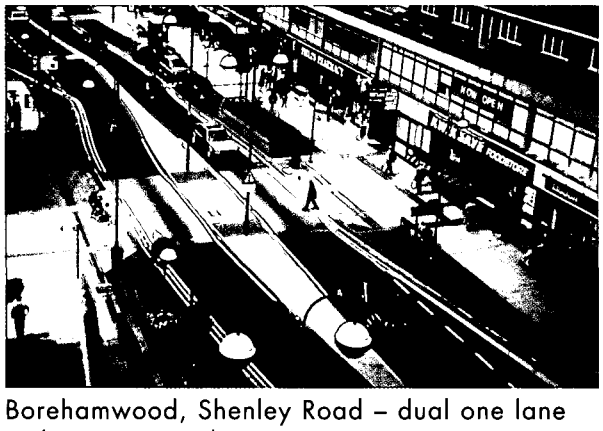
Topic 9 – The Use of Segregated Lanes

Historically speaking, lane separation in residential roads was sometimes achieved through the provision of large, elongated central islands often with trees and planting, thus providing a physical deflection to each direction of travel, a visual barrier and a significant residential amenity. This encouraged calmer and controlled traffic movement and more recent residential design guides for new estate roads contain such features.

"Segregated lanes" are traffic lanes that are separated, usually by physical means, to control the access or movement of vehicles. They may be for all traffic (on a narrow one-way system or a dual one lane road) or for buses only, or cycles etc. They are useful as a traffic calming measure in regulating and controlling access and "through" movement and/or restricting turning at certain locations.

Examples of segregated traffic

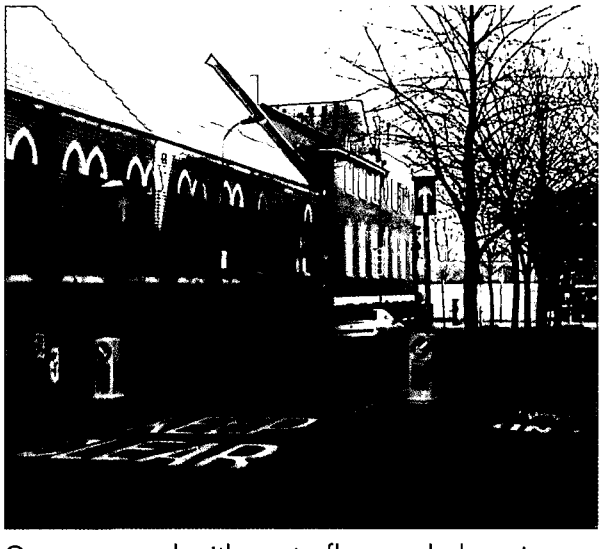
Shenley Road, Borehamwood is shown below. Traffic in the town centre has been calmed by a combination of features, including the use of segregated traffic lanes. These confine drivers to a narrow strip of carriageway for through movement



Borehamwood, Shenley Road – dual one lane with service roads.

and assist pedestrians in crossing the road, using the long flat top humps.

Crisp Road and Hugon Road (see illustrations) in the London Borough of Hammersmith and Fulham are both examples of where segregated lanes have been used effectively to provide a contraflow cycle lane on short sections of one-way road. Kerbing is provided to ensure that the cycle lane is protected from the opposing flow of traffic and in Crisp Road the general streetscape has also been improved through the planting of trees in the separating island. The use of a physical boundary between traffic lanes also removes problems that might otherwise occur due to obstruction by parked vehicles.



One-way road with contraflow cycle lane in Crisp Road, Hammersmith.

At junctions where side roads have restrictions to movement such as "no right turn" or "no left turn", the main road traffic lanes can be segregated right across the junction to ensure that drivers from the side junctions cannot carry out the banned manoeuvre.

Segregated lanes can also be used alongside one-way or two-way roads to maintain an access to estates or premises. If rat-running is a major

One-way road with contraflow cycle lane in Hugon Road, Fulham.

problem, a one-way road can be provided in the opposite direction to the majority of rat running traffic, whilst at the same time a two-way cul-de-sac access road can be provided to maintain local access to properties.

More typical use of segregated lanes is in bus lanes on main traffic routes where the re-allocation of existing road space can be a traffic reduction measure as part of an area wide, or route specific, traffic calming approach.

Segregated lanes can also be used to enable left turning traffic to bypass roundabouts or traffic signals and thus create a continuous flow of traffic for that movement. However, this is not a traffic calming measure as such and care should be taken to ensure that pedestrians or cyclists trying to cross the junction are not disadvantaged.

Other Points to Note

Segregated lanes can be used to control the movement and access of vehicles through the use of either "physical" or "non-physical" measures. The "physical" measures that can be used are kerbing or long traffic islands to maintain a separate lane or a "contra-flow" lane. The "non-physical" measures are signing and lining and, in the case of bus lanes, there is the requirement for an associated traffic regulation order (TRO).

Segregated lanes are particularly effective as part of an area access schemes when providing contra-flow cycle lanes protected by physical measures. These types of measures have been used to good effect in circumstances where in conjunction with lengths of one-way road, they can provide an attractive route for cyclists.

Adverse effects and concerns

Problems can occur when drivers enter a segregated lane that leads to somewhere that they did not want to travel, and this is particularly problematic when using physical measures as the driver would then be unable to take an alternative route.

In residential urban streets it can be difficult to deal with broken down or abandoned vehicles in segregated lanes. This is a particular problem with physically segregated bus lanes since an obstruction can cause long delays.

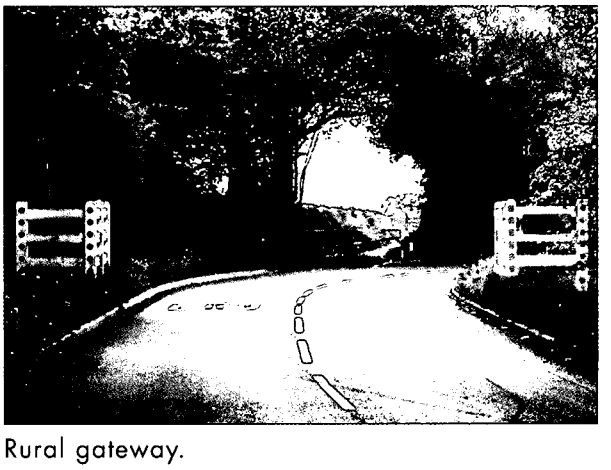
Physically separated cycle lanes can also cause maintenance problems as they may need to be swept manually because of their narrow width.

Such measures can appear very heavily engineered and unsympathetic to the surroundings. This issue should, therefore, be considered very carefully at the consultation and design stages.

Topic 10 – Gateway Features

"Gateways" are created to draw drivers' attention to a significant change in the road environment, for example at the commencement of a village speed limit or when entering an urban traffic calming scheme.

Gateways can incorporate a number of techniques and by bringing them together at a single location can have a greater impact on drivers' behaviour. A village gateway can, for example, be introduced quite simply by combining edge of carriageway markings to visually narrow the carriageway, together with contrasting surfacing, speed limit terminal signs and a village nameplate.



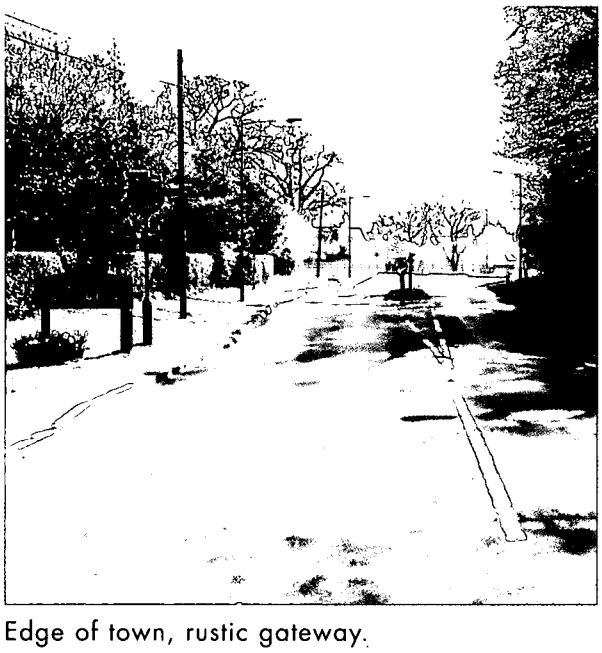
Rural gateway.

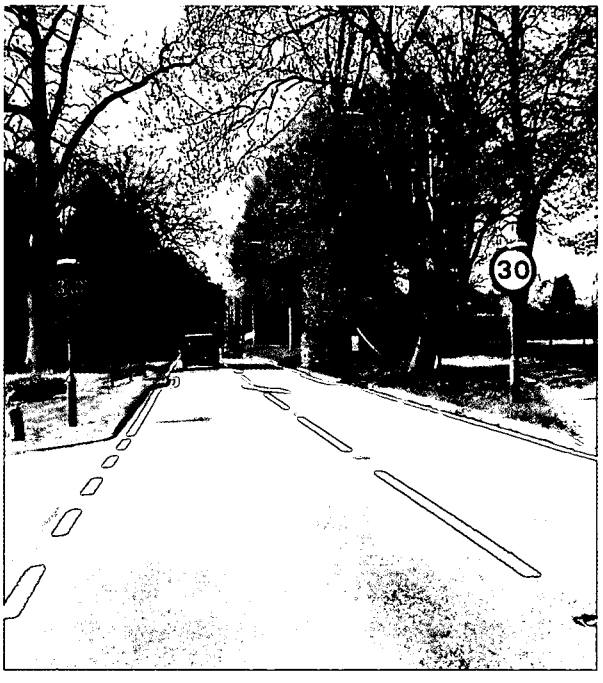
Strong visually engineered gateway.

Gateways can also be quite elaborate and be devised to enhance the point of entry to a small town or village by the use of traditional local materials such as wood or natural stone. Involvement of the local community in the design of the gateway can help increase the sense of ownership of the scheme and hence help minimise any adverse criticism.

Effectiveness

Experience in the use of gateways has demonstrated that the speed reduction that will be achieved by a gateway alone is not likely to be significant unless it is used in combination with other measures, or is particularly conspicuous. Nevertheless, gateways are a popular method of marking the commencement of an area where particular emphasis has been placed on achieving lower speeds and where additional engineering measures or enforcement effort can be expected. The main impact on drivers is to alert them to the fact that they are now entering a specially designated area where a new speed regime is in place.


Edge of town, rustic gateway.



Rural gateway.

Depending on their actual nature, minor gateways can give a reduction of approximately 3mph in 85th percentile speed whereas physical restrictions can give 6-7mph or more. The speed reduction is unlikely to be sustained unless there are further measures beyond the gateway.

Design and construction

Gateway features may be placed at the start of new speed restrictions, (eg, 30mph, 20mph or a Home Zone), or as a "stand alone" feature to emphasise a change in the environment ahead. In ideal circumstances the street environment should accord well with the speed restriction, otherwise further physical measures may be necessary in order to make the limit more self-enforcing.

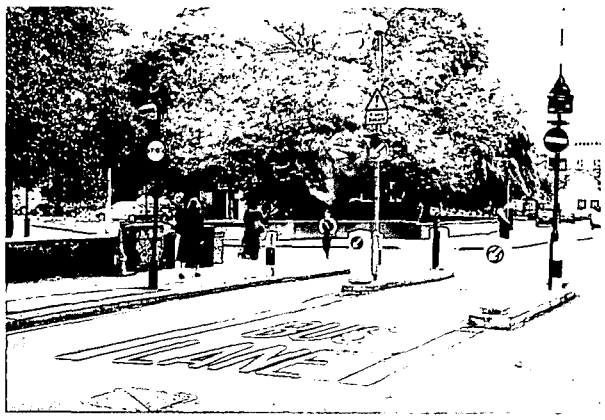
The gateway feature might be a gate, fence, wall or even a work of art; but consideration has to be given to three important factors.

- ◇ The safety of the feature in case of impact from a vehicle;
- ◇ the second, is the long term maintenance implication, as a suitable regime for maintenance needs to be agreed from the outset, so as to retain its freshness and visual impact;
- ◇ the third factor is the suitability of the feature for the local environment.

Topic 11 – Rising Bollards

Rising Bollards are moveable posts or bollards, used to prevent access by unwanted vehicles. They are generally used as a physical measure to enforce the provision of a legal traffic regulation order restricting access to certain classes of vehicle, such as buses. They are either lowered, or raised (from their stored position under the carriageway surface, or a horizontal "lie flat" position) in response to a signal from a suitably equipped approaching vehicle; or by manual operation.

Rising bollards are sometimes used to enforce width restrictions and road closures, whilst still maintaining an access route for designated vehicles. These vehicles might be buses, the emergency services, servicing vehicles, and sometimes shopkeepers or residents at a particular location.



Rising bollards, Peterborough Road, Hammersmith & Fulham.

In the example shown in the illustration, Peterborough Road (in the London Borough of Hammersmith & Fulham) is situated in a dense residential area and used to experience heavy use as a shortcut route by commercial vehicles. A decision was made to provide width restrictions in order to prevent this occurring. A gate was initially provided for emergency access, but there was a later requirement to allow access for a re-directed local bus route.

A rising bollard was installed (instead of the emergency access gate), and transponders (activating devices) were supplied to the bus company and the fire service. This allows access to be gained through the rising bollard in the centre lane, which also operates as an alternate one way system due to the low levels of traffic through it. An emergency push button facility is also provided to operate the bollard.

Rising bollards can also be used to enforce the provision of pedestrian zones in town centres where vehicle access is allowed during certain hours. In these situations the bollards are raised at the start of the restricted period and lowered again at the end of the time period. Authorised users, such as the emergency services, can gain access through the bollards using a variety of methods. Elsewhere in London rising bollards have been used in traffic calming and resident access schemes.

Effectiveness

The main benefit with automatic rising bollards is that they require no manual resources to be committed to the management of access through the closure or restriction point, and are a very versatile and effective device. However, the reliability of the automatic rising bollard depends on the robustness of the equipment installed, especially where there is likely to be high use.

Rising bollards present a physical obstruction and drivers should be made aware of their presence by reflective banding on the bollard and also by entry signals and signs located at the access point. Care must also be taken to ensure that adequate signing and forward visibility of the obstruction is provided and that regular maintenance is undertaken to avoid problems of malfunction.

Alternative designs

Rising bollards can be of various types. The older, manually operated, cylinder posts are fixed to the ground at a pin joint and then rotate 90° to an upright position where they are locked in place. These are generally used in private car parks and problems can occur when in their lowered position as they can create a trip hazard for pedestrians.

More recent devices consist of cylindrical posts that are stored below the surface when not in use and are pulled vertically (manually) into an upright position and then locked in place.

Rising bollards in Warrington Town Centre.

Rising barrier for limiting access.

The latest systems consist of automatic rising bollards that are located in underground sockets and raised using a remotely triggered, pneumatic system. This equipment is now being installed more widely on public highways both in town centres and elsewhere on the edges of towns.

The bollards can be operated using various methods including electronic transponders, swipe cards, manual operation or, where the system operates in conjunction with a security system, users can phone through to an operative who will grant access. The system itself can also be set to a pre-determined time schedule so that the bollards are, for example, raised during the day and lowered at night.

Other Points to Note

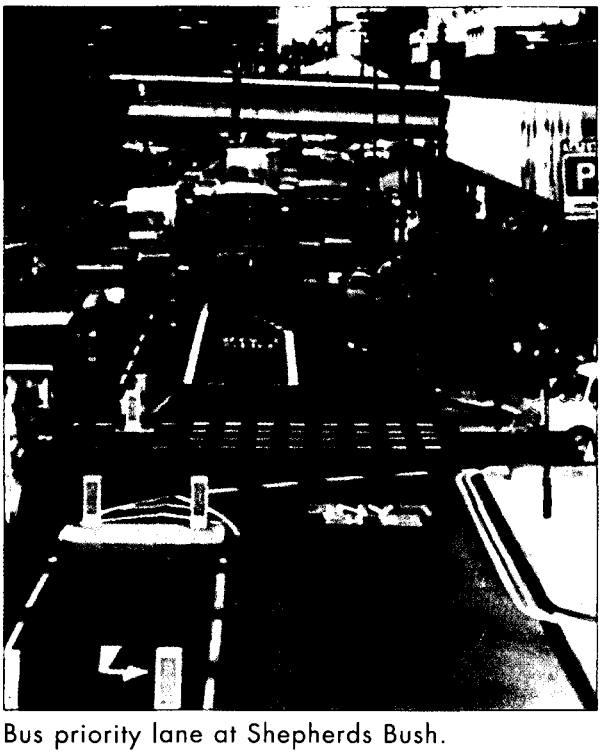
In town centres, the issue of vandalism must also be carefully considered in maintenance regimes. The greater risk is, however, where the bollards pose a potential trip hazard to pedestrians as they are rising and this can be an issue where the bollards are installed in pedestrianised town centres.

Consideration should also be given to the possibility of an unauthorised vehicle attempting to "tailgate" an authorised vehicle, with the possibility of damage from a collision with the bollard or the vehicle in front.

Topic 12 – Bus Gates

A "bus gate" is a restriction to a road or section of road permitting access only to buses, usually with an accompanying legal traffic order. The bus gate is either a "signed only" or a physical gate and is used to give buses priority at traffic signals, in areas prone to congestion, or to control access into a restricted area or segregated bus lane.

Bus gates are not, strictly speaking, a traffic calming measure in themselves as they do not affect the speed of general traffic flow along a street. However, priority measures are often used to ensure that only vehicles that are regarded as either essential or acceptable in a particular location, are allowed through. Thus bus gates, and similar priority measures for taxis, cycles, motorcycles and service vehicles can have a role to play in a traffic calming scheme. (See also Topic 9 – Segregated Lanes).



Bus priority lane at Shepherds Bush.

Effectiveness

Compliance with "No entry, except buses" restrictions is generally good. On the Shepherds Bush Green scheme (see illustration) there are several sets of traffic lights where delays can often occur due to the high volumes of traffic using it. To give priority to the bus services using this route, they enter a bus lane prior to a set of bus advance traffic signals. Buses are then channelled into a segregated lane and can bypass queuing traffic held at another set of approach signals before rejoining the mixed use traffic lanes.

Bus gates are particularly effective in providing bus priority, as abuse is seen to be unsuccessful. It is advantageous for self enforcement, particularly in congested areas, if the priority is restricted solely to identified scheduled buses, to avoid confusion with other coaches or large passenger carrying vehicles.

If bus gates are to be enforced by traffic signs, they must be as prescribed by the Traffic Signs

Central median bus gate on A40 Shepherds Bush Green/Uxbridge Road.

Regulations and General Directions (2002) (Ref. 12), and backed up by a *Traffic Regulation Order*. The Department for Transport recommends the use of positive traffic signing indicating that access is for buses only, rather than the use of "no entry" signs with the "except buses" plate.

Other Points to Note

An alternative to the physical barrier is the 'signed' gateway that consists of a route for "buses only" to which other classes of vehicle are denied access by regulation and enforcement. This is achieved through the use of measures such as signing, carriageway markings, kerb realignment and in some instances, traffic signals.

The limitation on the minimum width of a bus gate is entirely dependent on the swept path of the buses that are to pass through it. In certain situations, particularly in heavily trafficked areas or where there are multiple traffic lanes, the use of advance lane indicator signing should be considered.

Adverse effects and concerns

Bus gates require regular safety monitoring, particularly if they have entrances that incorporate rising bollards or barriers. The mechanical breakdown of these features can lead to problems and may lead to buses not being able to gain access to, or exit from, a segregated bus lane.

Maintenance, safety and expenditure problems have arisen because rising barriers have been struck by goods or other non-authorised, vehicles attempting to pass through. There can also be problems associated with channelising bus gates that are situated in the middle of the carriageway and it is preferable to locate bus gates on the nearside of the carriageway, or at a clear physically defined point, such as the start of a bridge or the entrance to a bus station.

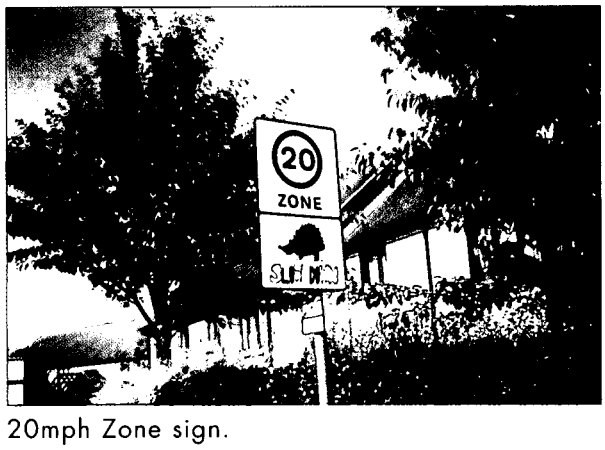
Group: C
Traffic Signs, Road Markings and Lighting

Topic 13 – Traffic Signs

Traffic signs are widely used for a variety of purposes and all road signs permitted for use on the public highway are defined in the Traffic Signs Regulations and General Directions (TSRGD) {2002}) (Ref. 12), categorised as regulatory, warning or informatory. The *Traffic Signs Manual* (Ref. 21) also provides useful guidance, Chapter 3 on regulatory signs, Chapter 4 on warning signs and Chapter 5 on road markings. It is important to ensure that traffic calming measures are conspicuous at all times and adequate warning should be provided through the use of suitable signs. This will depend on the type of measure and status (or classification) of the road. Where a non-standard or experimental sign is required permission for its use must be sought from the Department for Transport (in England) and sufficient time must be allowed for this process. Traffic signs are often employed as an integral part of traffic calming schemes and examples are given below.

Regulatory signs

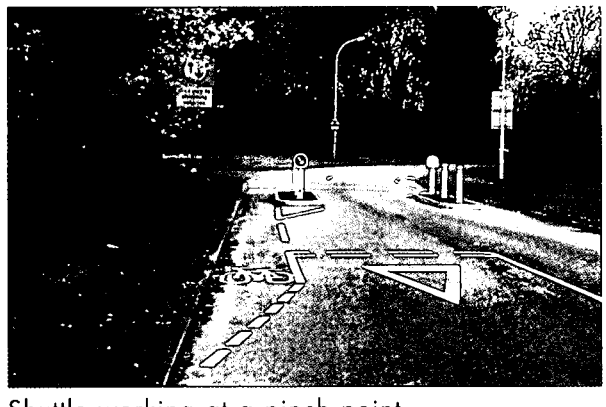
Speed limit terminal signs and repeater signs are the most obvious examples of signs aimed specifically at speed control and these have been used for many years to impose conventional speed limits which are enforceable by law. 20mph speed limit signs were introduced for the first time in the 1994 TSRGD and are used in areas of speed limits and "zones". The most common use is as a zone, in residential and shopping areas in support of a low speed environment brought about by either physical traffic calming features or by a suitably designed road layout. 20mph zone signs are unique in that local highway authorities now have the discretion to incorporate a panel displaying a road safety message, or local name, as part of the sign. These messages are often devised with the involvement of the local community. More information on speed limit signs and zones is given in Topic 18.



20mph Zone sign.

Grey or yellow rectangular backing boards are permitted for use with terminal signs for 30, 40 and 50mph speed limits where there is a need to emphasise their presence, though they can obscure the distinctive shape of the sign. Shaped backing boards can also be used, incorporating a village nameplate (Diag. 2401.1) with the village speed limit terminal signs. Repeater signs (ie, the small speed limit signs placed within a speed restricted area) are still specifically prohibited in 30mph speed limit areas where the limit is achieved because of the existence of street lighting to the required standard.

Roundel markings on the carriageway are only permitted with the upright terminal signs on the entrance to the limit area, or alongside repeater signs, where they are permitted.


Shuttle working at a pinch point.

Another frequently used regulatory sign is the "give way to oncoming traffic" sign, which can be used to create shuttle working in the vicinity of pinch points or significant build-outs in the carriageway (see Topic 2). The definition of priorities at these traffic calming features is sometimes required, to clarify which direction of flow is required to give way to the other. But care should be taken to avoid confusing drivers by ensuring, as far as possible, that the geometric layout emphasises the priorities indicated on the signs. The explanatory plate should always accompany the sign.

Warning Signs

The TSRGD prescribes a number of warning signs, which were introduced specifically for use with road hump schemes. The regulations also contain many

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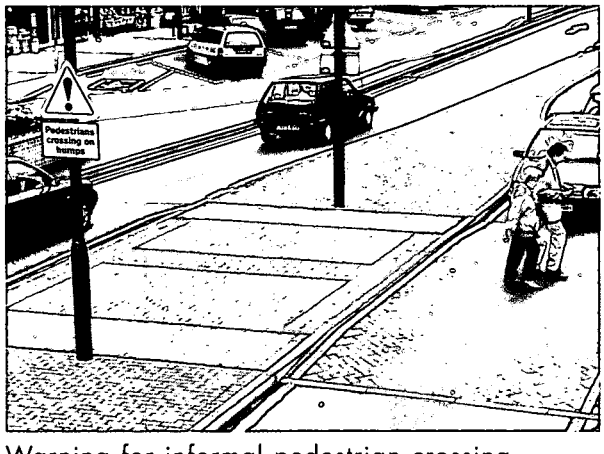
other signs such as "road narrows", "bend" and "pedestrians in road" which have been successfully incorporated into traffic calming schemes involving horizontal deflections, pinch points and narrowings. The exclamation mark (!) sign, (to Diagram 563) has been used with a suitably worded plate "Pedestrians crossing", to highlight a potential hazard with pedestrians crossing on flat top humps. (See Borehamwood Case Study which pioneered these signs), the wording in TSRGD having now changed.

Traffic calming schemes, particularly when introduced in rural situations where the aim is to reduce speeds to 40, or perhaps 30mph, sometimes result in a significant increase in the number of warning signs in advance of the traffic calmed area. Along with carriageway markings (see Topic 14) and other features, they are used to alter the drivers' perception of the road on which they are travelling and hence bring about a change in behaviour leading to slower speeds.



Warning for informal pedestrian crossing.

Unfortunately, there is often a conflict between the need for the signs in order to influence speeds and the adverse environmental impact that the signs themselves have on their surroundings, because of their colour and size. Some sensitivity is therefore needed to achieve an acceptable balance on this difficult design issue and discussion with the local community may well be helpful. Signing in conservation areas is often a problem and discussions should be held with the local planning authority to try to resolve the issues.

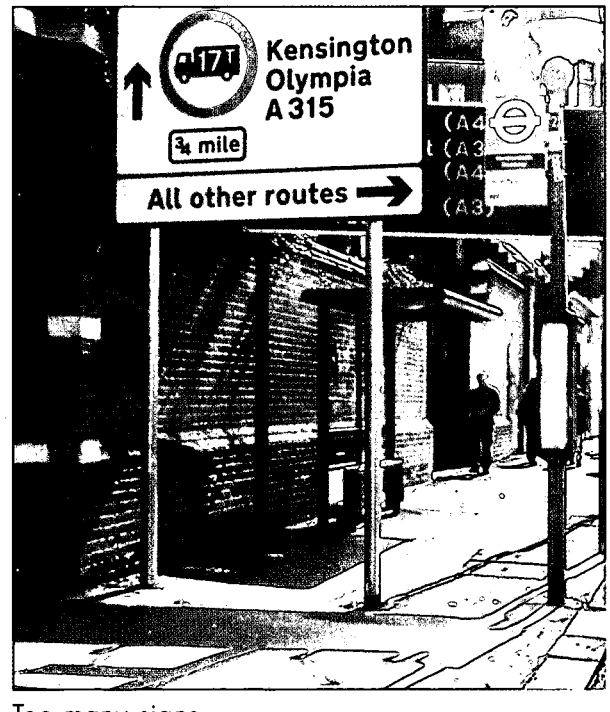
Direction Signs

Direction signing is not usually of great significance in traffic calming schemes (except Quiet Lanes – see Topic 20), but if the design is aiming to bring about a significant reduction in speed then consideration can be given to reducing the overall size of the direction signs, by reducing the "x" heights for lettering to suit the new speed regime. In terms of public acceptance this can be very important, as there can be considerable objection to new signs because of their environmental intrusion.

Parish and Town Councils are often keen to see the reinstatement of cast iron or aluminium "finger posts", which inevitably have small letters and are therefore often considered unsuitable for modern traffic conditions. If, however, speeds are reduced to the point where finger posts are both suitable and appropriate, they can positively enhance the appearance of the overall scheme, particularly in rural and conservation areas. It should, however, be noted that they are not permitted on A or B class roads.

Combinations of traffic signs

In some locations a combination of different types of sign can help emphasise that special care is necessary. This is especially appropriate at the beginning of a speed limit, where a village nameplate and a road safety message can be combined with physical gateways (see Topic 10), to create a significant visual impact. The use of "roundel" speed limit signs on the carriageway can also help support the signing messages.



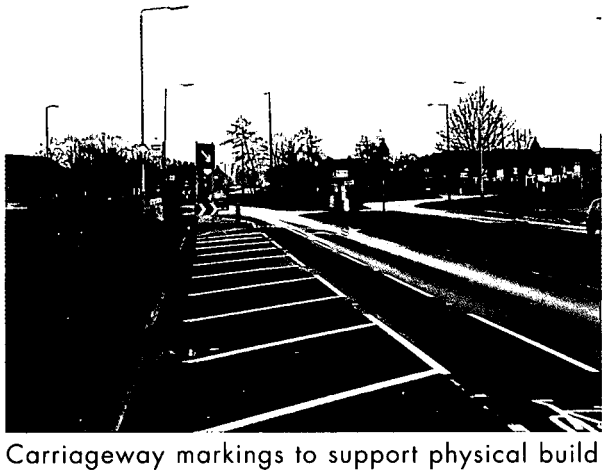
Too many signs.

If this approach is used, care must be taken to ensure that the signing is not confusing to drivers and does not represent a sensory overload to the extent that they become distracted. In addition, the use of large numbers of signs can draw criticism from those who feel they are out of keeping with their surroundings. A balanced judgement is required to overcome such problems and an audit of traffic signing may well be useful.

Topic 14 - Use of Carriageway Markings

White longitudinal road markings (of different types) are frequently used to separate opposing traffic streams and to delineate traffic lanes. They are also used as "edge of carriageway" lines to highlight and protect carriageway boundaries and, in conjunction with hatching and other surface treatments, to delineate protected margins and cycle lanes. The use of lines and the details of pattern and width are all defined in the relevant sections of *The Traffic Signs Regulations and General Directions* (2002) (Ref. 12) and are explained in the *Traffic Signs Manual* (Ref. 21). Road markings are an invaluable road safety device and not only provide guidance to drivers but, when laid continuously (for example as part of a centre double white line system, or to designate a mandatory cycle lane) are also enforceable by law.

White lining systems designed and installed by individual highway authorities must be in accordance with the regulations, the relevant chapters of the *Traffic Signs Manual*, and other national advice. There is, however, considerable discretion over the extent and layout of most white lining schemes, and indeed whether certain markings are required at all.



Carriageway markings to support physical build out.

Using fewer road markings

Experience has indicated that the clearer the road marking layout, the more positive will drivers be in their actions and general behaviour. This can lead to more aggressive driving as drivers "claim" their priority, with a resulting increase in speeds. In the same way wider, clearly defined lane widths, with their feeling of spaciousness, can promote a feeling of comfort and create a road environment considered suitable for higher speeds.

In order to achieve a traffic calming effect through the use of, (or perhaps the non-use of) road markings, exactly the opposite approach could be adopted. This approach has been applied successfully in a number of locations but considerable engineering judgement is required to minimise any resulting risks.

Carriageway markings to separate traffic.

Narrowing the Carriageway (see also Topic 2)

Visual carriageway narrowing can be achieved either by in-setting the edge markings or by hatching a delineated margin in the centre of the road. In the case of narrowing from the edges, if the road is sufficiently wide the space behind the edge of carriageway markings can be utilised to create parking bays, or a cycle lane, depending on the need and location. However, cycle lanes should only be created if they are part of a continuous route and should not be created just to fill the space over a limited length, since there are obvious risks in encouraging people to cycle in these lanes if they are then left to their own devices when there is no longer sufficient space. In the case of providing only a narrow margin, this can still be used to advantage in that it will automatically promote a greater degree of separation between vehicles and the carriageway edge, often with reduced risk and an improved feeling of comfort and safety for pedestrians.

Visually narrowing the road by creating a central hatched margin, is another alternative, and this is often used in conjunction with central refuges and/or right turning facilities. In many cases a combination of central hatching and edge narrowings, can be employed to displace the centre line of the road and remove the "straight through" vista, which for some drivers is an invitation to speed. In general, the narrower the running lanes the more likely that speed reduction will be achieved, but the mix of traffic will usually be the determining factor, as regular over-running of the road markings by heavy goods vehicles will quickly lead to maintenance problems.

Markings used to create narrow lanes.

Use of marking to emphasise sign.

As a guide, running lanes of between 2.6 and 2.8m in width (see also Topic 2 on road narrowings) should be the aim, although as usual the speed reducing effect will be enhanced if used in combination with other features such as physical refuges, kerb build-outs and centre line displacements. Provision should be made for the satisfactory safe movement of HGV's and buses, (eg, through over-running of hatched areas). It is noted however, that at certain historic locations, drivers can safely manage extreme width restrictions over short lengths. In such circumstances the street environment is giving clear visual messages to drivers, that such driving conditions are present and have to be managed. Where cyclists are likely to be present the use of narrow lanes is to be avoided unless an alternative provision for cycling can be made (as explained in more detail in Topic 2).

Removing centre lines

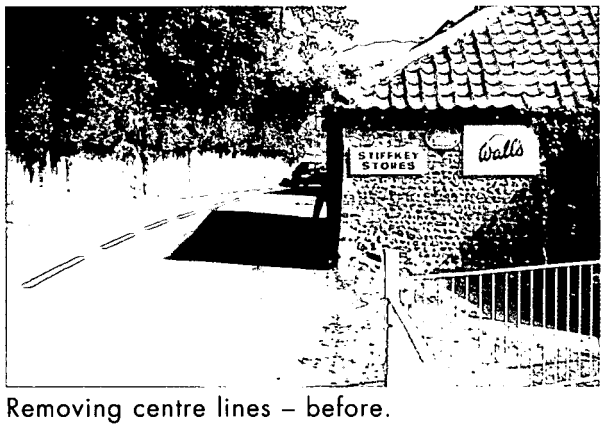
Another technique has been used in rural villages where traffic flows are not high and there is a mix of traffic including agricultural machinery. This is to visually narrow the carriageway with edge lining and to remove the centre line at all locations except at bends and other potential hazards. The edge margins also provide some protection for properties that face directly on to the road and assist pedestrians who may have to walk in the road due to the absence of footways. This technique can also reduce the extent to which the edges of the carriageway are damaged by vehicle overrun and hence save on maintenance costs. However, the consequences for safety need very careful consideration, since this approach also results in drivers moving towards the centre of the road thus reducing the tolerance in vehicle clearance.

A decision to remove the centre line should be taken in full knowledge of the guidance in Chapter 5 of the *Traffic Signs Manual* (Ref. 21), bearing in mind likely speeds, flows, widths, alignment and forward visibility.

Effectiveness (generally)

Where opposing flows of traffic are light, the reduction in 85th percentile speed that can be expected is at most 1-3mph depending on the general speed levels, but there is evidence to suggest that, rather than causing vehicles to come into direct conflict, there can be significant benefits in reducing the number of personal injury accidents. It is believed that this is due to drivers having to pay greater attention to the road environment and other road users in less conventional highway surroundings. However, extensive use of edge of carriageway markings in the rural situation can sometimes attract criticism due to their visual impact.

White lining can have a very significant part to play in many traffic calming schemes and can in itself bring about significant benefits, although these are likely to be greatest when used in combination with other techniques. White lining alone is unlikely to reduce actual speeds by any significant amount but it can influence drivers' behaviour so that personal injury accidents are reduced.



Removing centre lines – before.

Removing centre lines – after.

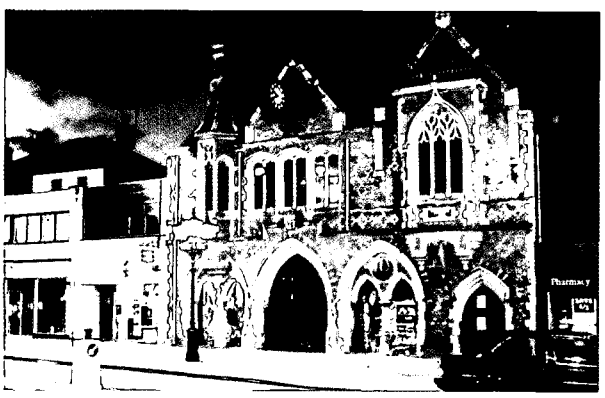
Topic 15 – Lighting for Traffic Calming Schemes

The need for, and design of, appropriate street lighting needs to be carefully considered wherever traffic calming measures are being installed. The following notes have been extracted, with the permission of the Institution of Lighting Engineers, (Ref. 38 Technical Report number 25, *Lighting for Traffic Calming Schemes*). The report is based on lighting performance measures specified in British European Standards for road lighting; and the relevant standards and documents to be used when determining appropriate lighting levels are:

- BS 5489-1: 2003 Code of practice for the design of lighting for roads and public amenity areas (Ref. 39).
- BS EN 13201-2: 2003 Road Lighting – Part 2: Performance requirements (Ref. 40).
- BS EN 13201-3: 2003 Road Lighting – Part 3: Calculation of performance (Ref. 40).
- ILE Technical Report 25 - *Lighting for Traffic Calming Features* (Ref. 38).

Choice of light source

A light source (lamp) giving a good colour rendering, (ie, distinction between colours) is necessary to assist the motorist in safely navigating the traffic calming feature, especially when the calming measure involves the use of colour. Good lighting also enables judgements to be made concerning driver priority and the actions of other motorists, cyclists or pedestrians. The use of a light source at the locality of the horizontal calming feature, which is different to that used on the adjacent area, can help draw the motorists' attention to the feature during hours of darkness.



Lighting to suit historic building and traffic calming.

The motorists' "ability to see" is affected by a number of physiological and psychological factors:

- the higher the lighting level, the better that people can see an object;
- the more time people have to view an object, the greater their recognition;

Good lighting enables judgement to be made over driver priority.

- the greater the contrast between an object and its background, the better the visibility.

All of these factors can be balanced against each other during the design process to achieve the required level of visibility. During the day there is usually enough light available and levels can be as high as 40,000lux on a sunny day. However, at night even the best street lighting will only be giving 20lux and on some roads where traffic calming is used it may be 5 lux or even less. When the light level is poor it is important to maximise the visibility of any traffic calming features by considering the contribution of all three of the above factors (ie, lighting, time and visual contrast).

Good contrast is required to ensure that the object or road marking stands out against its background. Thus white markings on a black road can increase in contrast by increasing the lighting level as the white markings reflect proportionally more light than their background. Deliberately creating shadows against a bright background is another way of improving contrast.

Differences in colour can also be effective as long as the colour changes can be seen and therefore lamps which provide greater colour rendering should be used. The greater the contrast between the object and its background the better the visibility; this applies as much during the day as in the night.

If no contrast exists between the feature and the background (road surface) then it does not matter how much light is projected at the surface, the feature will not be clearly identifiable and will be a hazard to the driver. This is why white road markings are used to indicate the presence of road features.

Lighting of Horizontal deflections

Within traffic calming schemes, one direction of traffic is often given priority over the other and

these are considered as junctions or conflict areas (within BS EN 13201). Drivers approaching the traffic calming feature need to be able to identify the feature concerned and its layout, and be able to make judgements about driver priority, the intended actions of oncoming drivers, and how to safely navigate the road system.

The Institution of Lighting Engineers (ILE) recommends that the choice of lighting level for a traffic calming feature should be one class higher than that of the road in which it is situated, with a minimum level of lighting of CE4 (as specified in table 2 of BS EN 13201-2: 2003 – Ref. 40). In addition a change in the type of light source to that used for the remainder of the road would help in drawing the motorist's attention to the feature.

For safety reasons it is recommended that illuminated signs are not located on any islands forming the horizontal features and if illuminated bollards are required, then they should be of the base light type. This approach will minimise the risk of damage and injury during any road accidents, but does not apply to centre islands of roundabouts where five metre columns with globes may be required to increase conspicuity.

Lighting of Vertical Deflections

Other than in 20mph zones the Highways (Road Humps) Regulations (Ref. 6) require that lighting should extend over the length of the road containing the humps. This must consist of at least three street lamps placed not more than 38m apart, as the lighting must comply with BS 5489-1: 2003 – Ref. 39).

The ILE suggests that, to provide good visibility of the features, ideally a good contrast in materials should be used to form or mark the vertical features and the associated road markings need to be well maintained. For lighting, both the CE and S-series of lighting (as given in BS EN 13201-2: 2003) apply, depending on the category of road, though a colour contrast is not always required.

For round top humps and speed cushions the Institution of Lighting Engineers has no specific recommendations for column locations, but achieving the correct level of light uniformity is still important.

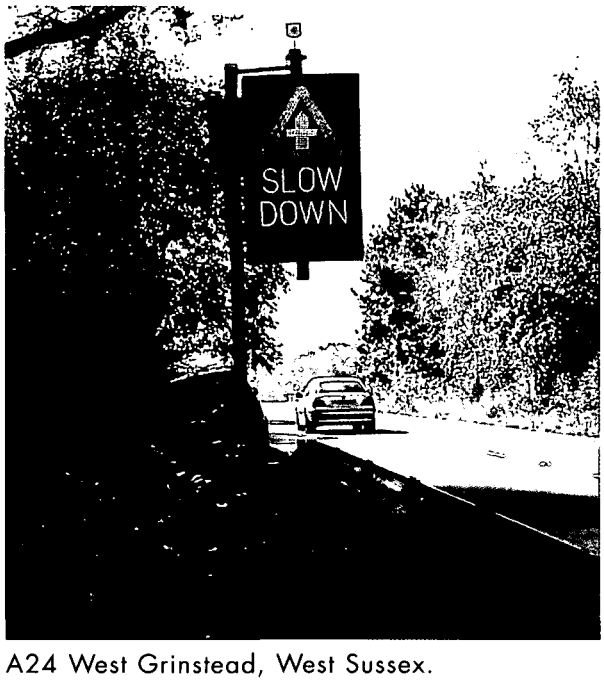
For flat top humps, unless used at important junctions, columns do not need to be located over the feature but either side of it, to provide maximum visibility.

Where flat top road humps are used to form a pedestrian crossing place then the lighting should be sufficient to ensure that drivers can be aware of pedestrian movements or intentions.

Lighting of areas of coloured carriageway

Where coloured surfacing is used to highlight features such as gateway effects and road markings such as "SLOW" or "30", the choice of light source should provide the correct degree of colour rendering to enable the feature to be adequately visible at night.

Topic 16 – Vehicle Activated (Interactive) Signs



A24 West Grinstead, West Sussex.

The purpose of installing an interactive sign is to warn drivers of a hazard ahead, or to remind them of the speed limit in force. They should be used in addition to, not instead of, conventional signing and should only be considered after a full review of the adequacy of the existing signing.

Recent practice has involved the use of portable, vehicle activated signs used for a temporary period to emphasise a change in the road layout or speed limit. This is to draw road users attention to the new feature and help them become accustomed to it.

Vehicle activated sign devices are particularly useful on the approaches to bends and junctions where motorists may be unable to judge a safe speed until they are in the bend, or are unaware of side road visibility restrictions. The examples pictured show a rural crossroads and a bend, where traditional signing and engineering techniques had failed to reduce accidents and full scale engineering

A24 West Grinstead, West Sussex approaching bend.

improvements to modern standards were either inappropriate for the setting, or required long term development (see Ref. 41).

The Equipment

Vehicle activated signs usually display a simple message based on a pictorial representation of highway signing contained within Schedule 1 of the Traffic Signs Regulations and General Direction (TSRGD 2002 regulation 58) (Ref.12). A limited number of warning signs are allowed to be used in combination with "Slow Down" plates (see TAL 1/03 Ref. 41 for details).

The display can be either fibre optic or more normally LED; and is activated when passing vehicles exceed a predetermined speed, typically by a microwave vehicle detector or inductive loops. The sign shown above shows a typical example. These signs can take their power from the mains, or from solar or wind power, and currently cost around £8,000 each to supply and install.

Effectiveness

The latest generation of vehicle-activated signs was developed during the 1990s and has been used to assist with speed enforcement and hazard warning. These signs have been trialled in Norfolk and evaluated by TRL (Ref. 42). In particular signs installed at Felthorpe (junction warning) and Fellbrigg (bend warning) provided very encouraging results.

The signs are switched on for four seconds when a vehicle exceeding the speed threshold is detected. This exposure time was calculated to be sufficient for the driver to register and understand the message. The threshold speed, at which the vehicle-activated warning signs were switched on, was set at the 50th percentile speed detected at the location of the signs before they were installed.

Other Points to Note

Until recently this type of sign required site specific authorisation from the Department for Transport (DfT). However, new provisions for these signs were included in the *Traffic Signs Regulations and General Directions* 2002 (Ref. 12) and the DfT issued a Traffic Advisory leaflet (TAL.1/03) in March 2003 (Ref. 41) to give advice on how the signs could be used.

The inclusion of vehicle activated signs in the new Regulations followed work carried out on behalf of the DfT. The Transport Research Laboratory (TRL) has carried out a full-scale study of vehicle-activated signs covering 62 installations, mainly on rural single carriageway roads in Norfolk, Wiltshire, West Sussex and Kent. The trial aimed to assess:

- the effect of the signs on drivers' speeds;
- the effect of the signs on injury accidents;
- drivers' understanding of the signs, and any regional differences.

The results are contained within the published report TRL548 *Vehicle Activated Signs – a large scale evaluation* (Ref. 43). The following points are taken from that evaluation:

Sites should be considered for the use of interactive warning signs if:

- there is a recent history of accidents in which inappropriate speed was a contributory factor, or;
- excessive speed for the conditions (ie, approaching junctions or bends) is a problem, and;
- other accident remedial measures have been considered and found unsuitable.

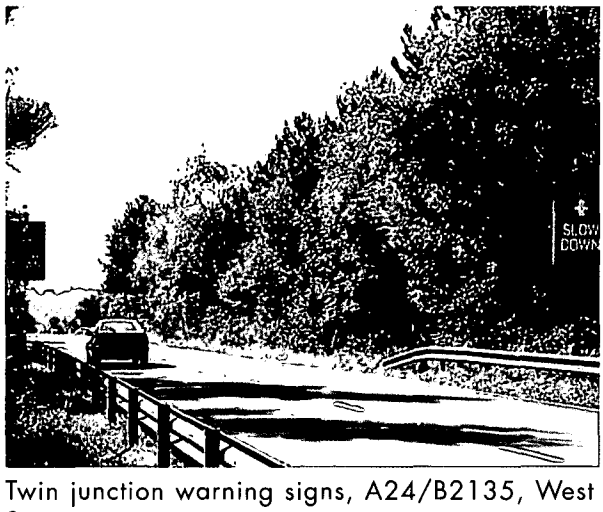
While there are many locations that might be suitable there are other considerations that may rule out the installation of vehicle-activated signs. For example, where there are natural features of the highway, such as road geometry and poor sight lines that may reduce the effectiveness of the sign. Sites should also be rejected if there is insufficient time to display the message to drivers due to these constraints. It is recommended that vehicle-activated signs are not deployed until it has been proven that the available fixed signs and markings are in full compliance with guidance and are inadequate to remedy the problem.

In general terms the sign should be located within 100m of the hazard and be triggered at a speed appropriate to safe passage. Other considerations are:

- Safety Camera Symbols: The use of vehicle activated signs to display the safety camera symbol has been analysed in three locations in Norfolk. The use of such signs is to provide additional feedback to drivers beyond that which is implied by using a safety camera. Results for these signs showed mean speed reductions of between 0.5 and 3.7mph.
- Accident Reduction Potential: In terms of accidents, results suggest that in appropriate circumstances vehicle activated message signs can produce around a 30% reduction in accidents.
- Sign authorisation: *The Traffic Signs Regulations and General Directions* (2002) (Ref. 12) covers the use of vehicle activated signs under regulation 58. In addition each sign display must comply with the requirements set out in TR2136 Issue C March 2002 (Ref. 44).
- Site selection: Site selection should be made on the basis of speed related accidents and should be justified on that basis. To date, vehicle activated signs have been used primarily in rural locations and few results are currently available for urban installations. Whilst these signs closely match the desirable characteristics of rural safety remedial measures, their use in urban situations should not be ruled out.

A number of matters that will influence the decision to implement a vehicle activated sign are:

- the current speed profile as measured on the road (in general the closer the current traffic speeds are to those which are desirable, the less effect the sign is likely to have);
- geometric site constraints;
- clear sight line for drivers to the sign with a 3 second exposure to the message;



Twin junction warning signs, A24/B2135, West Sussex.

- good visual background and sufficient room to install the sign safely (typically 100m to 150m from the hazard);
- provision of power supply (although alternative power sources such as solar or wind power are available);
- if alternative power is considered then the likely "hit rate" for sign activation, and therefore power usage, should be considered together with the likely power charging potential at the location;
- on high speed roads it may be appropriate to remote mount the microwave vehicle detector (MVD) in advance of the sign to allow three seconds exposure time to the message;
- vehicle activated sign installations should be designed to "fail safe" (ie, static signing should be retained);
- prioritisation of sign installation should be based upon their predicted casualty reduction potential as with all safety measures.

Use of vehicle activated speed limit signs

Speed limit signs including 20, 30, 40 and 50mph provide additional information to drivers where inappropriate vehicle speed is a confirmed problem.

Typical mean speed reductions that can be expected in a 30mph limit are between 2.6 and 7.1mph and in general terms the greatest speed reductions are achievable at the sites with the greatest "before" speeds. In setting thresholds for activating speed limit signs, consideration should be given to road conditions. A reasonable benchmark would be the ACPO guidelines on enforcement of 10% +2mph on top of the posted limit, (ie, in a 30mph speed limit the threshold would be set at speeds up to 35mph).

Typical mean speed reductions with a 40mph limit sign vary between 1.2 and 4.4mph and, as might be expected, in general terms the greatest speed reductions are achievable at the sites with the greatest "before" speeds.

Example 1 – vehicle activated sign to warn of a junction

Junction warning signs can be erected where site conditions require reduced vehicle speeds within the current, appropriately set, speed limit. Mean speed reductions can vary considerably within the range 0.8 to 9.2mph.

The picture opposite shows a twin installation on a dual carriageway at the approach to a junction, and the results can be found in the table. In this instance both signs are triggered from the sign in lane two at approximately 62mph.

Table 5 shows results at the A24 junction with B2135, West Sussex – junction warning signs on 70mph dual carriageway.

Example 2 - Use of a vehicle activated speed limit sign

In this case a 50mph site was trialled on a dual carriageway, on the A24 in West Sussex. The sign is triggered at the speed limit and is situated on the nearside kerb line. Results are shown in the table below.

Table 6 and the related picture are for a scheme on the A24 at Findon, West Sussex, a 50mph speed limit sign on dual carriageway.

50mph speed warning sign, A24, Findon, West Sussex.

Lane	Mean Speed mph	% greater than 70mph	% greater than 75 mph
Offside Lane			
Before	67.2	37.3	17.6
After - one sign only	61.5	17.9	7.4
After - twin signs	60	11.6	4.1
Nearside Lane			
Before	60.2	17.0	7.5
After - one sign only	56.1	8.4	3.3
After - twin signs	55	6.4	2.5

Table 5: Use of junction warning signs on 70mph dual carriagway A24/B2135.

Lane	Mean Speed mph	% greater than 50mph	% greater than 55 mph
Offside Lane			
Before	55.2	79.7	50.2
After 1	50.5	51.1	19.0
After 2	50.6	53.8	19.6
Nearside Lane			
Before	48.8	38.1	14.5
After 1	45.4	16.5	4.6
After 2	45.2	16.0	4.4

Table 6: Use of a 50mph speed limit sign on dual carriageway A24.

Group D:
Zone (or Area-Wide) Treatments

Topic 17 – Pedestrian Zones

During the last 20 years or so we have seen the creation of many pedestrian zones, with or without limited vehicle access, in town centres. A frequent dilemma is whether to allow entry to the pedestrian dominant area by buses, taxis, cyclists and transport for the disabled. Each situation needs to be considered on its merits but very few pedestrian zones in town centres have no access by vehicles. Those zones in which there is no vehicle access tend to be in the centre of purpose built new towns and shopping centres. Historic town centres will have evolved over many centuries and it is likely that demolition would be required to achieve good rear access facilities for vehicles, to avoid using the pedestrian zone. This will rarely be seen as an acceptable way forward, so alternative measures need to be devised.

It is often possible for through traffic to be diverted away from the pedestrian area, using alternative routes, but that access for servicing and deliveries has to be maintained. If the carriageway within the pedestrian area remains with a kerb upstand and narrow footways, then the area will still appear to be vehicle dominated, even if few vehicles use it. Pedestrians will feel unsure of themselves in the carriageway area and drivers will tend to treat the area as a vehicle space and drive accordingly.

To be transformed into a pedestrian friendly space that also permits some vehicles to have access, the street environment will need to be changed so that vehicles are clearly seen as intruders in a pedestrian dominated scene. The conventional treatment is to mark the vehicle track with buried kerbs (top face only showing) or a similar material, but with no upstands defining the edge of the pedestrian area. With suitable deviations on the alignment and loading areas, the street will appear to be pedestrian dominated and drivers will usually move very slowly.

As with other schemes involving changes or restrictions on the use of vehicles, a traffic regulation order will normally be required to permit legal enforcement. The development and installation of the scheme will need to go through the full consultation process as outlined in Chapter 3.

Pedestrian zone at Gravesend.

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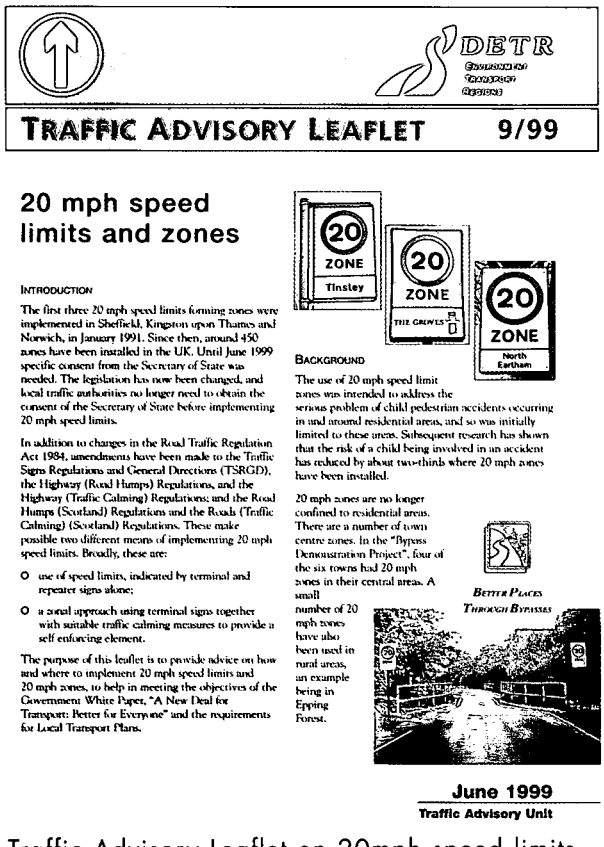
Topic 18 – 20mph Zones and 20mph Speed Limits

The introduction of 20 mph speed limits and zones, when placed appropriately, can have a significant effect on vehicle speeds and help to reduce road casualties.

There are two different means of introducing 20mph restrictions to an area and these are:

- a 20mph speed limit: indicated by terminal signs and repeater signs, either alone or with supporting speed reducing measures;
- a 20mph zone: using terminal signs together with suitable traffic calming measures (in accordance with TSRGD – Ref. 12) to provide a self-enforcing environment throughout the zone.

It is for local traffic authorities to decide which method (ie, speed limits or zones) should be used. This will depend on the characteristics of the area in terms of highway layout, traffic flows and existing speed levels. It is also important that the form of speed limit does not place unreasonable demands on the police in terms of enforcement and that it is, in effect, self-enforcing. Clearly there are also financial implications – the cost of introducing a 20mph zone with its associated traffic calming works generally being significantly higher than a "signs only" 20mph speed limit.



DETR

TRAFFIC ADVISORY LEAFLET 9/99

20 mph speed limits and zones

INTRODUCTION

The first three 20 mph speed limits forming zones were implemented in Sheffield, Kingston upon Thames and Norwich, in January 1991. Since then, around 450 zones have been installed in the UK. Until June 1999 specific consent from the Secretary of State was needed. The legislation has now been changed, and local traffic authorities no longer need to obtain the consent of the Secretary of State before implementing 20 mph speed limits.

In addition to changes in the Road Traffic Regulation Act 1984, amendments have been made to the Traffic Signs Regulations and General Directions (TSRGD), the Highway (Road Humps) Regulations, and the Highway (Traffic Calming) Regulations; and the Road Humps (Scotland) Regulations and the Roads (Traffic Calming) (Scotland) Regulations. These make possible two different means of implementing 20 mph speed limits. Broadly, these are:

- use of speed limits, indicated by terminal and repeater signs alone;
- a zonal approach using terminal signs together with suitable traffic calming measures to provide a self enforcing element.

The purpose of this leaflet is to provide advice on how and where to implement 20 mph speed limits and 20 mph zones, to help in meeting the objectives of the Government White Paper, "A New Deal for Transport: Better for Everyone" and the requirements for Local Transport Plans.

20 ZONE Tinsley

20 ZONE The Greves

20 ZONE North Eartham

BACKGROUND

The use of 20 mph speed limit zones was intended to address the serious problem of child pedestrian accidents occurring in and around residential areas, and so was initially limited to these areas. Subsequent research has shown that the risk of a child being involved in an accident has reduced by about two-thirds where 20 mph zones have been installed.

20 mph zones are no longer confined to residential areas. There are a number of town centre zones. In the "Bypass Demonstration Project", four of the six towns had 20 mph zones in their central areas. A small number of 20 mph zones have also been used in rural areas, an example being in Epping Forest.

BETTER PLACES THROUGH BYPASSES

June 1999

Traffic Advisory Unit

Traffic Advisory Leaflet on 20mph speed limits and zones.

How to make the choice

Traffic Advisory Leaflet 9/99 (Ref. 45) advises that 20mph speed limits using signs alone would be most appropriate where 85th percentile speeds are already low and further traffic calming measures are not needed.

Twenty mile per hour zones, on the other hand, should be considered where excessive speeds occur, and where traffic calming measures would be needed to achieve compliance with the speed limit. Twenty mile per hour zones would be particularly appropriate where there is an existing record of accidents to children occurring over an area, or where concentrations of pedestrians and/or cyclists are anticipated. They can help to protect children walking to and from school, and may encourage other children to walk or cycle. Because of this most 20mph zones are found in urban and residential areas as well as in town centres.

Effectiveness

It is generally recommended that 20mph speed limits, including 20mph zones, should be imposed over an area consisting of several roads. Applying the limit to a single road is likely to be less effective, unless it is at least 500m in length with calming measures spaced less than 100m apart.

The first 20mph zones within the UK, (in Sheffield, Kingston Upon Thames and Norwich) were introduced in 1991 to address the problem of child pedestrian accidents in and around residential areas. In a study of 250 such zones carried out by the Transport Research Laboratory (TRL) in 1996 (Ref. 46) it was found that:

- ◇ average speeds had fallen by nine miles per hour;
- ◇ the annual total of accidents had fallen by 60%;
- ◇ the number of accidents involving children had fallen by 67%;
- ◇ the number of accidents involving cyclists had fallen by 29%.

It was also found that, on average, traffic flows had reduced by 27%, with increases of 12% on surrounding boundary roads. There was, however, little evidence of accident migration.

The TRL have also undertaken a study (Ref. 47) of areas where lower speed limits have been introduced and where reliance is placed primarily on the signing of the limit (ie, without extensive traffic calming). The review indicated that the use of 20mph signs alone, without associated traffic

calming methods, led to speed reductions, on average of about one mile per hour, so it can be seen that they are generally much less effective in reducing traffic speeds than when a zone treatment is used.

Introducing a short length of either a 20mph limit or zone outside a school, without significant other measures, is unlikely to be observed by most drivers. Those that do slow down may also speed up again on leaving the area, where there may still be numbers of children present.

Other Points to Note

Prior to changes in legislation in 1999, specific consent from the Secretary of State was required for 20mph speed limits and such consent was generally only given if the zone contained a coherent system of traffic calming. With the removal of the consent regime, local traffic authorities were given the freedom to introduce either 20mph zones, or 20mph speed limits, covered by an amendment to Schedule 9 of the Road Traffic Regulation Act 1984 (Ref. L7). These changes have also been incorporated in amendments to the Traffic Signs Regulations and General Directions (Ref. 12), the Highways (Road Humps) Regulations (Ref. 6) and the Highways (Traffic Calming) Regulations (Ref. 10).

Signing and lighting

Twenty mile per hour speed limits are indicated by terminal and repeater signs. Within 20mph zones, repeaters are not required. Diagram 674 of the TSRGD (the zone "entry" sign) indicates to drivers that they are entering an area where they will encounter traffic calming features and for this reason the regulations do not require such features to be separately signed. This is of great benefit to the street scene as signing can be minimised.

Within areas covered by a 20mph speed limit, other traffic calming features may still be provided, but road humps would need to be signed separately and appropriately lit. Other traffic calming features (eg, chicanes) may also need to be signed and lit, depending on individual circumstances, but Diagram 670 (of TSRGD) should not be regarded as a warning of such features.

Lighting in 20mph Zones

Whilst the latest DfT guidance does not require illuminated signs or the lighting of traffic calming features, where the highway is in a 20mph zone (ie, where self enforcing measures are used and not just 20mph speed signs), it is the view of the Institution of Lighting Engineers panel that all traffic calming features should be adequately illuminated during the hours of darkness, including those within 20 mph zones. In any event lighting is often provided within these zones for other purposes, such as highway safety and crime reduction, in which case the recommendations given above still apply.

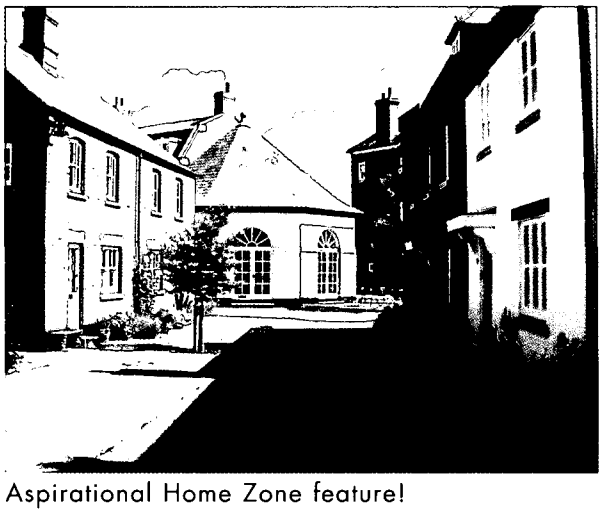
Consultation

Consultation with the police is a statutory requirement for both 20mph speed limits and zones. It should also be standard practice to consult with the fire and ambulance services having regard to possible implications for emergency response times. Public transport operators will similarly need to be considered. Any schools or colleges within the area may also wish to input to the process. Finally of course, seeking the views of the residents in the area will be crucial in securing local "ownership", a vital ingredient in a successful scheme (as explained more fully in Chapter 3).

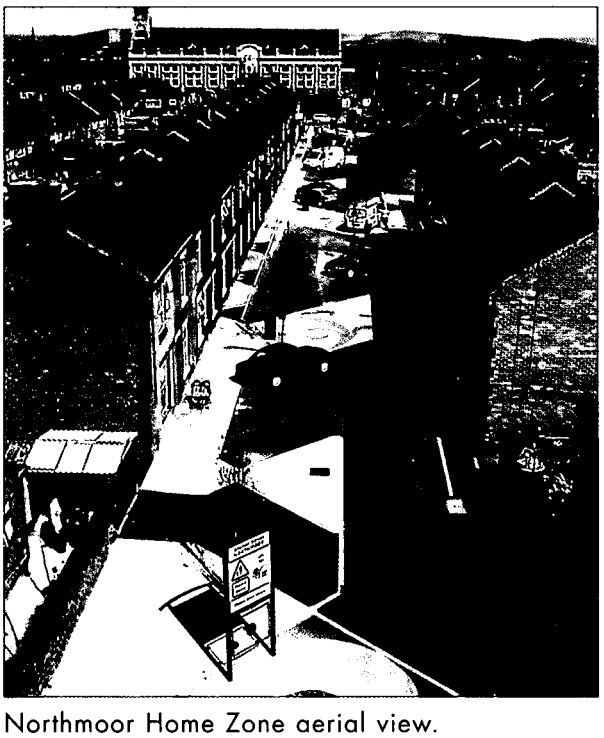
Topic 19 – "Home Zones"

"Home Zones" are residential areas where the streets are shared between residents and motorists. They are designed to be places that people can use for a wide range of activities, instead of just being thoroughfares for motor traffic, so they rely upon strong visual indications in the street to encourage slow and careful driving.

The Home Zones concept originally came to the UK from the Netherlands, where they have been constructing "woonerven" for over 30 years. There are now a number of Home Zones in existence in the UK and a new Home Zone sign has been introduced to inform drivers that they are entering an area where the road space is shared by all users.



Aspirational Home Zone feature!



Northmoor Home Zone aerial view.

Although the introduction of a Home Zone can contribute to highway safety, the main benefit for people is in improving their quality of life and neighbourliness. Introducing a Home Zone allows greater scope for a wider range of activities to take place in the street space that was previously considered to be for exclusive use by vehicles. The key to accommodating these activities in the street is in achieving very low vehicle flows and speeds and the development of a Home Zone can include the use of many of the traffic calming techniques observed in this book in a focussed and integrated way.

What areas are suitable for "Home Zones"?

Home Zones are intended for use within residential areas. Local authorities are being encouraged to develop Home Zones as a model for their residential streets, both in existing communities and when planning new developments.

Home Zone features.

Section 268 of the Transport Act 2000 (Ref. L6) provides the legislative basis for establishing Home Zones in England and Wales. These powers came into effect on 1 February 2001 and local traffic authorities have a specific power to designate Home Zones in their area. They will, in due course, also be able to make orders about the use of the roads and about speed reduction measures in Home Zones, subject to regulations to be made by the Secretary of State (for England) or the National Assembly (for Wales). At the time of publication the DfT was consulting on the "Quiet Lanes and Home Zones Regulations, England". [In Scotland, the legislative basis for establishing Home Zones is Section 74 of the Transport (Scotland) Act 2001.]

Unlike "20mph Zones", Home Zones aim to completely change the role and function of the street. Features of the highway and its environs must encourage an understanding by the people that use them, that the living environment is at least as important as the provision for traffic.

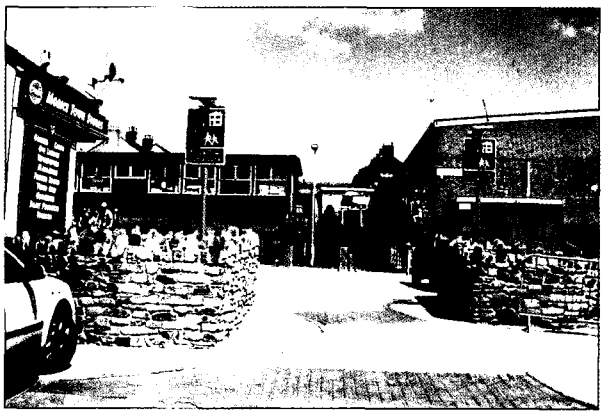
Design features should ensure self-enforcing restraint of vehicular speed to the extent that drivers understand and accept the rights of other users of the street space and adjust their speed accordingly. The nominal design speed is typically 10mph.

In practice there is much scope for imaginative design using different colours and textures of materials to designate different parts of the highway and shared areas. Speed reducing entry features are often used and schemes can incorporate play areas and other places for social interaction.

Other Points to Note

Effective community involvement is an essential ingredient in the development of any Home Zone. The involvement of all sectors of the community; including children, the elderly, families and teenagers, can help ensure that the design of individual Home Zones meets the needs and priorities of local residents. It is vital that the scheme reflects local people's needs and priorities, as fully as possible. The use of independent facilitators may assist in the planning process and also help to avoid fears that a scheme is being imposed on the community by the local authority.

The planning of a Home Zone should include the involvement of people who would benefit disproportionately from environmental improvements to their local area; for example, the elderly, people with impaired mobility and the young. These groups are often less vocal than others in their community. The use of computerised, 3-D, visualisation can help to show the community how the scheme will appear.



Home Zone gateway.

A number of pilot schemes have been undertaken, supported by the Department for Transport. In Northmoor, Manchester the area of the scheme covers some 1,400 dwellings and was a large regeneration project in an area of social deprivation. It has high density terraced housing built to a grid pattern with on-street parking and limited recreational facilities.

A dramatic streetscape design was adopted after extensive community consultation. The carriageway was relaid with a shared use surface. Parallel parking was replaced by echelon parking which acts as a traffic calming measure. Some houses have been demolished in the middle of each terrace to create a green street with lawned areas, play spaces and walkways.

Other sources of advice

A number of sources of advice have been developed and more are expected in the future in the light of growing experience of developing and implementing Home Zone schemes.

In December 2001 The Policy Press published Home Zones: A planning and design handbook (Ref. 48). This handbook is aimed at anyone who is starting out on the process of planning and designing a Home Zone scheme. It does not prescribe solutions but aims to ensure that the right issues are covered so that any Home Zone scheme achieves its full potential, through the information and advice it contains.

Home Zone features.

The Institute of Highway Incorporated Engineers published their *Home Zone Design Guidelines* in June 2002 (Ref. 49). The Guidelines complement the planning and design handbook by providing practical advice on good practice to designers and others in planning, designing or approving Home Zone schemes. The Guidelines are being revised and updated, to reflect the experience gained from the schemes already implemented.

The Department for Transport has published two Traffic Advisory Leaflets on Home Zones:

- TAL 10/01 *Home Zones Planning and Design* (December 2001) (Ref. 50), and
- TAL 8/02 *Home Zones - Public Participation* (December 2002) (Ref. 51)

both are available on the Department's website at tal@dotditm3.demon.co.uk

The legislation covering the introduction of Home Zones in Scotland is different to England and Wales. The Scottish Executive has, therefore, published a consultation document on Home Zones in Scotland *Home Zones Guidance Consultation.* This is available on the Scottish Executive's website: http://www.scotland.gov.uk/consultations/housing/hzgc-00.asp

Websites are valuable sources of advice and guidance on home zones. Whilst many of the individual schemes have their own websites, there are two main websites for Home Zones in the UK:

- www.homezonenews.org.uk
- www.homezoneschallenge.com

The first provides an overview of Home Zones in the UK together with details of the pilot schemes and other schemes being introduced. The second provides details of the schemes being introduced in England through the Home Zones Challenge.

Results so far

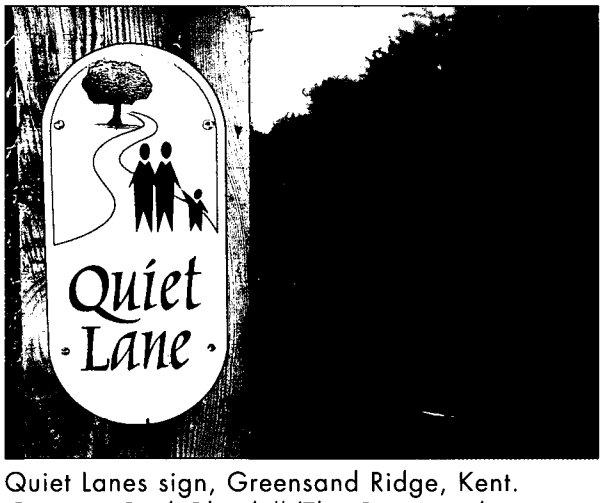
The indications from completed schemes are that they have often led to a stronger, more vibrant and diverse community. For example, residents in Northmoor, Manchester are far less concerned about crime than they once were; house prices there have risen significantly and there are now very few empty properties - a good measure of success. In Morice Town, Plymouth, it has been observed that with the development of the Home Zone there is now greater community activity.

Topic 20 – "Quiet Lanes"

Quiet Lanes are minor rural roads which are appropriate for shared use by walkers, cyclists, horse riders and motorised vehicle users. These roads should already have low levels of traffic travelling at low speeds. The aim of Quiet Lanes is to maintain the character of minor rural roads by seeking to contain rising traffic growth that is now common in rural areas.

The "Quiet Lanes" concept is still relatively new, having been initially established by the Countryside Commission (now the Countryside Agency) in 1996 and aimed at rural areas. Two national demonstration areas were established in 1998, (in North Norfolk and West Kent), to test and develop the concept. These schemes are reported in TAL 3/04 (Ref. 52) and associated evaluation reports (Refs. 53 to 56). They show that Quiet Lanes can be an effective way of maintaining the tranquillity and character of minor rural roads. There are now other projects in varying stages of development across England.

Quiet Lanes represent the "softer" side of traffic calming by aiming to reduce the impact of vehicular traffic in rural lanes, without the introduction of physical speed management techniques. Projects are community based, leading from the desires and needs of local people. Key to the success of Quiet Lanes is influencing attitudes and behaviour of road users – the majority of whom tend to live locally in rural areas. Unusually for traffic calming, the areas identified as being suitable for a Quiet Lanes project tend not to have any substantial accident record at all. Often, this is coupled with very low traffic flows and road geometry that tends to naturally constrain vehicle speeds. Quiet Lanes projects therefore build on this inherently calm environment in order to limit the rising traffic growth that is widespread in many rural areas. They involve local people in significant and sustained consultation workshops to build consensus and encourage community responsibility with consideration for others.



Quiet Lanes sign, Greensand Ridge, Kent.
Courtesy Paul Glendell/The Countryside Agency.

Quiet Lanes, Greensand Ridge, Kent.
Courtesy Paul Glendell/The Countryside Agency.

Quiet Lane schemes often involve changes to direction signing to re-route traffic away from the network. In Norfolk, direction signs were changed so that they only indicated the next village, not the major towns further on. However, this must be done carefully to ensure no villages are "lost" to visitors.

Quiet Lanes are not simply about the imposition of speed limits or the introduction of "urban style" traffic calming features. Measures that are introduced need to respect the character of an area and match the road environment to the expectations of road users. Simple devices such as false cattle grids used sparingly, in conjunction with other features (such as village nameplates) to give them an appropriate context, have been used in the Quiet Lanes areas to good effect. Early monitoring of this site showed a reduction in speed of 4mph, but unfortunately this was not sustained, with monitoring in 2002 showing a drop of only two miles per hour, compared to speeds before the implementation. In addition, to define the area encompassed by the Quiet Lanes, specific signs have been installed using oak posts in an unobtrusive manner to indicate the start and finish points for the Quiet Lanes network.

Design features

As with other traffic calming schemes all engineering and design features used in a Quiet Lanes network should be developed through a consultation and participation process with local people. The following measures can be considered for inclusion in a scheme, remembering that the key aim is to develop an holistic approach to travel within a local area.

- A continuous network incorporating off-road links – use of existing bridleways, creation of new permissive bridleway links and widening of existing footways to allow for shared use.
- Signing – a review of existing road signing to rationalise and minimise the number of signs.
- Re-routing of traffic – away from the Quiet Lanes network using revised direction signs.
- Crossing points on busier roads – with improved visibility splays, improved warning signing and accompanying "slow" marking on the carriageway.
- Surface measures – might include high skid resistance or buff coloured surfacing to warn of the approach to a junction. Edge of carriageway markings may also be helpful to indicate where there is an access point.
- Road links from Quiet Lanes – to provide links between the Quiet Lanes network and adjoining areas, on a road that is not regarded as a Quiet Lane. Such links can be treated with surface changes to give the impression of a reduced carriageway width.
- False cattle grid – these comprise five raised parallel bars across the road in a light grey colour and gives a gentle rumble as vehicles pass over. The bars may be accompanied by white edge of carriageway markings to warn drivers who might not otherwise see the bars (see also Topic 5 – Alerting Measures).

Where Quiet Lanes might be used

Quiet Lanes must be developed in consultation and participation with the local community, allowing consensus to be established at the "grass roots" level.

The road network for the Quiet Lanes area should be geographically relevant to the locality and need not necessarily relate to Parish boundaries or existing hierarchies for roads and Public Rights of Way (PROW).

False cattle grid.

Effectiveness

Monitoring of the National Demonstration Projects has shown negligible changes in vehicle speed and small but significant reductions in vehicle flows. The numbers of non-motorised users were very low and fluctuated greatly throughout the study with no statistically significant changes.

Support for the schemes was very high in both areas with over 75% of respondents in favour of the schemes. However, a significant proportion of the respondents did not believe the scheme was working in practice, often because of continued concerns over rat-running and vehicle speeds.

Other Points to Note

It should be noted that Quiet Lanes are not intended to be anti-car, but they are pro-people and are designed to respect the local environment by conserving and managing local landscapes and rural character. Access for vehicles within the network must be maintained, along with the need to enhance the economic vitality of the countryside. The needs of extremely large vehicles such as farm machinery must be considered, along with the general needs of deliveries, emergency vehicles and the normal traffic needs of everyday living in the more remote areas.

Section 268 of the Transport Act 2000 (Ref. L6) gives legal status to the term Quiet Lanes. The Act enables local traffic authorities to designate roads for which they are responsible as Quiet Lanes. The Department for Transport (DfT) are producing regulations and guidance (Ref. 52) setting out the procedures for designating Quiet Lanes and enabling the making of Use Orders and Speed Orders.

Group E: Enforcement Activity

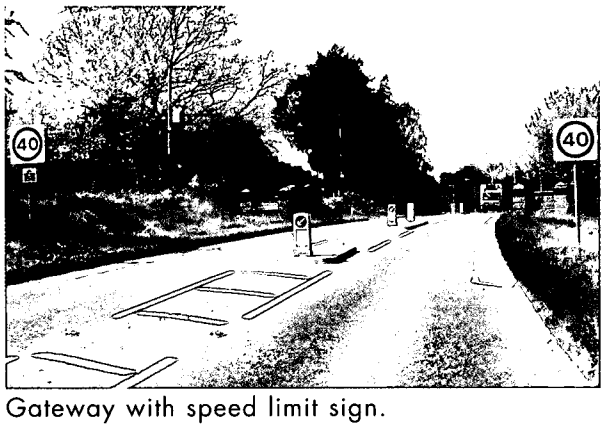
Topic 21 – Speed Limits

Speed limits were first introduced into the UK in the 19th Century to limit the damage caused by traction engines on roads and danger to local communities. Legislation in the form of the Locomotives on Highways Act 1865 (known as the Red Flag Act) restricted the speed of these road engines to four miles per hour (two miles per hour in towns) and required an attendant to walk ahead with a red flag to warn oncoming traffic.

The first motor cars appeared in the 1890's and were initially subject to these low speed limits, but in 1896 a further Act removed the red flag requirement and raised the speed limit to 14mph, although this was soon reduced to 12mph to limit damage to road surfaces. In 1903 a new Act raised the limit to 20mph and in 1935 the basis of today's speed limits was introduced with the 30mph, built up area, speed limit. In 1967 the 70mph national speed limit was introduced.

The need for traffic calming has arisen, at least in part, because many drivers frequently disregard the authorised speed limits. A further reason is that in some areas a limit of 30mph is now not thought to be sufficiently low, due to the current or desired uses of the road. The speed limit and the need to ensure that it is observed, is the key factor in the demand for many traffic calming schemes.

The primary purpose of a speed limit is to indicate the maximum permitted speed to be driven on a road or within a defined area, in good driving conditions. It is not intended to be a target speed, although it often appears to be interpreted in this way by drivers. Allied to the purpose of speed limits is the need to set a limit that is appropriate for the particular road and the purposes for which it is used. Opinions from within the community at large are often very different on this issue!



Gateway with speed limit sign.

National guidance

In order to provide a consistent framework of speed limits for motorists, the government has determined a range of maximum speeds for different classes of road and vehicle. The overall framework of national speed limits is supplemented by powers given to highway authorities to make lower, local speed limits. In order to encourage consistency of application, national guidance is given on speed limit criteria in Circular Roads 1/93 (Ref. 57), which is being reviewed and updated.

Effectiveness

Most people believe that speed limits are necessary and highway authorities continue to receive many requests for new or lower speed limits, from individuals and communities concerned about road safety. In practice, however, most drivers exceed speed limits and they are not as effective as intended. National surveys have revealed that 59% of drivers exceed 30mph limits, and over 50% regularly exceed 70mph limits. Research by TRL has concluded that speed reduction leads to casualty reduction (Ref. 20), supporting the evidence that a significant proportion of road casualties are caused by excessive or inappropriate speed.

Signing

Requirements for speed limit signing are set out in national legislation and guidance. Key references are:

- ◇ *Circular Roads* 1/93 (Ref. 57.)
- ◇ *Traffic Signs Regulations and General Directions 2002* (Ref. 12)
- ◇ *The Traffic Signs Manual* (DfT) (Ref. 21)
- ◇ Traffic Advisory Leaflet 1/95 – *Speed Limit Signs – A Guide to Good Practice* (Ref. 28)
- ◇ Traffic Advisory Leaflet 9/99 – *20mph limits and zones* (Ref. 45)
- ◇ Traffic Advisory Leaflet 1/04 – *Village Speed Limits* (Ref. 58)

The importance of consistent and adequate signing of speed limits cannot be underestimated, as it provides the essential communication with the driver en-route as well as providing the legal basis for enforcement of local speed limits. Terminal signs are required at the start and end of each speed limit length (or zone). Speed limit repeater signs are required on all roads except street lit 30mph roads and where the national speed limit is in force.

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More recent developments and reviews

Following release of the national guidance in 1993, almost all highway authorities followed a consistent approach by adopting the national criteria for setting speed limits. However, within a few years, a number of authorities developed road safety initiatives based on departures from national guidance, in response to local public concerns about traffic speeds and road safety.

A significant example of such a departure was the programme introduced in Suffolk in 1996, which applied 30mph speed limits in all villages, irrespective of the national criteria at that time, (Ref. 58 – TAL 1/04 on village speed limits). Since that time a number of other authorities have departed from national speed limit criteria, or developed their own local criteria as part of their road safety and speed management strategies.

Since speed limits carry with them legally enforceable penalties when they are not observed, it is vital that any departures from national guidance are considered very carefully, since the imposition of speed limits which are perceived to be either too low, or indeed too high, for their situation, will cause frustration and lead to widespread abuse. In these circumstances they will be very difficult to enforce, not achieve their aims and may actually worsen road safety rather than assist it.

The developing practice of using departures from national guidance, concerns about traffic speeds and the link to road casualties, were all recognised by the government in announcing the national speed review in 1998. The subsequent DETR interim report (2000) *New Directions in Speed Management – A Review of Policy*, (Ref. 59) identified the need to review speed limits and national guidance for setting limits. This review recognised that road humps, chicanes and other engineering measures are amongst the most effective methods of reducing vehicle speeds in urban areas. They found no evidence that they cause damage to vehicles, when negotiated at sensible speeds.

Research and development is still ongoing (Ref. 60 in 2004) on the national speed limit policy framework, the making of speed limit orders and a review of speed limit criteria. In the meantime highway authorities are continuing to develop their own innovative schemes using national and/or local criteria, and an evaluation of their experience will assist the national review before new guidance is issued by the government.

Topic 22 – Speed (Safety) Cameras

Speed cameras are a relatively recent development first introduced into the UK in 1992 on a trial basis. Because of their success in recording and prosecuting errant motorists, sometimes in large numbers, they have attracted much criticism, attention in the media and on-going public debate. Nevertheless, since enforcement of traffic regulations is such a fundamental part of traffic control, and inter-alia of traffic calming, we can expect to see the use of cameras increasing, both for enforcement of speed limits and in other ways.

The purpose of speed and red light cameras (collectively referred to as safety cameras) is to provide an effective means of focussing police enforcement resources on casualty reduction. When this linkage is not transparent and the principle is not closely followed there is considerable risk that the speed camera will be perceived by the public as "unfair" and simply a means of raising revenue. This situation must be guarded against as far as is possible, as it undermines the understanding and driver compliance that is required at locations where there is a higher risk of accidents occurring.

It is important to appreciate that whilst camera equipment can be used to help enforce speed limits, (or other types of traffic regulation order), the presence of the camera itself can act as a calming device. The use of speed cameras varies from some of the other traffic calming techniques described in this publication, in that speed cameras by their very nature, are not a self-enforcing measure, as they do not physically control vehicle speeds. This distinction is important and should be borne in mind from the outset in considering what traffic calming speed enforcement "tools" might be available to deal with any speed related casualty problem.

The first stage for any highway or traffic authority contemplating the deployment of a single speed (safety) camera, or a system of such cameras, is to liaise very closely with the area camera partnership

Truvelo installation. *Courtesy Truvelo.*

Hand held detector. *Courtesy Truvelo.*

/local police force at the earliest opportunity. Many highway/traffic authority and police force speed management strategies make it clear that enforcement of speed limits under the provisions of the Road Traffic Act 1991(Ref. L14) are considered only where other speed management techniques such as engineering measures or community speed awareness campaigns, are unlikely to be, or have not been, successful. Indeed, this requirement is embodied in the DfT rules (see below).

In 1996, Home Office research (Ref. 61) concluded that whilst cameras were effective at reducing casualties, the full benefits were not being realised due to budgetary constraints, and that these could be removed by allowing local road safety groups to recover enforcement costs from fine income. Two years later a policy decision was taken to allow local partnerships, subject to strict Treasury criteria, to recover the costs of speed enforcement through the hypothecation process. DfT decided to run a pilot scheme in eight partnership areas, and these commenced in April 2000. Results were encouraging after only the first year and the decision was taken to roll out the project nationally.

The enabling legislation for this national scheme was the Vehicles (Crime) Act 2001 (Ref. L16), and the scheme is now called the UK National Safety Camera Programme. Partnerships of highway/traffic authorities, police forces and other health and safety agencies were encouraged to join in order to recover the costs of safety camera activity, but only where the cameras are wholly justified on their road casualty reduction potential. This fundamental principle underpins the justification for any Partnership's operation of speed and red light cameras under what has now become known as the "cost recovery" or "netting off" system. The rules and guidelines, which include site selection criteria, are contained in the DfT's *Handbook of rules and guidelines for the operation of the national road safety camera programme for England and Wales* (Ref. 62) (NB a similar document exists for Scotland). The DfT intends to make public a revised version in 2005/06, which would be subject to further revisions through the life of the programme.

In short, therefore, the operational costs of safety cameras cannot be recovered under the national programme unless such locations have the prior approval of this programme. Safety cameras should not be considered as a speed management tool under the following circumstances:

- ◇ where there is no speed related road casualty problem;
- ◇ merely as a lower cost alternative for the highway/traffic authority to other engineering led traffic calming measures;
- ◇ as a means of achieving driver compliance with an otherwise unrealistic speed limit regime.

It must also be remembered that there will be high, ongoing, system management and offence data processing costs to the local police force and Magistrates Court Committee as a consequence of the installation and use of camera enforcement equipment.

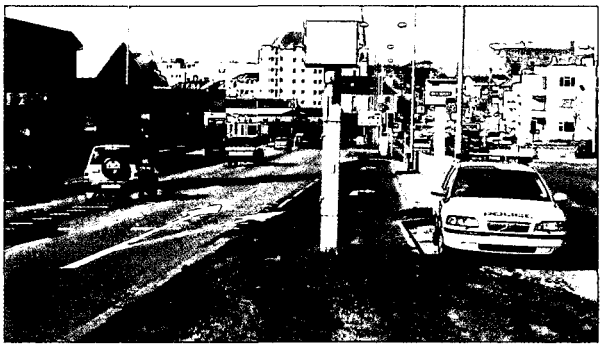
Effectiveness

Where appropriately applied as part of a road casualty reduction and speed management partnership between highway/traffic authorities and local police forces (and also often in partnership with local Magistrates Court Committees and Health Authorities), safety cameras can produce impressive reductions in speed related road casualties and associated speeds.

The DfT published a report (Ref. 63) on the two-year pilot scheme in 2003 which contained the key statistic that killed and seriously injured casualties at the camera sites had fallen by 35%. It also claimed that fixed camera sites had the greatest impact (a 65% reduction) but that mobile sites had also been effective (29% reduction). (DfT research paper *A cost recovery system for speed and red light cameras a two year pilot evaluation* 11 February 2004 {Ref. 63}).

The average speed across all sites had been reduced by 3.7mph. At some locations, such as in Nottingham, where road fatalities were eliminated, and in Northamptonshire, with an overall 50% drop in accidents at camera sites, there were very high accident reductions. On average, the numbers of drivers speeding at camera sites has dropped from 55% to 16%.

These encouraging results are being supplemented by returns from the subsequent "roll out" of the cost recovery (netting off) system to other partnerships, mostly based upon police force operational boundaries. It was the aim of DfT that, by April 2004, all 41 areas in England and Wales would have joined the national programme and this was achieved except for two authorities. In Scotland, all police areas are part of the programme.



Speed camera with police car. *Courtesy Devon and Cornwall Safety Camera Partnership*

Safety (or speed) cameras can be used effectively on most types of road in the urban, suburban and rural road environment and within any speed limit regime other than sub-30mph locations, where a number of equipment types are not calibrated and type approved to operate at these lower speeds. This point should be borne in mind when considering the application of cameras to support 20mph speed limits or zones, although the latter should be self enforcing by design (see Topic 18).

Safety cameras will, however, often provide the most appropriate solution in the urban, suburban or rural road environment where the following combination of factors are present:

- ◇ a high number of speed related road casualties have occurred as evidenced from police recorded crashes;
- ◇ other engineering led measures have been tried and proven to be wholly or partially ineffective;
- ◇ other traffic calming options, (for example road humps, tables or cushions) are unavailable as a remedy, such as on roads subject to a greater than 30mph speed regime;
- ◇ there is evidence of a high number of drivers (eg, 20%) exceeding the posted speed limit
- ◇ there is evidence that the 85th percentile speed is at or above the ACPO enforcement guidelines (the Association of Chief Police Officers has their guideline set at 10% above the speed limit plus two miles per hour, ie,. 35mph in a 30 zone) and therefore cameras are likely to have a deterrent effect on the fastest drivers.

Safety cameras will be of most benefit to the community in a speed management role when their application is considered carefully against the above site selection criteria. Data returns from Safety Camera Partnership pilot areas and newer operational partnerships across the UK are continually updating the understanding of the effectiveness of cameras in speed and casualty reduction. Furthermore, their likely economic benefits, when the costs of installation and ongoing management and maintenance are weighed against the estimated values of casualties saved, are also being evaluated.

Legislation

The current application of speed and red light (safety) cameras on the UK's roads takes place under the provisions of the Road Traffic Act 1991 (Ref. L14). The Act introduced the following powers:

- ◇ for local authorities to install and maintain roadside camera equipment;
- ◇ for Police to require information about the identity of a driver [under Section 172 of the Road Traffic Act 1988 (Ref. L15)];
- ◇ the provision for evidence generated by type approved speed and red light cameras to serve as the sole evidence against the offender;
- ◇ a new conditional offer of a fixed penalty, which could be sent through the post.

The Vehicles (Crime) Act (2001) (Ref. L16) permits approved Safety Camera Partnerships to recover their costs for safety camera activity against fine revenue collected. This has strengthened the need for any camera installations within those areas to be fully justified on their casualty reduction potential and not as a method of producing revenue, as is often believed by the public.

The method by which a partnership can introduce a camera site is to submit its inclusion in an annual operational (business) case, justification being based on the traffic data and the casualty figures for the previous three calendar years. A site can only be accepted if there have been at least 4 Killed or Seriously Injured Collisions (KSICOLL) in the last three calendar years. In certain circumstances it may be possible to submit a supplementary business case during the (financial) year.

Equipment and Signing

There are two main types of static speed camera currently in use in the UK. Only devices which have been type approved by the Home Office and prescribed in law can be used.

The most common type is the Gatsometer (known as the Gatso), a Dutch product which utilises Doppler radar to detect speed. The camera, radar unit and flash are installed in the roadside housing. As vehicles pass the radar detector their speed is constantly monitored. When a vehicle is detected travelling above the set trigger, or threshold speed, the camera is activated and two pictures are taken 0.7 second apart. The white "zip" markings placed on the road provide a quick secondary check to validate the recorded speed by viewing the progress of the vehicle in the two pictures. Gatso always detects vehicles receding from the site and photographs the back of the target vehicle.

The detection/camera equipment used in the fixed

site can also be set up on a tripod at the side of the road, or from the back of a parked van – commonly known as a "mobile site".

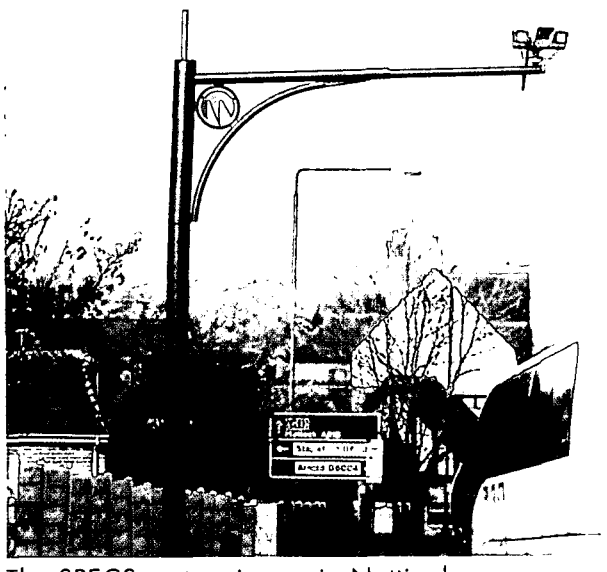
The other main device used in this country is the Truvelo. This is a South African product which uses sub-surface loops to detect vehicle speed rather than radar. Truvelo takes photographs of the front of the vehicle as it approaches the site. The detection equipment cannot be used away from its fixed installation because it relies on pre-installed and calibrated detection loops cut into the highway.

There are also other speed detection devices which are approved for "attended" use – in other words they are for use by police officers as part of their operational enforcement tools, but cannot be used as part of a fixed installation. These devices include hand held radar and laser used from inside a vehicle or set up at the side of the road.

Other camera types are also entering the market, following lengthy type approval processes. These are based on digital technology.

A digital camera gaining popularity where there is a bad collision history along heavily trafficked routes is the SPECS system (Speed Check Enforcement System). This is based on the time-distance principal whereby one set of cameras, fixed above the carriageway on a gantry arrangement, detects and records number plates using Automatic Number Plate Reading (ANPR) technology. The vehicle enters the speed-controlled zone and further down the road, (within a range 200m to 10km), the exit camera registers the number plate. Both readings, and a colour image of the front of the vehicle, are stored in a remote cabinet. The SPECS system measures the average speed over a distance and records speed violations as evidence of the offence.

This system has been used successfully in Nottingham where results indicate a speed reduction of five to six miles per hour and an associated 51% reduction in collisions. Northamptonshire and Leeds, among others, also claim success with the system.



The SPECS system in use in Nottingham.

Type Approval

In order to comply with the provisions of the Road Traffic Act 1991 (Ref. L14) and for the evidence collected to be admissible in a court of law, it is essential that all equipment purchased under any of the above categories should feature in the Home Office Police Scientific Development Branch (PSDB)/Association of Chief Police Officers (ACPO) (Traffic) Manual of Traffic Enforcement Equipment and have a "type approval" certificate under Section 20 of the Road Traffic Offenders Act 1988 (Ref. L17). Unless equipment has Home Office Type Approval (HOTA) then it cannot be used as evidence in a prosecution.

The flexibility of full digital technology is on the way, with HOTA in its final stages. The labour-intensive wet film process may, therefore, soon be a thing of the past.

Local authorities considering the purchase and installation of safety (speed) camera enforcement equipment for operation outside an operating partnership are advised to:

- ◇ consult closely with the local Police Force over suitability of the proposed equipment and enforcement and data processing methods proposed;
- ◇ liaise with the Police, to ensure that the prospective equipment has the necessary Type Approval certification (if necessary advice should be sought from PSDB/ACPO(Traffic) prior to purchase).

Other Points to Note

Current best practice dictates that safety camera installations should be signed with informatory signing in accordance with the advice contained in Circular Roads 1/95 *Traffic Signal and Speed Camera Signing* (Ref. 64). A "speed camera ahead" sign should be mounted within one kilometre of a camera location, and not less than 0.1km ahead.

Much adverse comment from the public is directed at perceived lack of information as to the speed limit. A recent addition to the TSRGD is sign 880, (Speed camera ahead and reminder of 30mph speed limit) and this can serve as a useful reminder to motorists of the posted speed limit. It must always be remembered that the aim of any camera partnership is casualty reduction and not as a generator of revenue.

A directive was introduced by DfT in 2001 (Ref. 65) that all partnerships must colour their camera housings yellow to increase visibility, and carry out regular audits to ensure that no housings are hidden behind obstructions such as trees, bridges, or road signs. Housings (but not necessarily the post) need to be wholly visible to a driver 60m before, in a 30mph zone, and 100m before in a 40mph zone or above. The signing and camera apparatus conspicuity guidance is intended to supplement and not replace the prescribed speed limit signage contained in the Traffic Signs Regulations and General Directions 2002 (Ref. 12).

Community Speed Initiatives

Some police authorities are working with the local communities in "Speed Watch" programmes, where local residents are officially on the streets checking on the speed of vehicles (at agreed sites) using speed gun equipment. They advise the police about offenders, then the police issue warnings to drivers and eventually take action if offences reoccur. This is a fairly new initiative, which could be expanded to become an important tool in the speed management process.

Topic 23 – Increased Police Enforcement Activity

The use of additional police enforcement resources to tackle an identified speed or traffic nuisance problem should only be undertaken after consideration of all other available traffic calming solutions has been exhausted.

One key factor that distinguishes "enforcement" from the majority of other measures outlined in this book to "calm" traffic, is that with other options the highest costs are usually incurred at the time of installation, and most often by the promoting highway or traffic authority. With enforcement, however, the costs, which may be high in resource terms, will be borne primarily by the Police Authority and can continue to be required for a considerable period of time, if the enforcement action is not successful in influencing road user behaviour for the longer term. Increased police enforcement should, therefore, only be seen as a temporary, or short term approach to casualty reduction.

A Police View

Police Forces generally only respond positively to approaches from highway/traffic authorities for enforcement in support of traffic calming measures (or other highway engineering measures for that matter), when it can be demonstrated that the resources to be deployed can be shown to meet the key objectives of the National Roads Policing Strategy (NRPS). These objectives include achieving safer roads and improved road user behaviour and a key goal of the NRPS is, therefore, to help achieve the national road casualty reduction targets (as contained in the DTLR *National Roads Safety Strategy – Tomorrow's Roads – Safer for Everyone* Ref. 5).

Police forces will wish to be assured that requests for enforcement form part of a comprehensive casualty reduction package that includes appropriate road design, infrastructure layout and supporting traffic management measures, including signing and markings as explained elsewhere in this book. The main advice to any highway or traffic authority contemplating a request to the local police force for additional enforcement presence is to liaise very closely with them at the earliest opportunity. This would ensure that they are aware of the particular situation and understand the thinking behind the request. It would also be helpful if the authority can demonstrate the need for a targeted approach through its speed monitoring data.

The Development of Joint Strategies

Many highway/traffic authorities and Police Forces have produced joint speed management strategies which make it clear that enforcement of speed limits under the provisions of the Road Traffic Act are considered only where other speed management techniques such as engineering measures or community speed awareness campaigns, have not been, or are unlikely to be, successful.

Where appropriately applied as part of a comprehensive traffic calming solution involving casualty reduction and speed management (through engineering measures, signing, publicity and education), additional enforcement can be beneficial. However, where police enforcement is to be included as part of a solution it should be aimed at a particular objective, and only for a limited period. For example, where new physical measures have been introduced which require driver compliance, the presence of highly visible enforcement, for a limited period, may help establish the new speed regime within the community. In these circumstances it may be that "white warnings" rather than immediate prosecution, can help establish appropriate driving standards for the area in question, particularly amongst the local community.

Group F: Community Involvement

Topic 24 - Working with the Community

In recent years there has been widespread recognition of the advantages of involving local communities in all aspects of the decisions which affect them. This is particularly important for traffic and safety matters which are often contentious. Time spent understanding and working with local people and organisations will invariably result in proposals which have local support and are therefore more accepted and effective when implemented.

Local highway authorities have the responsibility to manage, maintain, improve and keep safe the highway network for residents, businesses and other highway users. These "stakeholders", who ultimately pay for the services provided, sometimes have legal rights to be involved and consulted by a highway authority when it exercises these responsibilities; but beyond these specific responsibilities there is a great deal to be gained from engaging with the community from the outset.

The community needs to be involved in the development of policies or works that affect the highway in order to:

- ◇ provide local knowledge and understanding;
- ◇ ensure that the outcome meets, as far as possible, the needs and aspirations of the community;
- ◇ obtain community ownership, and;
- ◇ achieve the desired action or behaviour from the community to address the particular problem or issue being considered.

When should the community be involved?

Residents and businesses will usually have an interest in the impact of any proposal which affects their home or business interests. Highway users, who may also be local residents or business people, will want to know how a proposal will affect their journeys or access to their premises. Thus the community at large needs to be involved from the start of any project that will significantly impact on the way in which they use the highway network, or affect the street scene.

Examples of proposals that create such an impact include:

- ◇ changes to the use of the highway;
- ◇ changes to traffic flow/composition/priority;
- ◇ changes to parking provision;
- ◇ changes to access arrangements;
- ◇ restrictions on vehicle speed and type;
- ◇ changes to the street scene.

Many traffic calming schemes include one or more of these features.

Communities can be involved in the development of projects in many ways ranging from attendance at formal council committees through focus groups, attending public exhibitions and displays, and a variety of other means (see below). Communities can also be asked to identify issues and potential solutions through activities such as "planning for real" group activities, or to simply comment on proposed policies or schemes through public exhibitions or mail shots. The role of the community in any exercise needs to be carefully considered and discussed with key people from the community and representative groups.

The objectives of so called consultation can vary and can include:

- ◇ Providing information: advising the community of intended action, to allow them to plan for it; and as a matter of courtesy to them.
- ◇ Consultation: seeking views on the objectives of a scheme, or its detail to fine tune proposals so that they better meet the needs and aspirations of the community.
- ◇ Referendum: giving the community the choice to decide whether a policy or scheme proceeds.
- ◇ Involvement: where the community, or representatives of it, are associated with the different stages of a scheme from its beginnings through to implementation and evaluation.

The choice of what type of consultation to undertake is very important and should relate to the type of action being contemplated. The right decision at this stage can prevent subsequent problems and help engender support for what may turn out to be contentious proposals later on. It can also encourage confidence in the work of the local authority.

Methods for Involvement

Community involvement can be achieved through the use of one or more of the following methods:

- ◇ workshops or focus groups;
- ◇ committee meetings of elected bodies (Unitary, District, County, Town, Borough or Parish Councils);

◇ public meetings;
◇ circular letters and leaflets;
◇ questionnaire surveys;
◇ "Citizen Panels";
◇ opinion surveys;
◇ use of the media;
◇ statutory consultation processes;
◇ special events involving the community.

Properly targeted and focussed community involvement will promote and encourage ownership and agreement to a proposed course of action.

Adverse effects and concerns

Community involvement can sometimes raise public expectations to a level greater than can realistically be delivered and local highway authorities should try to manage this expectation in order to avoid resentment or criticism of the scheme at a later date. Consultation also has time, resource and cost implications to the local authority and these can be considerable, sometimes far outweighing the implementation costs of the scheme itself. Furthermore, despite best efforts there is always the risk that someone may be missed out of the process or feel aggrieved at the eventual outcome and hence criticise the process by which decisions are made. This is why it is so important to plan and explain the process clearly from the outset.

Topic 25 – Advertising and Publicity

In order to raise awareness of road safety difficulties and inform the public of dangers at certain sites, it may be effective to carry out an advertising campaign. The picture below shows temporary sign boards that were erected on the A24 in West Sussex to advertise the dangerous nature of the road ahead, due to the excessive speed of many motorists.

It should be emphasised that these are not traffic signs in the conventional sense, but temporary message boards erected by the highway authority. They are not in accordance with TSRGD and the DfT do not want to see a proliferation of such signs, as in some locations they could be considered to be a safety hazard in their own right.

The objective of any advertising and publicity in this context is not simply telling people about a particular situation, it should be aimed specifically at encouraging a change in behaviour by road users.

Advertising and publicity can also support other road safety initiatives by providing background information, explaining particular issues, raising the profile and stimulating public interest.

Speed kills sign on the A24, West Sussex.

It is important that the messages given through advertising and publicity are easily accessible to their intended audience, so a variety of media can be used and these need to be chosen carefully. Whilst these techniques can be used as a traffic calming measure on their own, they can also be used to support other engineering, enforcement and education measures, or indeed physical techniques of the kind explained elsewhere in this chapter.

The approach

The usual approach in publicity campaigns involves:

◇ The targeted delivery of key education and road safety messages to an identified audience, through an appropriate medium. That audience can be identified through analysis of accident data and might be drivers of cars, motorcyclists, pedestrians, children or any other road user groups seen to be either at special risk and/or involved in the accidents that are occurring.
◇ The form of advertising and publicity chosen can be either subtle or more blatant in the way it delivers its messages, and is usually designed to convey a specific message to a specific audience. Blanket messaging will not typically result in a blanket reception. Users of this technique should, therefore, construct a profile of the audience they want to reach and be clear about the "simple" message they wish to give. It is important for the intended audience to be able to access and understand the messages provided in an easy, understandable and informative way. The type and positioning of advertising and publicity is, therefore, crucial to its success.
◇ Advertising and publicity can be used to deliver a single message and to portray a way of behaving. Presenting positive images of desired behaviour can aid compliance and acceptability. Alternatively, campaigns may have a negative

side to them when they show the adverse effects of not modifying driver behaviour. Many "Drink & Drive" campaigns have taken this approach.

The advertising media includes many alternative means of getting a message across (eg, TV, cinema, radio, press, poster sites, flyers, Internet, specific publications, static displays, etc.). The costs and suitability of each of these can vary enormously so great care needs to be taken in choosing a medium which is suitable, effective and affordable.

Other Points to Note

- These costs can sometimes be offset by obtaining financial support from a commercial sponsor.
- Many advertising and publicity methods can be expensive, due both to the choice of medium (eg, TV) and to the potential level of repetition required to deliver the required results.
- The final choice of the medium to be used may come down to financial constraints and can mean that the most appropriate medium is not the finally selected one. There can also be difficulty deciding what constitutes an "appropriate" medium and which method would achieve the best results.
- Evaluating the success of an advertising campaign can also be difficult as the evaluation process would typically focus on such issues as recall, opportunity to see/hear/view, and the effects on perception and action.
- Advertising and publicity often needs to take place over a protracted period, and may need to be repeated at regular intervals in order to reinforce the message.
- Involvement of advertising professionals can provide invaluable support in designing publicity strategies and developing ideas so that they achieve the maximum effect.

Effectiveness

Advertising and publicity campaigns can reach a large audience within a small time frame, allowing a simple message to be delivered in a co-ordinated manner. It can be particularly effective when it engages the target audience, either through building up their own thought images or by encouraging them to be inquisitive.

Many large organisations, particularly those involved in retail, frequently spend huge sums of money to advertise their products, and are clearly happy with the results they get in influencing the buying patterns of the public. The most prominent road safety advertising success in the transport context has been the anti-drink/drive campaigns where in conjunction with the enforcement policy, and some local education initiatives, drink/drive related deaths and injuries have dropped significantly over the last 25 years. Other national campaigns have been mounted in respect of seat belt and excessive speed in urban areas.

Topic 26 – Speed Pledges

"Speed Pledges" are a technique in which drivers are encouraged to make a personal commitment, or pledge, to adhere to speed limits with the aim of bringing about a general change in driver attitude and behaviour and, ultimately, reducing speed related road casualties. Sometimes called "Make the Commitment", this technique influences the behaviour of drivers not yet "signed up", by demonstrating an acceptable level of driving behaviour on the part of those who have taken the pledge and are therefore leading by example.

This technique can be attempted with a large population, say a county or city, but may be more effective within smaller communities like a town or village. It can be particularly useful for small communities who have expressed concerns over perceived traffic speeds, but where there is no evidence of significant "rat-running" or through traffic, and the majority of traffic is local to the area.

Explanation of the technique

Drivers are encouraged to commit to adhering to speed limits through the signing of a "pledge". The pledge can take the form of a certificate, a returnable postcard, a community book, an e-mail service, or any other appropriate medium. Drivers are encouraged to become community minded and thus help contribute to improving the safety of all road users.

The pledge could be signed at public events (eg, County Shows, fairs, parish meetings etc.) and also be made available through local authority offices and public buildings. Individual households can also be targeted, particularly in small areas where there are strong local concerns, to encourage all drivers to make a commitment.

Advertising and publicity (see Topic 25) is vital to providing public information on the technique and for encouraging drivers to make the pledge as well as providing credibility and support to those who do sign up.

Publicity can also help to create the desire amongst drivers to be part of the scheme and thus help create peer pressure.

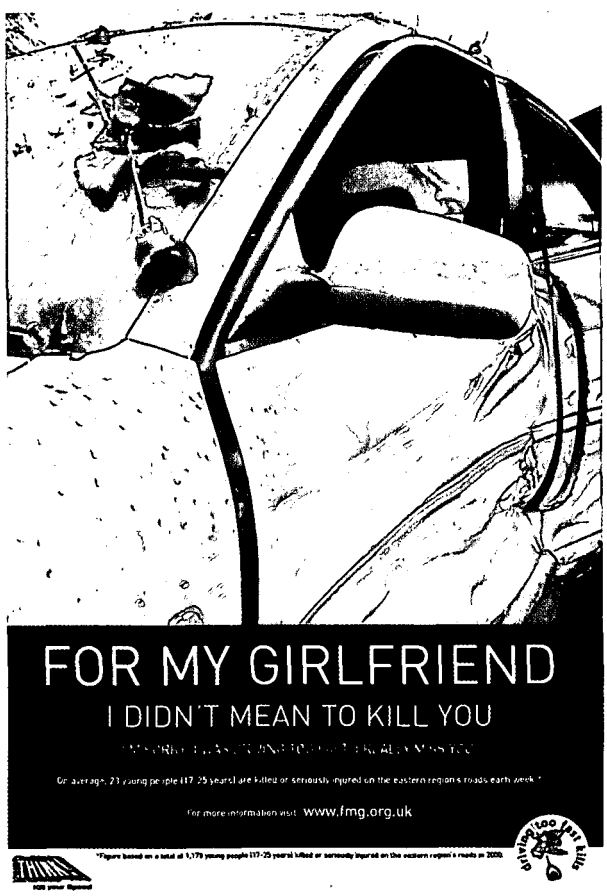
Drivers who make the pledge can receive a "welcome pack" containing useful information and materials such as bumper stickers. A maintained database may also be helpful to maintain the details of those who make the pledge and to facilitate ongoing communication within the community.

Example 1 – "Make the Commitment"

"Make the Commitment" is a publicity campaign that asks individual drivers to make a pledge to kill their speed. Suffolk County Council's road safety team initiated the campaign in 1995 and a year later they were joined by other local authorities in the eastern region.

Over the next five years the authorities pooled resources to run campaign launches, displays, touring buses and canvassers to take the message into the community. The result was that over 120,000 people signed up, 25,000 from Suffolk alone.

"Make the Commitment" is still active but it has now been supplemented by a new, eastern region anti-speeding campaign, "For My Girlfriend", which targets 17-25 year old drivers.



Advertising can deliver the road safety message.

This campaign uses a postcard with a graphic image. 180,000 cards were distributed during 2002 and a re-launch took place on Valentine's Day, 2003.

Example 2 – "Community Pace Car Scheme"

This campaign, in North-East Lincolnshire, seeks not only to reduce the accident rate, but also to improve the quality of life in communities throughout the county, by reducing the impact that excessive and inappropriate vehicle speeds have upon them.

Having completed an extensive review of speed management, and established the problem areas, methods of overcoming them (ie, enforcement, highway engineering measures and community involvement) are being researched, developed and introduced. All the measures introduced are encompassed in the Authority's, "THINK! – Slow down" campaign which was launched in mid 2002 with a number of innovative measures. Further measures are to be introduced progressively over the next five years.

The "Community Pace Car Scheme" is a community-based, self help initiative to reduce speeding and improve the neighbourhood quality of life. It is a simple idea to use local drivers and their vehicles to calm other traffic in everyday driving behaviour.

To participate, motorists volunteer to sign a pledge, administered by North East Lincolnshire Council's Traffic Accident Reduction and Road Safety Unit. This voluntary agreement requires them to adhere to speed limits at all times when driving in North East Lincolnshire.

This simple commitment is intended to influence all drivers following behind a designated "Community Pace Car" to also drive within the speed limit. In effect, the Pace Car becomes a mobile traffic calming measure. Motorists taking part in the scheme are issued with a highly visible yellow sticker (measuring 175mm x 140mm), the design of which incorporates the logos of both North East Lincolnshire and Humberside Police.

The Community Pace Car Scheme is intended to:

- ◇ provide the opportunity for safety minded motorists to contribute to the safety and quality of life of other residents within North East Lincolnshire, and to influence other drivers driving habits by their own behaviour. Thus good drivers can influence the behaviour of bad drivers "on the road";
- ◇ reduce the speed of traffic on North East Lincolnshire's roads without the need for physical measures such as traffic calming;
- ◇ save the community money by reducing the amount spent on expensive traffic calming measures;

◇ free up police officers' time by reducing the need for them to carry out enforcement measures;
◇ force other drivers to recognise the speed limits and slow down, and to plan ahead for their journeys.

Effectiveness of the "Pace Car" scheme

It is believed that once sufficient numbers of people have been encouraged to join the scheme, and observe the speed limits, North East Lincolnshire will become a safer, more pleasant place in which to live, work and travel.

Definitive studies into the effectiveness of such a scheme have yet to be carried out and it would be wise to proceed with caution until there is good evidence of the technique achieving a positive result.

Local Authorities who currently use this technique generally measure its effectiveness through self completed questionnaires by their audience. Anecdotally their results suggest that following making their pledge, most drivers observe speed limits most or all of the time.

After two years in operation, over 900 volunteer drivers had signed up to the scheme. Although there were fears that the volunteers would be intimidated by following drivers and subjected to road rage, this has not been the case, possibly because of the support given to the scheme by the Humberside Police. Whilst it is not yet possible to give long term results, the short term effects have been encouraging, with reductions in both fatal and serious accidents. However, these reductions cannot be attributed solely to the pace car scheme.

Other Points to Note

◇ Advertising and publicity forms an integral part of this approach, particularly in triggering the interest and desire amongst drivers to be involved, and to widen understanding amongst other road users.
◇ Costs include advertising, database maintenance, ongoing communication, pledge documentation, pre-paid reply systems and staffing of events where the pledge is explained and taken.
◇ It should be noted that those drivers who "take the pledge" may well be those whose behaviour does not actively contribute to casualty statistics, but good behaviour is being used as an example to others who may speed frequently.
◇ It may be appropriate to question whether there should be a time limit to the length of an individual's pledge, or if it should be a lifetime pledge? Issues will include the cost of re-signing

The "Community Pace Car" in North East Lincolnshire.

drivers, if there is a time limit, and the potential distress caused by sending out information to any drivers who may be deceased.
◇ There are also data protection issues associated with collecting and storing personal data of drivers.
◇ Incentives to join the scheme may increase membership, (eg, small, free gifts like tax disc holders, etc.) The securing of sponsorship would allow the "free gift/incentive" aspect to be developed.

Other points of interest

Adopting a "Speed Pledge" approach will create many opportunities for extending positive links with the community on other traffic and safety matters and in other forms of advertising and publicity; not merely to publicise the scheme but also to achieve a linked casualty reduction effect in its own right.

Although the "pledge" is an individual's commitment, groups of individuals can be encouraged to take part. Employers making a "Company Commitment" could gain broader benefits including enhancing a company's community image, affecting their Health and Safety record and, potentially, influencing their motor insurance premiums.

Positive messages should be used in association with this type of scheme, such as "Thank you for not speeding", rather than the negative "Don't speed". It should, however, be remembered that a speed pledge is a voluntary undertaking and cannot be enforced beyond normal speed limit enforcement.

Topic 27 – Working with Schools

Effective traffic calming projects can be achieved with the help and involvement of school communities.

This technique can be employed in any community where there is a school or college, but is particularly appropriate where concerns have been expressed locally about road safety and the particular dangers to pupils and students.

These projects are usually aimed at:

- casualty reduction;
- reduced congestion (ie, through less use of the car);
- improved health and fitness of pupils;
- achieving a safer local environment; and
- a change in modal shift to more sustainable forms of transport.

It is in any event important to involve schools, their students, teaching staff and the wider community in any proposed traffic calming scheme. Using the consultation process (see Topic 24) should ensure that:

- the school community will help identify problems and, more importantly, potential solutions;
- they will take ownership of the problems and/or solutions;
- students can learn road skills with particular relevance to their local environment – pedestrian, cycle and pre-driver training;
- the consultation process itself can provide links to core curriculum subjects and therefore to contribute further to road safety education;

Walking buses encourage children to walk to school in a safe and organised manner.

- there is an opportunity to engage the wider community through the pupil and student population.

An Approach to working with schools

Schools should first be approached by contacting the key people in their local environment, such as head teachers and school governors. Through them contacts can be established with other teachers, parent/teacher associations, parents and ultimately the pupils/students themselves. It is likely that Road Safety Officers and School Travel Advisers will already be in contact with these people so they should also be involved in the scheme.

A variety of resources are available to encourage schools to consider participation in schemes of this nature. Examples of the type of information and other measures that are available include:

- casualty data highlighting the vulnerability of school age children and other students;
- road safety education guidance available on websites and in text form;
- cycle and pedestrian training schemes;
- lesson plans for core curriculum subjects;
- school "Travel Plan" guidance.

Other Points to Note

"Walking buses"

Encouraging schools to become actively involved in traffic calming schemes can produce innovative projects to complement the local environment. One example of this, known as "Walking Buses", originated in Hertfordshire as part of a *Safer Routes to School* project and has since become well known and popular nationally.

"Walking Buses" are created to encourage children to walk to school in a safe and organised manner. In practice, parents develop a voluntary rota and act as the "driver" and "conductor" of the bus. The "walking bus" then takes the same agreed route each day at the same times, and the children wait at designated places (stops) along the route. Clearly this technique is best suited to areas in which there are relatively large numbers of younger age group children living reasonably close to their school.

"The bike train"

In a development of the "walking bus" approach, Woodford Halse School in Northamptonshire has devised a "bike train". Known as "Woody" the train aims to encourage cycling to school in a safe and fun way.

Topic 28 – Safer Routes to School

"Safer Routes to School" projects aim to improve road safety and reduce child casualties, particularly on journeys to and from schools or colleges and are, therefore, considered as traffic calming measures in their own right. In combination with "School Travel Plans" (see below), these projects are designed to reduce dependence on the car and can usefully contribute to wider transportation objectives. These objectives are achieved by encouraging and enabling children to walk and cycle to school with practical and educational help. Safer routes schemes also promote the health benefits of travelling sustainably and provide the opportunity for children to learn essential road safety skills when using the highway.

Effectiveness

Engineering schemes outside Northamptonshire schools carried out as part of the Safer Routes to School programme have reduced casualties by 50%. This has helped achieve good progress towards saving child accidents to meet national targets. School Travel Plans are, however, also important to encourage less car use and improve the health of future generations.

Other Points to Note

Each school is different, with its own local problems and possible solutions. Developing a "School Travel Plan" in conjunction with the school itself, can help ensure that a more comprehensive situation is considered so that appropriate action is identified and taken.

Successful "Safer Routes" projects are child-centred and benefit the whole local community by helping to create safer, healthier environments. Physical measures can be included as part of the package and could include anything from the traffic engineering toolbox (such as 20mph zones and toucan crossings). But equally important are specific "sustainable transport" facilities such as secure cycle parking and providing better access for school buses.

The typical project will follow the following stages:

1. The school starts work on its own School Travel Plan (see opposite);

2. Travel surveys are carried out to quantify the existing modes of transport used by pupils, teachers, governors and anyone else visiting the school site. They are also asked what problems are encountered on the school journey and if they have ideas for solutions to these problems;

3. The scheme co-ordinator uses the survey results and any additional information from the Travel Plan to design preliminary measures to solve highlighted problems, and make walking, cycling and public transport more attractive;

4. The school, pupils, parents, residents and police are then invited to comment on the preliminary plan and the measures arising from it through exhibitions and leaflets;

5. Final designs of the proposed measures are completed incorporating comments from consultees, and works carried out on site, preferably during school holidays;

6. The measures agreed upon are monitored and evaluated against an agreed timescale.

A School Travel Plan

An effective school travel plan puts forward a package of measures to improve safety and reduce car use, backed by a partnership involving the school, education and transport officers from the local authority, the police and the health authority. It is based on consultation with teachers, parents, pupils and governors and other local people.

There are elements that every school travel plan must contain. It must be a written document and should include:

- a brief description of the location, size and type of school;
- a brief description of the travel/transport problems faced by the school/cluster of schools. This should include all pupils' travel needs, journeys to and from school at normal start/finish times, journeys to attend pre- and after-school events and journeys made during the school day to attend activities at other locations;
- the results of a survey to identify a) how children currently travel to/from school and b) how they would like to travel to/ from school;
- clearly defined targets and objectives;
- details of proposed measures;
- a detailed timetable for implementation;
- clearly defined responsibilities;
- evidence that all interested parties have been consulted, and
- proposals for monitoring and review.

Many of the traffic calming techniques mentioned in this book could be useful in conjunction with Safer Routes, but especially useful for Safer Routes to School schemes are:

- priority measures to aid cycling and walking; such as "toucan" crossings;
- 20mph zones (including children's artwork);
- markings on footways to show walking routes;
- variable message signs (which change message at the main school entry and departure times) although Traffic Advisory Leaflet 1/03 (Ref. 41) says that in practice these had little effect on reducing vehicle speeds and requests for sign authorisation are therefore unlikely to gain approval.

As with all road crossings, careful consideration to location must be given, when a crossing is to be installed adjacent to a school entrance, due to the large numbers of moving and stationary vehicles.

Consideration should also be given to the possible increase in vehicle emissions caused by some traffic calming techniques and their potential effect on pedestrians.

The use of painted signs on footways can sometimes be perceived as graffiti, especially in conservation areas.

Group G:
The Needs of Special User Groups

This section provides advice on how traffic calming can affect different types of road users. It is in three sections:

1. Traffic calming and the emergency services;
2. Traffic calming and bus operators;
3. Other local users – including pedestrians, cyclists, equestrians, disabled people, motorcyclists and large vehicles.

1. Traffic Calming and the Emergency Services

Traffic calming measures, which slow passing traffic by physically making it difficult or impossible to negotiate the device at anything above the design speed or speed limit, can and do cause concern to fire and ambulance service operators whenever they compromise their ability to meet Home Office required emergency response times. A limited trial carried out in 2001 (Ref. 31 TRL Report 482) found that roundabouts and road humps resulted in average delays to a fire tender of approximately 1.4 seconds per measure.

Realising the potential difficulties arising from the use of speed humps of varying profiles, a Code of Practice was agreed in 1994 by the Joint Committee on Fire Brigade Operators, the Department of Health's Ambulance Policy Advisory Group, the Local Authority Association and the (then) Department of Transport, each of whom recommends the Code to its members.

The Code of Practice is set out in DoT Traffic Advisory Leaflet 3/94 (Ref. 26) and explains how a dialogue needs to be established with fire and ambulance services at an early stage of scheme design. The key points are as follows:

Emergency Service needs must be considered.

1. The highway authority and emergency services should establish a dialogue on the broad principles and consult on individual schemes.
2. A road hierarchy which includes strategic routes for emergency access should be agreed.
3. The types of traffic calming measures to be used on different roads in the hierarchy should also be agreed.
4. Monitoring of journey times should be considered.
5. A post-scheme review to determine the performance of traffic calming measures and their impact on journey times, should be conducted.
6. Traffic calming measures for use on different roads then need to be reviewed and agreed.

Practical Issues

Many fire services have established a network of strategic routes through cities and towns in order to reach their destinations as swiftly as possible. These routes are agreed by the local authority with the fire (and ambulance) services and the more severe speed reduction measures should not be used on them.

Because of the problems caused by full-width road humps, the speed cushion (see Topic 1) was devised to allow vehicles with a wider wheel track to pass over them with less interference. However, some discomfort can still be caused to passengers in smaller ambulances if the cushions are wider than 1.7m.

Because of these issues, local authorities have been encouraged to consider very carefully the type of calming measures that are employed in any situation and to consult with the emergency services to ensure that their response times are not unduly affected.

Other points to consider

The difficulties encountered by emergency service operators can affect their ability to deliver an effective service, and some operators claim that situations in which their vehicles have to repeatedly negotiate vertical deflections can result in excessive wear and even damage to their vehicles as well as causing discomfort to the occupants. For these reasons all new schemes need to be carefully considered. However, a review of speed management found no evidence that, when negotiated at sensible speeds, properly engineered

measures such as road humps or chicanes cause damage to vehicles.

Although the UK has one of the best overall safety records in the European Community, it has one of the worst records for child pedestrian deaths and it is this that has prompted many of the local safety schemes in urban areas which include physical traffic calming features.

Speed reduction can reduce both the likelihood of an accident and the severity of those accidents that do still occur. This can result in substantial savings to the National Health Service in the provision of hospital treatment and ambulance services.

Thus, as in many things, a balance needs to be struck between achieving an effective traffic calming scheme, with the safety rewards it can bring, and minimising the possible adverse effects on the emergency services. The approach taken for new schemes should preferably avoid the use of vertical deflections on strategic routes for emergency vehicles, although these devices are still one of the most effective ways of controlling vehicle speeds. Careful investigation is recommended to ensure that any special local circumstances (eg, premises frequented by injured or disabled people) are also properly considered.

2. Traffic calming and bus operators

Traffic calmed areas present a variety of issues for bus operators.

Traffic calmed areas present a variety of issues for bus services and operations and these can affect drivers, passengers and operators. With good design potential issues can be resolved – and even provide positive benefits for buses by, for example, giving priority over other vehicles at features such as restricted traffic lanes or bus gates (see Topics 9 and 12).

Traffic calming is often considered for through routes in residential areas, or on roads approaching town centres. These routes are, however, also attractive to bus service providers, since they allow good patronage levels to be achieved with services operating in a direct, and therefore economically viable, manner.

The bus is a relatively rigid vehicle resulting in the effect that vertical traffic calming measures are felt at a much lower speed than with cars. Horizontal deflections and barriers, therefore, present special issues for buses since to be effective on cars they have to be of narrow dimensions to ensure that they reduce traffic speeds.

Vertical deflections

On bus routes, vertical deflections such as speed humps, cushions or tables need to be fully considered and kept to a minimum. However, speed cushions provide the least adverse impact on buses (see also Topic 1). A key consideration when designing a traffic calming scheme should be the cumulative number of similar measures that affected bus routes will encounter elsewhere on their route.

The rigidity of bus suspensions, combined with the fact that a bus driver may traverse a traffic calmed route many times in a single day mean that there are real concerns over the effects they may have on both drivers and vehicles. Back injuries in particular are a major concern for bus operators and any sick leave resulting from such injuries can mean a deterioration in bus service, especially in an economic climate where it is difficult to attract drivers.

Vertical calming measures can also affect passengers. The placing of measures in relation to bus stops is important, since passengers standing or moving on board the bus risk being jolted or injured if they do not have a good grip on handrails. Bus passengers are often also the people most vulnerable to such dangers – the elderly, young or people carrying heavy shopping. These considerations are particularly significant for "hail and ride" buses.

As a guide, where they are used, humps with lower heights (75mm) and less severe on/off ramp gradients (1:15–1:20) will often overcome objections. Passengers in short wheel based mini buses will be most affected by road humps but bus speeds of 15mph or less will minimise discomfort.

Particular care needs to be taken with the length of tables or plateaus, since this can influence the potential to ground a bus. It will be beneficial to involve local bus operators when new measures are

being considered and possibly to undertake physical trials to determine the effect on the buses in use.

Horizontal deflections

Horizontal measures (such as chicanes, kerb buildouts or narrowing) are generally more acceptable on bus routes than vertical ones since they do not cause the same level of discomfort or potential damage. These measures are generally used to break up a long straight run of carriageway and prevent driver "see-through" along the corridor, thus reducing speeds.

However, care does need to be taken to ensure the swept path of buses can be accommodated, particularly if there is a likelihood of parking in the vicinity of measures. Kerb build-outs in particular may be used to provide excellent locations for accessible bus stops as well as creating a traffic calming feature.

Other measures

The use of other measures such as mini-roundabouts, coloured surfacing, pedestrian islands and speed cameras do not generally affect the operation of bus services and they are generally welcomed by operators.

Care is, however, required on the design of raised mini-roundabouts since the combination of horizontal and vertical deflection can create undesirable movements, particularly on double deck buses where increased discomfort can be experienced by people on the upper deck or staircase.

Further advice

There are a number of excellent publications and guidelines on buses and traffic calming, often promoted by Passenger Transport Executives (PTE's) or in the case of London by Transport for London (Ref. 66) (or former sections of London Transport). The CSS together with the Confederation of Passenger Transport have also published (1997) useful guidance (Ref. 67).

Bus operators also have a part to play. Good driver training can assist in alleviating potential problems and consultation with operators to identify location specific issues and reach an amicable solution is always recommended.

Finally, issues of safety and comfort for bus passengers should always be considered as part of the overall evaluation of a traffic calming scheme, as well as its potential to cause damage to public service vehicles.

3. Other road users

Whilst traffic calming aims to achieve an effect on motor vehicles (ie, maintain an appropriate traffic speed for the environment they are in) these same measures can have adverse effects on many other types of road users such as pedestrians, cyclists, disabled people, motorcyclists, equestrians and on large vehicles.

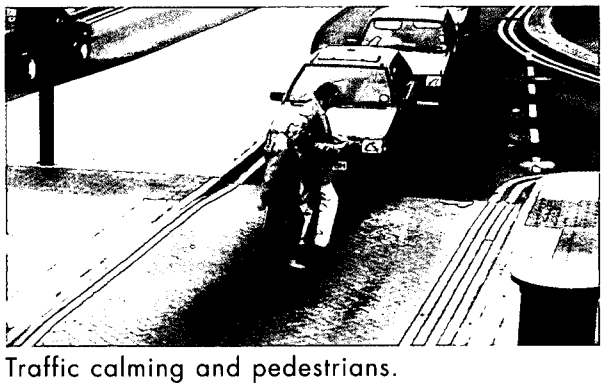
Opinion on what is an acceptable speed for motor vehicles often differs between motorists and non-motorised road users (NMUs). What seems an appropriate speed for motorists may well be too fast for NMUs travelling alongside a road or wishing to cross it. This dichotomy is important in understanding the acceptability of traffic calming measures to drivers and riders who prefer traffic calming measures that leave the decision about speed to themselves, compared with those preferred by non-motorised road users who often want measures that have a direct impact on speed. These two groups of traffic calming measures are sometimes known as "perceptual" and "physical" measures respectively.

- ◇ non-physical (or perceptual) measures are those which encourage changes in driver behaviour by making the road look or sound different, such as textured and coloured surfacing and gateways;
- ◇ physical measures are those which use changes in vertical and horizontal road alignment to encourage drivers to reduce speed such as humps, cushions and chicanes.

In rural areas traffic calming tends to be more of the perceptual kind with more use of gateways and changes in surface colour and texture, rather than humps and cushions. These types of measure are frequently used in combination. When well designed and implemented, this kind of traffic calming can create conditions much more conducive to walking, cycling and horse riding.

Pedestrians

Traffic calming measures can be of particular assistance to pedestrians. Any measure that reduces

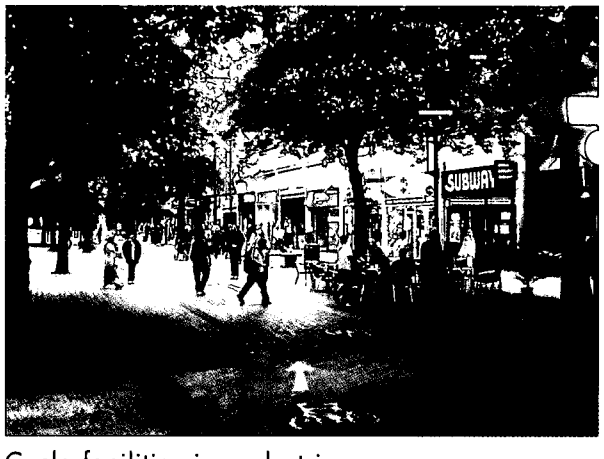


Traffic calming and pedestrians.

the width of the road to be crossed will decrease the exposure of pedestrians to moving traffic. This, coupled with lower speed, makes the road environment a safer and less threatening place, especially for people with reduced mobility and for children. Care should be taken when designing schemes, to look at them from the perspective of disabled and older people, and those with buggies and young children who need room on the pavement and on traffic islands to pass by signs and other obstructions with safety.

For ease of movement for people with walking difficulties and wheelchair users, kerbs should be flush with the top of a flat-topped hump, or dropped opposite a refuge. In assisting one group, this treatment can cause problems for another - people with visual impairments. In these situations tactile paving is needed so that in the absence of a kerb there is a warning device to those who would normally use the kerb for guidance. The Department for Transport's *Inclusive Mobility* (Ref. 25) gives general guidance for designing for a barrier-free environment.

Cyclists



Cycle facilities in pedestrian area.

Traffic calming can also benefit cyclists by slowing general traffic and in some cases, also reducing the volume. Sympathetic traffic calming can help increase cycling but poorly thought out schemes with inappropriate measures and poor or inappropriate surfacing can force cyclists onto other, less suitable routes. Provision for cyclists should not be an afterthought and the traffic calmed network should be made both convenient and safe for use by cyclists.

Pinch points and chicanes can create difficulties for cyclists and many report feeling increased stress and nervousness at locally narrowed sites. This is probably due to uncertainty about driver behaviour, as motorists may either pass too close to cyclists when overtaking, or wait directly behind them. Either course of action can be intimidating.

Where practicable, provision should be made to permit cyclists to bypass "narrowings" thus reducing the likelihood for conflict with vehicles. The bypass should preferably be at least 1.5m wide (or 1.0m over a short distance), straight and at road level.

If there is insufficient space for cyclists to be accommodated on their own and a need to share space with pedestrians, care should be taken to consider the needs of older and disabled pedestrians, and particularly those with impaired vision. Generally speaking, pedestrians do not like sharing with cycles and feel that a painted line to separate the cycles is inadequate. A positive physical separation is preferred but then issues around the passage of wheelchairs, prams and buggies also need to be considered.

Equestrians

On busier rural roads where non-motorised road users need to cross, the "Pegasus" crossing is suitable as it can provide for pedestrians and cyclists as well as equestrians, at a single location. Whilst not strictly a traffic calming measure, Pegasus, and other crossing points, can have a traffic calming effect if there is sufficient demand from those wanting to cross so that the crossing is activated frequently enough to slow traffic flow.

The comments given above about pinch points, refuges and chicanes in urban areas also apply to their use in rural areas with the added need to consider how to prevent vehicles from trying to squeeze equestrians as well as cyclists on the approaches.

Disabled people

Tactile surfaces can be a valuable tool for visually impaired pedestrians, but they must be used consistently if they are to be of maximum benefit. (*Guidance on the use of tactile paving surfaces* - Ref. 68). Involving local organisations of visually impaired people in the design of traffic calming schemes will help to ensure that the professionals have a better understanding of their mobility needs and are therefore better able to provide for them in their design solutions.

The use of tactile surfaces

Tactile surfaces (ie, surfaces that can be distinguished underfoot because of their texture) can be used within a traffic calming scheme to convey important information to visually impaired pedestrians about their environment. These matters are important in calmed areas where a mix of pedestrians and vehicles are to be expected.

The most commonly used tactile surface is the "blister" surface which comprises rows of flat-topped "blisters". The purpose of this type of surface is to provide a warning to visually impaired people at pedestrian crossing points, where the footway is flush with the carriageway, to enable pram and wheelchair users to cross unimpeded. In other circumstances a visually impaired person would expect a height difference between carriageway and kerb of at least 25mm to provide differentiation between the two surfaces.

Blister surfaces should only be used to demarcate the crossing point. Where an extensive area of the footway is level with the carriageway it will not be appropriate to install tactile paving along the full length and in such circumstances blister paving should be limited to the crossing area and a level difference of at least 25mm should be maintained, or some form of continuous barrier provided. For example, planters or railings along the remaining length.

Side road entry treatments and raised junctions will also be suitable for the application of the blister surface. The precise layout and colour of the surface will depend on the type of crossing provided on such facilities, (ie, whether it is controlled or uncontrolled); this is covered in the DfT guidance. (Ref. 68).

The use of audible warnings

Audible warnings are used to supplement the visual information given by standard pedestrian signals at pedestrian crossings (Puffin and Pelican crossings); and where pedestrian signals are provided at signalled junctions. They are also used at shared pedestrian and cycle crossings (Toucan crossings). Audible (and tactile) signals both provide information about the status of the green pedestrian signals to assist visually impaired pedestrians.

Advice on the use of audible and tactile signals is given in Local Transport Note 2/95, *The Design of Pedestrian Crossings* (Ref. 29). Normally, audible and tactile signals are recommended for use at all signalled crossings. However, it may not be safe to use audible signals where crossings are sited close together as the signal intended for one crossing may be mistaken for another and tactile signals should be used at these sites.

Audible and tactile signals are described in Traffic Advisory Leaflet 4/91 (Ref. 69), and in Traffic Advisory Leaflet 5/91 (Ref. 70). Traffic Advisory Leaflet 4/91 also applies to Puffin and Toucan crossings.

The standard audible signal produces an interrupted tone, a repeated "beep". An alternative form of audible signal, the "bleep and sweep" audible has also been developed for use at "staggered" pedestrian crossing sites (ie, road crossings where the pedestrian has to cross the road in two separate crossing movements). In these cases the sound output level is automatically adjusted with respect to background noise so that the signal cannot be readily discerned at the other part of the crossing. "Bleep and sweep" produces a different sound to the standard audible signal and is a repeated frequency sweep.

"Bleep and sweep" equipment above left is used for an audible signal. The rotating cone is a tactile signal.

In addition to the audible signal, the tactile signal at a pedestrian crossing is a small cone fitted below the push button "call" box. When operated, the cone rotates to indicate that the green pedestrian signal is showing. As these are used by people with guide dogs, it is important that a tactile signal is installed at the right hand side of the waiting area. This allows the pedestrian to hold the tactile signal in their right hand while taking the dog's lead in the left hand. An additional push button box may be required to provide this at a one-way street or at a staggered crossing.

Motorcyclists

Making a journey by moped, scooter or motorcycle, is a completely different experience to making the same trip by car. The rider who has little or no physical protection from contact with obstructions or other vehicles may encounter a whole range of situations that place him, or her, in a vulnerable position, which may not even be apparent to a car driver. In view of these factors, special regard should be given to the needs of motorcycles when designing and installing traffic calming measures and the following points are particularly important.

Motorcyclists have indicated that their preferred type of vertical deflection is the speed cushion. As these do not traverse the full width of the carriageway, a motorcycle can ride in between the cushions themselves, which does mean of course that they are likely to be less effective in controlling the speed of motorcycles.

Special regard should be given to the needs of motorcyclists when designing and installing traffic calming measures.

Block paved vertical deflections that are wet, covered with fallen leaves or frosty can pose a special risk to motorcyclists especially when turning on a slippery surface or as they climb up the ramp. The risk can be reduced by using block paving material that affords good residual skid resistance. Clay paviours, although more aesthetically pleasing, tend to polish up and should not therefore be used unless traffic flows are very low. Speed tables should also extend far enough along each arm of the junction to ensure that motorcycles are travelling in a straight line when they enter onto or leave the table.

Rumble strips or jiggle bars can pose a problem if the rider brakes whilst they are being ridden over. Given that the road surface is not level, the ease and effectiveness with which a rider can brake may be affected. A particular problem exists for small motorcycles and scooters as they typically have smaller wheels which can more easily lead to a loss of stability.

Mini roundabouts with a small radius can also be difficult for motorcycles to negotiate especially at slow speed. The white arrow markings on the carriageway indicating the direction and flow, can be a hazard to motorcycles as these, as with all road markings, can be slippery when wet.

With all of these issues in mind the designer of a traffic calming scheme should take account of the particular needs and potential problems posed to motorcyclists, particularly when physical obstructions or channelling features are placed in the carriageway.

Larger vehicles

Knowledge of local needs and conditions is important in providing for the access requirements of larger vehicles, especially refuse vehicles and deliveries to farms and other commercial premises. These practical issues need to be considered at an early stage as they can have a significant affect on what type of calming measures are, or are not, appropriate.

In rural areas farm vehicles can be very large and the routes taken between fields, even if only once a year, can rule out certain of the narrower traffic calming features unless an alternative route is available. Hardened verges or raised over-run ones may provide a suitable solution as long as no sign posts are installed within them. In these situations it may be useful to consult the local office of the NFU for further details on farm vehicle movements etc.

Other Points to Note

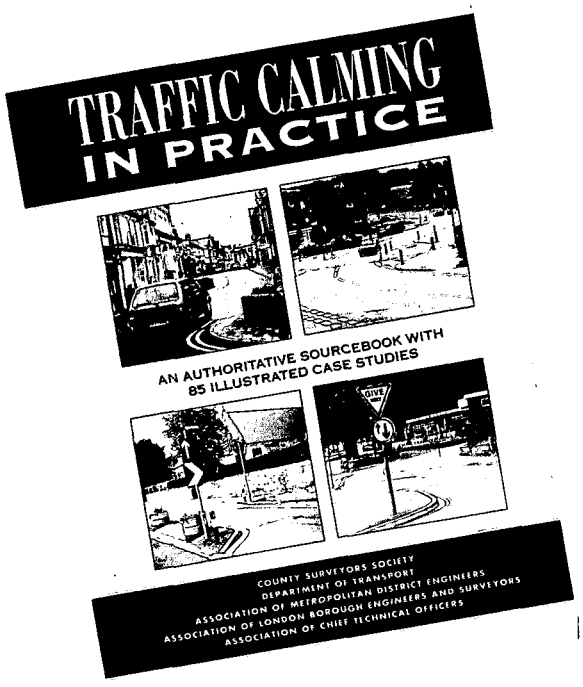
A further issue with block paved speed or junction tables is that should a block become loose, others also tend to unlock and shift out of position causing the herring bone pattern to fail. This may then make the surface uneven causing a particular hazard to motorcyclists. To save time and money repairs are sometimes made using tarmacadam. This is unsightly and given that it has different properties to block paving, it will perform differently over time, perhaps causing it to sink, thus creating an uneven and potentially dangerous surface. Should repairs to a block paved surface be necessary, it is therefore important that they are carried out as soon as possible and using the same materials as were originally used.

Attention also needs to be given to "tracking" which can occur in both blacktop and block paving surfaces when most vehicles take the same line. "Tracking" creates longitudinal seams in the road surface which can be hazardous particularly for motorcyclists.

Maintenance of all signs and lighting is particularly important where bituminous speed humps are used, as they are black and not easily visible at nights, or if obscured by shadows. The white triangles on speed humps are designed to warn road users that they are about to cross a road hump. However, the passage of traffic generally wears these away and they can become covered in black tyre marks. As a result, they become less visible, thus reducing their effectiveness as a warning measure.

Diesel and oil spilt on the road surface is treacherously slippery, especially for motorcycles when they are turning. Road humps, speed tables and other vertical deflections can cause a vehicle to jolt, causing fuel to spill from the vehicle. Highway authorities should be mindful of this when inspecting and maintaining traffic calming measures and deal with any significant diesel or oil that has leaked onto the highway as soon as possible.

CHAPTER 5
Lessons Learned from Experience



Cover of *Traffic Calming in Practice*.

In the ten years since the publication of *Traffic Calming in Practice*, much has been learned about which techniques work effectively and which of them do not. Over the years many different calming techniques have been developed and refined, and they have often been combined with the introduction of quality streetscapes to provide an improved quality of life to pedestrians and residents in home zones, town centres and other locations throughout the country.

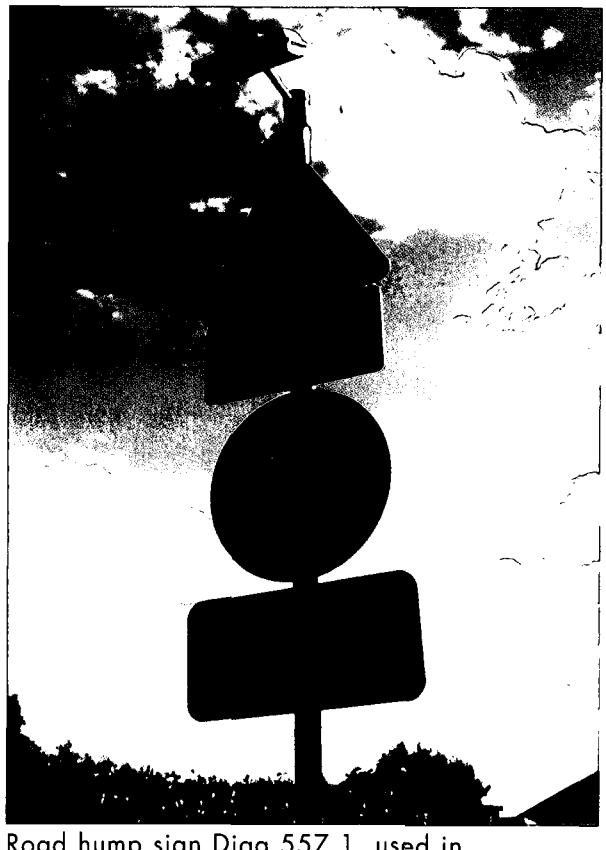
Experience has also shown that whilst physical traffic calming measures are still much requested by the public, they can also be criticised and considerable publicity has been given to these issues in the media in recent years. Whilst many people believe that traffic calming is the answer to their traffic problems, others feel that they are an unnecessary inconvenience and a nuisance. With early schemes difficulties often arose from an over-enthusiastic use of road humps with excessive heights, short ramps and sometimes a spacing between the humps which was too far apart to encourage continuous, calm, driving. This situation often resulted in the use of the accelerate/brake/accelerate driving technique. In other cases the location of humps on main bus and HGV routes caused complaints from bus passengers and from commercial operators and the emergency services.

As experience and knowledge have been gained newer schemes have taken note of these points and been designed to avoid the earlier problems. Newer schemes are usually designed to be virtually "self-enforcing" by ensuring that the road appearance is in keeping with the new design speeds (10, 20mph etc) through changes to lane widths and the construction of suitable features and the design of the streetscape. Drivers are, therefore, enabled to drive slowly without harassment from others behind them, "encouraging" or pressurising them to drive faster.

As traffic calming techniques have been developed various problems have had to be overcome:

Problem – use of rigid road design standards which prevented a more flexible approach to traffic management

Prior to the late 1980's, when traffic calming regulations first became available for use in the United Kingdom, the normal procedure for the design of improvements on the highway, was to provide sufficient carriageway space for free movement of the largest vehicle at all times. Sufficient space was allowed for eventualities such as breakdowns, so as to enable the free flow of



Road hump sign Diag.557.1, used in combination. (See Case Study 34, page 256).

traffic to continue wherever possible. Whilst this approach facilitated traffic flow it also resulted in the domination of street space by motor vehicles in locations where other road users such as pedestrians and cyclists could suffer. The introduction of the Traffic Calming Regulations helped to change this by permitting certain legal obstructions to be built in the highway, challenging the previous design assumption that roads should always be wide enough to allow the movement of two way vehicles at "normal" speed. This new approach has, however, resulted in the presence of deliberately placed restrictions which can be unpopular with the motorist even though they are intended to overcome known problems.

Problem – improved vehicle performance

Continuous improvements to the performance of vehicles have greatly increased their capabilities. The size of vehicles has tended to increase and acceleration and braking improvements have led to higher speeds. Improved sound attenuation within vehicles, and their aerodynamics, has also resulted in drivers being less conscious of the speed at which they are travelling.

Driver performance has, however, not improved and reaction times are much the same, if not worse due to the temptation to use mobile phones, stereo systems and other in-car equipment and thereby lose concentration.

The increase in vehicle numbers and use has led to increased levels of congestion and higher volumes of traffic on local and residential roads. At the same time, the public have become more aware of, and more vociferous about, the problems of ever greater traffic flows and speeds. This has led to frequent calls to reduce the speed of vehicles and their intrusion in town centres and residential areas, and in rural villages, particularly those sighted on major roads – hence the demand for traffic calming.

Problem – the public perception of traffic calming

Nowadays the media frequently report public fears and criticisms about the impact of traffic on safety and the environment, but also about the adverse effects that traffic calming can have, such as:

- ◇ longer response times for the emergency services (police, fire and ambulance);
- ◇ the potential danger of additional hazards to negotiate;
- ◇ more stopping and starting;
- ◇ disturbance to passengers on buses and in other vehicles, due to road humps;
- ◇ increased journey times;
- ◇ increased air pollution due to uneven vehicle speeds as fuel is burnt inefficiently, generating greater volumes of noxious fumes;
- ◇ increased wear-and-tear on vehicles and drivers;
- ◇ increased fuel consumption;
- ◇ the inappropriate use of speed cameras (perceived as a revenue earning device).

Clearly there are conflicting views and opinions at work here. On the one hand, drivers campaign for better roads and freedom from congestion, whilst on the other hand many communities are still requesting a better deal for pedestrians, public transport, cyclists and freedom from fast moving vehicles outside their homes.

Thus every "traffic calming" scheme introduced to improve the environment or reduce accidents can also become a "driver-infuriating" scheme. In view of these well publicised but often conflicting opinions it is worthwhile reflecting on what has been learned from experience in order to minimise the perceived adverse effects of traffic calming.

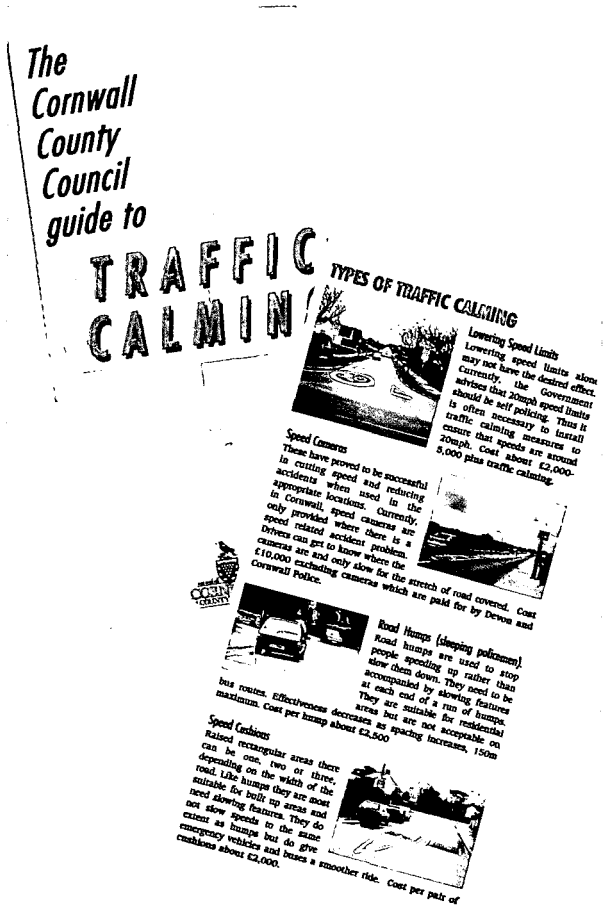
Lessons learned from the implementation of traffic calming measures

The need to involve the community

The key to successful traffic calming is its acceptance by both the local community and other road users. This can only be achieved by involving them in the preparation, design and implementation of the scheme. This is undoubtedly time consuming and needs to be built into the timescale of the project. The full support of all residents for measures in their road is rare and residents who support a scheme in principle, may oppose measures which are outside their property; the "not in my back yard" syndrome. It is therefore essential to build active support to ensure that there is a majority who support the scheme, before and after its introduction. (See also Chapter 3 on Implementation and Topic 24.)

Many people may simply not understand what is proposed and what the result will be. It is therefore important to ensure that the public fully comprehend the proposals. The support of the public is of no value if it is based on misunderstandings as when they experience the reality of the scheme, requests for its modification or removal will quickly follow.

Cornwall County Council has produced a useful leaflet giving a layman's guide to traffic calming techniques, describing their likely effectiveness and



Cornwall County Council traffic calming leaflet.

detailing the unwanted side effects. The leaflet allows more informed local debate and hopefully greater understanding of the outcomes of both the chosen scheme and any alternatives the community may wish to consider.

When developing a scheme it can be useful to mark out the proposed traffic calming scheme in paint on the highway during the consultation process. Lay people often find plans difficult to follow and this process leaves no doubt as to what is being proposed and where it is to be located. Local understanding is much enhanced and the responses from the public are much better informed as a result. It also concentrates minds and reduces the risk of apathy frustrating the consultation.

Being clear on the objectives of the scheme

A clear understanding and focus on the objective of the proposed scheme is necessary in order to lead to the most appropriate design. It is useful to ask the questions:

- Is there a need for accident and casualty reduction, speed reduction, environmental enhancement, a re-routing of traffic?
- Are there other quality of life issues for residents and pedestrians?

The choice of type of scheme will vary considerably depending on what it is required to achieve.

Design Issues

There are many practical factors which can affect the design of a scheme and these include:

Effectiveness of the measures

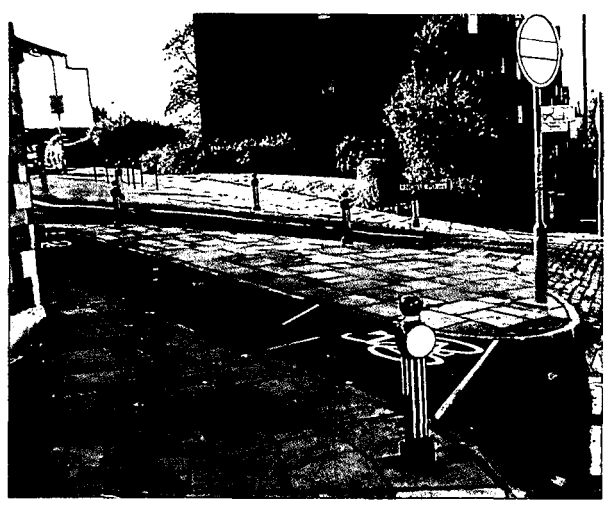
Whatever is being proposed should address the key objectives of the project, whilst also taking account of the requirements of *all* the types of user likely to be affected by it.

The use of many different skills

The design team should be able to call upon the skills of a variety of specialists when it is appropriate to do so. These can include traffic engineers, road safety experts, lighting engineers, landscape designers and urban designers in order to ensure that the project is properly suited to its environment and is well designed.

The concept of the whole street

Reorganisation and re-allocation of the street space can often result in big improvements for non-vehicle users. Traffic calming has, in the past, sometimes been considered as a set of specific control measures which are provided to address a single problem, often on the grounds of economy. Use of a more holistic approach, whilst often more expensive, can resolve not only the traffic problems, but perhaps also include renewing footways and street lighting, providing landscaping, pedestrian crossing points, seats, and dropped crossings for residents who may wish to park off-highway.



Pedestrian friendly setting using local materials.

These measures will not only improve the environment but also reduce the likelihood of trip claims, improve community safety, increase

community contact and ease parking. Naturally there are cost implications arising from this wider approach, but it can result in much greater satisfaction in the community and deliver a much wider range of benefits.

Environmental impact

Many of the early calming schemes ignored the visual appearance of the features on the justification that safety was paramount and the sole reason for carrying out the work. In some cases this may still be the best approach, particularly when the problems are quite specific, finances are limited and the economic rate of return is of paramount importance. But the inclusion of the whole street in the design process can lead to an environment in which the street looks calm and suited to a variety of uses, rather than a street in which drivers are simply forced to go slowly to avoid obstructions in the carriageway.

As explained in the many Topics in Chapter 4, different traffic calming features provide different benefits and are therefore suited to different locations and situations. "Gateways" will give good early visual notification of a change in the road environment but need following up quickly with other features to control traffic speeds for any benefit to be sustained.

Chapter 4 describes each of the traffic calming features currently in use and gives advice on the use of each one. The examples shown in Chapters 7 and 8 show how a combination of a number of different types often provides greater benefits than the sum of the individual ones.

Effects on special vehicles

Consideration should also be given to some of the special users of a street (see Section G in Chapter 4.) Buses can have problems with the exit from road humps, especially for passengers at the rear of the bus; and bus drivers may well have to traverse hundreds of humps every day.

Speed cushions (see Topic 1) are often chosen as providing the optimum calming solution for a bus route, but this may depend on the parking habits of other drivers on the route as a parked vehicle could cause the bus driver to run over the high point of the cushion rather than straddle it as intended. With regard to emergency service vehicles, consultations need to be held at an early stage to determine key route patterns and to help with the choice of calming features.

In some rural areas there will be a need for large farm vehicles to travel through the area, if only once a year at harvest time, and an allowance may need to be made with regard to pinch points or the inclusion of over-run areas.

In winter it may be necessary for large gritting vehicles, or even snow ploughs, to pass along the traffic calmed streets and this too can affect design standard.

Innovation and new technology

Pressure for more effective forms of traffic calming which can overcome the objections associated with road humps and other physical devices has led to the development of many new kinds of measure. Examples include the development of special types of kerbing, new surface profiles to create an undulating effect and new ways of dealing with surface water drainage.

In addition, the development of electronic detection and messaging systems have led to the use of both fixed and mobile, vehicle activated traffic signs, as well as cameras for the enforcement of speed limits and other kinds of traffic regulation.

As well as these new measures, innovation also means combining some of the more traditional technology in new ways. These approaches need treating with care and caution and it will often be beneficial to conduct trials before introducing a new technique in a "live" situation. The TRL (Transport Research Laboratory) often co-operates with local authorities and commercial companies in developing, testing and monitoring new techniques.

Experimentation and trials

As suggested above, community concerns for a scheme can be addressed by introducing it experimentally. If the scheme involves a particularly new technique, it will give the opportunity for changes to be made in the light of experience, before deciding whether or not to make the scheme permanent. Traffic regulation orders can be made experimental for a period of up to 18 months.

An alternative philosophy for traffic calming

More recent and adventurous thinking on road safety has produced an alternative approach to what are often seen as punitive techniques. This involves a more permissive approach and some traffic planners are suggesting that fewer traffic regulations, maybe no controls at all, can make roads safer.

Experiments including the removal of traffic signals and road markings have been carried out to compel

road users to look more carefully at where they are going and hence to drive with greater care. In one case (in Holland) the result was a reduction from three serious accidents a year at one junction handling 4,500 cars a day, to none at all over a period of four years.

The theory of this approach is that indecision on the driver's behalf, about the situation in front of the vehicle, may result in lower speed and hence safer conditions. How this can be achieved safely is central to the thinking on traffic calming, but it is impossible to prescribe for every circumstance.

Maintenance issues

Consideration needs to be given to routine maintenance requirements.

Many schemes carried out with great support and enthusiasm show some signs of distress within a few years. Over a period of time wear and tear from the passage of vehicles, perhaps the disturbance of utility workings, lack of maintenance and the correct materials being unavailable, can all take their toll.

These maintenance issues all need consideration before deciding on the design and the materials to be used. Traffic calming may once have been seen as a role for the highway/traffic engineer alone, but increasingly it needs a multi-disciplinary approach and longer term care to ensure that major investments are properly maintained.

After implementation the maintenance of planters, flower beds and some street furniture such as seats could be carried out locally by the District or Parish Council, or even a Residents' Association. As well as ensuring the continued good appearance of landscaping features, this approach can help retain a sense of local ownership of a scheme.

Enforcement issues

The best way of ensuring that the public at large respect and adhere to the speed limits introduced or encouraged by traffic calming, is to include their representatives at all stages so that the scheme achieves a good degree of local understanding and ownership.

Ideally a traffic calming scheme will be "self enforcing", meaning that the physical constraints and ambience introduced by the scheme will ensure that the motorist will keep to the desired speed without the need for enforcement. In practice, however, a police presence is often helpful, particularly when a scheme is first introduced. In these situations the police procedure is usually one of advising the miscreant, rather than immediate prosecution. The circumstances in which there is a need to employ enforcement procedures in the longer term might well trigger a review of the scheme itself as it is clearly not achieving its objectives.

Longer term performance

User audits are likely to become a major issue for highway authorities in the future and will be used for measuring the success of a project. In the past some, but by no means all, authorities have carried out "before and after" studies to check if the aim of the scheme has been achieved. The measurement of benefits to all types of highway user is, however, important both to evaluate the success and impact of the measures employed, and also to provide feedback to help the design process for subsequent projects. Whenever possible local authorities should give feedback regarding the success of the scheme to the local community.

Post construction modifications

The success of traffic calming schemes can be measured by the change of behaviour of drivers and other street users. An "after" study, as indicated above, should show whether it is achieving its aims and whether any further changes could give greater improvement. In some cases it is possible that certain features could be modified, or even removed, in order to be more effective, or perhaps to gain greater acceptability by the public.

Financing projects

Sources of funding for traffic calming can come from a variety of places depending on the area in which it is situated, its main uses and its status in the road highway hierarchy. In addition to the usual budgeting sources available to highway authorities, some parish councils have taken the opportunity to

fund schemes through powers contained in the Local Government and Rating Act 1997 (Ref. L18). This legislation enables town and parish councils to fund the introduction or removal of traffic calming measures. Section 30 of the Act states:

"A parish council or community council may contribute towards any expenses incurred or to be incurred by a highway authority in constructing, removing or maintaining: (a) traffic calming works, or (b) other works (including signs or lighting) required in connection with traffic calming works, if in the opinion of the council the expenditure is or will be of benefit to their area."

In other places, residents' associations or interest groups such as local business organisations, have either funded or made contributions towards traffic calming measures.

Many schemes have been funded by contributions made by developers of adjacent land if their proposal might adversely impact upon traffic conditions in the area.

Summary

From the many examples shown in this book and the wider experience of practice, it is now very clear that the many different initiatives around today are leading to "calmer" and safer driving in certain areas. At the same time it appears that we still have some way to go in educating and training drivers to always drive appropriately to the conditions. The large number of speed cameras now in use at known accident sites, the use of vehicle activated signs and the introduction of effective and attractive traffic calming measures are all contributing to the same aim; which is to achieve slower and more considerate driving in those locations where a safer and more acceptable environment is required. But as many features in the media demonstrate, there is still a battle to be won in convincing the public in general about the need to control speed in the wider interest of the community.

Practical experience in the use of an ever widening range of traffic calming measures has shown that, properly designed and implemented, they can achieve worthwhile benefits in many ways. However, we must also recognise that in some cases schemes have had to be removed or extensively modified in order to make them effective, or simply in response to public opposition.

It is only carefully developed and well designed schemes that are appropriate to their surroundings that will achieve their desired objectives as well as winning the support of the local community.

CHAPTER 6
Traffic Calming in the Future

During the last ten years the use of many of the traffic calming techniques described in this book have become well established. Experience gained in their use has, in some cases, resulted in different perceptions of their relative benefits and disadvantages. Significantly, the continued demands from communities for some form of traffic calming and the varying levels of support for different features have encouraged the development of new ideas and applications.

So what is the future role for traffic calming? In attempting to answer this question we should first consider its primary purpose which is:

- to control or influence traffic speeds and/or volumes so as to improve road safety, reduce actual and perceived danger to vulnerable road users, and improve the local environment.

As public demands increase for better management of the road network and improved road safety in the face of continuing traffic growth, so will there be an ongoing requirement for the use and development of appropriate techniques to modify or "calm" traffic. This situation is clearly demonstrated by the large backlogs of requests for action that are held by most highway authorities.

The future will be influenced by:

- public concerns, needs and perceptions;
- evolving traffic management strategies;
- key safety and accident reduction targets;
- evaluation of existing techniques;
- the development of technology; and
- the development of new calming techniques.

Public concerns, needs and perceptions

Public concern about road safety, particularly traffic speeds and volumes, will continue to exert a major influence on government thinking and on highway authority plans and programmes. Increasingly, however, there will be other factors which influence the balance of priorities and the way in which schemes are developed. These include:

- changing expectations for quality of life;
- developing standards and practices in urban design;
- increasing traffic congestion and the public reaction to it, and
- public beliefs and perceptions about the need for and effectiveness of traffic calming measures.

In response to this wider range of influences, local authorities will need to reconsider their approach towards:

- community planning;
- street management;
- innovation;
- risk management;
- consultation; and
- access to information.

People are becoming better informed and have ever higher expectations of accessibility to information and involvement in the development of local schemes. A current example of the effects of these changes lies in the planning and design of "Home Zones", where the emphasis is placed on community involvement and local ownership of scheme development and determination of local priorities for traffic calming features.

Public perception of road danger, whilst not always reflected in actual records of road casualties, is usually expressed with reference to traffic speeds and the need to calm traffic movements. Most people seem to want lower traffic speeds "where they live" or "near their schools". However, many drivers use inappropriate speeds "where they live" or in other sensitive areas which affect vulnerable road users, such as in town and village centres. This apparent difference in attitude between the local environment and the travelling environment may provide the key to engaging the public in how best to improve both safety and the quality of life.

Furthermore, it is now apparent that the influence of the media and political judgements are also having a significant impact on public beliefs and perceptions about the role of traffic calming and its various effects. This situation is particularly demonstrated by the intense debate over the use of speed cameras and funding issues.

Evolving strategies

Whilst the development of traffic calming techniques has progressed through trial, evaluation and experience, their use in the future needs a well thought out framework to ensure that they are both effective and accepted once implemented. This strategy could include such features as:

- the adoption of specific aims and targets for improvement;

◇ identification of a range of approaches to improve road safety;
◇ ways of reducing the perception of danger;
◇ identifying where traffic calming can contribute towards improving the local environment and quality of life;
◇ an approach towards engaging with the community;
◇ influencing driver behaviour.

Traffic calming techniques are likely to be employed as part of broader strategies for:

◇ route safety;
◇ area safety, and
◇ street management.

These initiatives are likely to be part of Local Authority's wider Local Transport Plan programmes to improve:

◇ road safety;
◇ the environment;
◇ congestion management; and
◇ quality of life.

Thus traffic calming in the future is likely to develop within a much wider framework of issues than has usually been the case in the past.

Key Targets

National targets for road safety have been established by government for 2010. These targets focus on reducing the numbers of people killed and seriously injured (KSI) by 40% compared with the average for 1994-98. For children, the target is a 50% reduction in KSI casualties. In taking forward the strategic framework for the use of traffic calming techniques, other local targets may also be set for:

◇ modal shift (including "safer routes to school" initiatives);
◇ enhancement of the pedestrian environment (using low speed zones);
◇ accessibility to the countryside (quiet lanes);
◇ congestion (comprehensive network management);
◇ improving the local environment (in a variety of ways).

Thus a framework of locally determined "key targets" may provide a continuing incentive for the use of traffic calming measures in the future.

The need for evaluation

The development of existing and new techniques should be accompanied by planned evaluation to ensure that the effects of any measures introduced are well understood and are quantifiable. Past experience shows that, for a variety of reasons, this is not always done. Evaluation should include measurement and consideration of changes to:

◇ traffic speeds;
◇ traffic flows;
◇ accidents/casualties;
◇ the needs of the most vulnerable road users;
◇ local environment (air quality, noise, appearance);
◇ public views;
◇ operational experience (including public transport and emergency services);
◇ the use of construction materials.

A particular example of operational experience lies in the development of the use of road humps during the past 15 years. Whilst they remain a most effective way of reducing vehicle speeds, they have tended to be amongst the most controversial of methods of traffic calming and can also create a long term maintenance commitment. As a consequence, the evolution of alternative speed reducing measures, as set out in this book, may well provide more acceptable long term solutions.

New techniques

Experience to date has shown that no single method has emerged which is applicable to all circumstances. New techniques are being developed continuously as a result of scheme evaluation and customer feedback as well as research and development.

More recent developments include:

◇ "Rumblewave" surfacing (see Topic 5), which is a new type of undulating carriageway surface designed to cause reaction similar to rumble strips within the vehicle, but little external noise;
◇ Self-explaining roads (see page 103);
◇ "Community Speed Watch" where members of the local community are trained to undertake informal speed monitoring to influence drivers by their presence on the route;
◇ Community or driver awareness campaigns;
◇ "Quiet Lanes" in rural areas;
◇ The wider use of "Home Zones";
◇ Inflatable road humps.

It is expected that innovation will continue to be a feature of traffic calming initiatives for the future.

Developing technology

As well as the evolution of new techniques, the role of technology is now having a strong influence on the future as new systems become available and affordable.

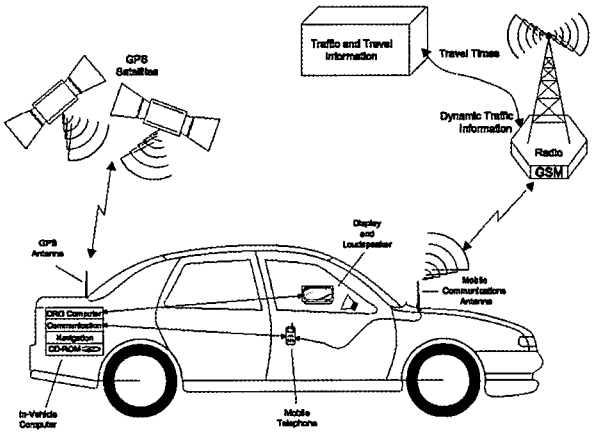
Adaptive parking information.

Examples of developing technology include:

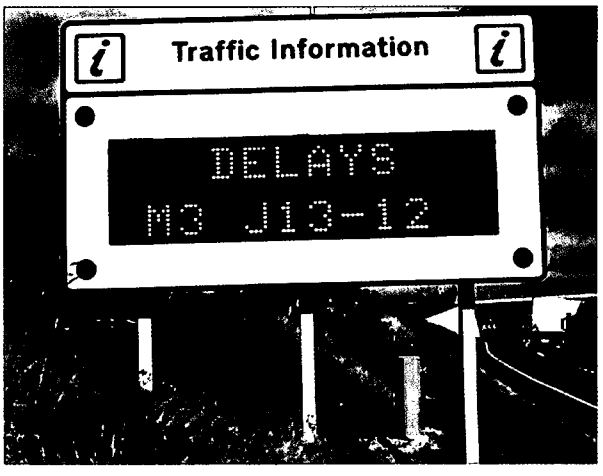
- ◇ differential global positioning system (DGPS) – satellite based location and reference system for vehicle location;
- ◇ in vehicle, mobile, real time communication – with both the driver and the vehicle;
- ◇ vehicle control mechanisms, both on board and remote;
- ◇ interactive message signs, triggered by remote systems control or directly on route by vehicle speed and other detection thresholds;
- ◇ detection systems capable of differentiating different classes of vehicles, recognising individual vehicles (number plates), and drivers/passengers;
- ◇ navigation systems;
- ◇ congestion charging.

Applications for this range of technology can enable in-car information linked to real time displays for the driver which can, for example:

- ◇ remind the driver about which speed limit currently applies;
- ◇ advise the driver about congestion and suggest alternative routes;
- ◇ warn of hazards ahead;
- ◇ avoid the vehicle travelling too close to the one in front;



Developing "in-car" technology.



Driver information on the motorway.

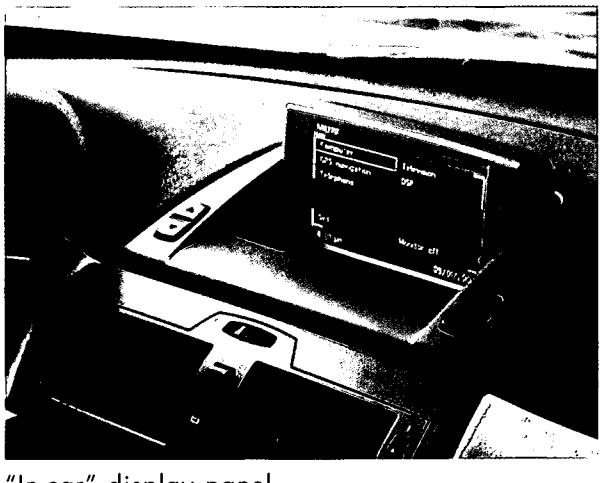
- ◇ intervene to automatically slow a vehicle travelling too fast.

It is evident that the progress of "new technology" is providing a huge capability for the use of new control techniques. However this may take some time to come into common use, as explained below.

The Future

It is possible to see a time in the not too distant future when the majority of speed reduction needs could be achieved by the use of new technology directly affecting the vehicle itself, rather than the implementation of physical engineering schemes aimed at influencing the behaviour of the driver. This approach would require the majority of vehicles to be fitted with the appropriate technology, but once a critical mass (of, say 30% of vehicles on the road) were able to be influenced this way, then a significant level of impact through technology would become achievable.

In practice, given the cycle time for the development of new vehicles and for manufacturers to develop and build-in low-cost, high-technology systems as standard new vehicle facilities, it is likely to be around ten years before this revised,



"In-car" display panel.

"In-car" GIS.

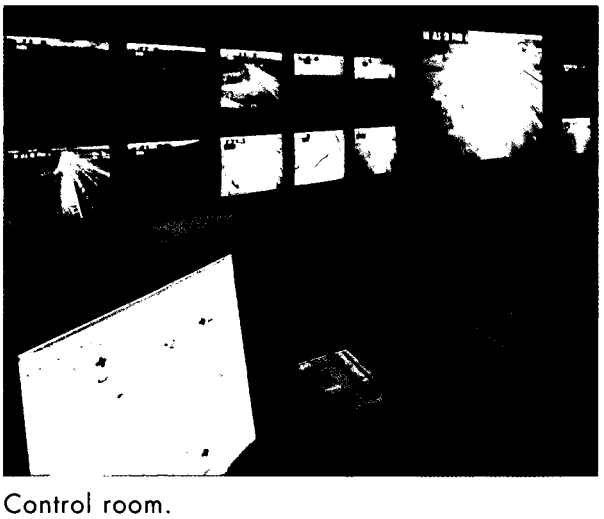
technology based, approach could revolutionise traffic calming techniques. There are also other potential legal barriers to implementation of this kind of technology. Human Rights legislation, privacy laws and the reaction of the public could well influence the rate at which both politicians and the motor industry adopt these new techniques.

The next ten years

So where should we focus our attention for the next ten years? Current practice has led us to identify a number of key strategies which involve the use of traffic calming techniques. We can, therefore, reflect on experiences to date and look forward to how the development of these techniques could apply in the foreseeable future. A number of approaches (or strategies) are likely to feature:

Speed Management

"Speed Management" is about the kind of intervention required to change driver attitudes towards speed, with the objective of achieving more appropriate speeds in the road network. In some cases this can be best achieved by developing a package of measures, and the concept of an "intervention menu" has already been promoted at local level (eg, in West Sussex) and more recently through broader national research (TRL for the Department for Transport). Physical intervention can incorporate a variety of traffic calming techniques, but the key to success is to determine the right balance for a particular scheme if it is to be both acceptable and cost effective. Some of the advice given in this book will help to determine the most appropriate combination of measures to deliver the required speed management outcome.



Control room.

The "Route Safety" approach

There is a growing trend towards assessment of casualty records and potential safety schemes on a route basis, rather than by concentrating on individual "spot" locations where relatively high numbers of accidents have occurred. Typically, route safety schemes aim to present to the driver a consistent set of messages and influences in addition to a range of intervention measures to tackle the causes of accidents along the route. In practice this means that funding can be targeted in a different way and justification for intervention does not need to rely on identifying high rates of return for investment for individual actions or single site schemes. Where the route passes through local communities, part of the package is likely to require some form of traffic calming and environmental improvements, which might include physical measures to reduce vehicle speeds.

Area-wide safety schemes

The past ten years have seen many successful examples of area-wide urban safety management schemes employing traffic calming techniques. The current national focus on child casualties will encourage further development of these techniques, sometimes in association with specific implementation of Home Zones.

For these to be successful there will have to be an increased engagement with the local community, both to contribute to the design of the local area scheme, and to support its implementation from the operational and social points of view. More generally, urban area traffic calming schemes need to embrace local community objectives, and may emerge from involving local people in community planning.

In rural areas, there is an increasing need to examine rural area safety as part of the management of the wider rural road network and within rural planning strategies. Strategic routes will be covered largely by the route safety strategies referred to above. However, for non strategic (ie, local access) networks, the development of rural area safety schemes will again require involvement of the local communities to understand the issues and to provide a balanced response which can deal with

actual and perceived dangers, whilst recognising the sensitivities and variety of activities needing to be managed in the countryside.

20mph Zones

When legislation was introduced in 1999 to allow local authorities to implement 20mph zones, there was an expectation that large numbers of zones would be installed. In practice, the need for a self-enforcing scheme has been generally recognised, and the numbers of schemes introduced has been limited and targeted at those areas with the highest priority. Priority is often based on casualty reduction, but is sometimes related to local development proposals or other transport strategies, such as the promotion of safer routes to school. In the future there will be a tendency to encourage more 20mph schemes to be designed into new developments, and to find more cost effective ways of achieving a self-enforcing regime, particularly in residential areas.

Home Zones

The recent development of the national programme for Home Zones has been funded mainly through the Government's Challenge Fund mechanism, with individual scheme costs averaging around £0.5 million. The success of Home Zones schemes relies on:

- ◇ extensive community engagement, involvement in scheme design and ongoing ownership of the use of the area by local people;
- ◇ significant interventions in existing areas to ensure traffic speeds are constrained to around 10mph, requiring a variety of traffic calming techniques;
- ◇ relatively high levels of expenditure to provide an enhanced local environment.

Whilst there will be opportunities in new build developments to incorporate Home Zones through integrated design, future expansion of the Home Zone concept will provide a real challenge in seeking more cost-effective methods of controlling vehicle speeds in restricted areas. The development of new traffic calming techniques will help to deliver this objective.

Quiet Lanes (in rural areas)

One of the more challenging areas for intervention involves the aim to maintain an appropriate low speed environment in the minor rural lanes. This approach centres upon establishing the appropriate environment for the more vulnerable road users, such as walkers, cyclists and equestrians to enjoy safe access to the local countryside.

New ways of encouraging drivers to choose appropriate speeds, whilst avoiding the introduction of significant visual impact, or "urbanisation" in the countryside, will be required if the "quiet lanes" concept is to attain widespread support and success.

"Self explaining roads"

Development of the concept of "self-explaining roads", relying less on physical control measures and more on visual perception of the road layout, will require more social engineering. The approach aims to make drivers more responsive to, and responsible for, the environment through which they are travelling so that the driver chooses to travel at the appropriate speed. Applications of this concept could influence all of the areas of activity outlined above for the next ten years and beyond, and would complement and support a transition to the longer term prospects for a technology based form of traffic calming intervention.

Congestion Charging

Whilst the development of systems and strategies for congestion charging is aimed primarily at demand management, there will also be the potential for traffic calming benefits, especially in urban areas where a significant reduction in traffic flow levels may be achieved. Lower demand for vehicular traffic would allow a different approach to street management for the benefit of all road users, and traffic calming techniques may be employed to achieve the necessary influences on the lower traffic flows to regulate vehicle speeds.

Conclusion

The rapid development of a range of alternative methods and approaches for calming traffic has provided a good indication of the widespread demand within the community for schemes which help create, or restore, a better balance of safe uses of the road system and less dominance by moving traffic.

Some of the earlier physical methods used to impede or slow traffic although successful in meeting safety objectives, have attracted criticism, particularly by drivers who dislike the physical effects on themselves, their passengers and their vehicles; and by some organisations (such as bus operators and the emergency services) who believe that some types of traffic calming impede their ability to provide services efficiently.

As a result of this situation a variety of new approaches have been tried. These more recent techniques aim at providing solutions for all of the

community and not just slowing traffic – even though that may remain a key objective. At present there is still a great reliance on measures which impact upon the driver, the road and its surroundings; and better ways of influencing the driver's choice of speed through changing the appearance of the route, are being developed.

An emphasis on the use of technology systems which can directly affect the driver and/or the vehicle itself, is likely to provide a new and radical approach to traffic calming in the years ahead.

The rate at which such systems are introduced will, however, ultimately be determined by wider factors such as public attitudes, political judgements, the availability of sufficient funding and the influence of lobby groups. Certainly the scene is now set for experimental trials of both the technology and the public reaction to its use – but it would need further initiatives from government, possibly in the form of pilot schemes and studies, to take this process forward.

Many of the techniques described in this book will continue to contribute to the creation of safer and sustainable street environments for the benefit of road users and local communities, and will be developed to incorporate the new technology systems as they become more widely available.

CHAPTER 7
Earlier Schemes Reviewed

TOWN CENTRE

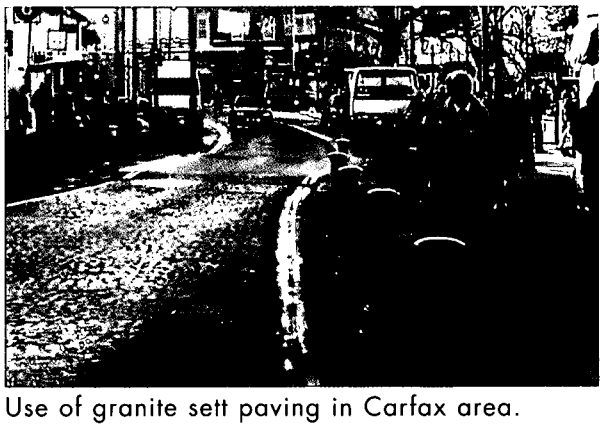
Updated Case Studies 1-9

1 Carfax, Horsham, West Sussex area-wide treatment, 20 mph zone, pedestrianisation, humps

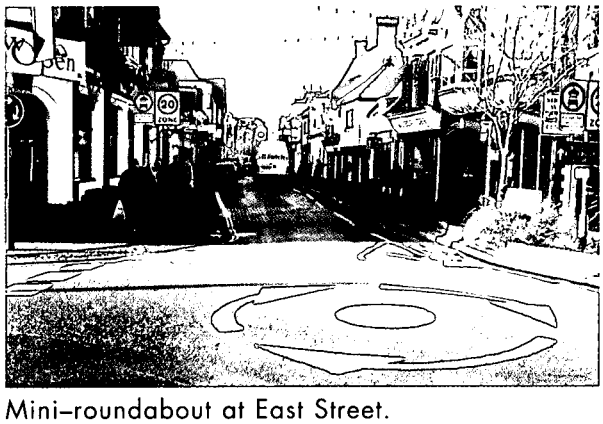
UPDATE: Whilst speed reductions have been maintained, there has been an increase in the number of recorded accidents in the central area in comparison with the first three years after implementation, when no accidents were recorded. However, all of the eight accidents (1999–2002) were "slight" and included several unusual accidents. In one case a car reversed into a ladder whilst somebody was on it. In another accident a bus clipped a bus shelter and pedestrians were injured by falling glass. Accidents in the peripheral areas have not increased, despite increased traffic levels.

OTHER COMMENTS: This scheme was the winner of the first Urban Street Environment – Traffic Calming Award in 1993. It has successfully stood the test of time in establishing a more relaxed and almost traffic free area in the central part of Horsham. Some of the natural stone materials used for constructing ramps and platforms have, however, not proved durable and have been expensive to maintain. Furthermore, the use of rapid hardening mortar seems to lead to increased brittleness in the longer term.

IMPLEMENTED: April 1992.
BACKGROUND: The introduction of pedestrianised streets and a 20mph zone was part of a comprehensive redevelopment of the town centre. Earlier stages included the construction of an inner relief road and shopping malls. An outer bypass also exists.
NEED FOR MEASURES: Improved environment, reduction in speed and volume of traffic.
MEASURES INSTALLED: A 20mph zone comprehensively enforced by round and flat topped road humps. Pedestrianised areas and extensive environmental improvements were installed.
SPECIAL FEATURES: Extensive high quality paved areas.
CONSULTATION: Consultation covered the period from 1985 to 1991. Initial consultation included a discussion document *People First* (March 1989). Comments on the scheme were sought through exhibitions, brochures, newspaper articles, consultations with specialist groups, public meetings and discussions with individuals. Consultation led to the introduction of such measures as specially textured surfaces to assist the blind and partially sighted to avoid obstacles and locate safe crossing places.



Use of granite sett paving in Carfax area.



Mini-roundabout at East Street.

MONITORING	ACCIDENTS (PIA)		SPEEDS (MPH)
	Within Conservation Area	Outside Conservation Area but within ring road boundary	
BEFORE	11 in 3 years	17	35
AFTER 1999–2002	8 in 3 years	15	15*
			*Not updated

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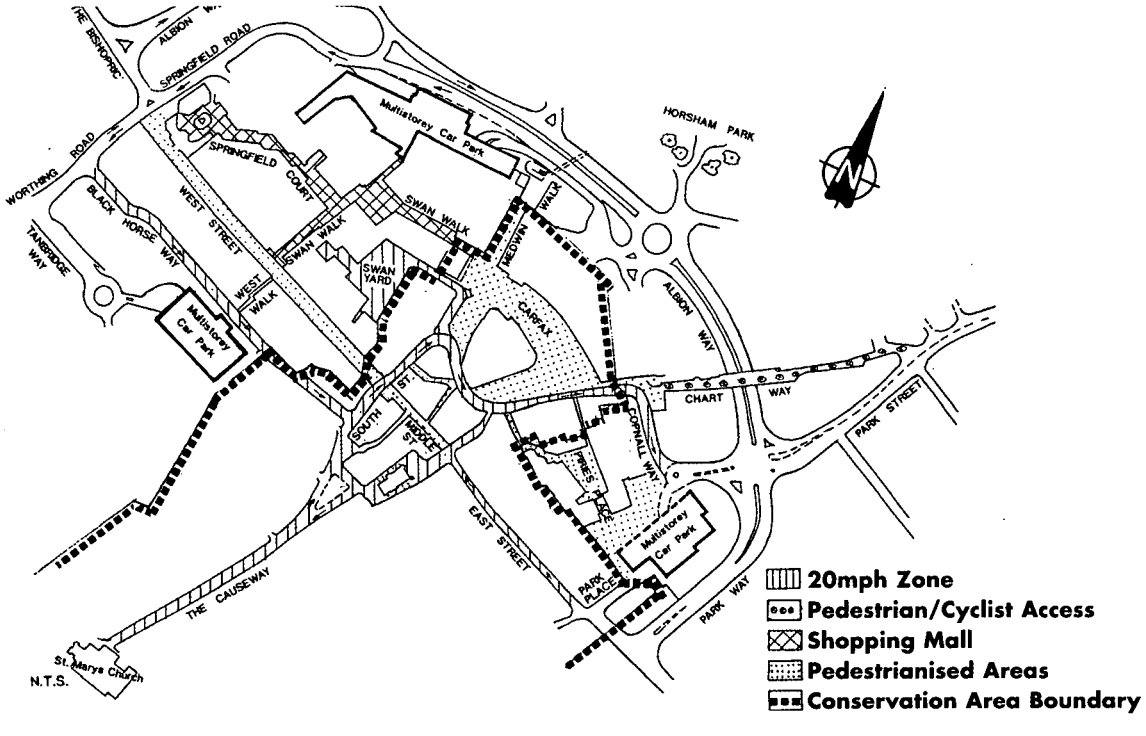
AUTHORITY: WEST SUSSEX COUNTY COUNCIL AND HORSHAM DISTRICT COUNCIL

Technical Data

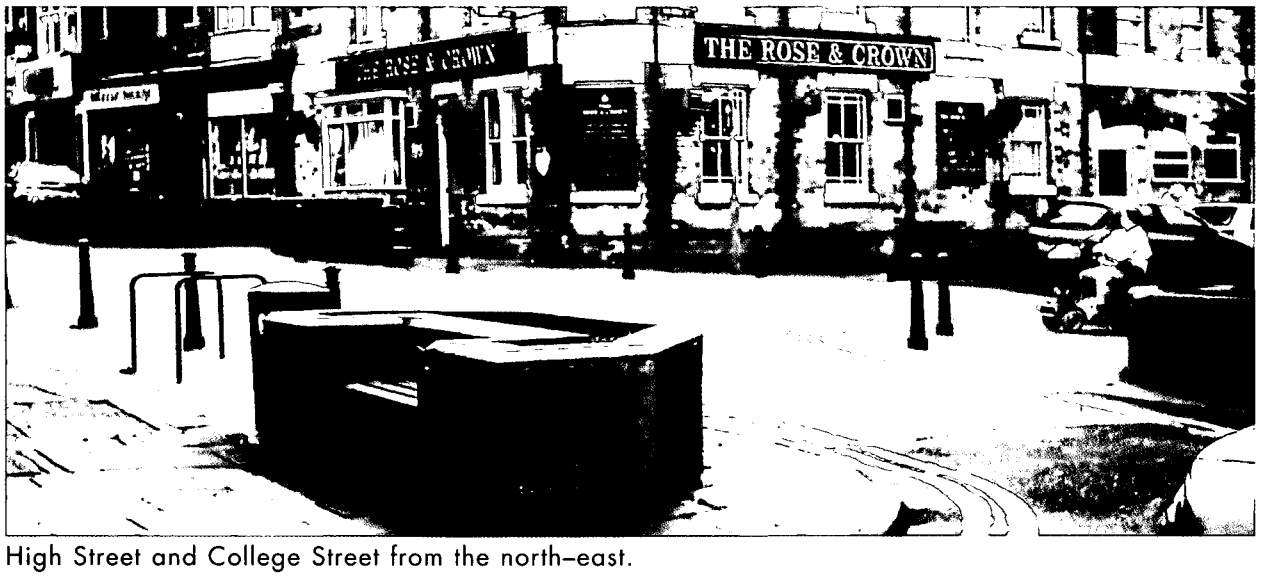
Location Type:	Town centre, part of which is designated a conservation area.	
Road Type and Speed Limit:	Urban unclassified: 20mph.	
Scheme Type:	Round and flat topped road humps using a variety of materials within a mainly one-way 20mph zone, incorporating road narrowings at the gateways.	
Length of Scheme in Total:	1.12km.	
Dimensions:	Road humps:	Height: 75mm.
	Width:	Full carriageway.
	Length:	Plateau 3-14m. Ramps 0.6m.
	Ramp gradient:	1:8.
Materials:	Road humps:	Ramps – natural granite setts. Plateaus – York stone setts or clay paviours.
	Bus and loading bays:	Coloured granite setts.
	Other carriageway areas:	Granite setts.
	Footway "routes":	Smooth sawn York stone.
	Other pedestrian areas:	York stone, with granite setts around street furniture.
Signs:	At entry to (Diag. 674) and exit from (Diag. 675) 20mph zone. No intermediate signs or road markings.	
Lighting:	Replaced in part with period style columns and lanterns.	
Costs:	Constructions costs were approximately £2.3m, funded by Horsham District Council. West Sussex County Council and Horsham District Council paid their own design and site supervision staff costs.	



Horsham Town Centre.

2 High Street, Rushden, Northamptonshire
20 mph zone, humps, chicanes, narrowings

UPDATE: The 20mph zone has been found to be a far better solution than the former pedestrianisation scheme. It has restored passing trade and has encouraged the public to continue to use the shopping facilities. The authority is keen to implement this type of solution elsewhere. It is encouraging to see that the accident reduction has been maintained during the last 10 years despite the entry of traffic into the controlled zone.



High Street and College Street from the north-east.

IMPLEMENTED: November 1992.

BACKGROUND: An experimental pedestrianisation scheme had proved unpopular with local traders. It was agreed to replace this with a 20mph zone in the traditional shopping area of Rushden, centred on the High Street. The area consists of traditional shops and small branches of chain stores, and is bounded on both sides by the A6 which was formerly a national route, but now downgraded following construction of a new bypass in 2003.

NEED FOR MEASURES: To slow traffic and enhance pedestrian safety, whilst maintaining delivery access to the shops and, by improving the urban environment, stimulate increased economic activity.

MEASURES INSTALLED: The measures included flat and round top road humps, pinch points, chicanes and pavement extensions.

SPECIAL FEATURES: Red block paving was used to complement the existing brick frontages, and brick constructed planters were installed to allow floral displays. Street furniture was manufactured of cast-iron and painted black to blend in with the surroundings and maintain the character of the area.

High Street and College Street from the south.

CONSULTATION: Public exhibition, meetings with the Chamber of Trade and District Councillors, consultation with the emergency services and bus operators.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (16HR)
BEFORE	11 in 3 years	24	2,541
AFTER (1999-2002)	4 in 3 years	17*	2,080*
			*Not updated

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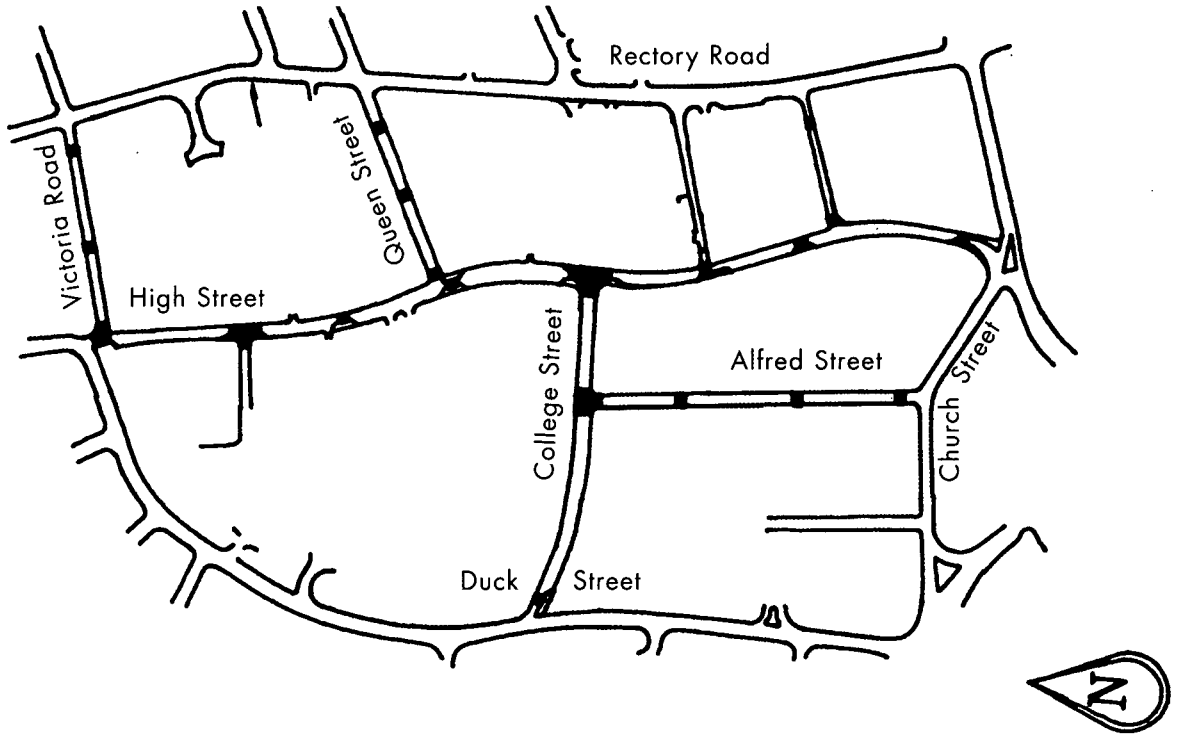
AUTHORITY: NORTHAMPTON COUNTY COUNCIL

Technical Data

Location Type:	Main shopping area.	
Road Type and Speed Limit:	Urban unclassified: 30mph.	
Scheme Type:	Flat top humps, pinch points and chicanes in High Street and College Street. Round top humps in side streets, and table junctions.	
Length of Scheme in Total:	Zone covers 10 hectares; 1km of carriageway.	
Dimensions of flat top humps:	Height:	75mm.
	Width:	Full road width.
	Length:	6m.
	Ramp gradient:	1:12.
	Distance from junctions:	Varies.
Materials:	Humps:	Block paving for flat top humps. Blacktop for round top humps.
	Kerbs:	Pre-cast concrete.
	Street furniture:	Cast-iron bollards and litter bins. Brick planters.
Signs:	As required for a 20mph zone (Circular Roads 4/90).	
Lighting:	The existing street lighting was retained.	
Costs:	Northamptonshire County Council £217,000; East Northants District Council £13,000. Total £230,000 (1992).	



Rushden 20mph Zone

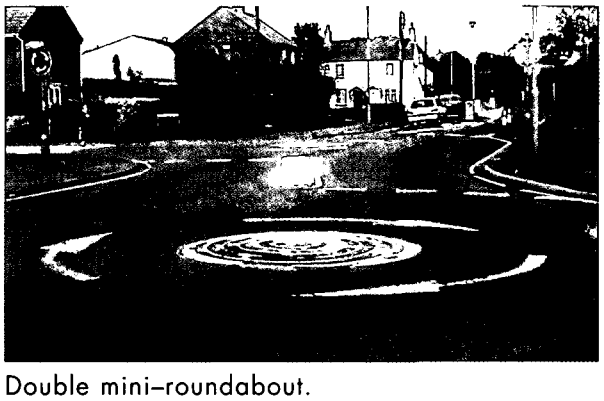
3 Eaton Socon, Cambridgeshire
mini-roundabouts, narrowings, chicanes, cycle lanes

UPDATE: Initially the local reaction to this scheme was not good, but it has improved since completion as it has proved its worth and the planting has matured. Although the speed reductions have not been huge, the accident reduction has been sustained at about 78%.

LESSONS LEARNED: Halfway measures are no good. They are often both unpopular and ineffective. Some of the cycle bypasses are difficult to use due to poor design. Setting aside funds for environmental enhancements helps with public acceptance of the scheme.

Cycle bypasses at road narrowings.

IMPLEMENTED: May 1992.
BACKGROUND: The B1428 through Eaton Socon is a former trunk road which acts as a main feeder route into St Neots town centre. The route severs two large residential areas and is subject to a 30mph speed limit. The road width varies between 7.3 and 10 metres.
NEED FOR MEASURES: Persistent high injury accident rate.
MEASURES INSTALLED: Mini-roundabouts, traffic islands, road narrowings, chicanes and cycle lanes.
SPECIAL FEATURES: Cycle lanes at road narrowings.
CONSULTATION: Town Council, local residents, bus companies and emergency services.



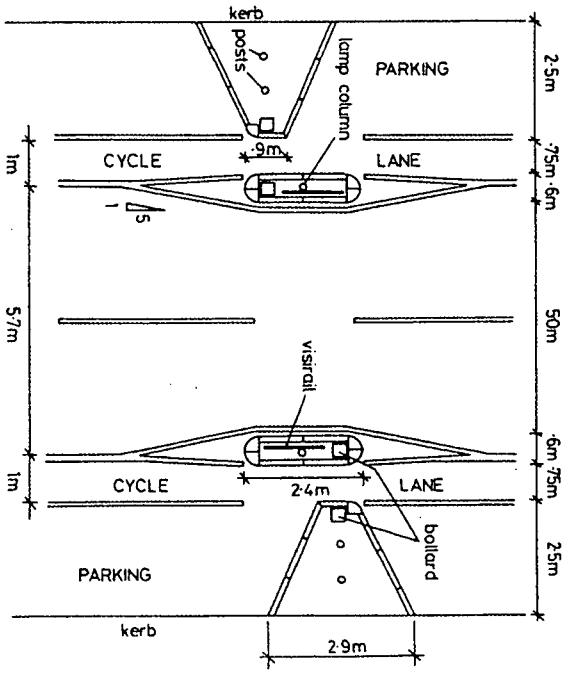
Double mini-roundabout.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (12HR)
BEFORE	56 in 3 years	38	10,700
AFTER (1999-2002)	13 in 3 years (all slight)	32*	8,900* *Not updated

CONTACT: AMANDA MAYS ☎ 01223 717565 E-MAIL: Amanda.Mays@Cambridgeshire. gov.uk
AUTHORITY: CAMBRIDGESHIRE COUNTY COUNCIL

Technical Data

Location Type:	Urban, market town.	
Road Type and Speed Limit:	Urban unclassified: 30mph.	
Scheme Type:	Road narrowings, mini-roundabouts, traffic islands and chicanes with cycle lanes.	
Length of Scheme in Total:	2.3km	
Dimensions:	Height:	Overrunnable islands 40-100m.
	Width:	Carriageway at islands 2.8-3.0m. Cycle lanes 1.0m. Carriageway at chicanes/narrowings 5.0-5.5m. Islands 1.2-2.0m. Overrunnable islands 0.9m.
	Length:	Chicanes and road narrowings - varies. Islands 6m. Overrunnable islands 2.4m.
Materials:	Chicanes:	Precast concrete kerbs/conservation kerbs with asphalt infill.
	Traffic islands:	Precast concrete kerbs/conservation kerbs with asphalt infill.
	Street furniture:	Cast-iron bollards and litter bins. Brick planters.
Signs:	Regulatory:	Islands Diag 610.
	Mini-roundabouts:	Diags 611.1, 1003.3 and 1003.4.
	Cycle lanes:	Diags 625.5 and 1049.
Lighting:	Existing 10m lamp columns with additional 5m lamp columns at some features.	
Costs:	Cambridgeshire County Council Traffic Management and Safety budget - £130,000.	

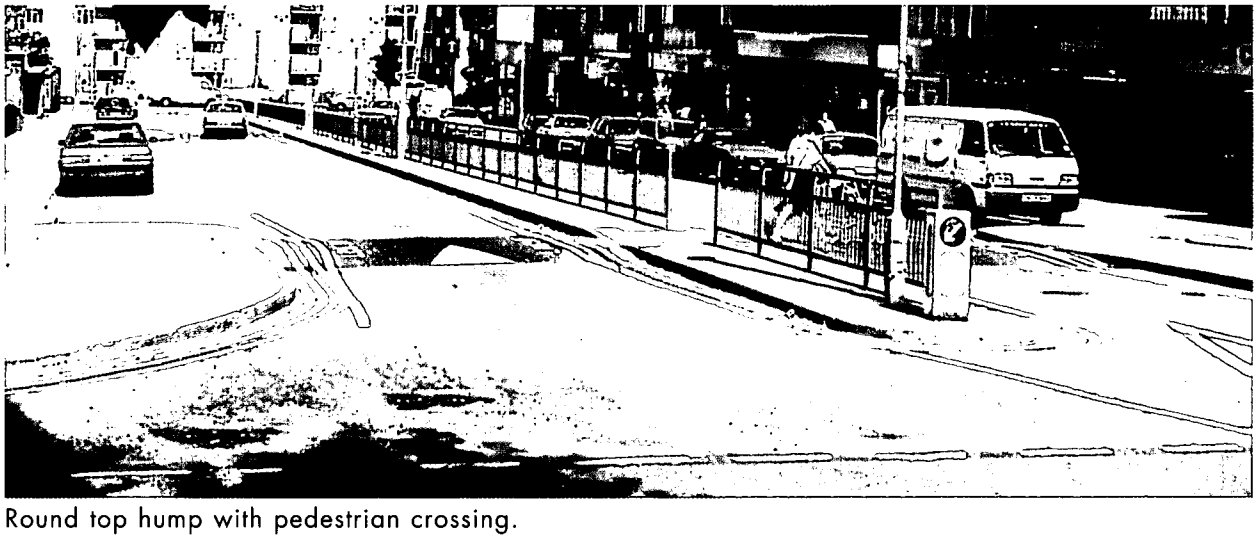


Layout for road narrowing with cycle bypass.

4 Twydall Green, Gillingham, Kent round top humps, parking bays, crossing points

UPDATE: Although the number of crashes decreased only slightly, the severity of the accidents reduced to slight. At least eight buses/day use this route, without apparent problems. Channelling pedestrians to identified crossing points has been successful but at the ends of the scheme, pedestrians are still at risk (two pia in three years).

LESSONS LEARNED: Lengths of dual carriageway in 30mph zones where there are shops are unusual. Whilst it is unlikely that schemes involving road humps on a busy bus route would be introduced today, in this case they have proved successful and the kerb build-outs that were used are now quite commonplace, and provide useful parking bays.



Round top hump with pedestrian crossing.

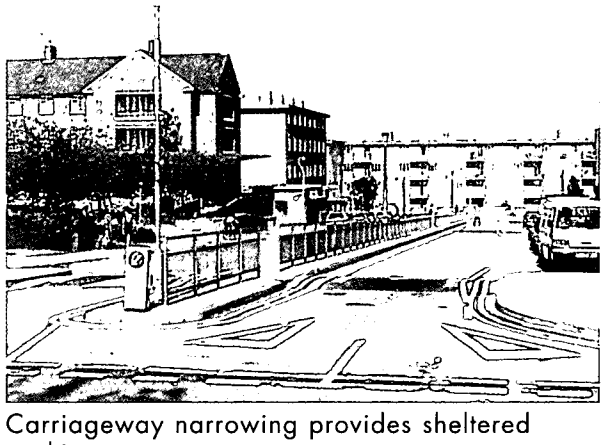
IMPLEMENTED: October 1988.

BACKGROUND: The Twydall Estate shopping and community centre is bisected by a short length of dual carriageway. It is within the 30mph limit and is a bus route.

NEED FOR MEASURES: Pedestrian accidents, including one fatal in the three years prior to 1998. Contributory factors were unreasonably high speeds and pedestrians crossing between vehicles parked on both sides including up against the central reservation.

MEASURES INSTALLED: A series of three DOT-style round top humps, with built out kerbs sited at the humps to create parking bays, and guard railing on the central reserve. Gaps in the railing at each hump allow pedestrians to cross. Some lighting columns were also re-sited.

SPECIAL FEATURES: Profile of humps was flattened to allow pedestrians to walk on them.



Carriageway narrowing provides sheltered parking space.

CONSULTATION: With the District Council and emergency services. There was no formal public consultation as this was an early scheme before KCC procedures had been finalised.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (12HR)
BEFORE	4 in 3 years	not measured	5,000
AFTER (2001–2003)	1 in 3 years	not measured*	5,000*
			*Not updated

CONTACT: DAVID CHEN ☎ 01634 331774 E-MAIL: david.chen@medway.gov.uk
AUTHORITY: KENT COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Urban shopping and community centre.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified:	30mph.
SCHEME TYPE:	Round top humps and sheltered parking on a dual carriageway road.	
LENGTH OF SCHEME IN TOTAL:	130m.	
DIMENSIONS:	Road humps:	Height: 100mm - flattened profile.
	Width:	Full width.
	Length:	3.75m.
	Distance from junctions:	Within 40m.
MATERIALS:	Road humps:	Hot rolled asphalt.
COSTS:	£18,000.	

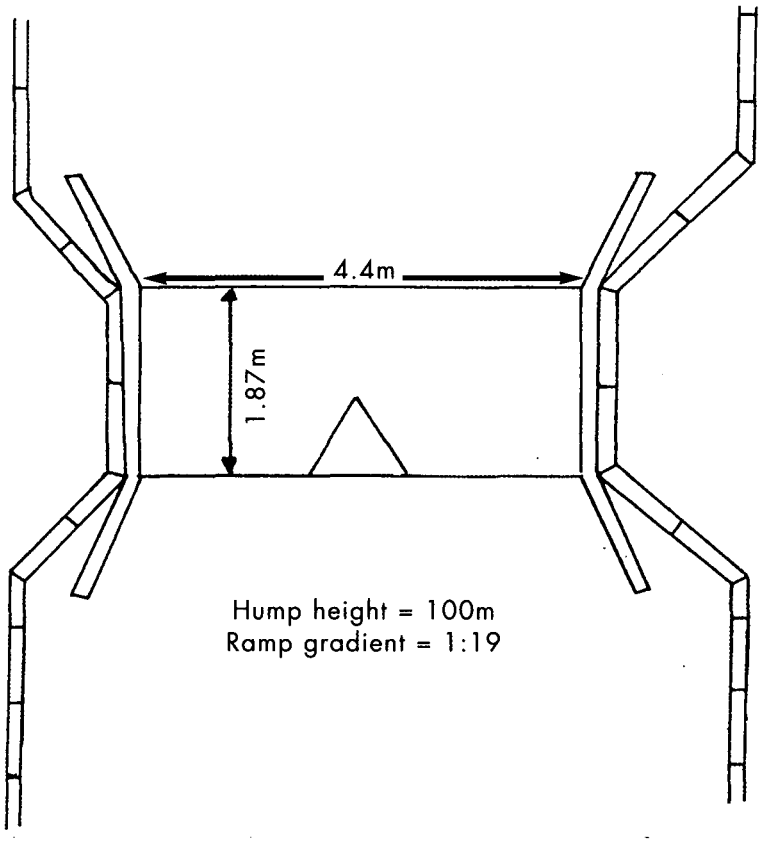


Diagram of round top hump layout at Twydall Green.

5 Vines Lane, Rochester, Kent
flat top humps, narrowings with priority

UPDATE: This has been a very successful, low cost scheme. Apart from the drop in accident numbers in the treated road, there was also a marked drop in the number of accidents in the residential roads surrounding Vines Lane, which seems to indicate a positive, peripheral effect on safety. In addition, the scheme has led to a diversion of traffic towards a nearby major route, but this has not resulted in an increase in accidents on that route.

Flat top humps with pedestrian crossing.

IMPLEMENTED: May 1990.
BACKGROUND: Vines Lane is on the periphery of the historic centre of Rochester. It is some 200m in length, subject to a 30mph speed limit and has lighting. It is used as a commuter cut-through and is bounded by a municipal park and school playing fields.
NEED FOR MEASURES: Speeds which led to child pedestrian accidents and rat-running.
MEASURES INSTALLED: Two single-way working ramps within 50m of junctions, each giving priority from main road.
SPECIAL FEATURES: Consideration was given to scheme blending in with historic setting.
CONSULTATION: With the local school and the police. No residents adjacent to this road, no bus route.

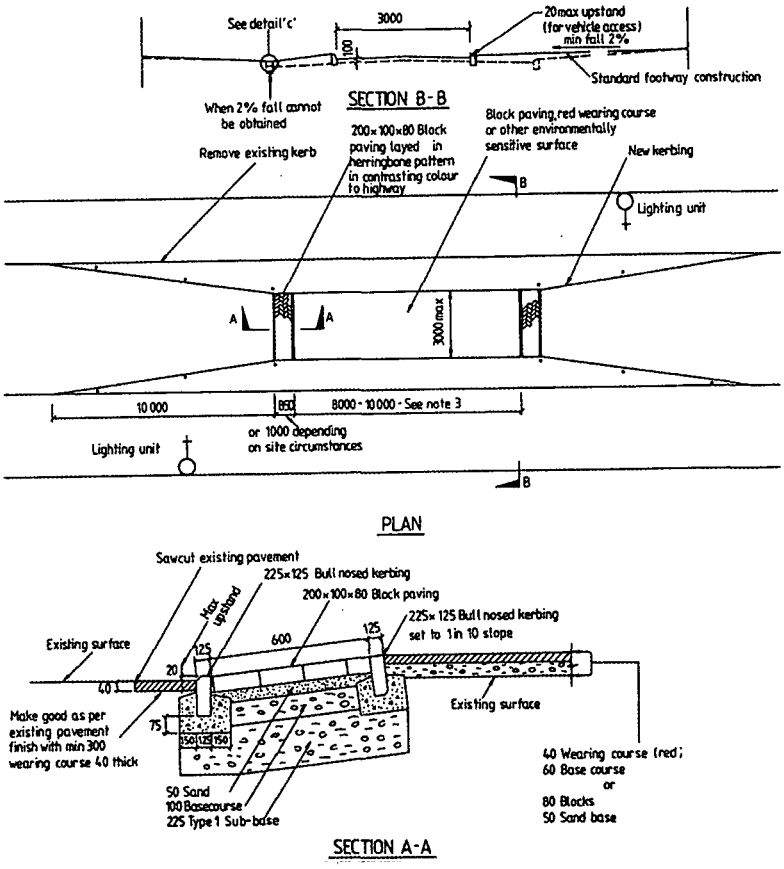
Further view down Vines Lane.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	6 in 3 years	35	8,000
AFTER (2001–2003)	0 in 3 years	21	4,900

CONTACT: DAVID CHEN ☎ 01634 331174 E-MAIL: david.chen@medway.gov.uk
AUTHORITY: KENT COUNTY COUNCIL

Technical Data

Location Type:	City centre conservation area.	
Road Type and Speed Limit:	Urban unclassified: 30mph.	
Scheme Type:	Flat top humps.	
Length of Scheme in Total:	235m	
Dimensions:	Height of flat top humps:	100mm.
	Width:	3m.
	Length:	Plateau: 10m Ramp: 1m.
	Ramp gradient:	1:10.
	Distance from junctions:	50m
Materials:	Plateaus:	Red block paving with 2m central band of grey block paving to denote crossing point.
	Ramps:	Recycled granite setts.
	Kerbs:	Recycled granite.
	Street furniture:	Cast-iron bollards with City crest.
Signs:	Regulatory sign: Diag 811 "Road Humps" sign: Diag 557.	
Lighting:	Existing period style lamp columns resited and up-graded.	
Costs:	Kent County Council Small Improvements budget £10,500. Rochester upon Medway City Council for environmental enhancements £5,500. Kings School donation £2,500. Total cost: £18,500.	

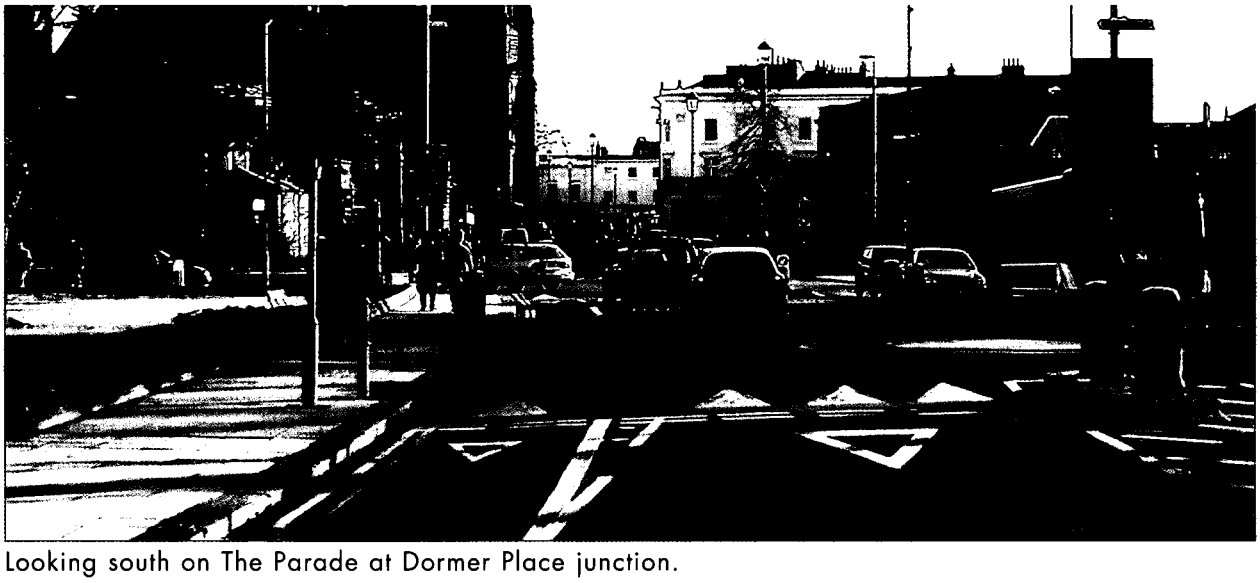


Construction detail of flat top hump.

6 The Parade, Leamington Spa, Warwickshire
flat top tables including raised mini-roundabouts

UPDATE: This scheme has continued in operation and a cycle lane was added in 1995 because of the incidence of accidents involving pedal cyclists. In 2002 Warwickshire County Council were awarded a substantial grant by DfT to fund one of the first schemes under their "Urban Mixed Priority" programme. Under this programme, selected roads in a number of town centres are to be upgraded, and have their road space reallocated to give greater priority to more vulnerable users. The Parade, in Leamington, forms part of the Warwickshire scheme. The scheme includes for resigning and re-lining the mini-roundabouts, together with additional cycle facilities.

OTHER COMMENTS: The traffic flow has reduced to about 10,000 vpd(16 hr). Low cost proposals which had been developed to further reduce the accident rate have been overtaken by the Urban Mixed Priority scheme. Clay paviours were replaced because of "polishing".



Looking south on The Parade at Dormer Place junction.

IMPLEMENTED: July 1992.

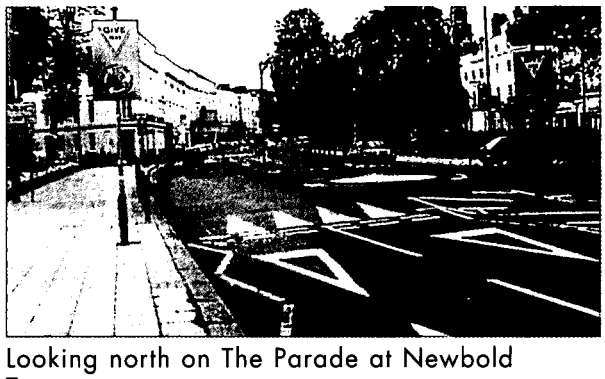
BACKGROUND: This road carries traffic through the middle of the town centre, bisecting large national retail shops frontages. Traffic type includes buses, delivery vehicles and the emergency services.

NEED FOR MEASURES: High injury accident record, particularly involving pedal cyclists.

MEASURES INSTALLED: Two speed tables with mini-roundabouts and associated signs and road markings.

SPECIAL FEATURES: Clay paviours used initially but replaced with asphalt because of low skid resistance value and skidding problems.

CONSULTATION: No residents, otherwise full legal consultation. No objections were received from the emergency services or bus operators.



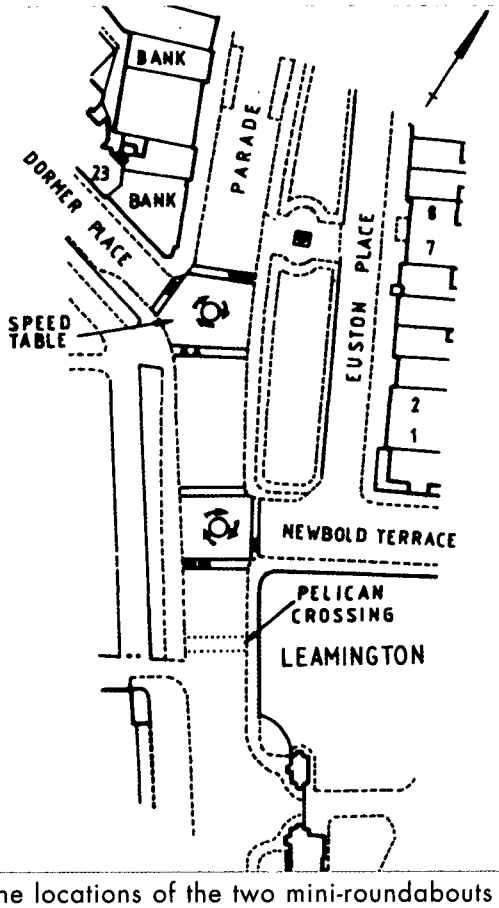
Looking north on The Parade at Newbold Terrace.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	7 in 3 years	not known	15,600
AFTER (2000-2003)	4 in 2 years	23	10,000

CONTACT: MALCOLM GRAHAM ☎ 01926 412650 E-MAIL: malcolmgraham@warwickshire.gov.uk
AUTHORITY: WARWICKSHIRE COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Town centre.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Two raised mini-roundabouts.	
LENGTH OF SCHEME IN TOTAL:	50m	
DIMENSIONS:	Height of tables:	100mm.
	Width:	15m.
	Length:	20m.
	Ramp gradient:	1:20.
	Distance from junctions:	On junction.
MATERIALS:	Plateau and ramps:	Asphalt.
	Kerbs:	Concrete.
	Street furniture:	Black cast-iron bollards to define footway.
SIGNS:	Advanced and local warnings signs together with "mini-roundabout" sign.	
LIGHTING:	High pressure sodium (as existing).	
COSTS:	Warwickhire County Council Local Safety Scheme budget £35,000.	



Plan showing the locations of the two mini-roundabouts at Dormer Place and Newbold Terrace junctions.

7 Ashlawn Road, Rugby, Warwickshire
mini-roundabout, flat top humps

UPDATE: This scheme has remained largely unaltered since it was first introduced as the result of a high accident record, back in 1992. Extensive use was made of block paving to create raised carriageway areas at junctions and crossing points. The ramp gradients have been modified from 1:10 to 1:15 after early complaints from the public. The ramps have had to be resurfaced in asphalt as the block paving started to break up under the traffic loads.

OTHER COMMENTS: Recent monitoring has shown that while the 85th %ile vehicle speeds have crept up to 29mph (from 25mph), the accident rate has remained very low.

Along Ashlawn Road at the Fareham Avenue raised mini-roundabout.

IMPLEMENTED: January 1992.

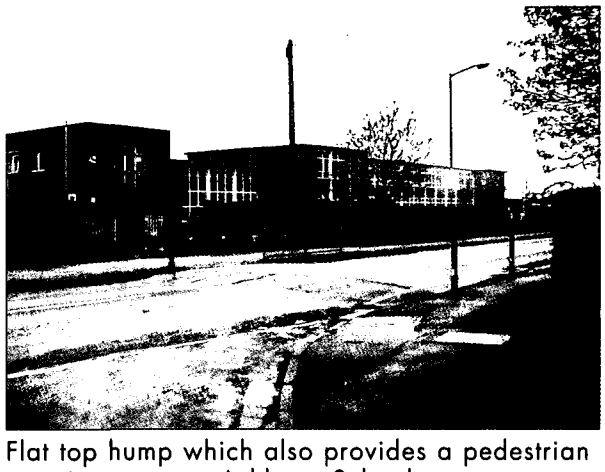
BACKGROUND: This road carries a mixture of both local and inter-urban traffic avoiding the town centre. To one side of the road is a large school and to the other there is housing.

NEED FOR MEASURES: High accident record. Very heightened local concern was felt and pressure exerted for traffic calming.

MEASURES INSTALLED: One junction improvement, one raised mini-roundabout and eight flat top humps.

SPECIAL FEATURES: Raised mini-roundabout constructed in blockwork on a "B" road.

CONSULTATION: Full legal consultation including leaflet drop, public exhibition for residents. No objections were received from the emergency services.



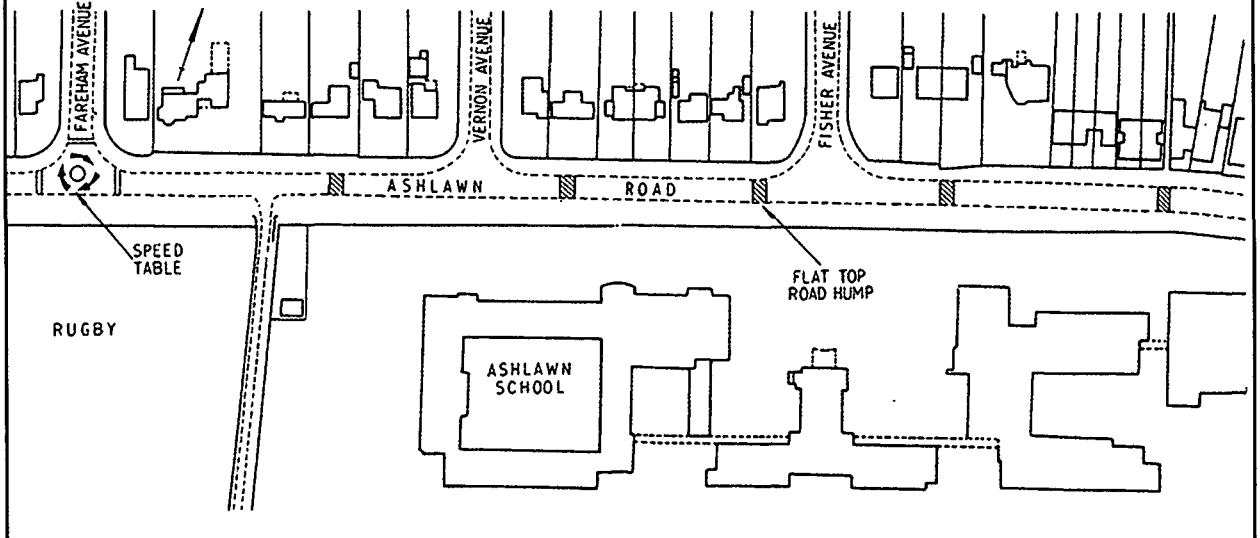
Flat top hump which also provides a pedestrian crossing route to Ashlawn School.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (16HR)
BEFORE	6 in 3 years	50	7,100
AFTER (2001-2003)	2 in 3 years	29	6,500

CONTACT: MALCOLM GRAHAM ☎ 01926 412650 E-MAIL: malcolmgraham@warwickshire.gov.uk
AUTHORITY: WARWICKSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Edge of town centre.
Road Type and Speed Limit:	Urban classified: 30mph.
Scheme Type:	Raised mini-roundabout and flat top humps.
Length of Scheme in Total:	550m.
Dimensions:	Height of flat top humps: 75mm (max). Width: 6.5-7.0m. Length: 3.7m. Ramp gradient: 1:15. Distance from junctions: Variable.
Materials:	Plateau and ramps: Block paving. Kerbs: Concrete. Street furniture: Steel posts incorporating retro-reflective red/white material.
Signs:	Advanced and local warning signs together with "mini-roundabout" sign
Lighting:	Low pressure sodium (as existing).
Costs:	Warwickshire County Council Local Safety Scheme budget £69,000.



Plan of Ashlawn Road showing the raised mini-roundabout junction at Fareham Avenue and the five flat topped humps.

8 Dragon Street, Petersfield, Hampshire
Bypass demonstration project

UPDATE: This relatively expensive scheme (£480,000) was a finalist for the 1994 Urban Street Environment Traffic Calming Awards. It was implemented following completion of the major A3 improvement (bypass), which removed most through traffic from the town. The scheme design involved extensive local consultation and was well received locally. It remains completely unaltered except for the increased impact of the planting that was included.

OTHER COMMENTS: The reduction in traffic impact (mainly due to the bypass) together with the enhanced environmental conditions, have undoubtedly contributed to the financial viability of the town and recent re-developments and investment. The scheme has also led to further transport investment to develop cycle and pedestrian networks. The same environmental themes are being continued and a 20mph zone is to be introduced covering the historic core of the town.

High Street/Dragon Street junction with raised, block paved area.

IMPLEMENTED: August 1993.
BACKGROUND: Petersfield was one of six towns across the country to be selected by the then Department of Transport for inclusion in a national project on how to maximise the environmental and safety benefits to towns relieved of trunk road traffic by new bypasses. Over a three year period, major re-modelling and environmental enhancement of the old A3 route through Petersfield was undertaken.
NEED FOR MEASURES: To restore a "sense of place" to Petersfield, to reduce the dominance of traffic, to provide a safe and pleasant environment for residents, shoppers and visitors, and to preserve and enhance local business viability.
MEASURES INSTALLED: Two single-way working ramps and raised areas within 50m of junctions, each giving priority from main road.
SPECIAL FEATURES: Consideration was given to scheme blending in visually with historic setting.
CONSULTATION: With the local school and the police. No residents adjacent to this road, no bus route.

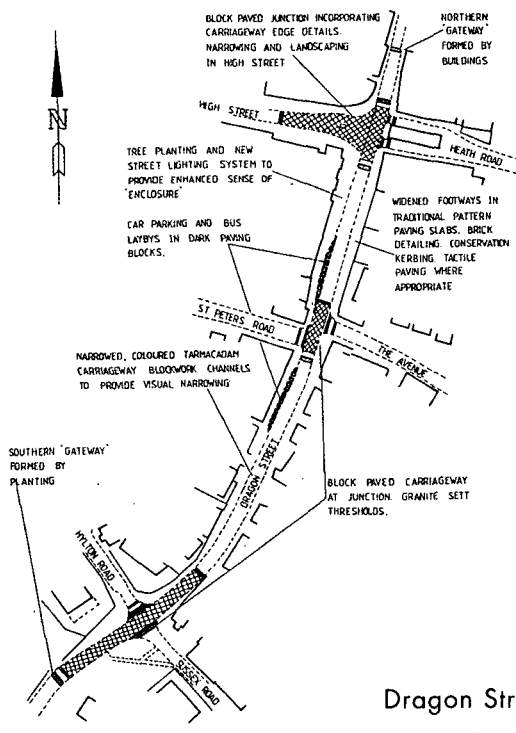
Dragon Street, Petersfield.

OUTCOME: This scheme was successful in achieving its objectives and has been well received by the town as a whole. It has reduced the impact of traffic and improved the environment.

CONTACT: GRAHAM CARTER ☎ 01962 857810 E-MAIL: graham.carter@hants.gov.uk
AUTHORITY: HAMPSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Market town, conservation area.	
Road Type and Speed Limit:	Formerly A3 trunk road. Now B2070 secondary road: 30mph.	
Scheme Type:	Narrowed two-way carriageway permitting widened footways incorporating parking bays.	
Length of Scheme in Total:	400m	
Dimensions:	Carriageway width reduced from 10m to 6.75m.	
Materials:	Junctions:	Bleijko blocks in autumn colour mix. Buff blocks to denote pedestrian crossing points and channels. Granite rumble strips at boundaries.
	Footways:	Three sizes of paving slab. Blockwork drainage runs. Conservations kerbing.
	Street furniture:	Locally sourced wrought iron grills and guards. Back cycle stands. Wooden slatted benches. Bus shelters.
	Tree planting:	Semi-mature specimens including ornamental pears, planes and alder to provide a sense of enclosure.
Signs:	Cast iron direction signs including black/gold pedestrian finger posts. No road markings.	
Lighting:	6m high black columns specially commissioned from Urbis which contribute greatly to the smaller scale street scene	
Costs (Phase 1):	DOT Bypass Demonstration Project Grant £193,500. Supplementary Credit Approval £193,500. Detrunking Maintenance Grant £93,000. Total £480,000.	



Dragon Street environmental improvements.

9 Shenley Road, Borehamwood, Hertfordshire

flat top tables, allocated parking, mini-roundabouts

UPDATE: The District Council believes the scheme has had a positive effect on the town centre and has helped maintain trade and promote the area in conjunction with other developments such as the shopping development. Flat top speed tables have worked well and provided much more freedom of movement for pedestrians. Driver and pedestrian attitudes changed from the start; traffic flow improved and is still regarded as an improvement over the previous situation. Traders like the design and servicing the shops is not a problem for deliveries and customers, (store deliveries often use the rear accesses).

OTHER COMMENTS: Flat top speed tables have proved to be a maintenance problem and have been reconstructed. The brick planters have been hard to maintain to an acceptable level and are often treated like litter bins. The District Council is still working to improve the situation. Some drivers and pedestrians are confused by the layout – often new to the area. Parking – the disabled and delivery areas are being more frequently abused by drivers as enforcement decreases. This is also the case at night when the central refuges are used for additional parking. Pedestrian/car conflict increases during the evening when there is less traffic flow and reduced pedestrian movement – possibly the fact that it is darker and faces are not so visible. There have been no fundamental changes to the layout of the scheme since implementation, but it has remained effective in keeping down speeds and accidents.

Pedestrian-friendly flat top tables.

IMPLEMENTED: 1992-1994.

BACKGROUND: Shenley Road is an east-west route between Barnet and Watford and is the main shopping centre for a population of approximately 30,000.

NEED FOR MEASURES: Serious congestion. Illegal parking on carriageway. Some pedestrian/vehicle accidents.

MEASURES INSTALLED: Low central reserve to create dual 3.6m wide carriageways, horizontal deviations, mini roundabouts and speed tables.

SPECIAL FEATURES: Flat top speed tables on low speed dual carriageway, with parking in marked bays.

CONSULTATION: Public exhibitions and leaflets to all premises in September 1988, March 1990, December 1991 and May 1993. Town Centre Panel of all interested parties set up.

Traffic calming using a mixture of techniques.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (16HR)
BEFORE	15	26	18,000
IMMEDIATELY AFTER	8	20	16,500
2003	7	20	18,992

CONTACT: KEITH HOPPER ☎ 01707 356320 FAX: 01707 356380 E-MAIL: keith.hopper@hertshighways.org.uk
AUTHORITY: HERTS HIGHWAYS

Technical Data

LOCATION TYPE:	Town centre shopping street carrying through traffic.	
ROAD TYPE AND SPEED LIMIT:	Formerly principal road A5135, now B5378. 30mph.	
SCHEME TYPE:	Narrowing to dual one lane. Flat topped road humps.	
LENGTH OF SCHEME IN TOTAL:	800m.	
DIMENSIONS:	Height of flat top humps:	100mm.
	Width:	Each carriageway 3.75m, plus variable central reserve.
	Length:	Plateaus 6m.
	Ramp gradient:	1:15 and 1:20.
	Distance from junctions:	Varies.
MATERIALS:	Plateau and ramps:	Red concrete blocks, but later replaced with asphalt.
	Kerbs:	Natural concrete.
SIGNS:	Diag 562 with sub-plate "Pedestrians on crossing humps" at each hump.	
LIGHTING:	Carriageway lighting - 8m columns with large globe. Footway lighting 6m columns with standard globe on swan neck. New lighting schemes allows extra lighting for road humps and pedestrians.	
COSTS:	Developer contribution £1m. County and District Councils £100,000 each. Total £1.2m.	

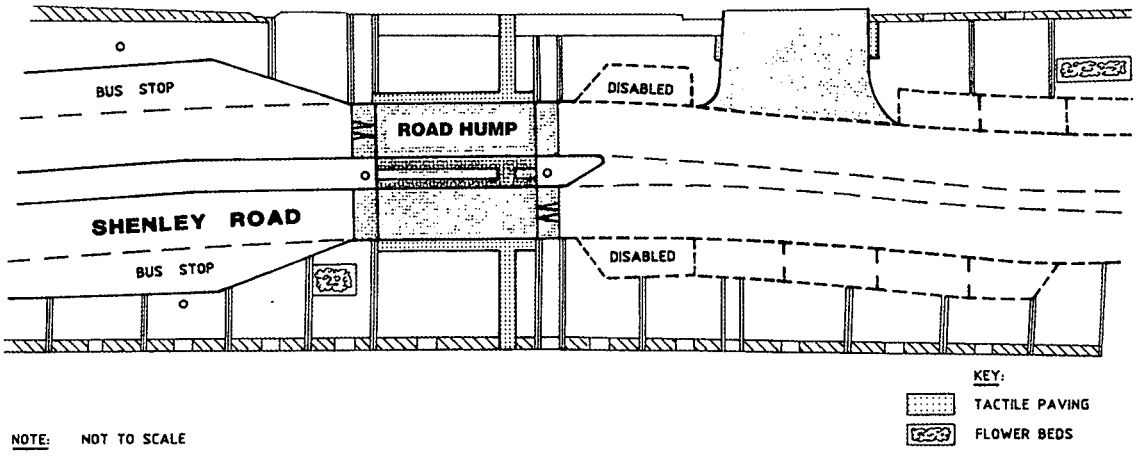


Diagram showing a typical informal crossing point.

Earlier Schemes Reviewed

RURAL

Updated Case Studies 10-21

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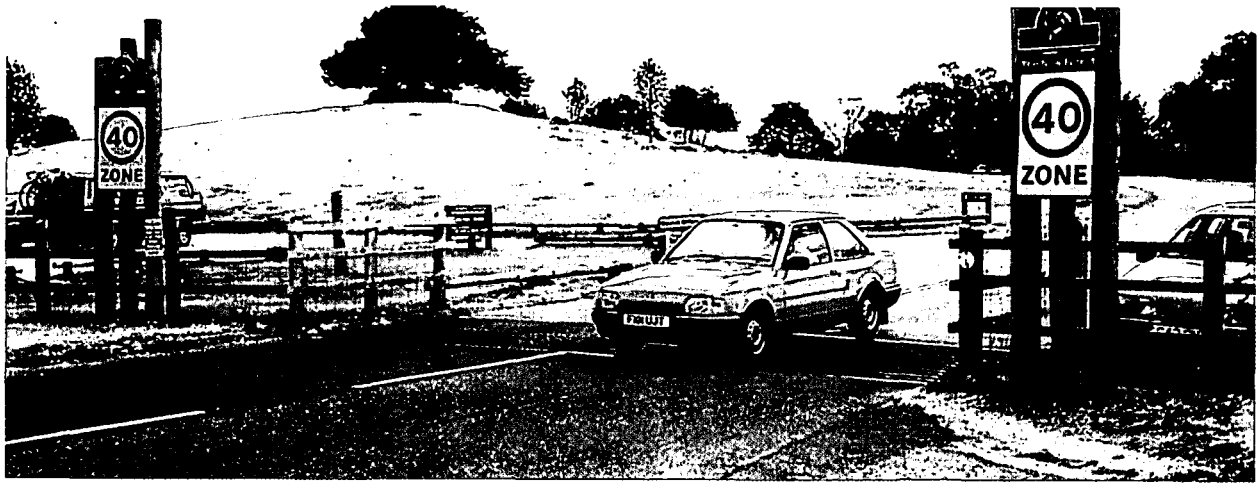
10 New Forest, Hampshire
40mph zone, rural road hierarchy

UPDATE: The original scheme was widely supported by the numerous local bodies with an interest in the Forest. The original New Forest 40mph zone has now been extended to coincide with the Heritage Area boundary, and white edge of carriageway markings have been used along some roads to visually narrow them, and reducing both edge of road erosion and vehicle speeds.

LESSONS LEARNED: The importance of comprehensive consultation and the use of natural materials, wherever possible, has contributed greatly to the success of this scheme.

MONITORING: Year by year monitoring has shown continuing reduction to animal deaths which are now about 30% down on the pre-scheme situation.



Example of a "Gateway" feature at the main entry point to the forest.

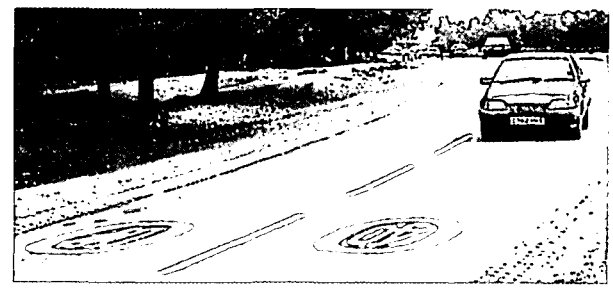
IMPLEMENTED: 1990 to date.

BACKGROUND: Established in 1079 by William I as a royal hunting ground, the New Forest Heritage Area covers 580km^2, of which 198km^2 is unenclosed common grazing lands. As well as trunk and principal roads, it contains approximately 400km of Class 2, Class 3 and unclassified roads.

NEED FOR MEASURES: Increasing and unrestricted traffic flows often travelling at high speeds, were causing the death of about 150 stock animals and 70 deer per year. Over-running and damage to the verge was occurring and repairs or reconstruction of the haunch were producing an increase in carriageway width.

MEASURES INSTALLED: An areawide 40mph zone, a three tier road hierarchy with direction signing designed to keep traffic on the highest category of road, and close liaison with the police. More recently 30mph limits have been applied in villages.

SPECIAL FEATURES: To minimise sign clutter within the Forest, road markings rather than post mounted speed limit signs have been used. "Gateways" and chicanes have been constructed, plus "reminder" (regularly changed) and "slogan" signs.



30mph roundel signing at the entry to a village.

CONSULTATION: Hampshire County Council, New Forest District Council, the New Forest Verderers, the Forestry Commission and the Nature Conservancy Council, the police, the public and parish councils, were all involved.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)
BEFORE		40
AFTER (2000-2002)	40% reduction to humans 30% reduction to animals	38* *Not updated

CONTACT: MARTIN WILTSHIRE ☎ 01962 857816 E-MAIL: martin.wiltshire@hants.gov.uk
AUTHORITY: HAMPSHIRE COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Rural location, popular tourist destination and recreation area.
ROAD TYPE AND SPEED LIMIT:	Rural "B", "C" and unclassified roads: 40mph.
SCHEME TYPE:	Rural highway strategy incorporating speed limit with supporting features.
LENGTH OF SCHEME IN TOTAL:	Approximately 422km of 40mph speed limit, and 68km of 30mph speed limit.
MATERIALS:	Locally sourced rough hewn timber posts for zone entry, slogan and repeater signs.
SIGNS:	Unique New Forest style zone entry, slogan and repeater signs authorised by DOT. 30 and 40mph road marking roundels.
LIGHTING:	None.
COSTS:	Pre-1992 from Highway Maintenance budget. 1992/93 £200,000. 1993/94 £100,000. 1994/95 provisional £100,000. 1999/2000 £64,000 to extend zone and include first 30mph village speed limit. 2001/02 £15,000 for further village speed limits. 2002/03 £3,000. Total cost to date – £482,000.

Example of a reminder sign with an interchangeable "slogan" plate.

CONTACT'S COMMENTS: The 40mph zone has been widely supported and is now part of the Forest way of life. Enforcement is targeted at certain types of motorist, such as the early morning commuter. The key to success has been the cooperation and support of many local bodies with an interest in the Forest.

11 Gamlingay Village, Cambridgeshire
narrowing, road humps

UPDATE: This was one of the first schemes of its type to be introduced in Cambridgeshire. The scheme relies heavily on round top road humps and since there are significant HCV movements the scheme would probably have used speed cushions rather than humps if it were to be installed today.

OTHER COMMENTS: Local concerns were expressed when the scheme was first introduced but these have diminished over time. The scheme has been successful in reducing accidents though the number has increased slightly in recent years.

A priority feature at the entrance to the village.

IMPLEMENTED: September 1990.

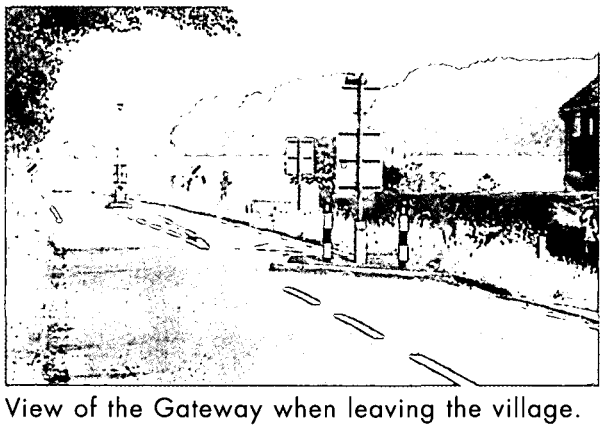
BACKGROUND: The B1040 through Gamlingay has a generally straight alignment with a road width varying between five and seven metres. The road is subject to a 30mph speed limit and is used as a rat-run between the A1 and A45 trunk roads.

NEED FOR MEASURES: High vehicle speeds and accident problems.

MEASURES INSTALLED: Eight round top and two flat top road humps, two priority road narrowings and three traffic islands.

SPECIAL FEATURES: None.

CONSULTATION: Parish Council, bus companies and emergency services.



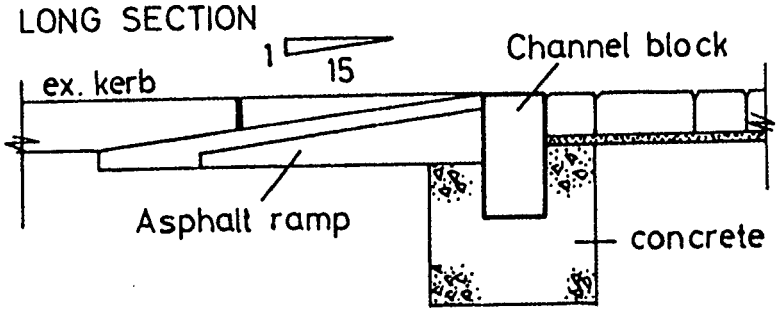
View of the Gateway when leaving the village.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (12HR)
BEFORE	8 in 3 years	37	1,700
UPDATE (2000–2002)	3 in 3 years	27*	1,500*
			*Not updated

CONTACT: AMANDA MAYS ☎ 01223 717565 E-MAIL: Amanda.Mays@Cambridgeshire.gov.uk
AUTHORITY: CAMBRIDGESHIRE COUNTY COUNCIL

Technical Data

Location Type:	Village.	
Road Type and Speed Limit:	Urban classified: 30mph.	
Scheme Type:	Road humps with road narrowings and traffic islands.	
Length of Scheme in Total:	1.2km.	
Dimensions:	Height:	Round top humps 50 to 100mm. Flat top humps 100mm.
	Width:	Carriageway at islands and road narrowings. 2.8 to 3.0m
	Length:	Round top humps 3.7m. Flat top humps 5.5m. Islands 3.65m.
	Ramps:	Flat top 1.5m.
	Distance from junctions:	Variable.
Materials:	Plateau:	Grey concrete blockwork.
	Kerbs:	Precast concrete.
	Street furniture:	Cast iron bollards.
	Ramps:	Medium temperature asphalt.
	Round top humps:	Medium temperature asphalt.
	Traffic islands:	Asphalt infill.
Signs:	Road humps:	Diag 557.1, 1060.1 and 1061.
	Road narrowings:	Diags 503, 602, 615 and 811.
	Advance:	Diag 562.
Lighting:	Existing 10m lamp columns complemented by additional lamps at some features	
Costs:	£32,000 Cambridgeshire CC Traffic Management and Safety budget.	



Section through a flat top hump.

12 Fen Ditton Village, Cambridgeshire narrowings, chicanes, refuges

UPDATE: This scheme was originally implemented using horizontal deflections because it is on a bus route. The local response was that a greater reduction in speeds was required and if this scheme were implemented today it would probably use a mixture of horizontal and vertical deflections.

OTHER COMMENTS: The number of accidents has increased in recent years following a successful initial period. Traffic flows have also increased significantly. As a result of this, a number of modifications have been introduced:

- a pelican crossing was added in 1997
- interactive signs were added in 2001/2002
- red patches and carriageway speed reminder roundels were added in 2002
- the site has been resurfaced due to normal wear and tear.

A central traffic island with local widening.

IMPLEMENTED: June 1992, and modified in following years.

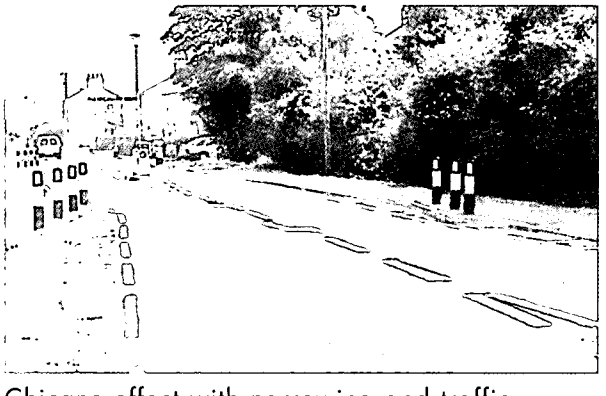
BACKGROUND: The B1047 through Fen Ditton acts as a main feeder road into the north east of Cambridge. The generally straight route which passes a primary school has sporadic frontage development and is subject to a 30mph speed limit.

NEED FOR MEASURES: High speeds resulting in a high injury accident rate including two fatal accidents.

MEASURES INSTALLED: Eight chicanes effect road narrowings; and seven traffic islands.

SPECIAL FEATURES: Dual use cycle tracks to bypass road narrowings.

CONSULTATION: Parish Council, local residents and emergency services plus public notices and advertisement for the new Pelican Crossing.



Chicane effect with narrowing and traffic island.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	17 in 3 years	47	10,600
UPDATED (2001-2003)	15 in 3 years but lower severity	41*	14,719 *Not updated

CONTACT: AMANDA MAYS ☎ 01223 717565 E-MAIL: Amanda.Mays@Cambridgeshire.gov.uk
AUTHORITY: CAMBRIDGESHIRE COUNTY COUNCIL

RURAL VILLAGE

Technical Data

LOCATION TYPE:	Rural village.	
ROAD TYPE AND SPEED LIMIT:	Urban classified: 30mph.	
SCHEME TYPE:	Road narrowings, chicanes and traffic islands.	
LENGTH OF SCHEME IN TOTAL:	4.2km	
DIMENSIONS:	Length:	Chicanes 10m. Islands 2.7-4.5m.
	Ramps:	1.5m.
	Width:	Carriageway at islands 2.8-3.0m. Islands 0.9-1.5m. Carriageway at chicaned narrowings 6.0m.
MATERIALS:	Chicanes :	Precast concrete kerbs with asphalt or grass infill.
	Traffic islands:	Precast concrete kerbs with blockwork infill
SIGNS:	Regulatory:	Diag 561 marker posts.
	Advance:	Diag 562 with supplementary plate "Speed Reducing Measures Ahead".
	Dual use cycle track Diag 956.	
LIGHTING:	Existing five metre lamp columns complemented by additional lamps at some features.	
COSTS (PHASE 1):	Cambridgeshire County Council Traffic Management and Safety budget £48,000. Local community contribution £6,000. Total £54,000.	

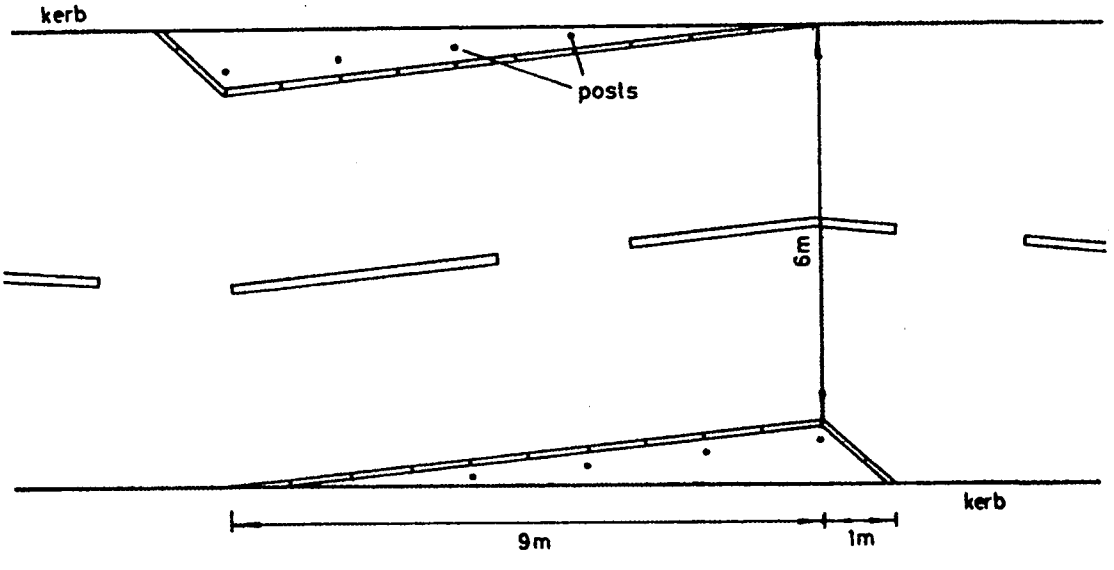
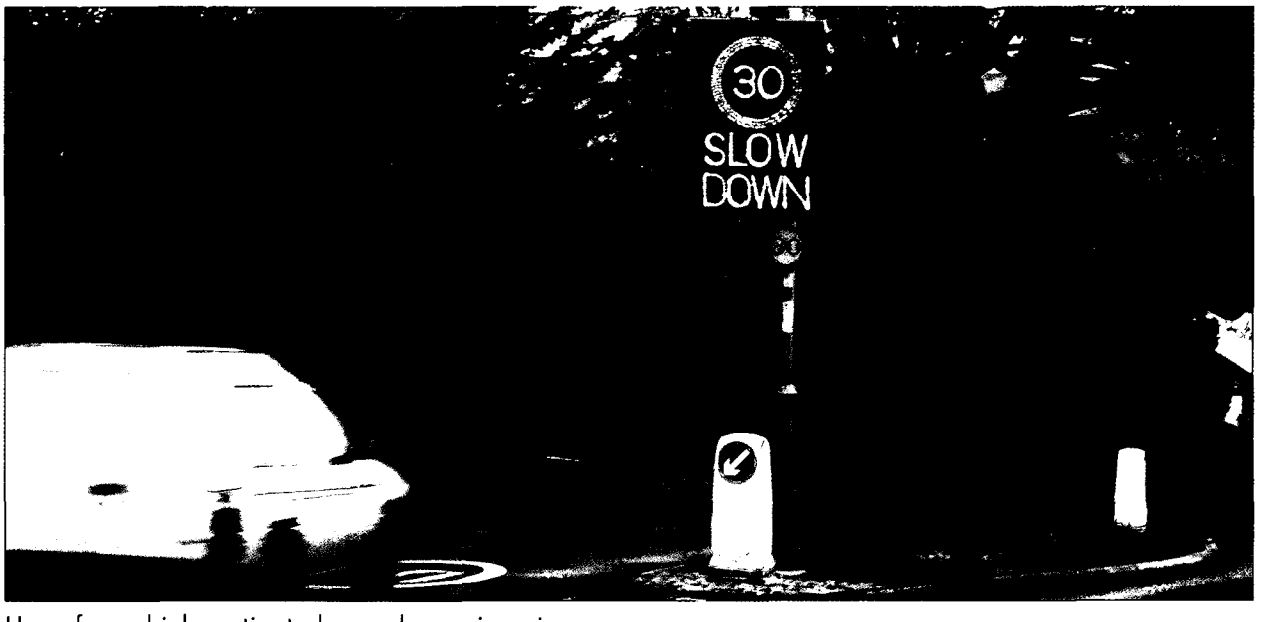


Diagram shows a narrowing chicane.

13 Newton Tracey Village, Devon narrowing, splitter island, interactive signing

UPDATE: Although the recorded accidents have remained low, traffic speeds and volume have remained a concern within the village community, particularly as there are no footways. As a result of continuing concerns and a further round of consultation (questionnaires and meetings), several changes have been made to the scheme. The extent of the speed limit at either end of the village was lengthened (in 2000) and an interactive speed warning sign was introduced for a trial period. This resulted in a reduction of the 85th %ile speed of four to five mph, so the sign is likely to be installed permanently with modifications to the traffic island on which it sits.

LESSONS LEARNED: Maintenance of the landscaping has not been very successful owing to a lack of community ownership of the scheme.



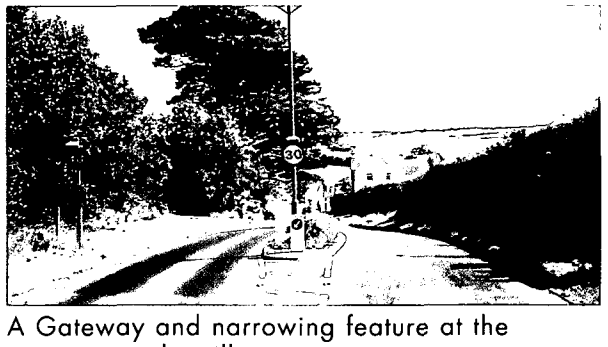
Use of a vehicle activated speed warning sign.

IMPLEMENTED: October 1992.

BACKGROUND: The village of Newton Tracey lies on a "B" class road which is the main route between Barnstaple and Torrington. It is a bus route and also carries a high proportion of Heavy Goods Vehicles. A straight downhill approach into the village was causing traffic to speed up as they entered the narrow road through the built-up area.

NEED FOR MEASURES: To reduce speeds which were causing accidents and damage to property.

MEASURES INSTALLED: Central "splitter" island with horizontal deviation, contrasting surface strips, street lighting, extra signing and landscaping to break up open space. A vehicle activated, speed limit warning sign was introduced later.



A Gateway and narrowing feature at the entrance to the village.

SPECIAL FEATURES: "Gateway" scheme emphasising entry into village by visual narrowing.

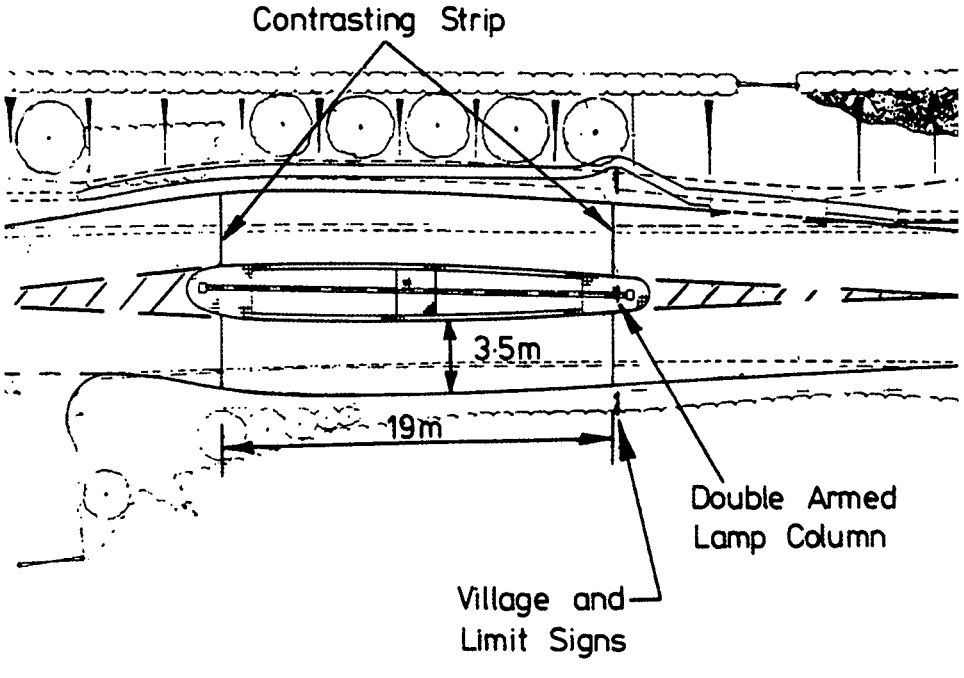
CONSULTATION: Parish councils and utilities.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	1 in 3 years	38	2,900
UPDATE	1 in 10 years	35*	3,000
			*Not updated

CONTACT: DAVID NETHERWAY ☎ 01271 388582 E-MAIL: dnetherway@devon.gov.uk
AUTHORITY: DEVON COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Approach to a rural village.	
ROAD TYPE AND SPEED LIMIT:	Rural "B" class: 30mph.	
SCHEME TYPE:	Narrowing of approach with central "splitter" island with extra signing, lighting and contrasting strip to form gateway.	
LENGTH OF SCHEME IN TOTAL:	130m	
DIMENSIONS:	Width:	Approach 5.5m. Lanes 3.5m
	Length:	Narrowing 75m. Island 22m. Contrasting strip 19m.
MATERIALS:	Contrasting strip:	Surface dressed with 14mm aggregate.
	Kerbs:	Countryside kerbs to carriageway edge. Precast concrete full batter to island.
	Island:	Simulated granite setts surface with planting in centre.
SIGNS:	Regulatory signs:	"30mph limit".
	Others:	Village name boards both sides.
	Road markings:	Diags 1024, 1040 and 1014.
LIGHTING:	Double armed steel column in line with signing and illuminated "keep left" bollards.	
COSTS:	Devon CC £20,000.	



Layout for the Gateway feature.

14 Sarre Village, Kent environmental enhancements

UPDATE: This was the first traffic calming scheme implemented on an "A" Class road in Kent and was given a Merit Award by the Institution of Civil Engineers in 1995. A comprehensive review of the scheme was conducted in 1997 from which it was concluded that the scheme had been successful in reducing the number of accidents occurring even though traffic flows have increased and traffic speeds have been only slightly reduced.

OTHER COMMENTS: The block paving used at the "Gateway" was expensive and has caused noise problems owing to movement. The narrowed space between the traffic island and the kerbs has caused problems for very wide vehicles, such as those used by farmers. Generally speaking however, the scheme has been well accepted though some concerns remain over vehicle speeds.

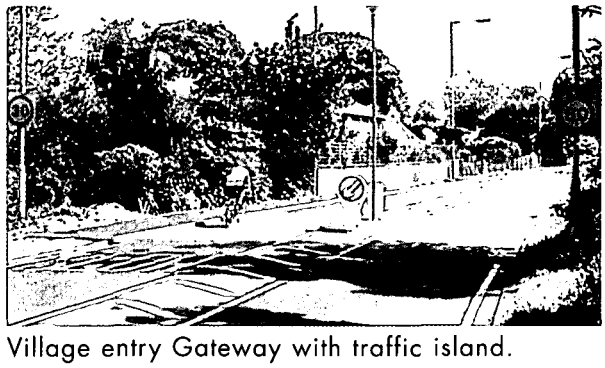
A "Chicane" in the village centre

IMPLEMENTED: June 1993.

BACKGROUND: Sarre Village is a small community situated at the junction of the A28 and A253 roads on the Isle of Thanet. Prior to the works it was subject to a 40mph limit. Existing street lighting was to full highway standards. Sarre has a population of approximately 100, many of whom are elderly. The central core of the village includes two pubs and a shop.

NEED FOR MEASURES: Speeding which led to accidents, and to a community split by heavy traffic flows.

MEASURES INSTALLED: 30mph speed limit, entry gateways, refuge islands, widened footways, a chicane and central mini-roundabout. Closure of a minor link road. General environmental enhancement, including tree planting.



Village entry Gateway with traffic island.

SPECIAL FEATURES: Main road based upon Danish style traffic calming for villages. Consideration given to scheme blending in with historic setting.

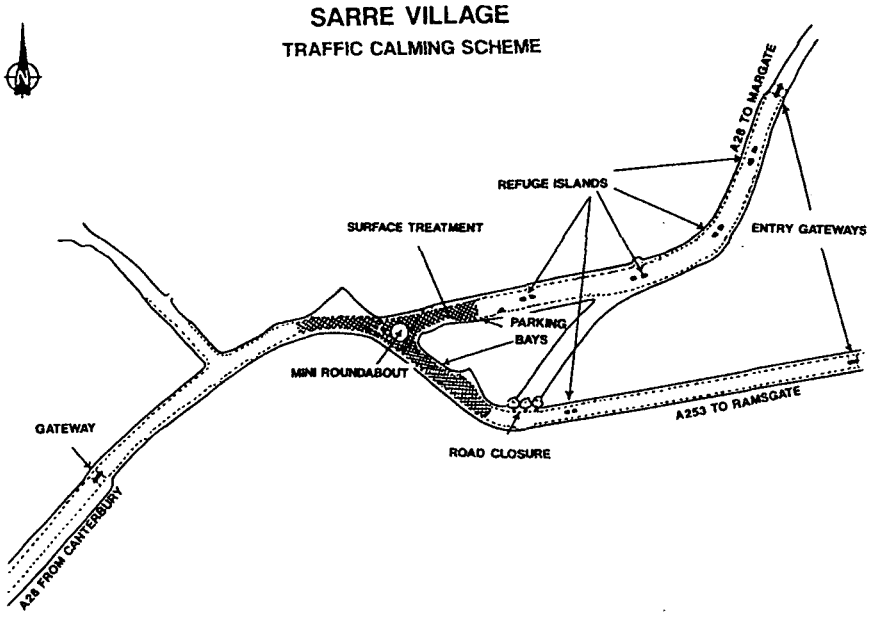
CONSULTATION: With the District and Parish Councils, residents, police, bus companies, emergency services and local companies.

MONITORING		ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (12HR)
BEFORE	A28	10 in 3 years	43	8,867
	A253		48	4,557
AFTER	A28	4 in 3 years	36	9,950 (2002)
(1997)	A253		47	5,079
(2000-2002)		2 in 3 years	*Not updated	*Not updated

CONTACT: JIM PEARCE ☎ 01622 221026 E-MAIL: Jim.Pearce@kent.gov.uk
AUTHORITY: KENT COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Small village.	
ROAD TYPE AND SPEED LIMIT:	Two rural "A" class roads, which previously joined at a priority junction in the central core. 40mph speed limit reduced to 30mph.	
LENGTH OF SCHEME IN TOTAL:	On the A28: 510m. On the A253: 350m.	
DIMENSIONS:	Gateways:	Lane widths reduced to 3m.
	Islands:	Lane widths reduced to 3m.
	Chicane:	Central island and clipped kerb.
	Mini roundabout:	Sited at central junction.
	Footways:	Widened to at least 2m.
MATERIALS:	Central core:	Redland Red Mac.
	Footways and gateways:	Halford & Baggeridge's brick paviours.
	Bollards:	Townscape timber.
SIGNS:	Ringway "30mph" backed by yellow.	
COSTS:	£140,000.	



Location of the main features of the Sarre Village scheme.

15 Brasted Village, Kent
gateways, chicanes, environmental enhancements

UPDATE: This was an expensive scheme (£425,000) in which both traffic speeds and accidents were causing concern. Although some speed reductions have been achieved (three to four mph), the reductions did not meet the expectations of the public and gateways without traffic islands failed to produce any real speed reduction. The chicanes did slow traffic speed but some accidents have occurred as a result of loss of control of the vehicle and some public concerns remain.

OTHER COMMENTS: Traffic flows have gradually increased and although comments from residents gradually reduced, this scheme has only had limited success. Problems have also occurred because the use of sharp sided "countryside" kerbs caused tyre damage where drivers misjudged their route through the chicanes. These kerbs were subsequently replaced.

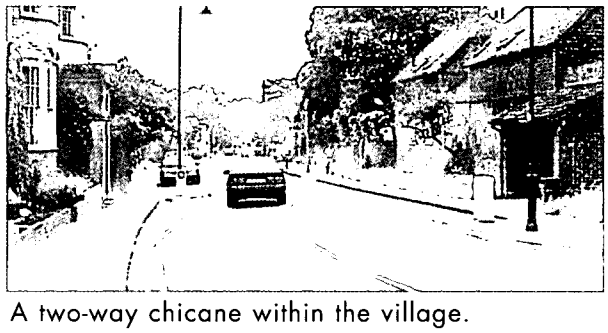
A two-way chicane with pedestrian island.

IMPLEMENTED: November 1993.

BACKGROUND: The village of Brasted lies on the A25 in West Kent, approximately four kilometres from Kent's county boundary with Surrey. It has an estimated population of 1,500. Although effectively by-passed by the M25, traffic flows are heavy, up to 14,000 vehicles per day. Brasted is a typical Kentish village situated in a broad street with fine buildings of a variety of periods. It is subject to a 30mph speed limit, but was unlit prior to the work apart from some low level amenity lighting.

NEED FOR MEASURES: Speeds, which led to accidents involving pedestrians, including a number of fatalities.

MEASURES INSTALLED: Introduction of highway standard lighting; "gateway" treatment; chicanes; change in carriageway colour through the central core; widened footways and general environmental enhancement. This work was incorporated into a major reconditioning scheme for the A25 through the village.



A two-way chicane within the village.

SPECIAL FEATURES: Main road scheme based upon Danish-style traffic calming for villages. Consideration given to scheme details particularly style of lighting and other materials used.

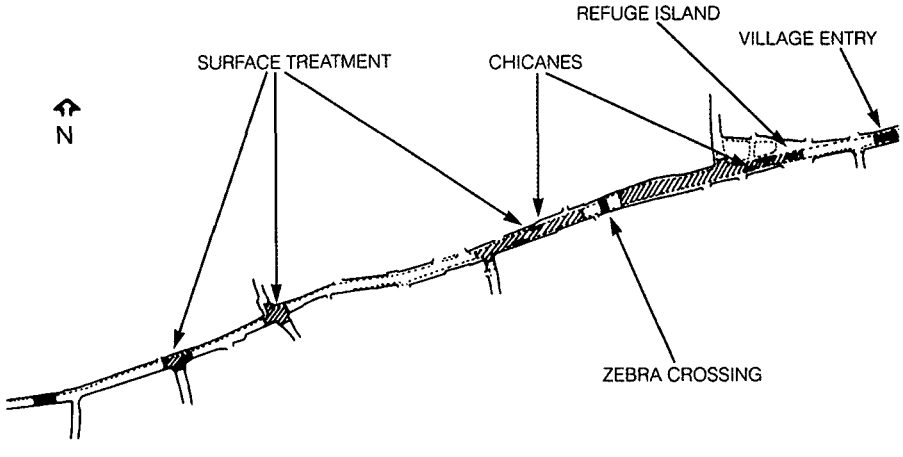
CONSULTATION: With the Parish Councils, local residents, police, bus companies, emergency services and local businesses.

MONITORING: No updated figures were available for this scheme.

CONTACT: JIM PEARCE ☎ 01622 221026 E-MAIL: Jim.Pearce@kent.gov.uk
AUTHORITY: KENT COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village.	
ROAD TYPE AND SPEED LIMIT:	"A" road: 30mph.	
SCHEME TYPE:	Road narrowings, chicanes and traffic islands.	
LENGTH OF SCHEME IN TOTAL:	800m	
SPECIFICATION:	Gateways :	Sited as speed limit terminals using change in carriageway surface, marked posts, yellow backed signs.
	Chicanes:	Sited at eastern gateway and in west part of village.
	Carriageway treatment:	Central core of village treated with "red mac".
	Footways:	Block paved and widened - parking bays installed.
SIGNS:	Backed with yellow.	
LIGHTING:	Brought up to highway standard.	
COSTS:	£425,000.	

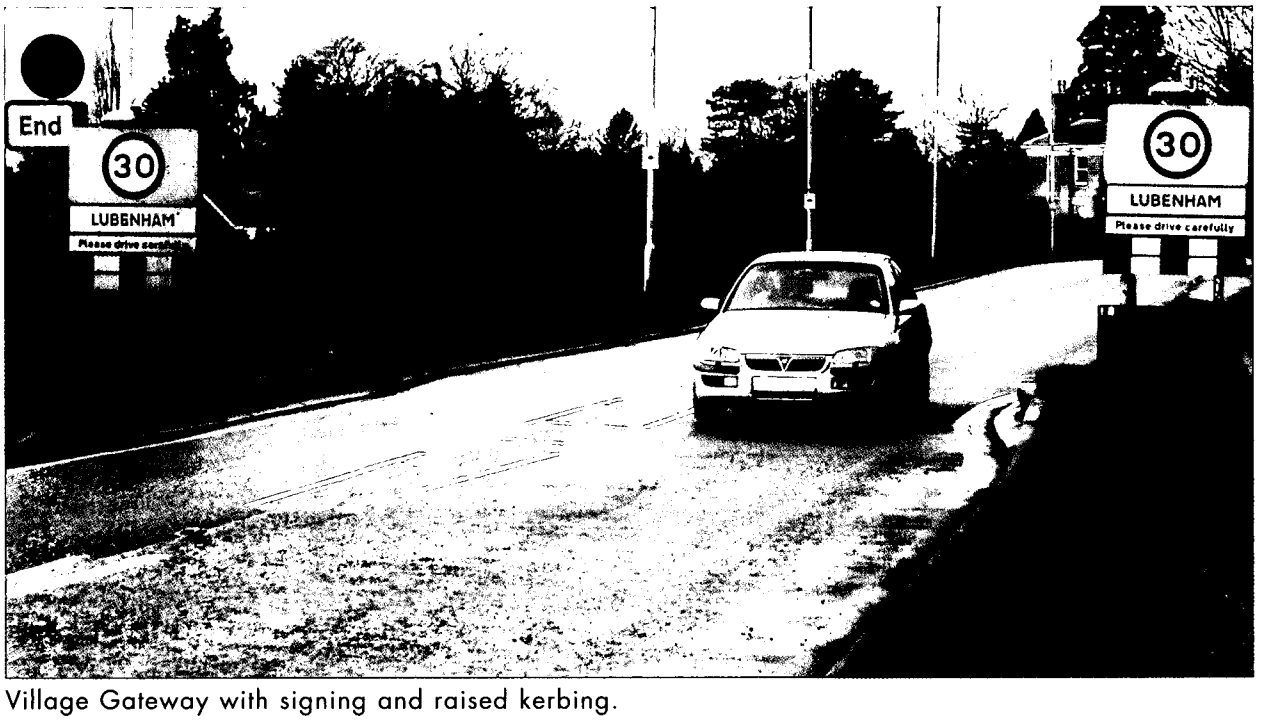


Location of the main features in the Brasted Village scheme.

16 A427 Five Villages, Leicestershire gateways and narrowing

UPDATE: Following implementation of this scheme, there was a reduction in the number of accidents to 21 in a three year period. However, in 1994 the opening of the A14 diverted some traffic away from the A430 and in 1997 a number of speed cameras were introduced which have affected driver behaviour and contributed to a further reduction in accidents in recent years (to 2001).

OTHER COMMENTS: This was a low cost scheme (£10,000 per village) and although the measures have not greatly reduced speeds they do appear to act as an alerting device, and have reduced accidents.



Village Gateway with signing and raised kerbing.

IMPLEMENTED: March 1993.

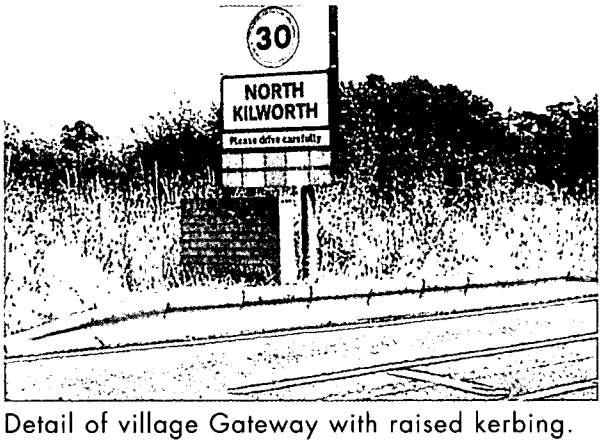
BACKGROUND: The A427 is the principal route that links Lutterworth and Marker Harborough, passing through the villages of Walcote, North Kilworth, Husbands Bosworth, Theddingworth and Lubenham. Prior to the opening of the A14 in July it formed part of the primary route between the West Midlands and the East Coast.

NEED FOR MEASURES: To slow traffic for speed limit compliance and to reduce accidents.

MEASURES INSTALLED: Village gateway treatment with road narrowing. Speed cameras added later.

SPECIAL FEATURES: Trief kerbing with hatching to reduce carriageway widths.

CONSULTATION: Parish councils and emergency services.



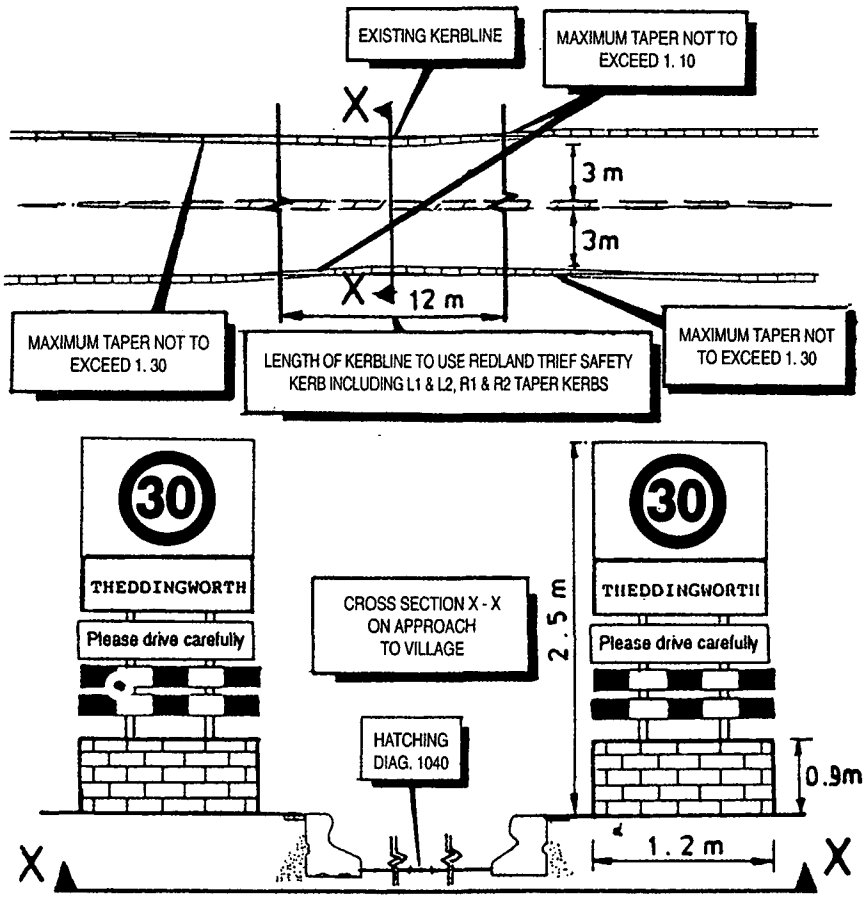
Detail of village Gateway with raised kerbing.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	32 in 3 years	50.5	10,197
UPDATE (to 2001)	13 in 3 years	44.5*	6,980
			*Not updated

CONTACT: MJ BRADFORD ☎ 0116 265 7222 E-MAIL: mbradford@leics.gov.uk
AUTHORITY: LEICESTERSHIRE COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village approaches.	
ROAD TYPE AND SPEED LIMIT:	Rural classified: 30mph.	
SCHEME TYPE:	Gateways to villages with associated narrowings.	
LENGTH OF SCHEME IN TOTAL:	At entrances to each village.	
DIMENSIONS:	Width of carriageway:	6.5m.
	Width of hatching:	1m.
	Taper of kerbline (entrance)	1:30.
	Taper of kerbline (exit)	1:10.
MATERIALS:	Walls:	Engineering reds with mass concrete.
	Kerbs:	Trief type.
SIGNS:	Diags 744.1, 575, 569.1, 1013.1 and 1040. 1969 Regs Diags 1 and 2.	
LIGHTING:	Extended in some cases to ensure good illumination of the narrowing.	
COSTS:	£20,000 from Traffic Calming budget. £30,000 from Local Safety Schemes budget. Total £50,000.	

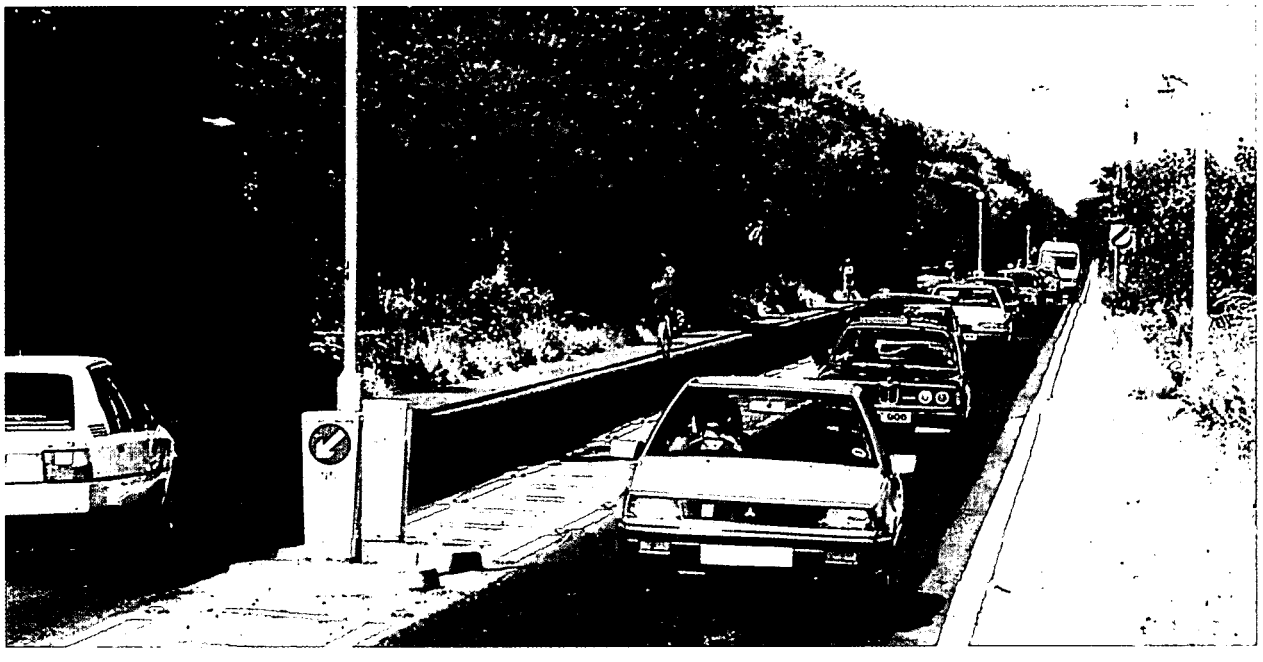


Detail of village Gateway.

17 Birdham Village, West Sussex
lane narrowing, cycle track

UPDATE: This scheme has been reasonably successful in reducing accidents but some problems have occurred due to its design, (see below).

OTHER COMMENTS: The main feature of this scheme is the cycle lane which also reduces the width of the traffic lanes available for all other traffic. Debris arriving onto the carriageway tends to accumulate in the cycle lane leading to a need for frequent cleaning. This problem is particularly prevalent where there are trees, particularly coniferous varieties. In addition, where vegetation exists beside the road it can grow across the cycle lane and need to be cut back.



Birdham Straight showing lane narrowing and refuge.

IMPLEMENTED: March 1992.

BACKGROUND: The A286 "Birdham Straight" is the only road into the Witterings, a busy coastal tourist and leisure area. The village of Birdham runs along the western side of this straight stretch of road which provides excellent forward visibility for motorists, thus inviting high speeds.

NEED FOR MEASURES: Reduction of injury accidents resulting from high speeds and overtaking movements.

MEASURES INSTALLED: A cycle track, central reserve markings and five central refuge islands.

SPECIAL FEATURES: Southern footway replaced with a cycle track.

CONSULTATION: Police, Parish Council, and all statutory consultees.

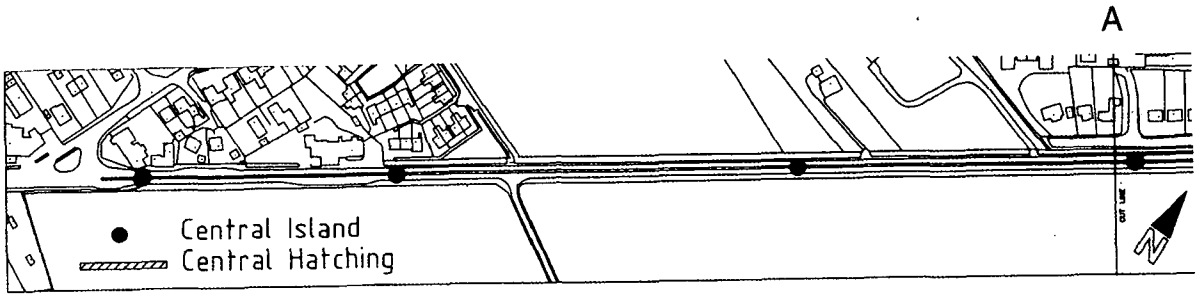
Central island and crossing point adjacent to local shop.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (12HR)
BEFORE (1988-1991)	13 in 3 years	56	11,350
UPDATE (1992-1995)	8 in 3 years (mean)	44*	-* *Not updated

CONTACT: ALEX SHARKEY ☎ 01243 777746 E-MAIL: Alex.Sharkey@westsussex.gov.uk
AUTHORITY: WEST SUSSEX COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village coastal recreation area.	
ROAD TYPE AND SPEED LIMIT:	Rural classified: 60mph (northern section) and 40mph (southern section).	
SCHEME TYPE:	A cycle track running along the eastern edge of the carriageway. A narrowing of the lane width by incorporating a lined central reserve and five refuge islands.	
LENGTH OF SCHEME IN TOTAL:	1.2km.	
DIMENSIONS:	Cycle track width:	1.2m.
	Length:	1,200m.
	Carriageway width:	7.3-8.5m.
	Lane width:	3.2m (minimum)
MATERIALS:	Cycle track:	Red surface treatment.
SIGNS:	No additional signing.	
LIGHTING:	Illuminated bollards and beacons installed on the refuge islands. Street lighting remained unchanged.	
COSTS:	£50,000.	

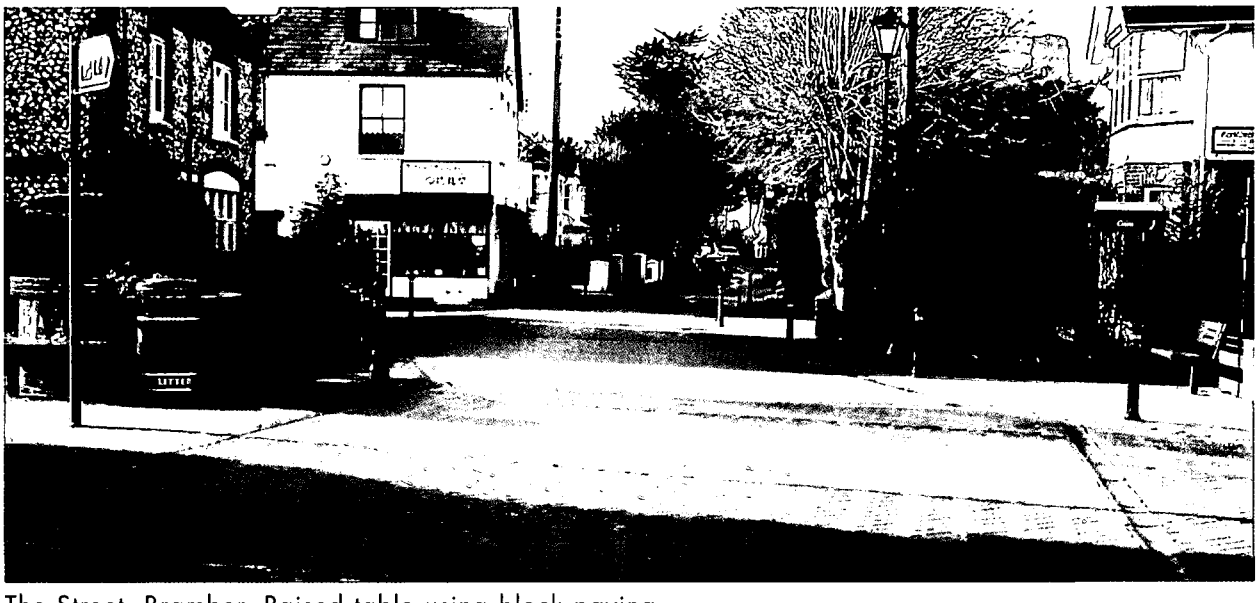


Location of calming features at Birdham Straight.

18 Bramber Village, West Sussex narrowing, flat top humps, environmental treatment

UPDATE: This has been a successful scheme in reducing accidents and reducing through traffic substantially in conjunction with the construction of a new bypass. The scheme lies within a conservation area and good quality materials were used with period style lamp columns and lanterns, integral flower beds, seating and extensive block paving.

OTHER COMMENTS: The scheme was well accepted locally and supported by the local parish council who maintain the cosmetic aspects of the scheme. No changes have been made in the 10 years since its implementation.



The Street, Bramber. Raised table using block paving.

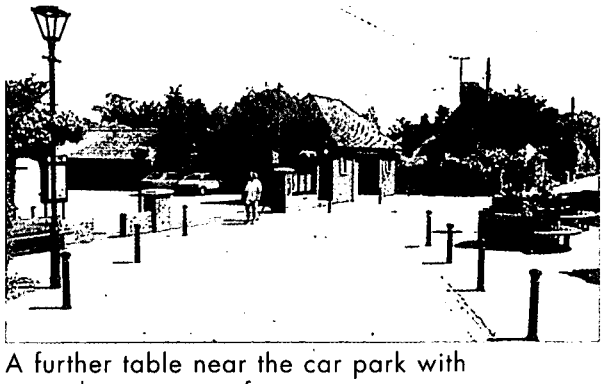
IMPLEMENTED: February 1993.

BACKGROUND: On completion of the Bramber/ Steyning bypass not all the through traffic transferred to the new route. An earlier traffic calming scheme using road narrowings proved unsuccessful in deterring through traffic and was removed. The measures subsequently implemented are outlined in this case study.

NEED FOR MEASURES: Reduction of through traffic. Speed was not considered a problem.

MEASURES INSTALLED: Six road humps, one carriageway width restriction and one chicane with paving to suit the environment.

SPECIAL FEATURES: The scheme lies within a Conservation Area, which influenced its design and implementation. Reproduction period lamp columns and lanterns were installed. A block paving chicane



A further table near the car park with reproduction street furniture.

with integral flower beds was incorporated into the village central area along with seating.

CONSULTATION: Residents, Parish Council, District Council, police, emergency services, bus companies.

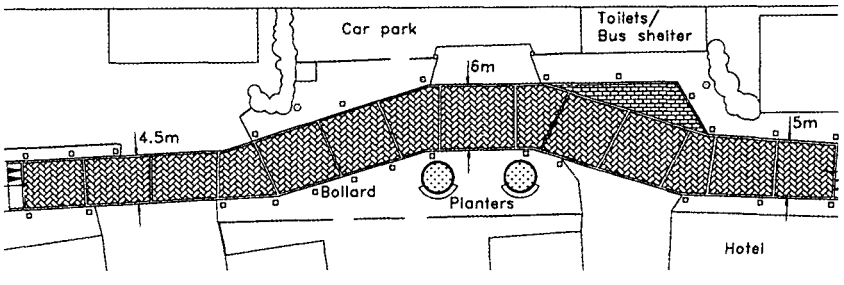
MONITORING	ACCIDENTS (PIA)	TRAFFIC (12 HR)	THROUGH TRAFFIC
BEFORE (1989-1992)	1 in 3 years	5,000	2,000
AFTER (1993-2002)	2 in 9 years	3,600*	930*
			*Not updated

CONTACT: ALEX SHARKEY ☎ 01243 777746 E-MAIL: Alex.Sharkey@westsussex.gov.uk
AUTHORITY: WEST SUSSEX COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village centre.	
ROAD TYPE AND SPEED LIMIT:	Rural classified: 30mph.	
SCHEME TYPE:	Flat top road humps. A road narrowing incorporating a road hump. A chicane formed from brick planters and bollards on a raised table in village centre.	
LENGTH OF SCHEME IN TOTAL:	680m.	
DIMENSIONS:	Road humps height:	75mm.
	Width:	Full carriageway.
	Length:	Plateau 2.5m. Ramps 1m.
	Road narrowing/hump:	
	Height:	75mm.
	Width:	3.5m.
	Lengths:	Plateau 10m. Ramps 1.2m.
	Ramp gradient:	1:16.
MATERIALS:	Road humps:	Rolled asphalt.
	Raised table/chicane:	Brindley/grey concrete block paving. Granite sett kerbing.Brick planters. Cast iron bollards.
SIGNS:	Road hump:	Diag 557.1.
	Road narrowing:	Diags 517 signs.
LIGHTING:	Reproduction period lamp columns and lanterns were installed to complement the environmentally sensitive nature of the historic village setting.	
COSTS:	£85,000. This includes £30,000 for special street lighting.	

Raised Table/Chicane



Plan of raised table layout near to the car park.

19 Fontwell, West Sussex
flat top humps, mini roundabouts

UPDATE: This scheme has successfully achieved its aims of reducing traffic volumes and speeds whilst also reducing the risk of accidents. It is a relatively simple treatment involving two mini roundabouts with four round-top humps and has been well accepted locally with no changes made in the ten years following implementation.

A flat top hump on Arundel Road, Fontwell.

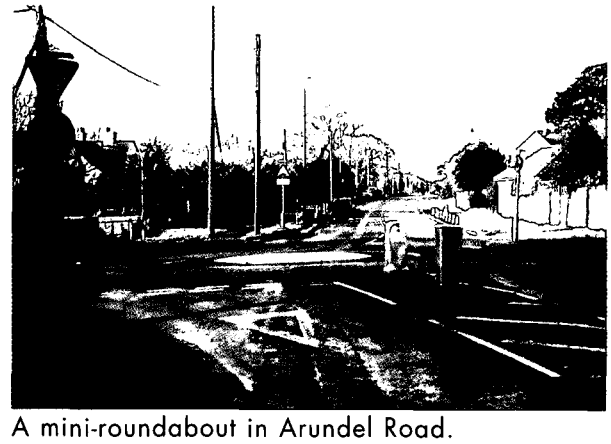
IMPLEMENTED: September 1992.

BACKGROUND: Fontwell village straddled the A27 trunk road, Arundel Road, until a bypass around the village was built. A proportion of the through traffic remained, (in the west bound direction), attracted by the shorter route and the speeds achievable due to the relatively light traffic flows.

NEED FOR MEASURES: Reduce through traffic in the westbound direction and reduce the speed of the residual traffic.

MEASURES INSTALLED: Four flat top humps and two mini roundabouts.

SPECIAL FEATURES: The mini roundabouts were installed as speed reducing features at either end of the series of humps. The 40mph speed limit was reduced to 30mph to enable compliance with the road hump regulations.



A mini-roundabout in Arundel Road.

CONSULTATION: Police, emergency services, bus companies, local residents' organisation, District Council, Councillor.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (10 HR)	
BEFORE	1 in 3 years	40	825	475
UPDATE	1 in 10 years	25*	605*	480*
			*Not updated	

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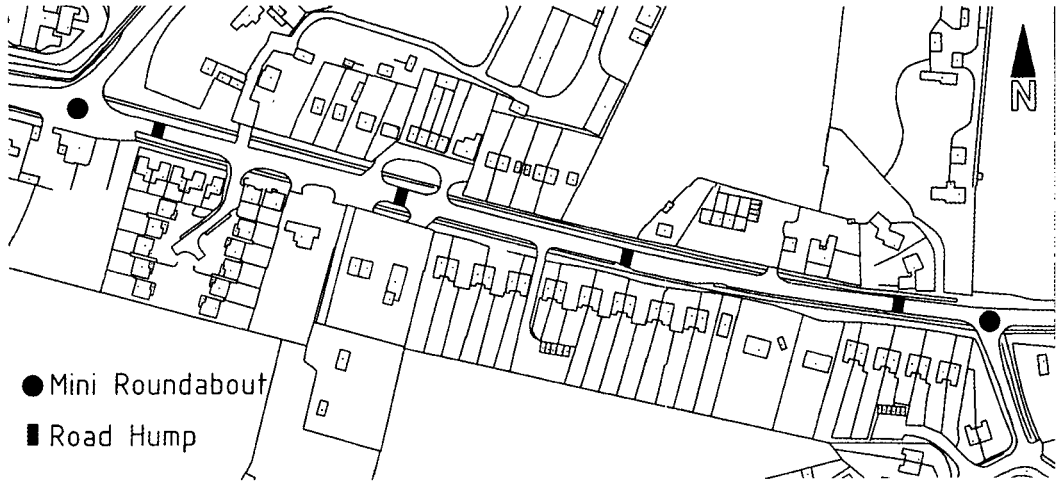
AUTHORITY: WEST SUSSEX COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village centre.	
ROAD TYPE AND SPEED LIMIT:	Rural classified: 30mph.	
SCHEME TYPE:	One brick and three tarmac flat topped road humps, with bollards installed in the verge adjacent to the toe of the ramps to draw attention to the presence of the humps. Two mini roundabouts.	
LENGTH OF SCHEME IN TOTAL:	550m.	
DIMENSIONS:	Road humps:	Height 75mm.
	Width:	Brick kerb to kerb. Tarmac-tapered sides.
	Length:	Plateau 2.5m. Ramp 0.6m.
	Ramp gradient:	1:8.
MATERIALS:	Road humps:	Three of rolled asphalt, one of clay bricks.
	Bollards:	Concrete.
	Mini roundabouts:	Rolled asphalt with reflective thermoplastic surface.
SIGNS:	Road humps:	Diag 557.1. Mini roundabout Diag 6.11.1.
LIGHTING:	No change required to the existing street lighting.	
COSTS:	£25,000.	



The layout of calming features in Arundel Road.

20 Selsey Village, West Sussex (initial and revised scheme) gateways, humps, rumble strips, road markings

UPDATE: This scheme has an unusual history. The initial scheme, involving three gateways and four sets of "mini" road humps was removed because it proved ineffective in reducing speeds and caused noise which was not acceptable to residents. A subsequent low-cost scheme used road markings to narrow the carriageway width, whilst at the gateways. This latter scheme was retained for eight years (see below) during which a further eight accidents occurred, one of which was serious.

OTHER COMMENTS: Since the later scheme had not achieved its objectives the road markings were removed when the road was resurfaced and a new roundabout was installed at the northern end of the scheme. No recent monitoring figures are available.

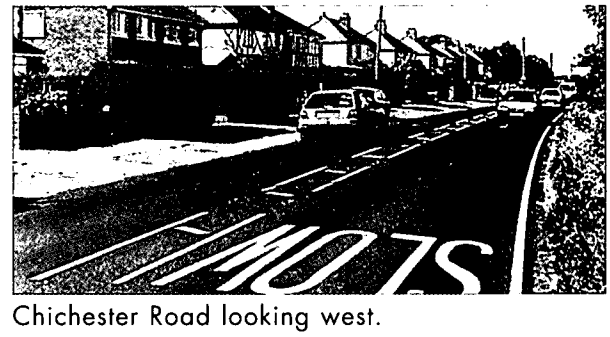
Chichester Road hatching scheme, (initial).

IMPLEMENTED: (1) Initial scheme: February 1992. (2). Revised scheme: March 1993.

BACKGROUND: The B2145 Chichester Road is the only access to Selsey. The section of road into the village centre has houses along only one side where the 30mph limit commences. The earlier set of traffic calming measures, based on brick gateways and rumble strips, reduced speeds only slightly and gave rise to complaints from residents about excessive traffic noise. The revised scheme made use of road markings.

NEED FOR MEASURES: Reduction of road accidents arising from excessive speeds.

MEASURES INSTALLED: (1) Three gateways and four sets of mini road humps. (2) Carriageway narrowing by means of road markings.



Chichester Road looking west.

SPECIAL FEATURES: (1) Experimental use of mini road humps. (2) Coloured reflective road studs installed with the road markings.

CONSULTATION: Police and Parish Council for both schemes, plus adjacent residents for revised scheme.

MONITORING	ACCIDENTS (PIA)	SPEEDS (85TH %ILE MPH)	TRAFFIC (16 HR)
1 INITIAL SCHEME			
BEFORE	4 in 3 years	42	10,100
AFTER	0 in 1 year	39	10,100*
2 REVISED SCHEME			
BEFORE	4 in 3 years	40	10,100*
AFTER	1 in 16 months	32	10,100*
Scheme removed in 2000: there were 4 PIA's in 2 years (2 slight, 2 serious)			

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AUTHORITY: WEST SUSSEX COUNTY COUNCIL

Technical Data

Location Type: Rural village.
Road Type and Speed Limit: Rural classified: 30mph.

First Scheme: Three block paved gateways with bollards located in the verge to highlight their presence. Four sets of mini humps/rumble strips made up of four round top mini road humps.

Length of Initial Scheme in Total: 550m.

Dimensions:
Mini Road humps:
Height: 75mm.
Width: 500mm.
Spacing: 1500mm.
Gateways: Height: Existing carriageway.
Length: 10m.

Materials:
Mini humps: Rolled asphalt.
Gateways: Block paving bordered by precast concrete channel blocks.
Bollards: Glasdon "Admiral"

Signs: No additional signing.

Lighting: No change was made to the existing street lighting.

Cost: £9,500.00.

Second Scheme: Reducing the effective lane width by adding carriageway edge and central reserve markings as well as the demarcation of residents' parking spaces. Three brick gateways installed as part of an earlier traffic calming scheme were retained.

Length of Revised Scheme in Total: 550m.

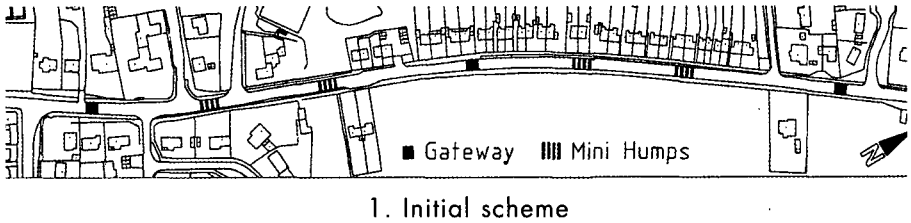
Dimensions:
Carriageway:
Width: 6.6m.
Lane width: 3m.
Layby width: 1.9m.
Gateways:
Height: Existing carriageway level.
Width: Full carriageway.
Length: 10m.

Materials:
Gateways: Block paving bordered by precast concrete channel blocks.

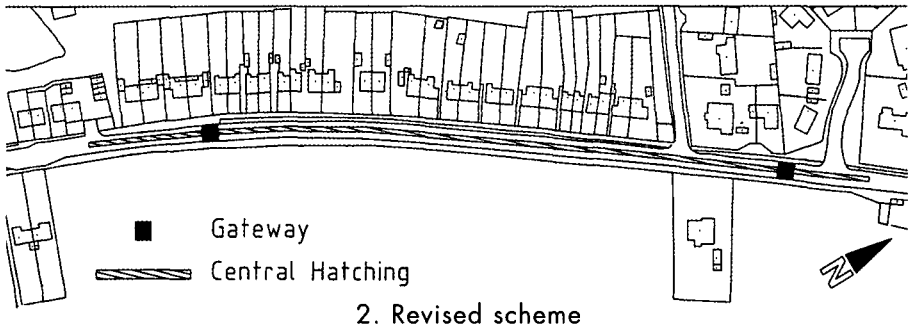
Signs: No additional signing.

Lighting: No change was made to the existing street lighting.

Cost: £3,000.00.



1. Initial scheme



2. Revised scheme

Chichester Road, Selsey – the two scheme layouts.

21 Matfield Village, Kent
visp, gateways

UPDATE: This was one of a number of low cost (£2,000) schemes introduced as part of a Department of Transport initiative to relieve the effects of traffic in villages. Although the scheme involved only the introduction of innovative signing to encourage drivers to take more care. A modest speed reduction was obtained (2mph) but this has been maintained and a significant reduction in accidents of some 40% was obtained.

LESSONS LEARNED: "Gateway" signs are now commonly used as an economical way of highlighting the presence of rural villages on busy roads. Yellow backed signs are intentionally visually intrusive so it is important that they have local support before they are implemented.

A Gateway sign combining the speed limit with the village name.

IMPLEMENTED: September 1992.

BACKGROUND: Matfield village lies on the B2160 about eight kilometres east of Tunbridge Wells and has an estimated population of 1,100. Traffic flows are moderate, with a six day, two-way mean (before the measures) of 6,900 vehicles per day through the village centre. There is a 30mph speed limit through the village centre. There is no street lighting.

NEED FOR MEASURES: Speeds, which led to accidents involving pedestrians and parked cars.

MEASURES INSTALLED: "Gateway" signing. This early VISP scheme combined, for the first time in the UK, a village nameplate with speed limit regulatory signs. These were located on the major road approaches.

SPECIAL FEATURES: Innovative Gateway signs which required special authorisation from the Department of Transport.

CONSULTATION: With the Parish Council and the police.

Technical Data

LOCATION TYPE:	Village approach.
ROAD TYPE AND SPEED LIMIT:	Rural "B" road: 30mph.
SCHEME TYPE:	Additional signing
LENGTH OF SCHEME IN TOTAL:	1km
SIGNS:	At both the north and south gateways:
NEARSIDE:	Enlarged village name plate sign (Diag 161.5 at 735mm) incorporating "30" roundel and the message "Please Drive Carefully through the Village".
OFFSIDE:	Plate (Diag 1075 at 875mm) displaying a "30" roundel with the village name underneath. Both signs backed with "derestriction" sign. The larger sign also shows the message "Thank You for Driving Carefully". Complementary signing of a similar style was installed on the eastern and western minor road approaches.
COSTS:	£2,200.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	7 in 3 years	40	6,900
AFTER (2000-2002)	5 in 3 years	38*	6,900*
			*Not updated

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AUTHORITY: KENT COUNTY COUNCIL

Earlier Schemes Reviewed

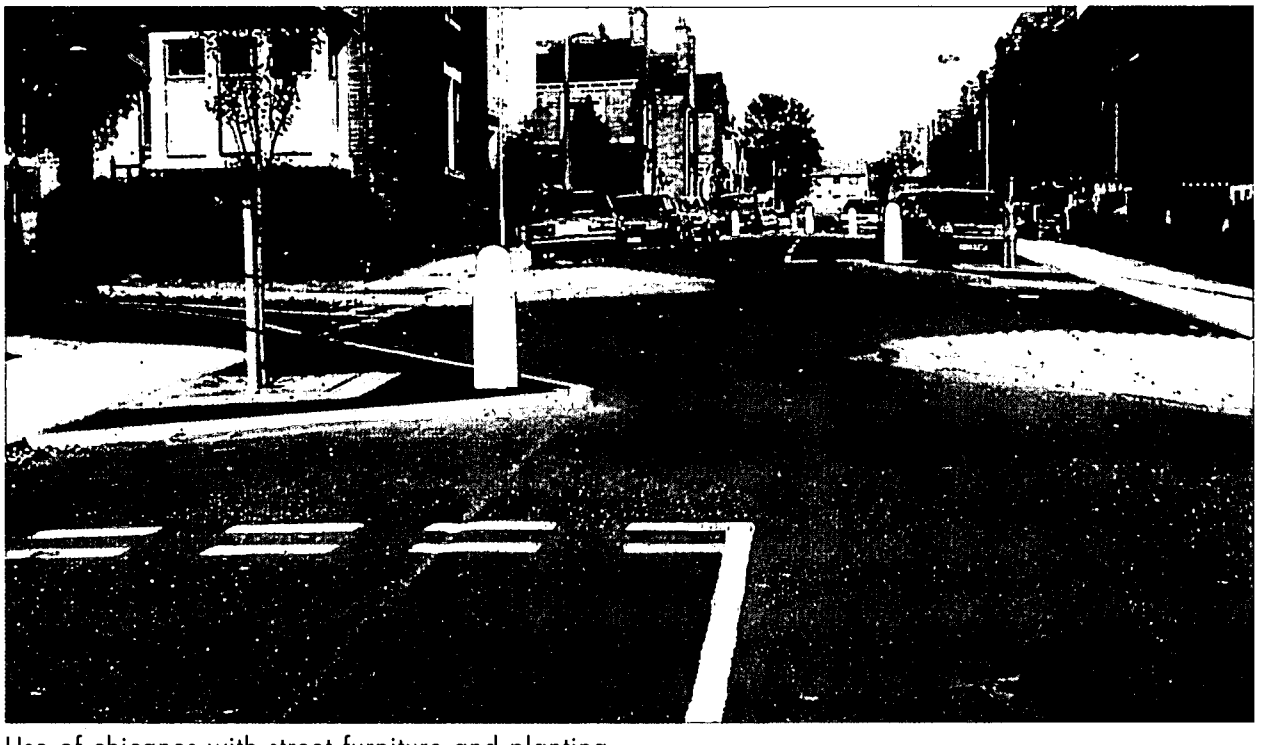
RESIDENTIAL

Updated Case Studies 22-36

22 Scotchman Road, Bradford West Yorkshire
20mph zone, chicanes, narrowing, flat top humps

UPDATE: This scheme remains in place despite local concerns over loss of parking space and concern over damage to vehicles.

OTHER COMMENTS: In practice "standard" road humps would have had advantages as they would not have removed as many parking spaces as the more environmentally aesthetic block paving chicanes. Vehicles tend to stay in the middle of the road and this has led to "tracking" and the need for repairs to the surface of the carriageway.



Use of chicanes with street furniture and planting.

IMPLEMENTED: May 1991. 20mph zone status 1993.
BACKGROUND: Jesmond Avenue and Scotchman Road are typical examples of inner city streets subject to a 30mph speed limit with sub-standard street lighting. Jesmond Avenue is entirely residential, consisting of terraced housing. Scotchman Road forms a direct access to two first schools and one middle school. Both are used as commuter cut-throughs.
NEED FOR MEASURES: Rat-running and excessive speeds which led to child pedestrian accidents.

MEASURES INSTALLED: 20mph zone with a system of chicanes, road narrowings and platforms.
SPECIAL FEATURES: Consideration was given to the scheme being sympathetic to the local environment and to maximising available on-street parking in Jesmond Avenue by constructing features at junctions.
CONSULTATION: With police, emergency services, residents and local schools.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)		TRAFFIC (PEAK HR)	
		Scotchman Rd	Jesmond Av	Scotchman Rd	Jesmond Av
BEFORE	4 in 3 years	32	27	679	101
UPDATE	3 in 5 years	19	17	604	57

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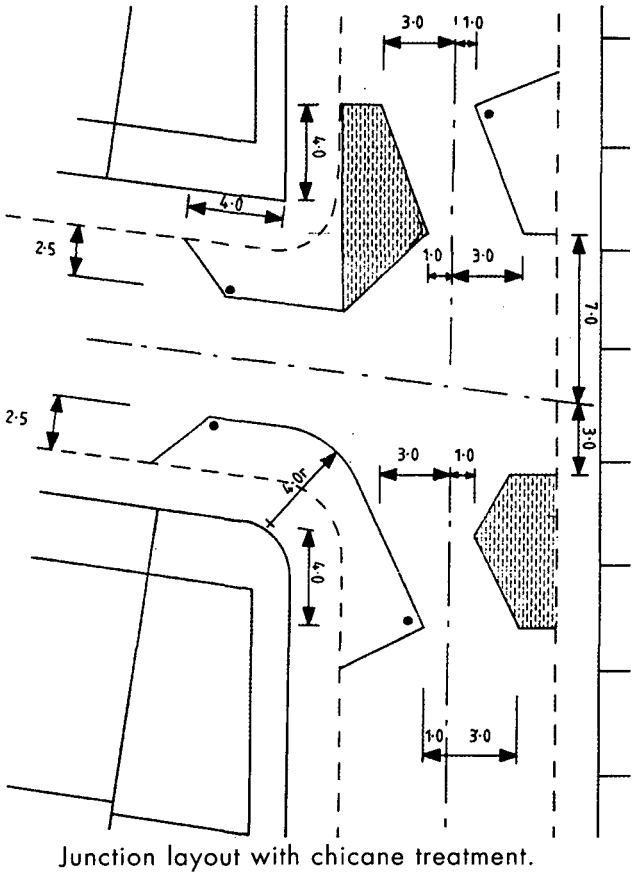
AUTHORITY: BRADFORD METROPOLITAN COUNCIL

Technical Data

LOCATION TYPE:	Urban residential.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Flat top humps, narrowings and chicanes in various combinations.	
LENGTH OF SCHEME IN TOTAL:	Scotchman Road 450m. Jesmond Avenue 300m.	
DIMENSIONS:	Height of humps:	80mm.
	Width:	Varies min 4m, max 6.2m.
	Length:	Varies min 5m, max 26m.
	Ramp gradient:	1:12.
	Distance between measures:	Average 60-80m.
MATERIALS:	Marshalls "Lambeth" deterrent paving flags. Marshalls "VTO" Buff Saxon paving slabs. Marshalls "Wimslow" reflective bollard.	
SIGNS:	20mph speed limit signs.	
	Road markings:	Centre line markings Diag 1004. Hatched markings Diag 1040. "Give Way" markings Diag 1003.
LIGHTING:	New 8m steel columns.	
COSTS:	Department of the Environment Urban Programme Grant (100%) £105,000.	

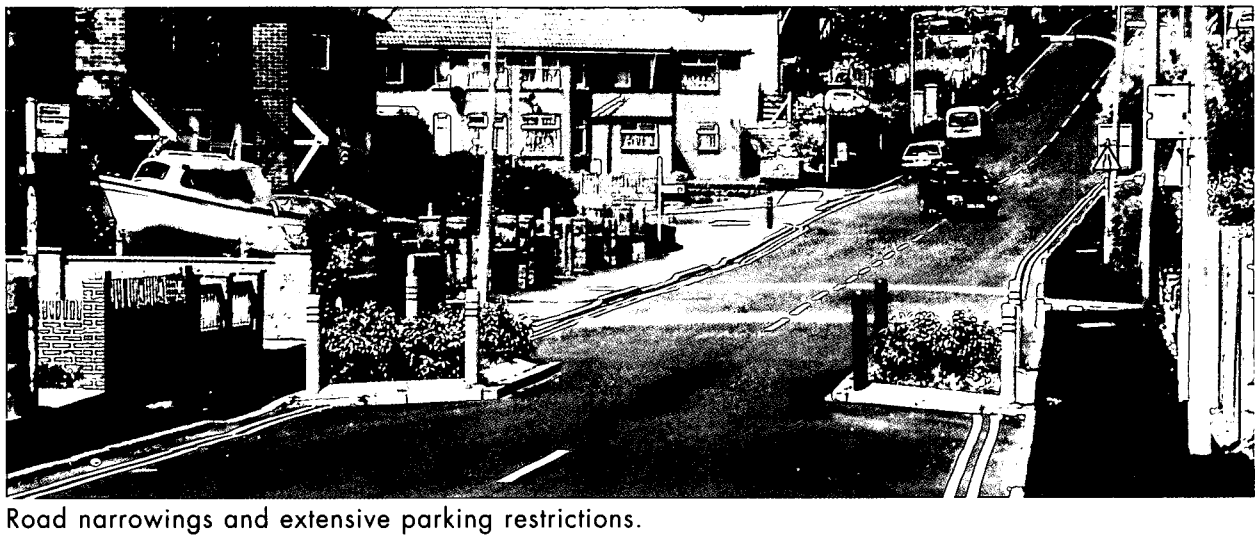


Junction layout with chicane treatment.

23 Upper Parkstone, Poole, Dorset
20mph Zone, tables, narrowings, humps, parking controls

UPDATE: No major changes have been made to this scheme though waiting restrictions have been introduced where vehicles were parking very close to traffic calming features and/or causing obstruction for buses and emergency vehicles. Requests have been made to extend the scheme into neighbouring areas and there are few complaints. The bus company and emergency services are generally happy with the scheme.

LESSONS LEARNED: Maintenance of the planting can be a problem, particularly where it affects forward visibility. Some bollards have been replaced by types which do not match the originals. The road surface is wearing well.



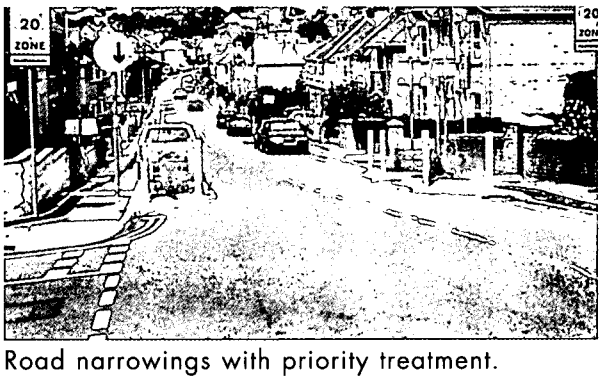
Road narrowings and extensive parking restrictions.

IMPLEMENTED: August 1993 to June 1997.

BACKGROUND: The Upper Parkstone area has 1930s housing on narrow but straight residential roads. It is bounded by heavily trafficked main roads on all four sides which are subject to a 30mph speed limit. The 1.7km^2 area is to be divided into three 20mph zones, of which Heatherlands was the first to be completed with a total of five phases introduced by 1997.

NEED FOR MEASURES: The area has more injury accidents per km than any other residential area in Poole and suffered from rat-running by traffic avoiding busy junctions on the boundary main roads.

MEASURES INSTALLED: 21 flat-topped, 75 mm high plateaus with 1:12 approach slopes; two round top humps, three junction plateaus, two mini roundabouts, 12 protected parking areas and a 20mph speed limit.



Road narrowings with priority treatment.

SPECIAL FEATURES: The plateaus are of varied design including narrows, planters, granite setts at the top and bottom of the approach ramps,and the use of recycled plastic bollards.

CONSULTATION: Extensive local public consultations took place including the emergency services and affected bus companies.

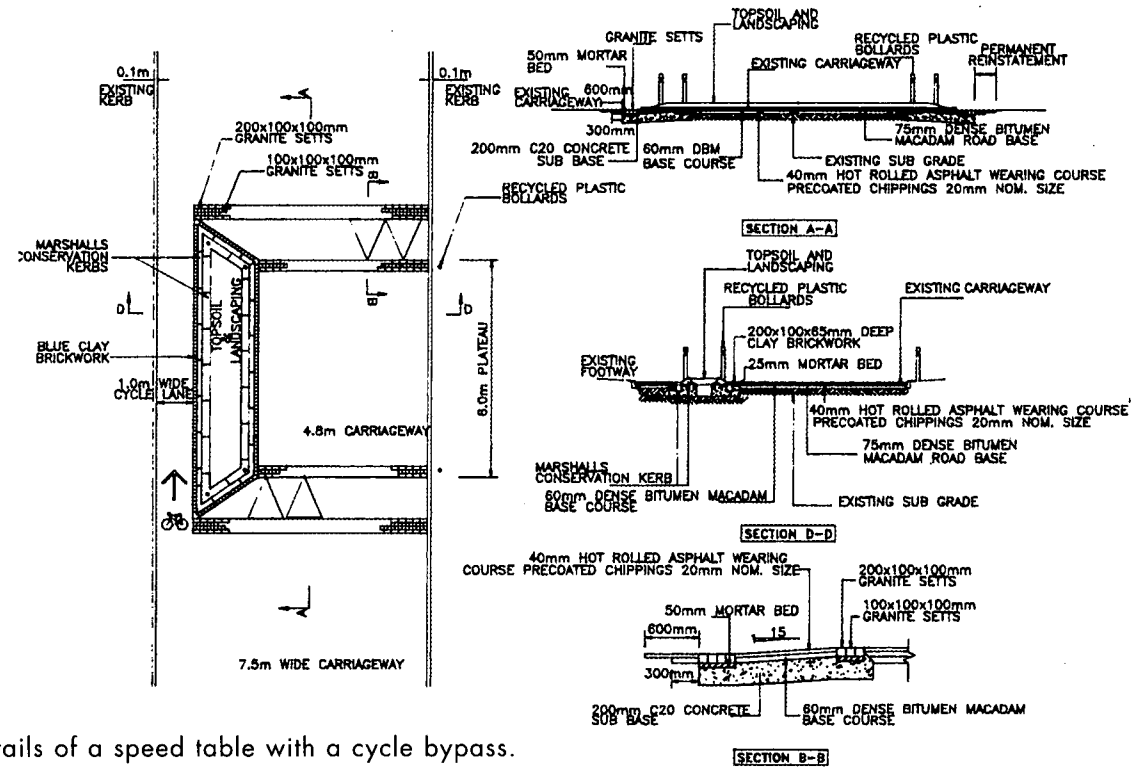
MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE (1992-1997)	83 in 5 years	31.3	5,333
AFTER (1997-2002)	43 in 5 years	15.7	-*

*Not updated/no data available

CONTACT: MARTIN BAKER ☎ 01202 262073 E-MAIL: m.baker@poole.gov.uk
AUTHORITY: DORSET COUNTY COUNCIL

Technical Data

Location Type:	Densely populated urban residential area with narrow streets laid out in straight lines but with steep gradients running north to south.	
Road Type and Speed Limit:	All unclassified:	30mph.
Scheme Type:	20mph zone with protected parking areas.	
Length of Scheme in Total:	Four roads comprising 2.2km.	
Dimensions:	Plateaus height:	75mm.
	Width:	Varies some 3.5m.
	Length:	6m.
	Ramp gradient:	1:12.
	Spacing:	50m-120m.
	Protected parking:	Kerbed planters 2m x 4m.
Materials:	Plateaus:	Hot rolled asphalt with three rows of granite setts at each end.
	Ramps:	Hot rolled asphalt with four rows of granite setts at the bottom.
	Bollards:	Red recycled plastic - later replaced with black.
Signs:	20mph speed limit zone signs. No road markings except for arrows on road hump approach slopes.	
Lighting:	Existing.	
Costs:	Dorset County Council:	Basic roadworks £224,500. Design and supervision £46,500. Consultation £7,000.
	Poole Borough Council:	Environmental enhancements £41,500.
	Total:	£319,500.



Details of a speed table with a cycle bypass.

24 Upper Rushton Road, Bradford, West Yorkshire
narrowing, flat top humps

UPDATE: This has remained an effective scheme though accident levels have increased slightly after a very successful initial period. At first some concerns were expressed because of discomfort to passengers and damage to vehicle suspension caused by the flat top humps. However, the scheme has gained acceptance due to its success in reducing both speeds and the volume of through traffic.

OTHER COMMENTS: Vehicles do tend to stay in the middle of the road and this has led to "tracking" and the need for resurfacing.

Junction entry humps and carriageway narrowing.

IMPLEMENTED: May 1992.

BACKGROUND: Upper Rushton Road is on the outskirts of Bradford approximately 2.5km from the City Centre. It is 750m in length, subject to a 30mph speed limit and had sub-standard lighting. It is straight throughout its length which encouraged high speeds, totally inappropriate to its residential nature.

NEED FOR MEASURES: High incidence of rat running and excessive vehicle speeds which led to a high number of pedestrian accidents.

MEASURES INSTALLED: Seven single way working flat top humps, two junction entry humps and one junction table.

SPECIAL FEATURES: Scheme sympathetic with the local environment. Tactile paving at all features.

CONSULTATION: With police, emergency services, local residents and Passenger Transport Executive.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (VPD)
BEFORE	13 in 3 years	33.7	3,380
UPDATE	6 in 5 years	24.9*	2,012*
			*Not updated

CONTACT: ANDY BROWN ☎ 01274 435714 E-MAIL: andy.brown@bradford.gov.uk
AUTHORITY: BRADFORD METROPOLITAN COUNCIL

Technical Data

Location Type:	Urban residential.	
Road Type and Speed Limit:	Urban unclassified. Part mini-bus route: 30mph.	
Scheme Type:	Flat top humps with width restrictions, junction entry treatments and junction table.	
Length of Scheme in Total:	750m	
Dimensions:	Height:	100m
	Width:	2.8m
	Length:	Plateau 4.0m. Ramp 1.2m
	Ramp gradient:	1:12
	Distance from junctions:	Average 75m
Materials:	Plateau and ramps:	Buff block paving. Bitumen macadam.
	Kerbs:	Concrete
	Street furniture:	Concrete bollards coated in reflective material.
Signs:	"Road narrows" sign:	Diag 516.
	Road markings:	Give way (both sides of each treatment). Centre line marking throughout.
Lighting:	New 8m steel columns.	
Costs:	Department of the Environment Urban Programme Grant (100%). £69,000.	

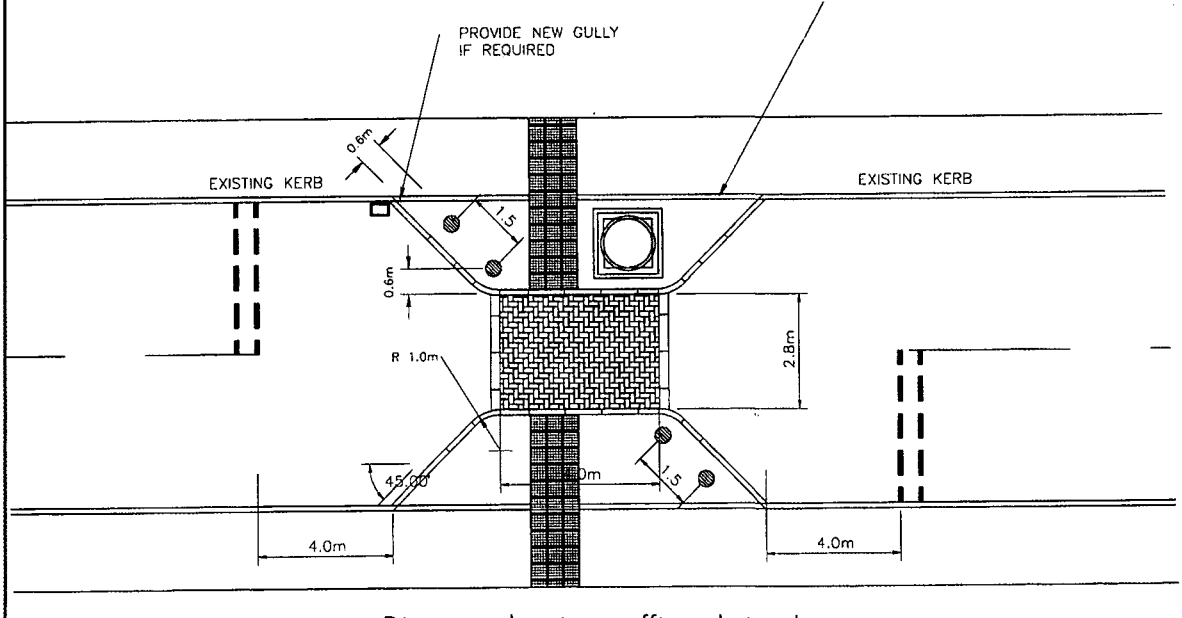


Diagram showing traffic calming layout.

25 Stalker Avenue, Tillicoultry, Clackmannan
chicanes, priority gateways, narrowings, cushions

UPDATE: This has been a successful scheme which has led to large reductions in recorded accidents and significant reductions in vehicle speeds, though these have risen slightly in recent years. Because of its success, and the perception that some drivers were speeding up after leaving Stalker Avenue, the scheme was extended (1999) to the neighbouring Fir Park, where there is a Primary School. Vehicle speeds here show a similar reduction (from 28 to 22mph in 2000, but increasing to 24mph in 2003). This part of the scheme was mostly funded from developer contributions. More recently, both Stalker Avenue and Fir Park have been designated as a 20mph zone.

OTHER COMMENTS: Speed cushions were used to allow small buses to pass but experience has shown that 1.9m width would perform better than 1.6m as the narrower cushions have only a limited effect. They also require a firmer structural base as the asphalt construction has smoothed out in use. Parking has proved a problem with residents using footways and blocking residential access. A traffic regulation order has therefore been brought in to control the location of parking.

A narrowing incorporating a speed cushion.

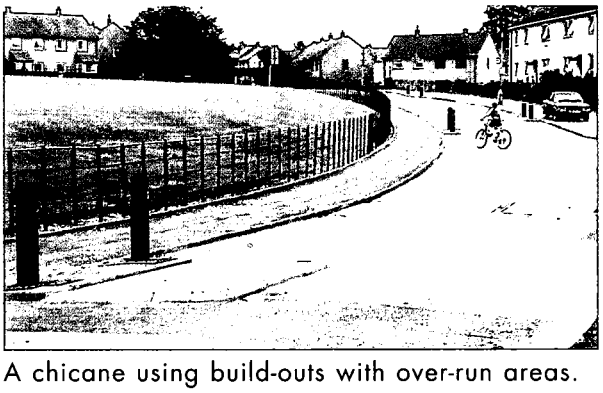
IMPLEMENTED: July 1991.

BACKGROUND: Stalker Avenue is a residential road bounded by a school over part of its length. The road is used as a busy route to the main A91 and is also a bus route.

NEED FOR MEASURES: High vehicle speeds and a high number of accidents involving young children.

MEASURES INSTALLED: Singleway "gates" at either end of the scheme and single-way "hard chicanes". The chicanes were designed by Central Regional Council after considerable consultation with various groups, particularly the emergency services and bus companies.

SPECIAL FEATURES: Over-run areas were created at the chicanes for ease of use by buses.



A chicane using build-outs with over-run areas.

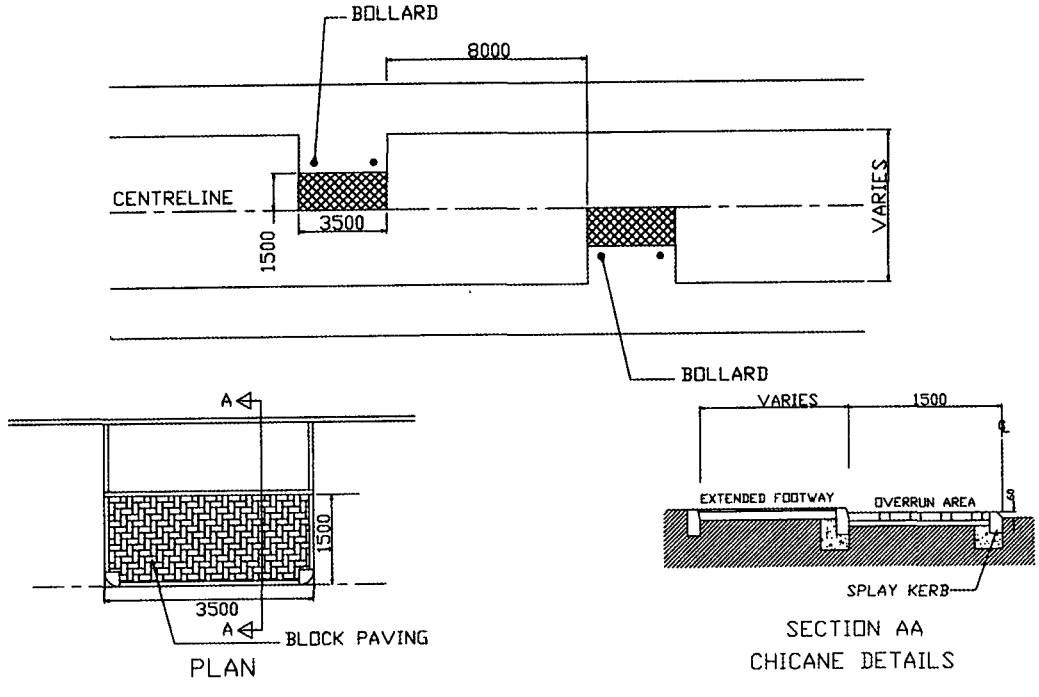
CONSULTATION: A letter was sent to the school, all residents, bus companies, public utilities as well as detailed discussions with the emergency services.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (VPD)
BEFORE	10 in 12 years	30+	n/a
UPDATE	1 in 10 years	22 (85th %ile)	2,000 *Not updated

CONTACT: ALAN MURRAY ☎ 01259 452565 E-MAIL: a.murray@clacks.gov.uk
AUTHORITY: CLACKMANNANSHIRE COUNCIL

Technical Data

LOCATION TYPE:	Residential.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Single way gates and single way hard chicanes.	
LENGTH OF SCHEME IN TOTAL:	300m	
DIMENSIONS:	Height:	60m overrun.
	Width:	0.5 x width of the road.
	Length:	Island: 3.5m. Overall: 15m.
MATERIALS:	100m upstand nibs in standard bituminous construction. 60mm upstand nibs in concrete block paving.	
SIGNS:	Warning signs:	Diag 516, 556 and 570.
LIGHTING:	Existing street lighting was satisfactory.	
COSTS:	Central Regional Council Capital budget £10,000.	



Layout for a chicane with over-run areas.

26 Park School, Barnstaple, Devon narrowing, refuge, markings

UPDATE: Whilst the original scheme has been successful in reducing both traffic speeds and accidents, it was changed because the location is on the National Cycle Network – Route 3. Because of this, the original refuge has been changed to a "Toucan" crossing (see smaller photo) and the access to the school was improved with the addition of a mini-roundabout (see plan and main photo) when a Park & Ride facility was constructed in 2000.

OTHER COMMENTS: Space limitations restricted what could be done but the new layout appears to be working well.

Use of a mini-roundabout and carriageway hatching.

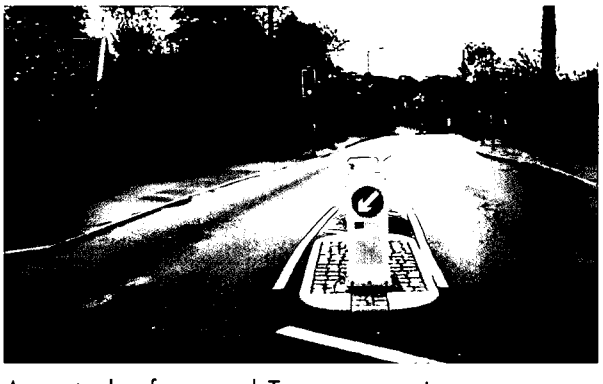
IMPLEMENTED: September 1991.

BACKGROUND: This is a major crossing site on a "B' class road with the main entrance of an adjacent secondary school and the junction of a footway cycleway. It is a busy commuter route on the edge of town. The road approach from the south was wide with the crossing point at the top of a crest.

NEED FOR MEASURES: To slow traffic and make provision for a safer crossing point for pedestrians and cyclists.

MEASURES INSTALLED: Central refuge, horizontal lane deviation with smaller approach islands and hatched central area road markings continued from right lane turn.

SPECIAL FEATURES: Brick crossing on carriageway and white lining to emphasise narrowing.



A central refuge and Toucan crossing (background) to assist pedestrians and cyclists.

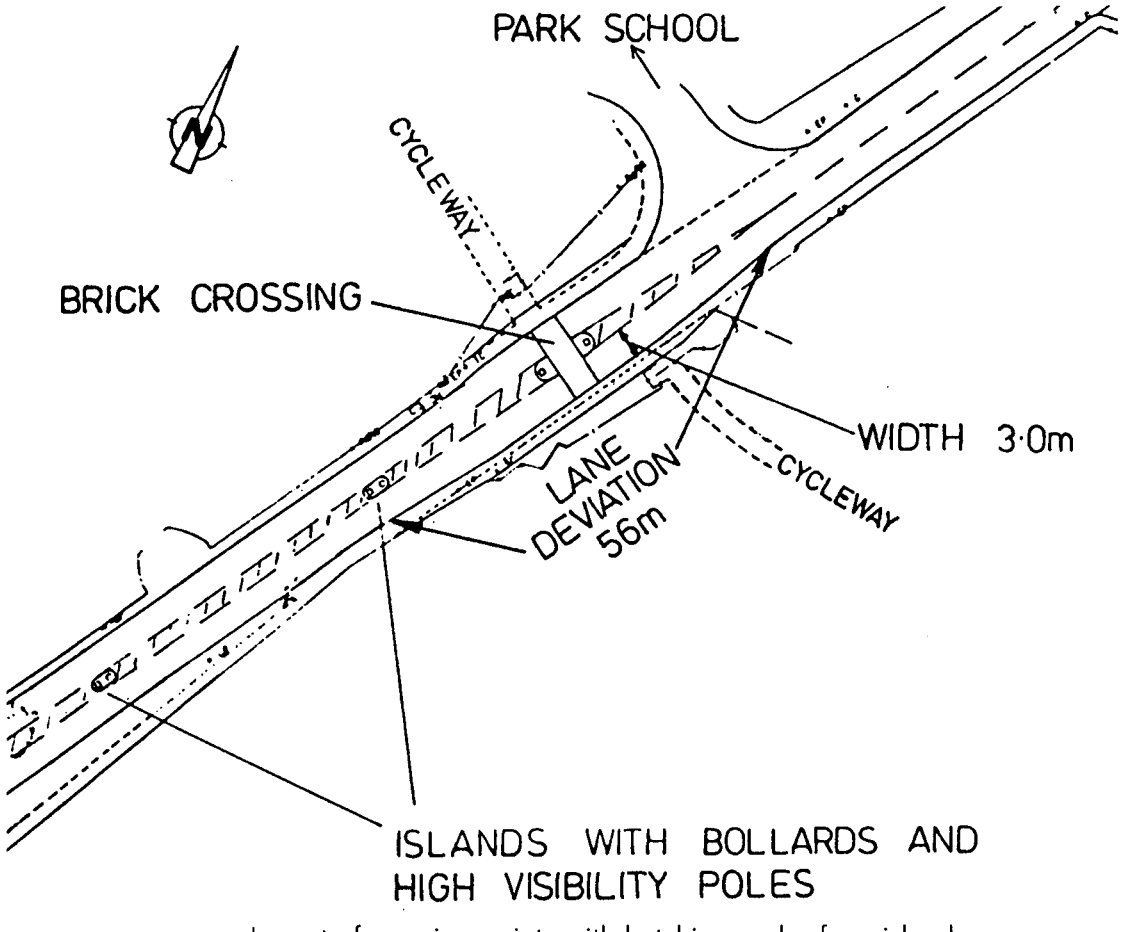
CONSULTATION: Town and District councils, utilities and local secondary school.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (16HR)
BEFORE	1 in 5 years	40	7,000
AFTER	0 in 2 years*	25*	7,000*
			*Not updated

CONTACT: DAVID NETHERWAY E-MAIL: D.Netherway@devon.gov.uk
AUTHORITY: DEVON COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Residential and shopping area.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Narrowings and flat top humps.	
LENGTH OF SCHEME IN TOTAL:	600m.	
DIMENSIONS:	Height:	85mm.
	Width:	7.5m.
	Length:	Plateau: 4m Ramp: 1m.
	Gradient:	1:12.
MATERIALS:	Plateau:	Brindle concrete blocks.
	Ramps:	Bitumen macadam.
SIGNS:	Road hump warning signs:Diag 557.	
LIGHTING:	Long reach columns at back of footway. Feature lighting units at the road humps.	
COSTS:	Devon CC £220,000.	



Layout of crossing points with hatching and refuge islands.

27 Burnthouse Lane, Exeter
narrowing, flat top humps

UPDATE: This scheme has remained in place as constructed in 1988. It has been successful in substantially reducing both accidents and traffic speeds.

OTHER COMMENTS: Although there were some initial concerns expressed by the bus operator, concerning discomfort for drivers and passengers, the scheme was generally well received by local residents and has remained unchanged.

Burnthouse lane showing raised crossing, planters and cycleway.

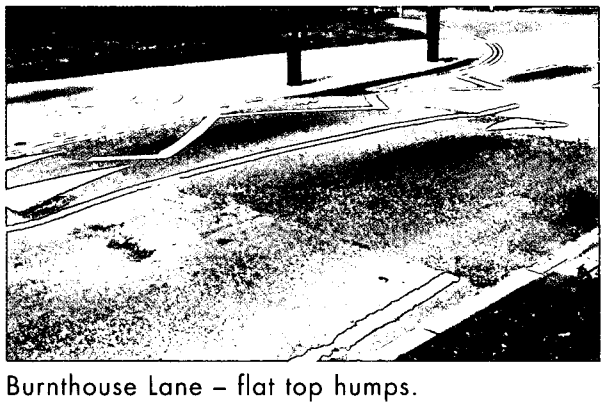
IMPLEMENTED: September 1988.

BACKGROUND: Burnthouse Lane is a residential street on the eastern outskirts of Exeter. Prior to the scheme being implemented, the carriageway was 12.5 metres wide. This, combined with the straight alignment, encouraged high speeds and created hazards for pedestrians.

NEED FOR MEASURES: To reduce traffic speeds and improve road safety.

MEASURES INSTALLED: The carriageway was narrowed to 5.5 m, with 1 m cycle lanes and 2.5 m sheltered parking bays on both sides of the road. Concrete block road humps were constructed, and at intervals along the route lateral displacements were introduced to further control speeds.

SPECIAL FEATURES: Spherical lighting units, tree planting and raised brick flower beds.



Burnthouse Lane – flat top humps.

CONSULTATION: A "Community Liaison Group" was set up for this scheme, including local members, the Community Association, school heads, the emergency services, the bus company and other local representatives.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	33 in 5 years	34	6,200
AFTER	18 in 14 years	24*	5,500*
			*Not updated

CONTACT: RICHARD OLDFIELD ☎ 01392 383800 E-MAIL: R.Oldfield@devon.gov.uk

Technical Data

LOCATION TYPE:	Residential and shopping area.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Narrowings and flat top humps.	
LENGTH OF SCHEME IN TOTAL:	600m.	
DIMENSIONS:	Height:	85mm.
	Width:	7.5m.
	Length:	Plateau 4m. Ramp 1m.
	Ramp gradient:	1:12.
MATERIALS:	Plateaus:	Brindle concrete blocks.
	Ramps:	Bitumen macadam.
SIGNS:	Road humps warning signs: Diag 557.	
LIGHTING:	Long outreach columns at back of footway. Feature lighting units at the road humps.	
COSTS:	Devon County Council £220,500.	

Burnthouse Lane – new junction layout.

28 Withycombe Village Road Exmouth, Devon
narrowings, flat top humps, mini-roundabouts

UPDATE: This scheme has been successful in achieving its objectives of reducing both traffic speeds and the number of recorded accidents; but several modifications have been required. One of the road humps was modified to include a drainage channel between the old kerbline and the hump to prevent rain water being diverted into an adjacent property. All but two of the brick top humps have been reconstructed in flexible surfacing as the brick construction was not able to withstand the heavy lorry traffic on this route.

OTHER COMMENTS: Local concerns have centred on the discomfort to drivers and passengers, particularly in buses, caused by the road humps. Because of this, speed cushions are now used in preference to humps, except where there is an identified pedestrian crossing movement. An imprinted asphalt, flat top speed hump with less steep (1:20) ramps is being installed at a nearby pedestrian crossing point.

Reconstructed flat top hump using flexible material, and sheltered parking.

IMPLEMENTED: June 1991.

BACKGROUND: Withycombe Village Road lies within a primarily residential area, but also serves two schools and a local shopping centre. The section treated is about 500m in length.

NEED FOR MEASURES: To reduce traffic speeds and improve road safety.

MEASURES INSTALLED: Concrete block flat top road humps were installed, with mini-roundabouts at each end to act as speed reducing features. The opportunity was also taken to provide sheltered parking on the south side of the road, and a new section of footway.

SPECIAL FEATURES: Tree planting on the footway extensions.

An earlier flat top hump constructed in concrete blocks.

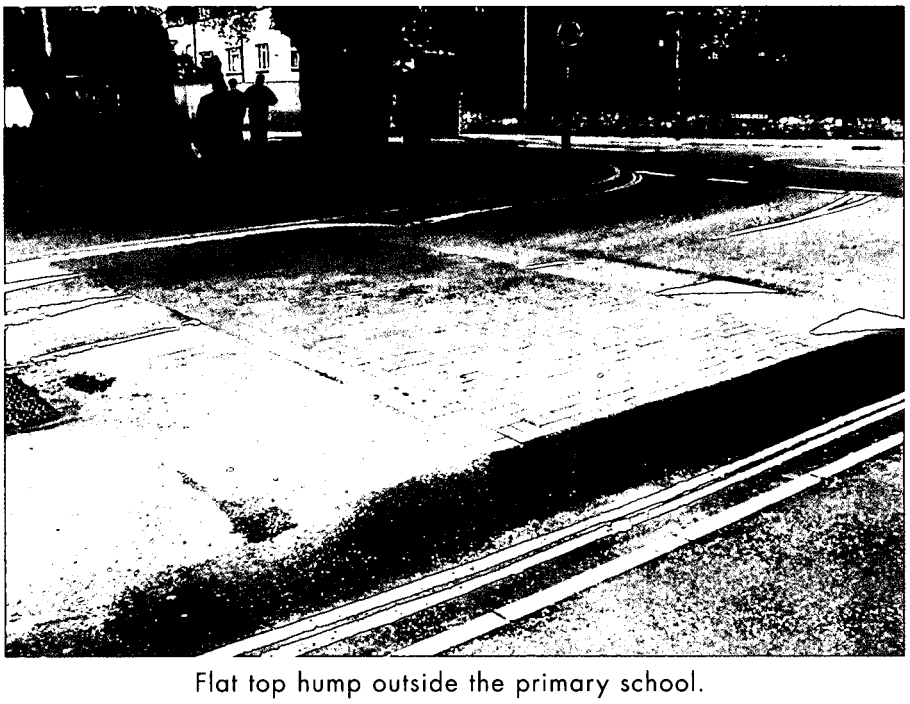
CONSULTATION: Local members, school headteachers and the emergency services.

MONITORING	ACCIDENTS (PIA)	SPEEDS (85%ILE MPH)	TRAFFIC (16HR)
BEFORE	14 in3 years	33	7,900
AFTER (2000-2003)	3 in 3 years	19	5,542

CONTACT: TONY MATTHEWS ☎ 01395 682100 E-MAIL: amatthew@devon.gov.uk
AUTHORITY: DEVON COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Residential and shopping area.	
ROAD TYPE AND SPEED LIMIT:	Urban Class "C" road: 30mph.	
SCHEME TYPE:	Narrowings and flat top humps.	
LENGTH OF SCHEME IN TOTAL:	500m	
DIMENSIONS:	Height:	85mm.
	Width:	6m.
	Length:	Plateau 4m. Ramp 1m.
	Ramp gradient:	1:12.
	Distance from junctions:	100m
MATERIALS:	Plateaus:	Brindle concrete posts.
	Ramps:	Bitumen macadam.
SIGNS:	Road hump warning signs: Diag 557.	
LIGHTING:	Existing lighting not replaced.	
COSTS:	Devon County Council £90,000.	
	East Devon District Council £1,000 for landscaping.	
	Total: £91,000.	



Flat top hump outside the primary school.

29 Llanthewy Road, Newport, Gwent
one-way street, chicane, humps, pinch point, exit built-out

UPDATE: This scheme is still in place and no changes have been made to it. It has proved successful in deterring rat-running and received local support for it to be extended to the remaining length of Llanthewy Road.

Flat top hump with road narrowing and sheltered parking in a one-way street.

IMPLEMENTED: May 1993.

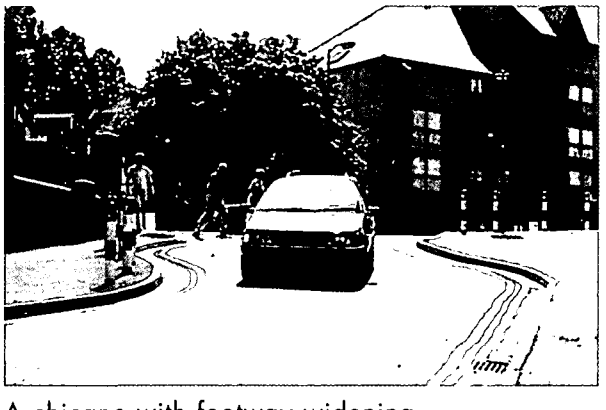
BACKGROUND: Llanthewy Road is a residential street on the periphery of the central area of Newport. The road has an overall gradient of 8%, with a maximum value of 10% at its southern end. It falls in a northeasterly direction towards the town centre. There is "No exit" out of Llanthewy Road at its southern end.

NEED FOR MEASURES: To reduce the speed and volume of short cutting traffic.

MEASURES INSTALLED: One way street, entry chicane, two round top humps, one pinch-point with a flat top hump and an exit build-out.

SPECIAL FEATURES: An entry chicane.

CONSULTATION: Public exhibition, emergency services, Borough Council.



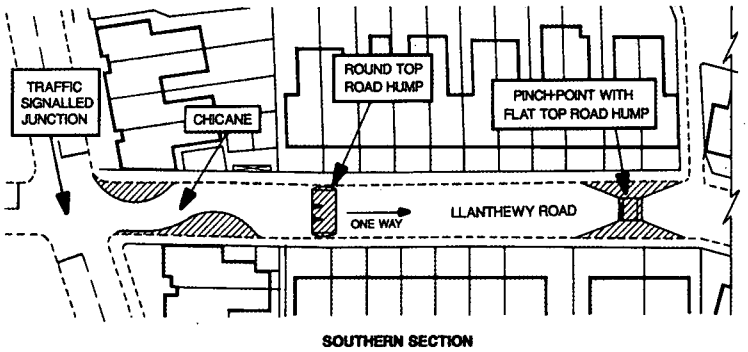
A chicane with footway widening.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (VPD)
BEFORE	3 in 3 years	32	2,228
UPDATE	0 in 3 years	20*	1,827oneway* *Not updated

CONTACT: MIKE TAN ☎ 01633 244491 E-MAIL: mike.tan@newport.gov.uk
AUTHORITY: GWENT METROPOLITAN COUNCIL

Technical Data

LOCATION TYPE:	Residential, close to town centre.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Southern sections made one way preventing homeward short cutting traffic; this section also has an entry chicane, two round top road humps, one flat top road hump with a pinch-point to 3.5m and an exit built-out.	
LENGTH OF SCHEME IN TOTAL:	600m.	
DIMENSIONS:	Round top hump:	
	Height:	100mm.
	Width:	8.5m.
	Length:	3.7m
	Flat top hump:	
	Height:	100mm.
	Width:	3.5m.
	Length:	3.7m.
	Plateau:	2.5m.
	Ramp gradient:	1:6.
	Chicane:	Overall length: 25m.
MATERIALS:	Plateau and ramp:	Blockwork paviours.
	Round top humps, chicane and build-out: Bitmac.material.	
SIGNS:	15 signs in total.	
LIGHTING:	No change.	
COSTS:	Gwent CC £25,000.	

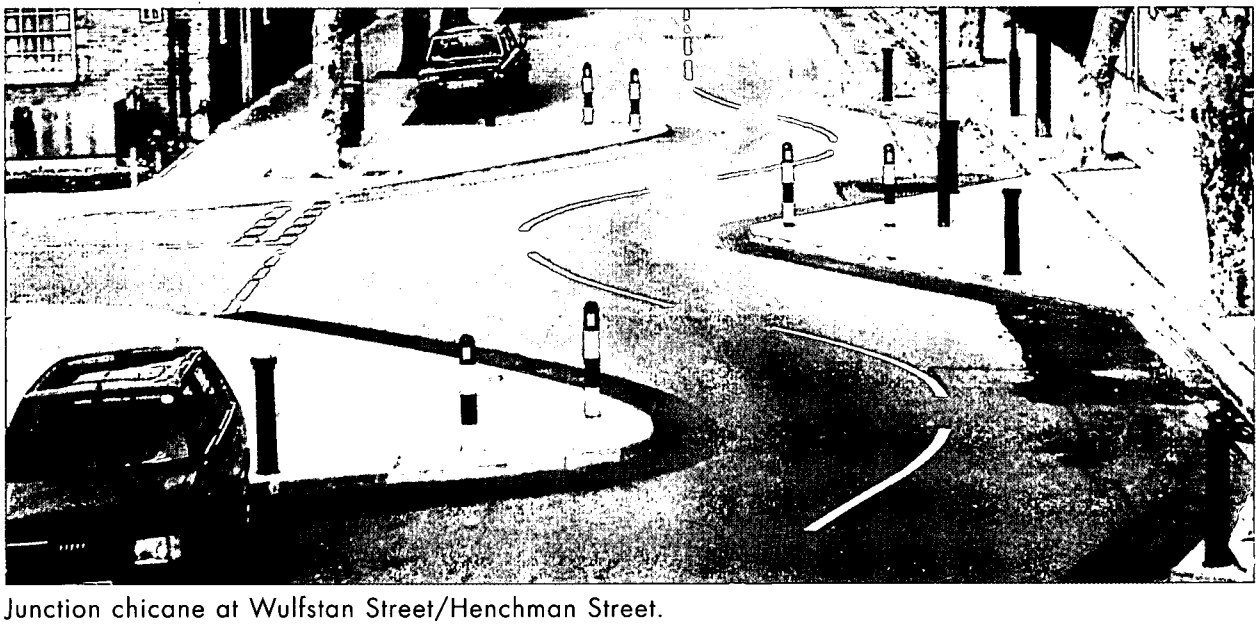


Layout of calming devices.

30 Wulfstan Street, Shepherds Bush, London
speed table, chicanes, pinch points

UPDATE: The original scheme (1989) was successful in reducing traffic speeds and volume on this "rat-run" route, as well as reducing recorded accidents. However, the scheme was reviewed and improved (1996) with the addition of mini-roundabouts, speed cushions in sets of three, hatched markings, pedestrian refuge islands, priority give ways and width restrictions. These were designed to improve and support the existing scheme and reduce accidents further.

OTHER COMMENTS: Longer term monitoring has shown that a further reduction in traffic flow has been achieved together with a small further reduction in accidents.



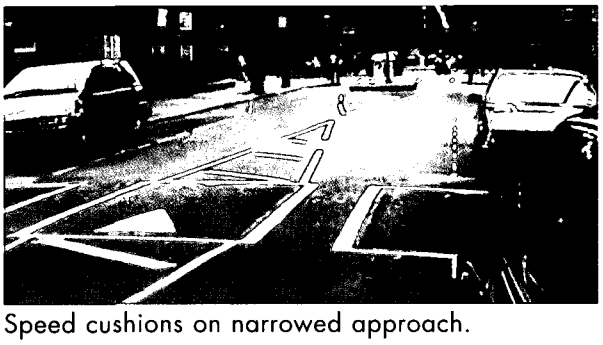
Junction chicane at Wulfstan Street/Henchman Street.

IMPLEMENTED: October-December 1989.

BACKGROUND: Wulfstan Street is situated within a popular, cottage style, terraced housing estate where a close knit, family orientated community lives. The tree lined street is 700m long, straight, well lit, with a 30mph speed limit, and is heavily parked. The street is used as a car commuter cut-through which divides the community from local facilities such as the local primary school, hospital, park and shops.

NEED FOR MEASURES: Parked cars, fast traffic, and many small children crossing created a real and increasing accident problem in the street which needed tackling.

MEASURES INSTALLED: Speed table, chicanes, pinch points, wide pedestrian islands and side road entry treatments.



Speed cushions on narrowed approach.

SPECIAL FEATURES: Measures designed to integrate with the symmetry of the unusual road layout and housing design in the conservation area.

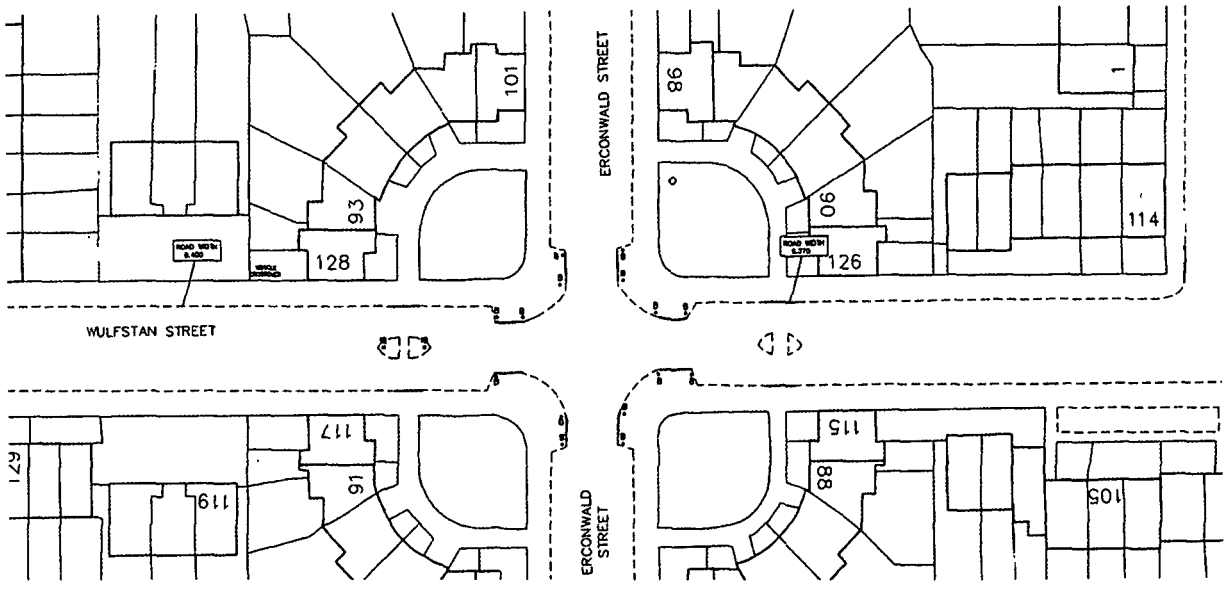
CONSULTATION: Meetings were held with the local community group and the emergency services. No bus or cycle routes were affected.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (VPD)
BEFORE	14 in 3 years	35	820
UPDATE (2002)	6 in 6 years	20*	272
			*Not updated

CONTACT: TOM FINNEGAN-SMITH ☎ 020 8753 3411 E-MAIL: Tom.finnegan-smith@lbhf.gov.uk
AUTHORITY: LONDON BOROUGH OF HAMMERSMITH & FULHAM

Technical Data

LOCATION TYPE:	Urban residential. Two-storey terraced houses. Conservation area status.
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.
SCHEME TYPE:	One speed table, two junction chicanes, two pinch points, three wide pedestrian islands, three side road entry treatments.
LENGTH OF SCHEME IN TOTAL:	700m
MATERIALS:	Various including the use of plastic reflective bollards.
SIGNS:	Diags: 516. 517. 602, 615 and 811. Markings: Hatchings, centre, give way.
LIGHTING:	Repositioned street lamps to highlight kerb build-outs.
COSTS:	1989/90 Transport Policies and Programme funds £70,000, and £90,000 for later supplementary scheme.



Detail of narrowed junction and pedestrian islands.

31 Stanhope Avenue Area, Sittingbourne, Kent
plateaus, raised junction, narrowings

UPDATE: More recent monitoring (1996) showed that recorded accidents rose very slightly to four in three years. Interestingly, all of the crashes occurred on one road (Chilton Avenue), and the overall number of accidents in this area actually reduced from 20 to 18. This is against a background of increased traffic in the area.

OTHER COMMENTS: A number of the 100mm road humps have had to be replaced because they collapsed and because of the impact they have on buses. "Speed cushions" would have been used had the scheme been implemented today. Nevertheless, the scheme has proved very successful and its popularity locally generated a number of similar schemes in this area. A further road hump was installed in 2003 to address the continuing accidents in Chilton Avenue.

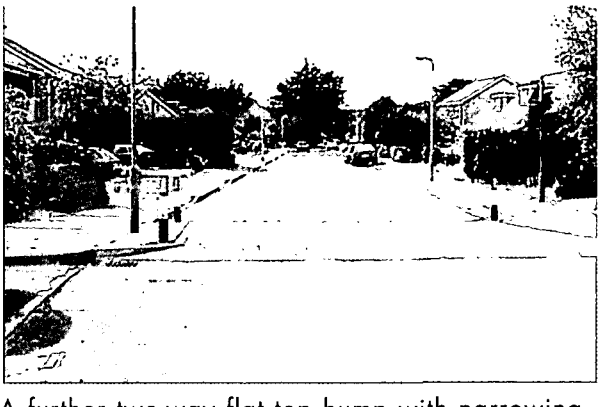
Two-way flat top humps with narrowing.

IMPLEMENTED: August 1989.

BACKGROUND: These roads lie in a residential area south-east of Sittingbourne, and are used by through traffic accessing a major supermarket, and by commuters cutting between the B2163 and A2. They are subject to a 30mph limit. Stanhope and South Avenues are bus routes and there are two schools in South Avenue.

NEED FOR MEASURES: Unacceptable level of accidents. There were two pedestrian fatalities in the three year period prior to 1989. Contributory factors were unreasonably high speeds and excessive volume of traffic. However, no other suitable route for the traffic exists.

MEASURES INSTALLED: Three two-way KCC style flat top block paved humps with narrowings in each of Stanhope and South Avenues; one similar in Chilton Avenue, together with a table junction.



A further two-way flat top hump with narrowing.

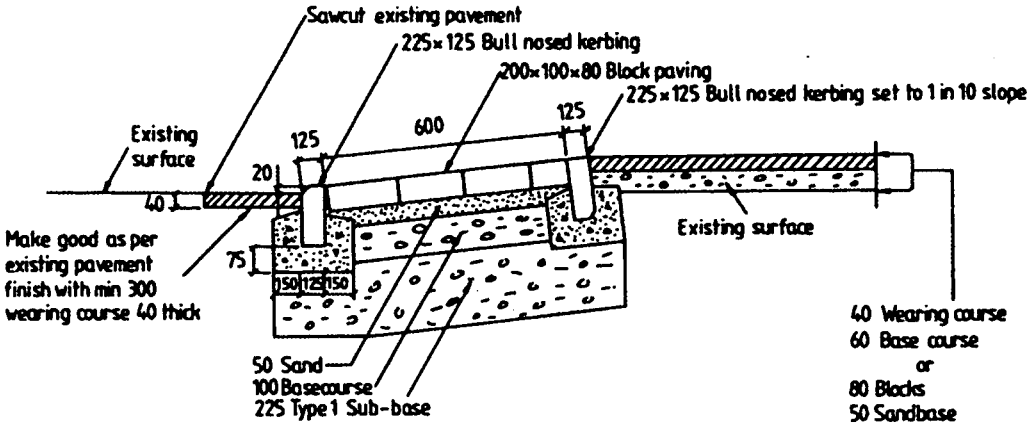
CONSULTATION: Full public consultation was carried out prior to the scheme being implemented, although attendance at the exhibition was very poor.

MONITORING	ACCIDENTS (PIA)	SPEEDS (85%ILE MPH)	TRAFFIC (12HR)
BEFORE	12 in 3 years	38 to 40	5,050
UPDATE (2000-02)	4 in 3 years	28 to 30*	3,500*
			*Not updated

CONTACT: JIM PEARCE ☎ 01622 696857 E-MAIL: jim.pearce@kent.gov.uk
AUTHORITY: KENT COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Residential, schools and buses.	
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.	
SCHEME TYPE:	Flat top humps with narrowings, raised junction.	
LENGTH OF SCHEME IN TOTAL:	1.2km.	
DIMENSIONS:	Height of humps:	100mm.
	Width:	5m.
	Length:	10m.
	Ramp gradient:	1:10.
	Distance from junctions:	40m.
MATERIALS:	Plateau and ramps:	Concrete blocks - buff.
	Street furniture:	Verge marker posts - Glasdon.
SIGNS:	Ramp:	Diag 516 plated.
LIGHTING:	Columns resited at each measure.	
COSTS:	£43,000.	



SECTION A-A

Cross-section of a sloping ramp.

32 Primrose Area, Lancaster narrowing, flat top humps, one-way streets

UPDATE: This scheme has not been modified in any way since its implementation 10 years ago. It is still accepted by the majority of residents but a shortage of parking space has become an issue and is currently being reconsidered.

OTHER COMMENTS: Because of the narrowness of the one-way streets a degree of carriageway maintenance is now required. Of the five accidents in the last five and a half years, three have involved a pedestrian and one a cyclist. As a result of this the area is being considered for a 20mph zone, and further consultation will be carried out.

Raised carriageway area with narrowing to create sheltered parking.

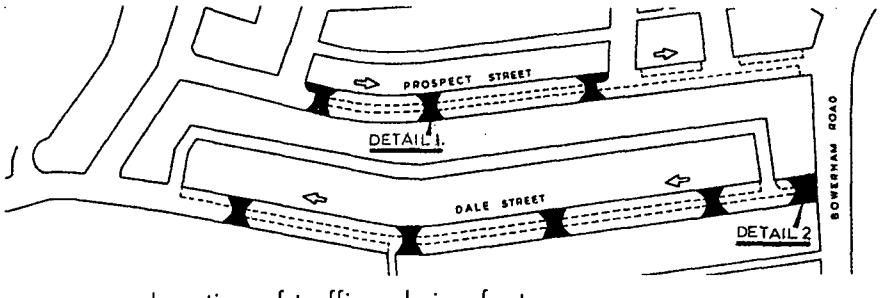
IMPLEMENTED: June 1993.
BACKGROUND: The Primrose Housing Action Area is on the periphery of the historic city centre of Lancaster. The roads in this area, with parking on both sides, are used by motorists to avoid using the city centre gyratory system. The roads are subject to a 30mph speed limit.
NEED FOR MEASURES: To reduce vehicular speeds and the incidence of "rat runners".
MEASURES INSTALLED: Flat-top humps with associated narrowings, one-way streets, 7.5 tonne lorry weight restriction order.
SPECIAL FEATURES: Materials to match the character of the area.
CONSULTATION: With residents, the police, Lancashire County Council, emergency services and bus companies.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC (16HR)	
			DALE ST	PROSPECT ST
BEFORE	9 in 4 years	34	2,600	1,500
UPDATE	5 in 5 years	17	n/a	2,610 (24hrs) *Not updated

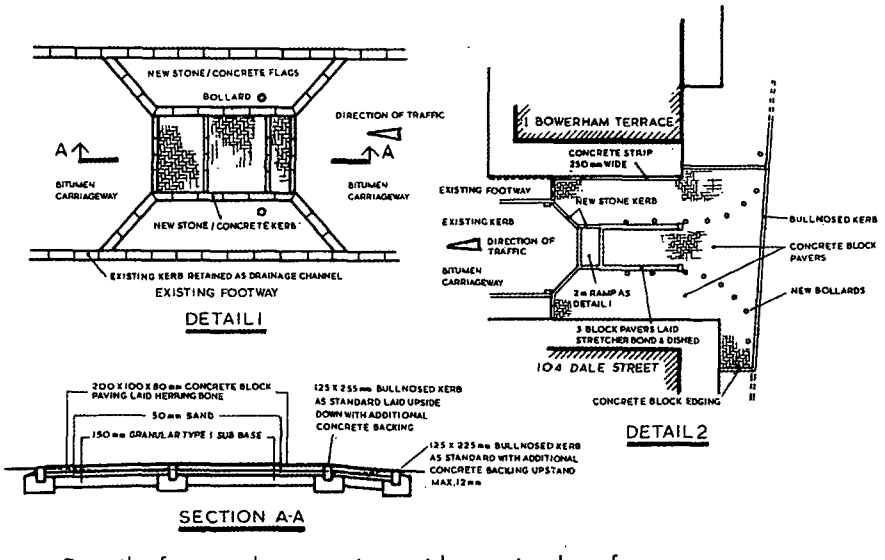
CONTACT: ADRIAN HANKS ☎ 01772 532237 E-MAIL: adrian.hanks@env.lancs.gov.uk
AUTHORITY: LANCASHIRE COUNTY COUNCIL

Technical Data

Location Type:	Residential, older housing adjacent to historic city centre.	
Road Type and Speed Limit:	Urban unclassified: 30mph.	
Scheme Type:	Flat top humps with associated narrowings. One-way streets.	
Length of Scheme in Total:	640m on three streets.	
Dimensions:	Height:	100mm.
	Width:	3m.
	Length:	Plateau: 2.5m. Entry ramp: 1m. Gradient: 1:10. Entry ramp: 2m. Gradient: 1:20.
Materials:	Humps:	Buff block paviours.
	Kerbs:	Recycled natural stone.
	Footway paving:	Natural stone flags.
	Bollards:	Cast iron.
Signs:	Signing and road markings as per regulations.	
Lighting:	Existing, which had been recently updated.	
Costs:	Lancashire County Council Small Improvements budget £30,600. Lancashire County Council Highways Maintenance Allocation £8,400. Total: £39,000.	



Location of traffic calming features.



Detail of a road narrowing with a raised surface.

33 Brougham Street, Burnley Lancashire
raised pinch points, chicane, build-outs

UPDATE: Whilst the original scheme was reasonably successful in reducing both traffic speeds and recorded accidents, the accidents that occurred after the scheme was implemented all involved child pedestrians in this high density residential area.

OTHER COMMENTS: As a consequence, in 1997 the scheme was changed to become part of a 20mph zone in the Daneshouse and Stoneyholme SRB area and the original pinch points were changed to chicanes with priority working (see photo and diagram). The revised scheme has produced further substantial reductions in both traffic speeds and accidents. The changes included extensive consultation and trials with the local bus company to ensure that the bus fleet could negotiate the new chicanes.

Brougham Street junction with Folds Street – use of chicane with priority giveway.

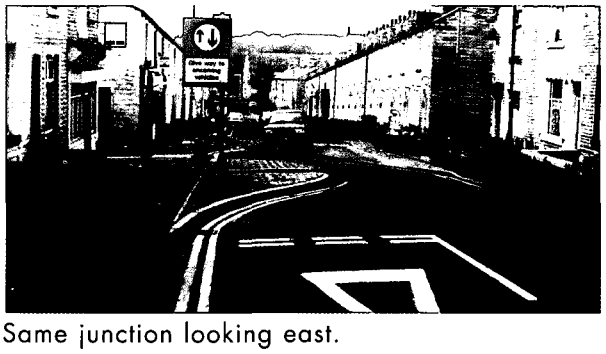
IMPLEMENTED: May 1992.

BACKGROUND: Brougham Street was used as a rat-run for commuters gaining access to the M65.

NEED FOR MEASURES: Child pedestrian accidents, primarily to resident ethnic population as a result of speeding.

MEASURES INSTALLED: Two slightly raised single way working pinch points, approximately 30m in length protected by a rumble area at one end and a chicane created by a refuge and build-outs. The scheme was later changed to become part of a 20mph zone which resulted in further accident reductions.

SPECIAL FEATURES: Rumble area and chicane.



Same junction looking east.

CONSULTATION: With bus companies, police, local residents (leaflets and other meetings) and Burnley Borough Council.

MONITORING	ACCIDENTS (PIA)	SPEEDS (85TH %ILE)	TRAFFIC (24HR)
BEFORE	19 in 3 years	35	5,592
AFTER	6 in 3 years	30	4,750
SINCE 20MPH ZONE	2 in 3 years	22	4,591
			*Not updated

CONTACT: ADRIAN HANKS ☎ 01772 532237 E-MAIL: adrian.hanks@env.lancs.gov.uk
AUTHORITY: LANCASHIRE COUNTY COUNCIL

Technical Data

Location Type: Urban residential.

Road Type and Speed Limit: Urban classified.

Scheme Type: Two single way working pinch points, slightly raised, with alternating give ways. One rumble area and one chicane as speed reducing features.

Materials:
Pinch points: Marshall brindle paving.
Rumble strips: Marshall tegula blocks.

Length of Scheme in Total: 400m

Dimensions:

	Pinch points	Rumble Area	Chicane
Height:	45mm	45mm	-
Width:	3.5m	4.3m	2.8m
Length:	30m	3m	25m

Signs:
Regulatory sign: Diags 516 and 615.
Informatory sign: Diag 811.
Road markings: Diags 1003, 1023 and 1024.

Lighting: Existing lighting upgraded.

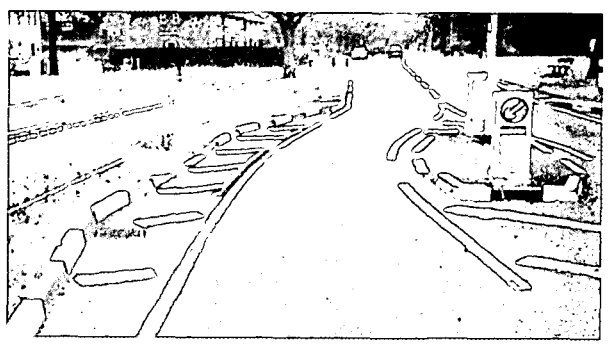
Costs: Lancashire County Council Small Improvements budget £45,000.
Lancashire County Council Accident Investigation and Prevention budget £2,000.
Total £47,000.

The Stoneyholme 20mph zone – a later addition to the scheme.

34 Albert Drive, Woking
chicanes, narrowing, cycle track protected parking

UPDATE: This scheme is still in place and continues to be effective in reducing speeding (only 23% of which now exceed 30mph limit and one percent exceed 40mph) and accidents (a 67% reduction).

IMPLEMENTED: August 1991.
BACKGROUND: Albert Drive is a mainly residential "D" road, approximately 2.4km long, with industrial units at west end and a school of 535 pupils at the east end. It provides an attractive alternative to the A245, the designated route for Woking town centre.
NEED FOR MEASURES: Accident problem with excessive speed. A bus route inappropriate for through traffic.
MEASURES INSTALLED: Three chicanes as shown, with a cycle track at the east end. Ramped protected parking, chicane
SPECIAL FEATURES: An additional kerb build out on exit of chicane to provide additional speed reduction. Chicane dimensions finalised by on-site bus trials. Chicane island designed at pedestrian crossing point.



CONSULTATION: Emergency services. Press release. No formal public consultation carried out by Woking Borough Council. (Surrey County Council now undertakes thorough public consultation during the early stages of all traffic calming schemes).

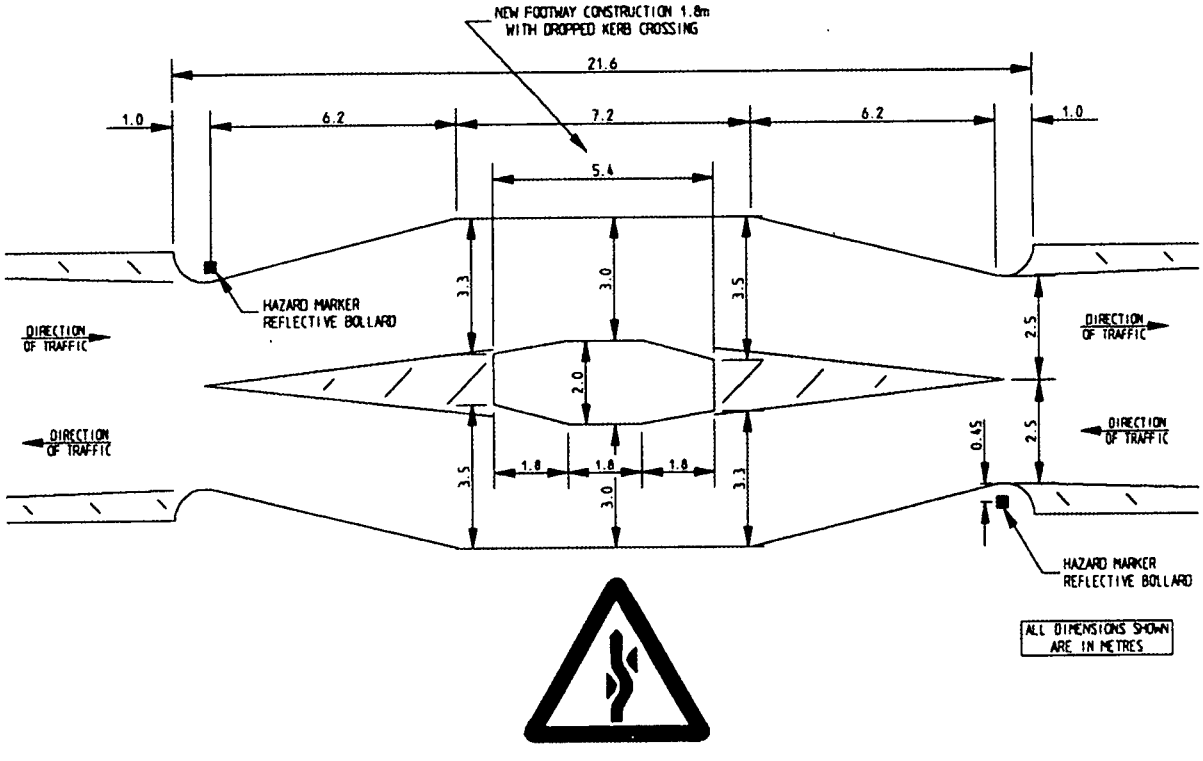
MONITORING	ACCIDENTS (PIA) IN CHICANE SECTION	SPEEDS (MPH) >30MPH	SPEEDS (MPH) >40MPH	TRAFFIC (24HR)
BEFORE	36 (5) in 3 years	75%	16%	6,334
AFTER	10 (1) in 2.5 years	23%[1]	1%[1]	5,761

1 between chicanes. Average freeflow speeds at chicanes are 25mph, and at fastest point between is 32mph

CONTACT: JOHN MASSON E-MAIL: john. masson@surreycc.gov.uk
AUTHORITY: SURREY COUNTY COUNCIL

Technical Data

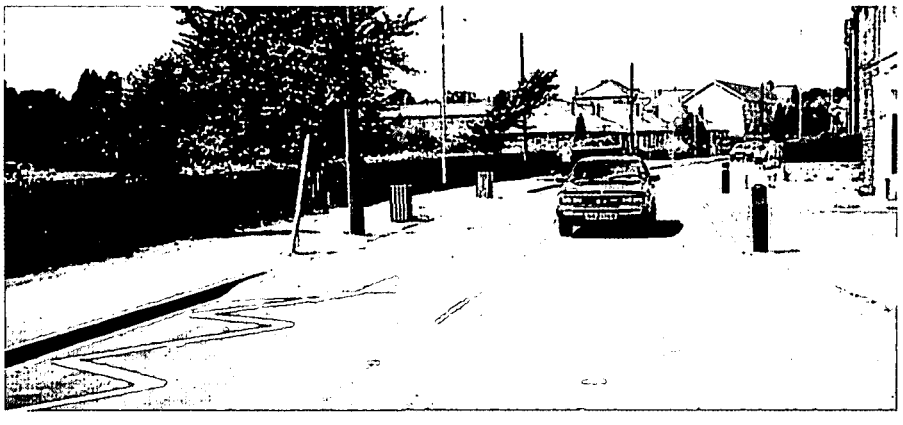
Location Type:	Residential.
Road Type and Speed Limit:	Unclassified: 30mph.
Scheme Type:	Chicane system. Special authorisation for use of non-standard sign.
Length of Scheme in Total:	500m approximately.
Dimensions:	Carriageway width on entry to chicane: 5m. (3m width available for each direction of flow at chicane and mid-point). Length of chicane: 21.6m. Distance between chicanes: 150m (average).
Materials:	Standard construction materials.
Signs:	Use of chicane sign on each approach as detailed above.
Lighting:	General lighting improvements required.
Costs:	Jointly funded by Surrey County Council and Woking Borough Council. Total £84,000 (including £17,900 for street lighting improvements).



Layout plan for refuge island with kerb re-alignment.

35 North Road, Ravensthorpe, Kirklees
plateaus and junction treatment

UPDATE: Before this scheme was implemented the high accident rate included 10 child pedestrians, or 56% of all accidents. Since implementation the accident rate has dropped to an average of about two accidents/year (previously six), of which just over half were child pedestrians. Thus the scheme has been reasonably successful and remains in place.



A junction plateau with local narrowing.

IMPLEMENTED: May 1991.
BACKGROUND: North Road is a well used through route from Ravensthorpe to Mirfield, The road is predominantly residential and sited on the mid-section of the treated length is a large primary school. The road is frequently used by buses.
NEED FOR MEASURES: A high number of child pedestrian accidents.
MEASURES INSTALLED: Plateaus and changes to junction layout.
SPECIAL FEATURES: The large number of plateaus used with spacings of 40m-50m to ensure a constant low speed throughout the treated section.
CONSULTATION: All residents were invited to a mobile exhibition in the area, Emergency services and bus operators were formally consulted.

Technical Data

LOCATION TYPE:	Urban residential area, school through route.
ROAD TYPE AND SPEED LIMIT:	Urban unclassified: 30mph.
SCHEME TYPE:	Plateaus with extended kerb lines at the junctions
LENGTH OF SCHEME IN TOTAL:	500m.
DIMENSIONS:	Height: 100mm. Width: 6.0m. Length: 8.0m. Ramp gradient: 1:10. Spacings: 40m-50m.
MATERIALS:	Red asphalt. Pre-cast concrete kerbs.
SIGNS:	Standard road hump markings to Diag 1061. Special non-prescribed warning signs. Road markings.
LIGHTING:	New 90watt LP sodium.
COSTS:	£80,000.

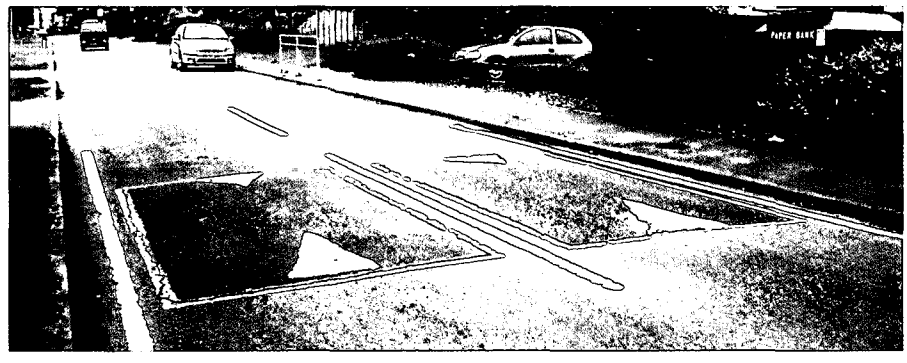
MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC
BEFORE	16 in 3 years	35	8,500
UPDATE	19 in 11 years	21	6,500*
NB: Child pedestrian accidents decreased from just over three per year to an average of less than one			*Not updated/no data available

CONTACT: MARK RAMSDEN ☎ 01484 225671 E-MAIL: mark.ramsden@kirklees.gov.uk
AUTHORITY: KIRKLEES METROPOLITAN COUNCIL

36 The Avenue, Featherstone Staffordshire round top humps and speed cushions

UPDATE: This scheme has remained in place and is unaltered. It has been particularly effective in reducing traffic speeds and in reducing the accident rate by about 50%.

OTHER COMMENTS: Locally the scheme has been well received and has led to requests for treatment in adjacent streets. These have been treated with speed cushions, as they are on bus routes, but local people complain that they are not as effective as the round top humps.



Use of speed cushions in the extended scheme.

IMPLEMENTED: October 1991.
BACKGROUND: Featherstone is a village close to Junction 1 off the M54 and within easy commuting distance of the West Midlands conurbation. The Avenue is the main distributor road serving the housing area of the village. It is subject to a 30mph speed limit and has street lighting.
NEED FOR MEASURES: The Avenue is straight, encouraging high speeds and runs past shops and a school. This has led to numerous complaints.
MEASURES INSTALLED: 75 mm round top humps, 3.7m in length with tapered sides extended across complete width of road. Approximately 150m apart.
SPECIAL FEATURES: This was one of Staffordshire's experimental schemes.
CONSULTATION: Local residents, Parish Council, District Council, emergency services and police.

Technical Data

LOCATION TYPE:	Suburban housing estate.
ROAD TYPE AND SPEED LIMIT:	Semi-urban: 30mph.
SCHEME TYPE:	Two way round top humps.
LENGTH OF SCHEME IN TOTAL:	800m (including Brook House Lane).
DIMENSIONS:	Height: 75mm. Width: 7.3m. Length: 3.6m. Ramp gradient: 1:24 (av).
MATERIALS:	Speed humps: Medium temperature asphalt. HRA 55/10.
SIGNS:	"Road hump" signs: Diag 557.1. Markings Diag 1060.1 (including on adjacent A460 main road).
LIGHTING:	Existing.
COSTS:	Staffordshire County Council Traffic Management budget £8,200.

MONITORING	ACCIDENTS (PIA)	SPEEDS (85%ILE MPH)	TRAFFIC (16HR)
BEFORE	6 in 3 years	39	3,600
UPDATE (2002)	8 in 9 years	25	2,700

CONTACT: PAUL GROSVENOR ☎ 01785 276672 E-MAIL: paul.grosvenor@staffordshire.gov.uk
AUTHORITY: STAFFORDSHIRE COUNTY COUNCIL

Case Study Matrix

Ref	Location	Type of scheme	Includes features:							
			Speed limit	20 zone	Gate way	Humps: *Cushions*	*Tables*	*Flat*	*Round*	*Special*	Material
	UPDATED CASE STUDIES										
	TOWN CENTRE										
1	Carfax, Horsham West Sussex	Town centre development	20	✔	✔			✔	✔		Blocks/ setts
2	High Street Rushden, Northants	Town high street	20	✔			✔	✔	✔		Blocks/bit surfacing
3	Eaton Socon Cambridgeshire	Residential through road	30								
4	Twydall Green Gillingham, Kent	Residential estate shopping centre	30						✔		Bit surfacing
5	Vines Lane Rochester, Kent	Town centre through route	30					✔			Blocks/ setts
6	The Parade Leamington Spa, Warks	Town centre through route	30				✔				Bit surfacing
7	Ashlawn Road Rugby, Warks	Residential road in the vicinity of a school	30				✔	✔			Blocks
8	Dragon Street Petersfield, Hampshire	Town centre	30				✔				Blocks
9	Shenley Road Borehamwood, Herts	Town centre through route	30					✔			Blocks/bit surfacing
	RURAL										
10	New Forest Hampshire	New forest heritage area	40		✔						
11	Gamlingay Cambs	Village through road	30					✔	✔		Block/bit surfacing
12	Fen Ditton, Cambs	Village through road	30								
13	Newton Tracey, Devon	Village through road	30		✔						
14	Sarre Kent	Small village main road	30		✔						Blocks/red surfacing
15	Brasted Kent	Village main road	30		✔						Red surfacing
16	A427 Five Villages Leicestershire	Principle route between a number of villages	30		✔						
17	Birdham West Sussex	A long straight stretch of road in small village	40/60								
18	Bramber West Sussex	Village centre development as a result of a bypass	30				✔	✔			Blocks/bit surfacing
19	Fontwell West Sussex	Village centre development as a result of a bypass	30					✔			Blocks/bit surfacing
20	Selsey West Sussex	Village through road	30		✔				✔		Blocks/bit surfacing
21	Matfield Kent	Village gateway signage improvement	30		✔						
	RESIDENTIAL										
22	Scotchman Road Bradford West Yorkshire	Inner city streets used as commuter cut through	20	✔			✔	✔			Blocks
23	Upper Parkstone Poole, Dorset	Residential area (Four roads in the area)	20	✔	✔		✔	✔	✔		Setts/bit surfacing
24	Upper Rushton Road Bradford West Yorks	Straight road within a city encouraging higher speeds	30		✔		✔	✔			Blocks/bit surfacing
25	Stalker Avenue Tillicoultry Clackmannan	Residential road bounded by a school along some of its length	30		✔	✔					
26	Park School, Barnstaple, Devon	Crossing point to school	30					✔			Blocks/bit surfacing

Case Study Matrix

Enhanced	Narrow	One way	P'point/ narrowing	Chicane	Mini r'bout	Cycle lane	Refuges	Coloured surfacing	Type of Crossings	Cost in £000	Year	Length
✔		✔	✔		✔	✔		✔	Informal on humps	2,300	1992	1.12km
✔		✔	✔	✔					Informal on humps	230	1992	1km
			✔	✔	✔	✔		✔		130	1992	2.3km
									Informal on humps	18	1988	130m
✔			✔						Informal on humps	18.5	1990	235m
					✔	✔				35	1992	50m
					✔				Informal on humps	69	1992	550m
✔	✔								Pelican & informal	480	1993	400m
✔			✔		✔		✔		Informal on humps	1,200	1992 -94	800m
								✔		482	1990s to date	~490km
			✔							32	1990	1.2km
	✔			✔		✔	✔	✔		54	1992	4.2km
			✔				✔			20	1992	130m
				✔	✔		✔	✔		140	1993	~1km
				✔			✔	✔	Zebra	425	1993	800m
			✔							50	1993	At entrances to each village
	✔					✔	✔		Informal crossings	50	1992	1.2km
✔	✔		✔	✔					Informal crossings	85	1993	680m
					✔		✔		Informal crossings	25	1992	550m
					✔					25	1992 -93	550m
										2.2	1992	1km
	✔		✔	✔					Informal crossings	105	1991 -93	~800m
			✔		✔				Informal crossings	319.5	1993 -97	2.2km
			✔						Informal crossings	69	1992	750m
			✔	✔						10	1991	300m
	✔						✔		Toucan	220	1991	600m

Case Study Matrix

Ref	Location	Type of scheme	Includes features:							
			Speed limit	20 zone	Gate way	Humps: *Cushions*	*Tables*	*Flat*	*Round*	*Special*	Material
27	**Burnthouse Lane Exeter, Devon**	Residential street on outskirts of Exeter	30					✔			Blocks/bit surfacing
28	**Withycombe Road Exmouth Devon**	Residential road serving schools and a shopping centre	30					✔			Blocks/ bit surfacing
29	**Llanthewy Road Newport, Gwent**	Residential street on outskirts of Newport	30					✔	✔		Blocks/bit surfacing
30	**Wulfstan Street Shepherds Bush London**	Residential street	30			✔	✔				Bit surfacing
31	**Stanhope Avenue Sittingbourne, Kent**	Residential area used as a through route	30				✔	✔			Blocks
32	**Primrose Area Lancaster Lancs**	Historic residential area used as a through route	30				✔	✔			Blocks
33	**Brougham Street Burnley Lancs**	Residential through road used to access M65	20	✔	✔						Blocks
34	**Albert Drive Woking Surrey**	Mainly residential road but with a school and industrial units at one end	30								
35	**North Road Ravensthorpe, Kirklees**	Residential through road	30				✔	✔			Red surfacing
36	**The Avenue Featherstone Staffordshire**	Residential road in village location	30			✔			✔		Bit surfacing
	NEW CASE STUDIES										
	TOWN CENTRE										
1	**Kensington High St Kensington, London**	Commercial high street with through traffic	30								
2	**Top of the Town Stirling**	Town side street historic	30								Setts/bit surfacing
	RURAL										
3	**A361 Ashford Nr Barnstaple, Devon**	Rural A Road	40								
4	**Bishop's Sutton village Hampshire**	Village main street	40		✔						
5	**Bradwell, Peak District Derbyshire**	Village centre - narrow footways	30								
6	**High Street Brant Broughton, Lincs**	Village main street	30		✔						
7	**Brinklow Warkwickshire**	Village through road	30								Red surfacing
8	**Tongwynlais Cardiff**	Village through road	20	✔	✔	✔		✔			Red surfacing
9	**Filleigh, South Molton North Devon**	Village through road	30/40		✔						
10	**Crawley Road Horsham, West Sussex**	Residential through road	30								
11	**Northwich Road Warrington**	Rural residential through road	30								
12	**Delamare Street Winsford Cheshire**	Residential through road	30		✔	✔	✔	✔			Blocks/mastic asphalt/bit surfacing
13	**Quiet Lanes North Norfolk**	Quiet Lanes scheme	60 (National)		✔						

Case Study Matrix

Enhanced	Narrow	One way	P'point/ narrowing	Chicane	Mini r'bout	Cycle lane	Refuges	Coloured surfacing	Type of Crossings	Cost in £000	Year	Length
			✔						Informal crossings	220.5	1988	600m
			✔		✔				Informal crossings	91	1991	500m
		✔	✔	✔					Informal crossings	25	1993	600m
			✔	✔			✔		Informal crossings	90	1989	700m
			✔						Informal crossings	43	1989	1.2km
		✔	✔						Informal crossings	39	1993	640m on three streets
			✔	✔			✔	✔	Informal crossings	47	1992	400m
	✔			✔		✔			Informal crossings	84	1991	500m
								✔	Informal crossings	80	1991	500m
										8.2	1991	800m
✔							✔		Pelican	135	2001	30m
	✔	✔		✔					Informal crossing	380	1997	
							✔	✔	Informal crossing	60	2002	145m
	✔							✔		15	1999	1.2km
	✔								Traffic signals Puffin style	60	2002	1.2km
	✔							✔	Informal crossings	~23	2002	1.3km
								✔		~14	2001	1.12km
	✔		✔					✔	2 zebras	60	2002	800m
								✔		10	2002	2km
	✔		✔		✔	✔	✔	✔	Informal crossing	83	2000	1km
	✔		✔			✔	✔	✔	Informal crossing	40	2002	800m
	✔				✔		✔	✔	Informal crossings	50	1999	420m
										16	2000	59km

Case Study Matrix

Ref	Location	Type of scheme	Includes features:								
			Speed limit	20 zone	Gate way	Humps: *Cushions*	*Tables*	*Flat*	*Round*	*Special*	Material
	RESIDENTIAL										
14	Abbey Village, Lancs	Village main street	30		✔						
15	Litchdon St/Trinity St Barnstaple, Devon	Residential through road	20	✔	✔			✔			Bit surfacing
16	Island St Area Belfast	Residential street	30								Bit surfacing
17	Meadow Road, Catshill Bromsgrove, Worcs	Residential near school	30					✔			Blocks
18	Cheadle Staffordshire	Residential near school	30		✔	✔	✔	✔			Bit surfacing
19	Welland Vale area Corby, Northants	Residential through road	20	✔	✔	✔	✔		✔	"S"	Blocks/bit surfacing
20	Ashdown Drive Crawley, West Sussex	Residential through road	20	✔	✔		✔				Bit surfacing
21	Douglas Housing Estate Dundee	Residential through road	30		✔	✔			✔		Rubber/bit surfacing
22	Davies Road, Evesham Worcestershire	Residential through road	30								
23	Munster Road, Fulham London	Residential through road	30		✔	✔	✔	✔			
24	Bristol Road, Gloucester Gloucestershire	Residential through road	30								
25	Finlay Road, Gloucester Gloucestershire	Residential through road	40								
26	Safer City project Gloucester, Glos	Residential through road	30	✔	✔	✔	✔	✔	✔		
27	Lathom, Lancashire	Village main street	40								
28	The Methleys Leeds, West Yorkshire	Residential near school	20 Home Zone	✔	✔	✔	✔				Blocks/bit surfacing
29	High St, Navenby Lincolnshire	Village main street	30		✔						Bit surfacing
30	Bettws Lane, Newport South Wales	Residential through road	30				✔	✔	✔		Blocks/bit surfacing
31	Llanyravon, Cwmbran South Wales	Residential through road	20	✔		✔	✔				Rubber/bit surfacing
32	Christchurch Road Newport, South Wales	Residential through road	30			✔					Rubber
33	Burnley Road Padiham, Lancs	Residential through road	30								
34	Ralston Area Paisley	Residential through road	30		✔				✔		Bit surfacing
35	Argyll Road Area Ripley, Derby	Residential through road	20	✔					✔		Bit surfacing
36	Springfield, Rugeley Nr Cannock, Staffs	Residential near school	30			✔					Bit surfacing
37	Sutton Avenue Seaford, East Sussex	Residential through road	30								
38	Middle Road Shoreham-by-sea West Sussex	Residential near school	30				✔	✔			Bit surfacing
39	Broadwater Crescent Stevenage, Herts	Residential through road	30		✔	✔	✔	✔			Bit surfacing
40	Thames Ditton Area Surrey	Village centre	20	✔	✔	✔	✔				Bit surfacing
41	Bridge Lane, Warrington, Cheshire	Residential through road	20	✔						"S"	Blocks/bit surfacing
42	Enfield Park Road Warrington, Cheshire	Urban distributor low volume	30								
43	St Lawrence Avenue Worthing, West Sussex	Residential street	30			✔					Bit surfacing
44	Walpole Street Garden Lane Area Chester, Cheshire	Residential near school	30			✔	✔				Bit surfacing

Case Study Matrix

Enhanced	Narrow	One way	P'point/ narrowing	Chicane	Mini r'bout	Cycle lane	Refuges	Coloured surfacing	Type of C'sings	Cost in £000	Year	Length
	✔						✔	✔		29	1997	460m
✔									Informal crossings	59	2001	6 streets
			✔	✔		✔			Informal crossings	43	1999	400m
									Zebra	20	1999	100m
								✔	1 zebra 2 Puffins	160	2002	1.5km
	✔						✔		Zebras	370	2001	5km^2
	✔			✔	✔		✔	✔	Informal crossings	516	1996	4km
	✔		✔		✔		✔	✔	Informal crossing	350	1998	~0.5 km^2
			✔				✔			36	1995	720m
	✔				✔		✔		4 zebras	210	2001	1.4km
	✔		✔	✔		✔	✔	✔			2000	3.5km
						✔	✔			163	1997	1km
	✔		✔	✔	✔	✔	✔	✔	Toucans Zebras	5000	1996 -2001	Citywide
					✔	✔	✔			22	2000	236m
✔	✔		✔					✔	Informal crossings	267	2001	~0.1km^2
	✔								Zebra	45	2002	1.4km
			✔		✔		✔		Informal crossings	381	1994	~4km
							✔	✔	Informal crossing	60	2001	780m
	✔		✔		✔		✔		Informal crossings	140	1997	850m
	✔					✔	✔	✔	Zebra	40	1997	1.26km
	✔		✔					✔	Informal crossing	40	2001	1.5km
	✔									24	2001	1.9km
			✔	✔		✔	✔	✔		244	2002	6km
	✔		✔		✔		✔		Zebras	230	2002	1.4km
	✔		✔		✔			✔	Informal crossings	107	1996	700m
					✔			✔	Zebras	487	2001	3.5km
				✔	✔		✔		Informal crossings	350	2000	Village centre
								✔		28	2002	400m
	✔								Zebras	110	2002	1.5km
					✔		✔			115	2001	1.6km
	✔		✔					✔	Zebra		2000	205m

CHAPTER 8
More Recent Schemes

TOWN CENTRE

Case Studies 1-2

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1 Kensington High Street, Kensington, London
pelican crossing, paving, revised layout

Pelican crossing near Kensington Court. Before alterations.

Pelican crossing near Kensington Court. After alterations (2001).

Implemented: March 2001.

Background: The Kensington High Street enhancement scheme started in October 2000 and was completed in phases by July 2003. The project includes complete renewal and rationalisation of all street furniture, replacement of the existing paving, implementation of new pedestrian crossing facilities along the High Street and major improvement at the major junctions. In developing the scheme, the design team questioned accepted criteria in order to come up with innovative ideas to challenge established and often out dated practices.

Need for Measures: The staggered pelican crossing near Kensington Court (east) carries very high volumes of pedestrians, averaging 500 ped/hr, in conjunction with high vehicle flows that average 2,800 veh/hr. There was a high accident history in the vicinity of the crossing that required treatment in order to reduce the problem.

Measures Installed: Alteration to the direction of the stagger so that pedestrians face oncoming traffic. Modernised signal installation. Reduction in street furniture clutter.

Special Features: As part of the aim to reduce street furniture clutter, the existing guard railing on the "sheep pen" and adjacent to the kerb were removed. The decision to omit the railings was taken by the Council with the insistence that it was closely monitored using video surveillance as it was acknowledged this was a departure from normal practice. Also a unique feature of the scheme is that all the nearside traffic signals are mounted on lamp columns. A lamp column was designed which satisfied the requirements of both the traffic signal authority (TfL) and the electrical suppliers.

Consultation: In December 1999 questionnaires were distributed to all residents and businesses on the whole High Street enhancement scheme. In conjunction with this an exhibition was held in the Town Hall.

Monitoring	Accidents (PIA)
Before	13 in 3 years
After	9 in 2 1/2 years
	*None of these accidents can be attributed to removal of the guard rails.

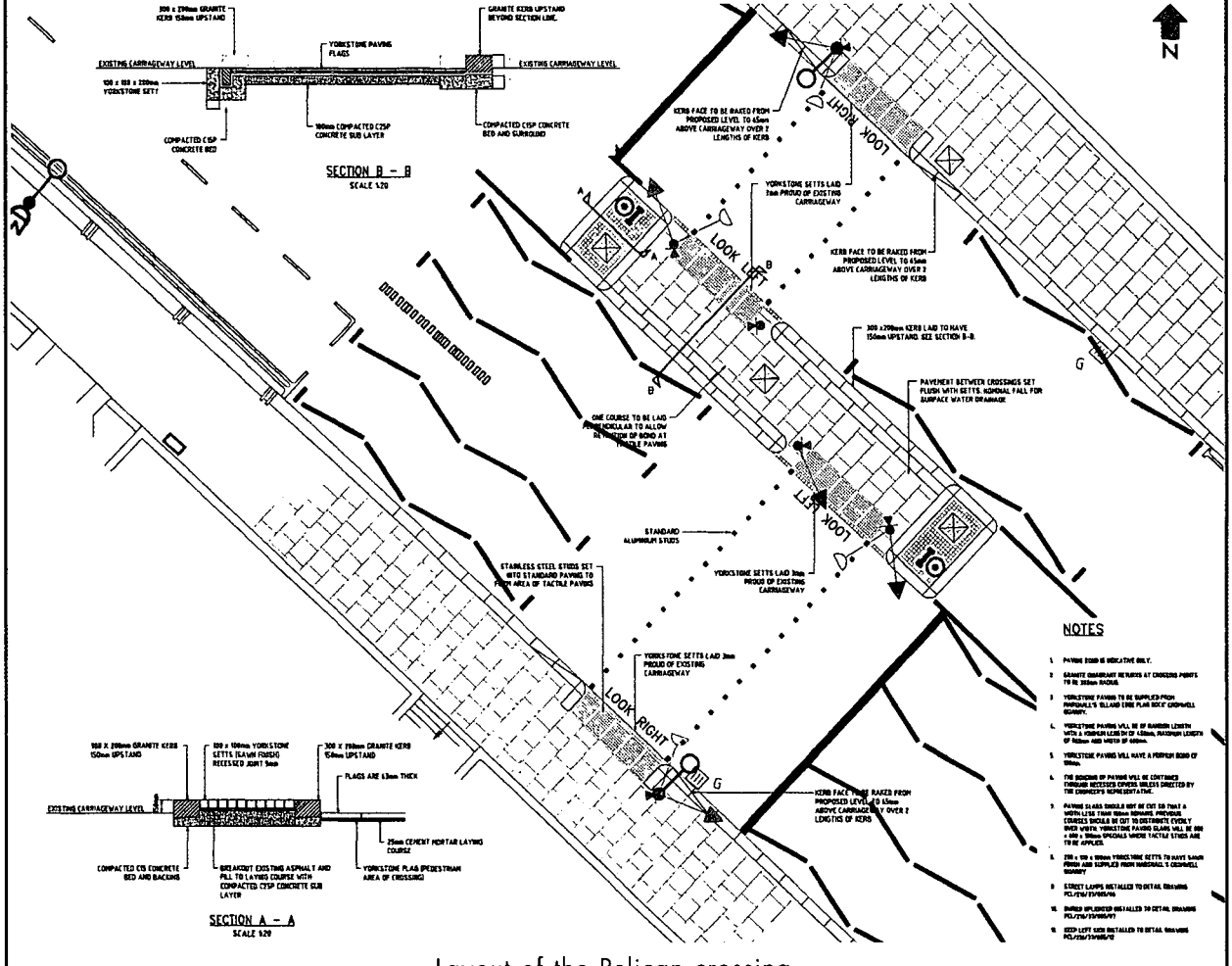
Other Comments: The aim of the scheme to reduce both accidents and street clutter has been very successful. Following the removal of the guard rail surveys have shown that the majority of pedestrians still follow the stagger. After the alterations only one accident involved a pedestrian on the crossing, which guard railing would not have prevented. The scheme has provided a modern, clean appearance that complements the other materials used in the High Street extremely well.

Contact: Peter Weeden ☎ 020 7361 3397 **E-mail:** peter.weeden@rbkc.gov.uk
Authority: The Royal Borough of Kensington and Chelsea

TOWN CENTRE

Technical Data

LOCATION TYPE:	Urban, city centre High Street.
ROAD TYPE AND SPEED LIMIT:	Commercial high street: 30mph.
SCHEME TYPE:	Staggered crossing modernisation.
MATERIALS:	York stone paving; all the street furniture from the "Geo" range by Woodhouse Plc (fabricated from stainless steel); "keep left" hoop signs shown in the picture are lit by uplighters; stainless steel studs.
SIGNS:	Diag.610.
LIGHTING:	A lamp column was designed to incorporate signal heads which satisfied the requirements of both the traffic signal authority (TfL) and the electrical suppliers. To ensure that pedestrians do not trip over the kerbs forming the island during darkness, the street lighting is of the highest standard.
COSTS:	£135,000.



Layout of the Pelican crossing.

2 Top of the Town, Stirling
chicanes, footway widening, one-way streets

Chicane with overrun area for large vehicles.

Implemented: January 1997.

Background: The scheme was part of an overall plan to improve the environment in Stirling town centre by reducing the impact of cars. The previous Central Regional Council and the present Stirling Council recognised the need to introduce new transportation policies to encourage people to reduce the use of private cars and change to alternative means of transport. As part of the new policies it was decided to introduce further pedestrianisation to the main shopping streets in Stirling town centre and traffic calming to the adjacent streets. The "Top of the Town" area is adjacent to the town centre.

Need for Measures: As noted above the measures were intended to reduce the impact of cars in the area and give greater priority to pedestrians. The streets were changed from two-way to one-way operation to discourage through traffic. The one-way system also enabled the footways to be widened to further enhance the facilities for pedestrians. The traffic calming was provided to control speeds particularly for the new one-way system and to keep the area safe.

Special Features: Natural stone surfaces were used where possible and the whole area designed to reflect the traditional nature of the location. Whinstone setts were used in the carriageway at road narrowings and natural stone slabs on the footway. Street lights were chosen which had a traditional appearance. Road signs were minimised and the poles painted black to be as unobtrusive as possible.

Consultation: Extensive consultation was carried out with interested parties. The proposals were discussed with the local Community Council and adjacent businesses as well as statutory bodies such as the police and public utility operators. Subsequently a public consultation meeting was held for a full day in an adjacent hotel with plans on display and staff available to discuss the project. Representatives of the Community Council and businesses attended progress meetings during construction.

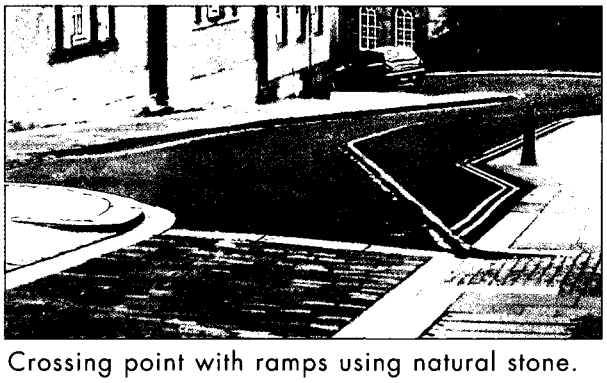
Monitoring	Accidents (PIA)	Speeds (mph) 85th%ile	Traffic Flow (24hr)
Before	2 accidents in 3 years 1 serious, 1 slight	24.75	3,496
After	2 slight injury in 3 years	22.6	2,643*

*Note: traffic changed from two-way to one-way operation

Contact: Brian Roberts ☎ 01786 442487 E-mail: roberts.b@stirling.gov.uk
Authority: Stirling Council

Technical Data

LOCATION TYPE:	Adjacent to town centre, comprising historic, residential and some retail premises.
ROAD TYPE AND SPEED LIMIT:	Unclassified local access roads with a 30mph speed limit as part of the overall urban area.
SCHEME TYPE:	The main physical features of the scheme were a narrowing of the carriageway, a widening of the footways and traffic calming using overrun "chicane" road narrowings.
LENGTH OF SCHEME IN TOTAL:	The area covered was the part of the town in the vicinity of the Castle.
DIMENSIONS:	The carriageway intended for the use of cars and cyclists was reduced to 3m width through the "chicanes" with a 35mm upstand overrun area for larger vehicles, particularly coaches.
MATERIALS:	Normal bituminous carriageway surfacing materials with natural whinstone setts on the carriageway at the road narrowing "chicanes" and natural stone Caithness slabs on the footway where possible.
SIGNS:	Signs were kept to a minimum and only one-way signs (Diag 652 TSR&GD) were used in relation to the scheme with bollards provided in the footways adjacent to the road narrowings.
LIGHTING:	Urbis Albany street lights were used to give a traditional appearance using 70 watt high pressure sodium luminares.
COSTS:	£380,000.00.



Crossing point with ramps using natural stone.

OTHER COMMENTS: Extensive consultation was carried out with all interested parties including a full day's consultation/display of proposals for the general public in an adjacent hotel. The general reaction was positive to the proposals. The main features to assist pedestrians were the widening of the footways and the provision of the traffic calming to control vehicle speeds thereby maintaining the good road safety record of the area. The scheme was specifically designed to blend in with the historic nature of the location using natural materials where possible. Street furniture was chosen to have a traditional look and all sign poles and lighting columns painted black to enhance their appearance. The scheme is considered to be a success having achieved the objective established at the outset.

More Recent Schemes

RURAL

Case Studies 3-13

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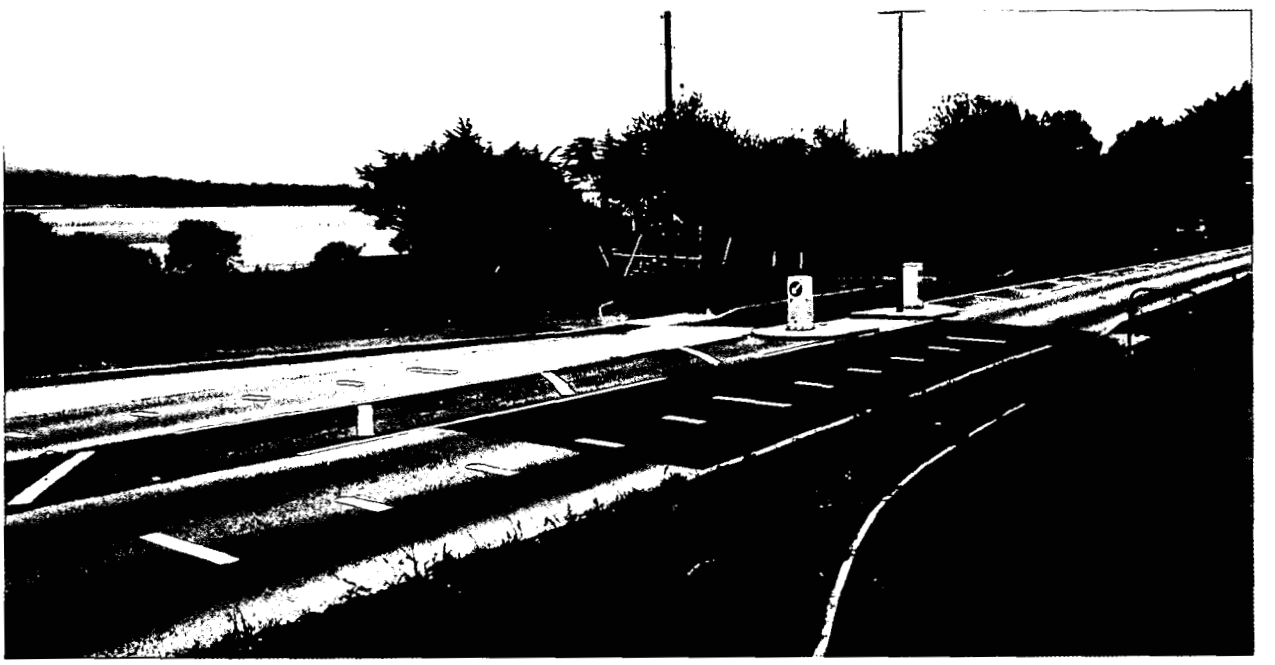
3 A361 Ashford, Nr Barnstaple, Devon

interactive signs, speed camera, coloured surfacing, refuge islands



Cyclist and pedestrian crossing.

Implemented: April 2002

Background: A longstanding accident history coincided with the implementation of part of the National Cycle Network and a long distance footpath (the Tarka trail). There was no safe road crossing linking the village of Ashford to the cycle route and footpath. Expansion of a nearby garden centre provided the opportunity to obtain S106 funding to create the new crossing point.

Need for Measures: Accident history, relatively high traffic flows and speed and no crossing facilities for cyclists and pedestrians.

Measures Installed: A new cycleway/footway leading to a relocated refuge. Coloured anti-skid surfacing together with interactive speed warning signs on the approaches (activated when drivers exceed the 40mph limit). A speed camera was also installed.

Interactive speed warning signs on approach to crossing and junction.

Special Features: Scheme developed in partnership with the developer to encourage use of the trail by cyclists and walkers.

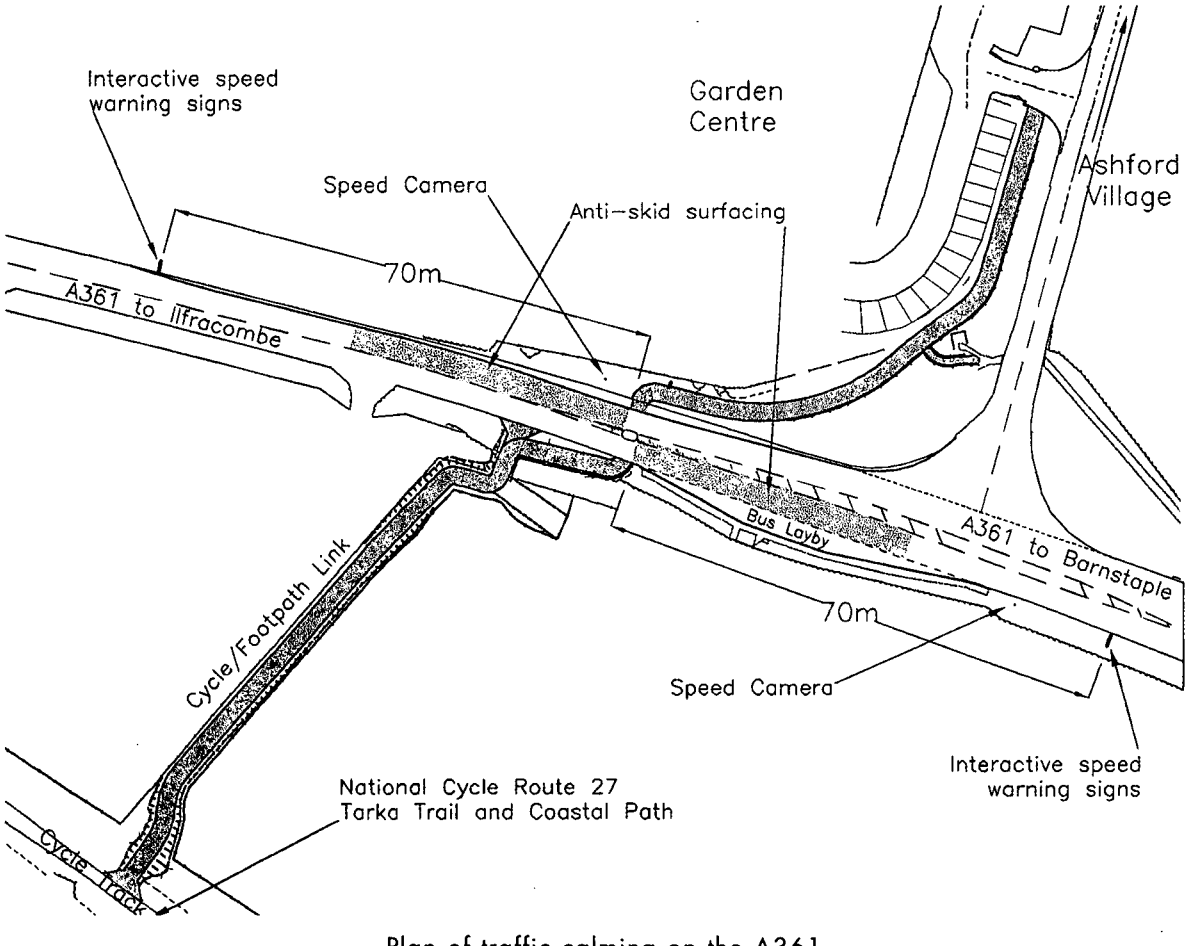
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	2 in 5 years	37	28,000
After	1 in 2 years	n/a	no change recorded

Other Comments: The scheme was welcomed by the local community and users of the trail who say they now feel much safer crossing here.

Contact: David Netherway ☎ 01271 388582 E-mail: dnetherw@devon.gov.uk
Authority: Devon County Council

Technical Data

Location Type:	Rural.
Road Type and Speed Limit:	"A" class, 40mph limit.
Scheme Type:	Traffic islands, coloured anti-skid surfacing, interactive speed warning signs, speed cameras.
Length of Scheme in Total:	145m.
Materials:	SMA anti-skid surfacing.
Signs:	Warning signs and markings to TSGRD.
Lighting:	As existing (see photograph).
Costs:	Approximately £60,000, including developer contributions through S106 Agreement.



Plan of traffic calming on the A361.

4 Bishop's Sutton Village, Hampshire **gateways, and review of road markings**

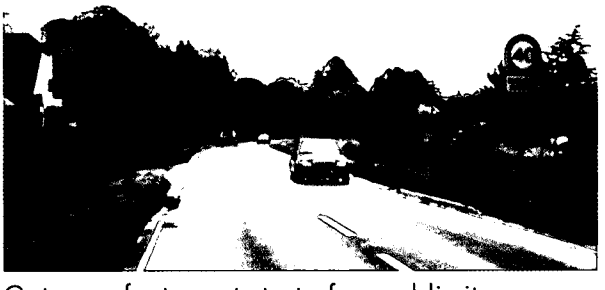
Centre lines removed on straight sections of road.

IMPLEMENTED: April 1999.

BACKGROUND: The B3047 through the village was previously the A31 Primary Route until a by-pass was constructed in 1986, although there were no environmental measures taken at that time. In 1998 the Parish Council expressed an interest in the County Council's Parish Partnership Programme, where, as well as providing an advisory service to help address local priority issues, Hampshire County Council will also match any locally generated funds. However, investigations showed a high injury accident rate through the village, albeit with no particular pattern as to location or cause. Consequently, the resulting scheme was funded entirely by the CC's Casualty Reduction Programme.

NEED FOR MEASURES: High injury accident rate.

MEASURES INSTALLED: Centre line markings removed along relatively straight sections of road and replaced by edge of carriageway markings 5.3m apart. Centre-line markings revised at wide section of carriageway either side of road junction to form hatched area with buff coloured infill. Centre-line markings retained through bends. Gateways were installed at speed limit terminal points comprising enhanced signing, buff coloured textured surfacing and yellow reflective bollards. At the east end, where the carriageway was straight, a 6m wide pinch-point was constructed. At the west end, which was on a bend, the centre-line was widened to incorporate hatching.



Gateway feature at start of speed limit.

SPECIAL FEATURES: To supplement the dashed edge of carriageway markings across private accesses, red reflective road studs were installed. At one location, to further highlight a "Slow" road marking, it was laid on a red surfacing patch.

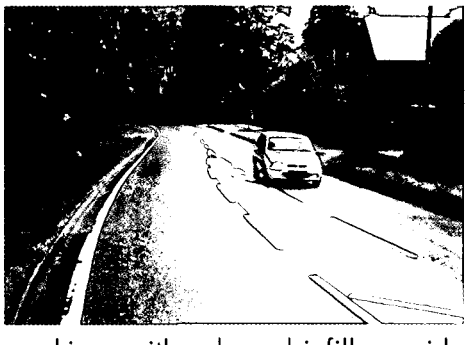
CONSULTATION: Prior to any design work, informal site meetings were held with representatives of the Parish Council to identify priority local issues. Consultation of the initial proposals with the local community, which did not subsequently require any significant amendments, was undertaken by the Parish Council, and included a special public meeting.

MONITORING	ACCIDENTS (PIA)	VILLAGE CENTRE 85%ILE SPEEDS (MPH)	
		EASTBOUND	WESTBOUND
BEFORE	8 in 3 years	42	41
AFTER	0 in 3 years	42	40
		No traffic volume data was collected as this was not a priority issue.	

CONTACT: J SOUTAR ☎ 01962 846049 E-MAIL: jim.soutar@hants.gov.uk
AUTHORITY: HAMPSHIRE COUNTY COUNCIL

Technical Data

LOCATION TYPE:	Village.
ROAD TYPE AND SPEED LIMIT:	Rural B-class, 40 mph.
SCHEME TYPE:	Gateways, road markings.
LENGTH OF SCHEME IN TOTAL:	1.2km.
DIMENSIONS:	Existing carriageway width varies between 6.5m and 5.5m. Width of Gateway Pinch-Point 6.0m. Width between edge of carriageway markings 5.3m. Length of textured surfacing at Gateways 10m.
MATERIALS:	Buff Imprint textured surfacing (45° herringbone pattern) at Gateways. Glasdon Jubilee bollards with full length yellow reflective sleeves at Gateways.
SIGNS:	Speed limit signs with yellow backing boards incorporating village name, mounted on black steel posts.
LIGHTING:	None.
COSTS:	£15,000 for works.



Centre line hatch markings with coloured infill on wider section of road.

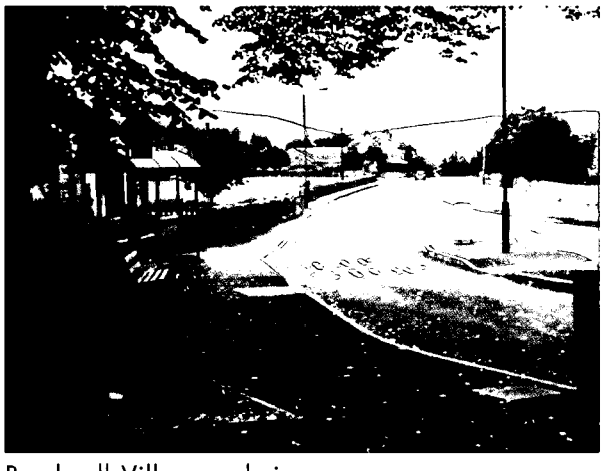
OTHER COMMENTS: The reason that there has no meaningful reduction in traffic speeds, as has occurred at some other road marking schemes, is likely to be that volumes are low so drivers do not continuously have to consider the activities of opposing vehicles. Nevertheless, the Parish Council has considered that conditions have improved for local residents. This could be because the edge of carriageway markings encourage drivers to travel further away from footways and verges than was previously the case.

Despite the lack of change in vehicle speeds, there has been a significant reduction in injury accidents. No user studies have been undertaken but it is surmised that the series of changes in the road marking system as drivers pass through the village leads to greater levels of concentration, whether consciously or unconsciously. As a consequence, they are thus in a better position to react to incidents and hazards.

One householder did complain about the noise generated by the Imprint textured surfacing. Although no noisier than the adjacent dressing, it is of a different "quality". No action was taken at this scheme but as part of the development of subsequent ones, local representatives are advised to visit existing sites to judge whether the material would be acceptable to their community.

5 Bradwell Village, Peak District, Derbyshire

traffic signals with shuttle working, narrowing, wider footways



Bradwell Village calming measures.

Implemented: March 2002

Background: Bradwell is in the heart of the Peak District. The B6049 passes through the village centre linking with other strategic "A" roads in the local highway network. The road carries significant traffic flows, a high proportion of which are heavy vehicles. This area is characterised by much heavy industry, notably quarrying and stone processing. The road is also a bus route and is used as the route to school.

Need for Measures: Restricted carriageway widths in the centre of the village (as low as 4.60m), allied with narrow footways (as low 0.60m) and restricted forward visibility resulting in a very uncomfortable and threatening environment for pedestrians using the footway or trying to cross. It was also the location of the School Crossing Patrol (SCP) that for a long time was vacant due to fears for personal safety. The injury accident at this location involved a collision with the SCP. The limited carriageway width relied on a "give and take" system and resulted in hard braking and many minor vehicle collisions, especially opposing heavy vehicles, with regular mounting of the footways.

Measures Installed: Traffic signals to provide "shuttle" working, to remove vehicle conflicts and allow widening of footways. New pedestrian crossing facility to assist the SCP and children/ parents as a stage in the signal cycle. One-way working introduced on a minor side road to ensure successful operation of the signals. These measures supported an earlier scheme of lane narrowing, footway widening and bus waiting facilities.

Special Features: Pedestrians: Greatly increased footway widths in places up to three times the existing. Infra red detection at crossing to detect pedestrians both waiting or crossing providing a "puffin" style facility.

Buses: Additional detection to allow bus movements into and out of a local depot within the controlled area.

Other Traffic: Signals "rest" at all-red to control vehicle speeds within the village and allow faster response to both pedestrians and waiting vehicles when called. Microwave detection provided in addition to loops to extend the clearance for slower vehicles such as tractors.

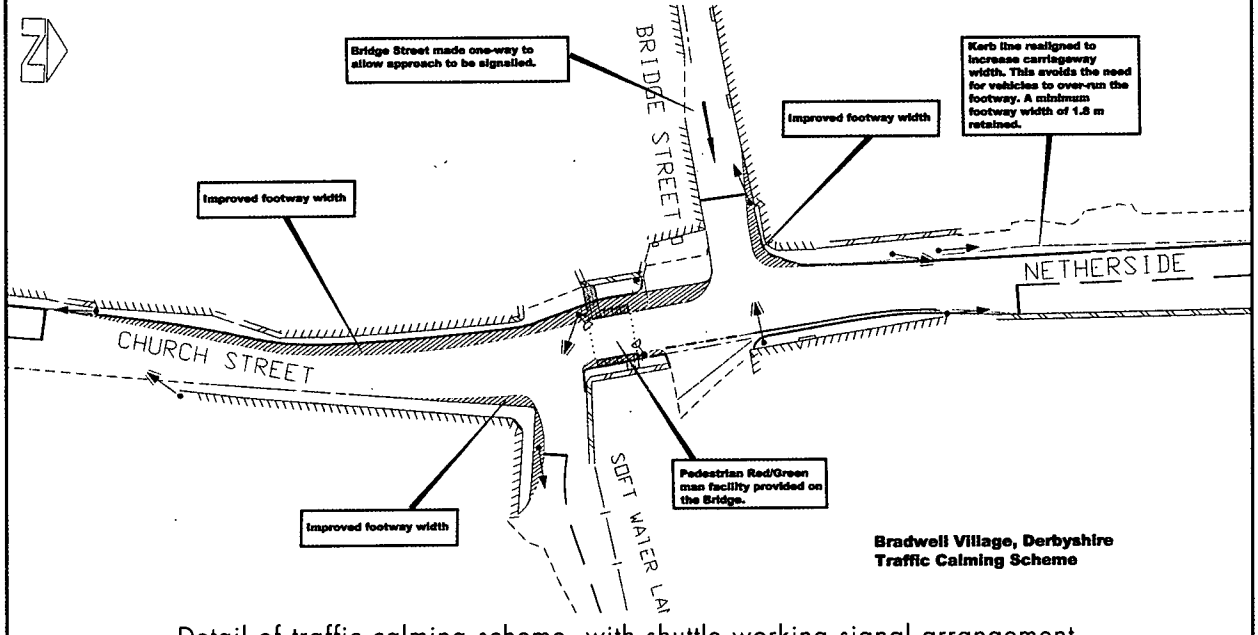
Consultation: Much of the informal preliminary consultation was undertaken by the Parish Council who developed "ownership" of the scheme. Detailed and statutory consultation carried out by the County Council. Consultation with local residents (public exhibition and letter drop), parish council, local County Councillor, Peak District National Park, Emergency Services, bus operators and internal Heritage and Design Group.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (12hr)
Before	1 in 3 years	-	3,400 (1997)
After	0 in 12 months	-	no update available

Contact: Philip Bellefontaine ☎ 01629 580000 E-mail: Philip.Bellefontaine@derbyshire.gov.uk
Authority: Derbyshire County Council

Technical Data

LOCATION TYPE:	Rural village.
ROAD TYPE AND SPEED LIMIT:	B Classified Road, 30 mph.
SCHEME TYPE:	Traffic signals, lane narrowing, pedestrian and bus facilities.
LENGTH OF SCHEME IN TOTAL:	1200m.
SIGNS:	Advance traffic signal warning signs. Review and rationalisation of existing signage to reduce clutter.
COSTS:	£60,000.



Detail of traffic calming scheme, with shuttle working signal arrangement.

OTHER COMMENTS: The scheme is operating well with very much reduced speeds (though no surveys). The traffic signals rest on red so this helps slow incoming vehicles. There is regular use of the widened footway and pedestrian crossing facilities with no reports of congestion, even at peak times. The scheme remains well received and other villages are asking for a similar treatment.

6 High Street, Brant Broughton, Lincolnshire

kerb build outs, gateway signing, road narrowing

Southern gateway to village.

Implemented: May 2002.

Background: Brant Broughton is situated approximately 10 miles southwest of Lincoln City Centre. The main road through the village is a "C" Class road which joins the A17 Sleaford-Newark route one mile south of the village.

Need for Measures: This traffic calming scheme was introduced to reduce the speed of vehicles going through the village centre, many of which were haulage vehicles from a local company. The width and visual openness of the road contributed towards speeding traffic.

Measures Installed: The scheme consists of physical and visual narrowing of the road. The scheme also involved gateway features at both ends of the village with "30mph" and "Brant Broughton Village" signs. After the scheme was complete, the road was surface dressed with parking areas dressed in an uncoated gravel to distinguish them visually.

Consultation: Consultation took place between Lincolnshire County Council and Brant Broughton Parish Council at various stages prior to construction work commencing. Residents were also given the opportunity to put their views forward to the Parish Council.

Kerb buildout (showing tactile crossing points and gravelled parking area).

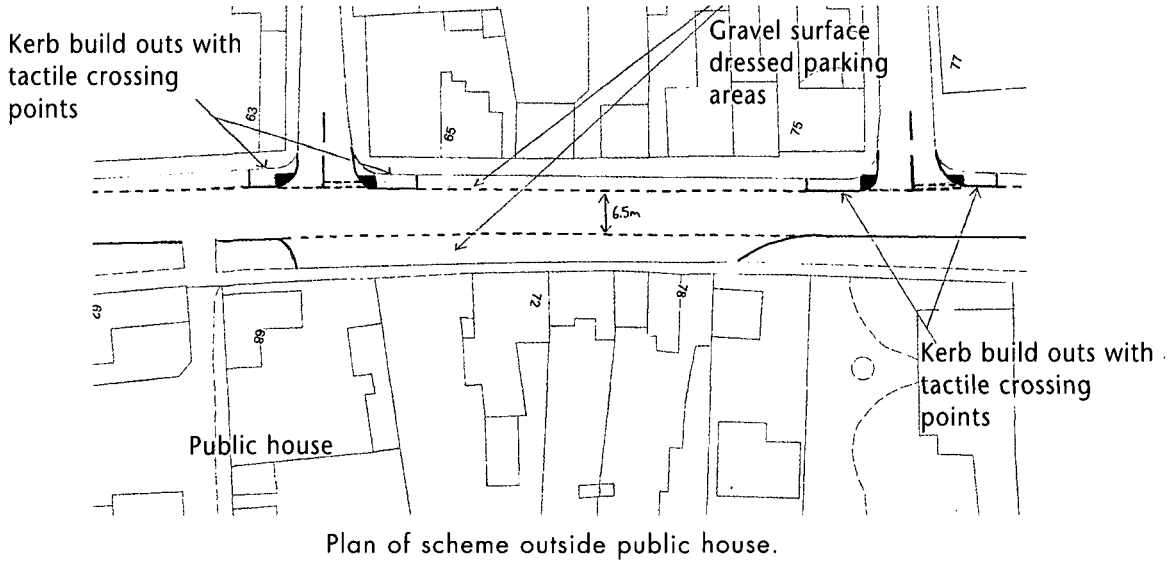
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	4 in 5 years	42	2,402
After	0 in 3 years	37	2,761

Other Comments: Traffic flows have risen slightly, but from public and Parish Council feed-back, confirmed by recent monitoring, speeds of traffic have generally been reduced. The speed limit through the village was, and still is 30mph. Prior to traffic calming, both to the north and south of the village was national speed limit, however as part and parcel of the scheme a 40mph limit north of the village for 1/4 of a mile has been implemented.

Contact: Nick Marsh ☎ 01522 553104 **E-mail:** nick.marsh@lincolnshire.gov.uk
Authority: Lincolnshire County Council

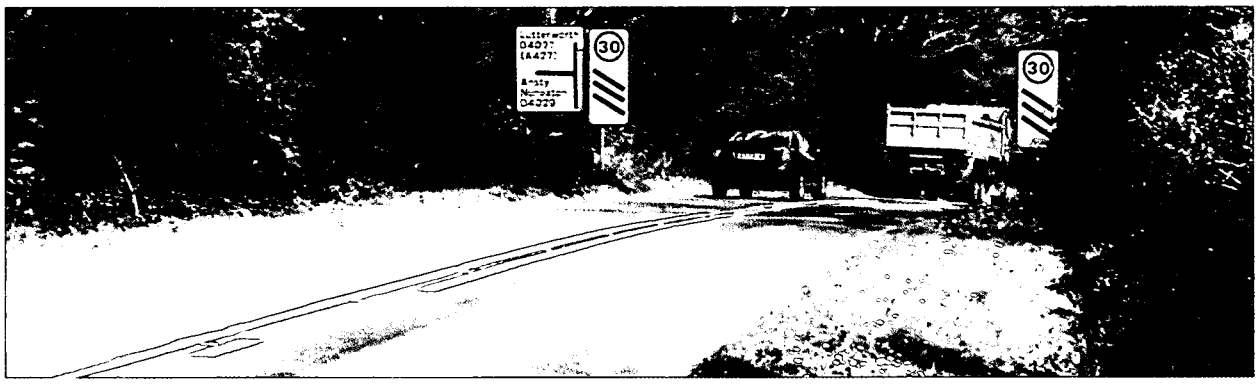
Technical Data

Location Type:	Village located on "C" road which joins the A17 Newark to Sleaford road a popular route.
Road Type and Speed Limit:	C road (Link Ref C001).
Scheme Type:	The scheme involved a series of kerb buildouts at various junctions to physically narrow the road, which in turn has created edge of carriageway parking, allowing easy parking for the local shops and residents. The parking area is 1.8m wide denoted by intermittent lines (1m wide – 1m gap). By constructing these junctions we have created a wider footway, and "buff" tactile crossing points have been installed. Parking areas have also been provided outside the public house and Rose Cottage (see plan).
Length of Scheme in Total:	1300m.
Materials:	For the tarmacced areas full construction. Kerbs for buildouts, including kerbs n.e. 12m radius. Buff coloured tactile paving slabs at dropped crossing points. White lining for parking areas (1m line – 1m gap) 100mm wide. Edge lines and new Give Way lines at junction Yellow bar markings of 300mm wide were also used 100m, 200m and 300m prior to 30 mph gateway signs.
Signs:	Gateway signs (non standard). In the 40 mph approach to the scheme 750mm diameter MPH signs were used with 300mm repeaters. (TS670).
Lighting:	Existing.
Costs:	£22,700. The scheme has been funded on a 50/50 basis between Lincolnshire County Council and Brant Broughton Parish Council.



Plan of scheme outside public house.

7 Brinklow Village, Warwickshire
vehicle activated signs, coloured surfacing, count down signs



Coventry Road eastbound approach - count down signs to speed limit.

IMPLEMENTED: November 2001.

BACKGROUND: The roads passing through Brinklow Village are local distribution roads, with a high volume of through traffic, including HGVs and Farm Traffic. There a number of residential properties fronting onto the roads. There had been six recorded injury accidents within the last three years. Local concerns regarding the speed of traffic travelling through the village prompted the Parish Council to approach Warwickshire CC for Environmental Traffic Calming. Warwickshire County Council has a budget for Environmental Traffic Calming, where the County Council contribute 75% up to a maximum of £10,000 towards the cost of a scheme, with the Parish Council funding the rest.

NEED FOR MEASURES: The traffic calming measures are intended to reduce the speed of vehicles travelling through the village.

MEASURES INSTALLED: The high volume of through traffic meant that the use of physical features such as road humps would be unsuitable in this village environment. The measures installed included three speed triggered, fibre optic signs, red coloured surfacing with "30" roundel through the village and speed limit count down signs on the Coventry Road and Broad Street approaches.

Fibre optic sign on Coventry Road after start of 30mph limit.

SPECIAL FEATURES: The Fibre optic flashing signs trigger a "TOO FAST" message and a "30"mph speed limit sign when drivers exceeded the 30mph speed limit. An MVD mounted on the top of the sign is used for speed detection. These signs where supplied by Dambach UK.

CONSULTATION: Consultation was carried out with the Parish Council and the Warwickshire Constabulary. This involved attending Parish Council meetings and two way correspondence via letter and telephone.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)						TRAFFIC FLOW
		COVENTRY ROAD (SITE 1)		BROAD STREET		COVENTRY ROAD (SITE 2)		
		IN	OUT	IN	OUT	IN	OUT	
BEFORE	6 slight in 3 years	43	43	34	37	36	34	5,700 (vehs in 24 hrs)
AFTER	5 slight in 2 years	35	38	31	34	37	36	No change

OTHER COMMENTS: This is the first environmental traffic calming scheme where we have installed the smaller size fibre optic sign incorporating the 450mm speed sign (750mm wide by 112mm high). In the past we have installed fibre optic signs incorporating a 600mm speed sign these are approximately 1150mm wide by 1600mm high, and have resulted in residents complaining about the visual intrusion. There has been no unfavourable reaction from the local community to this scheme.

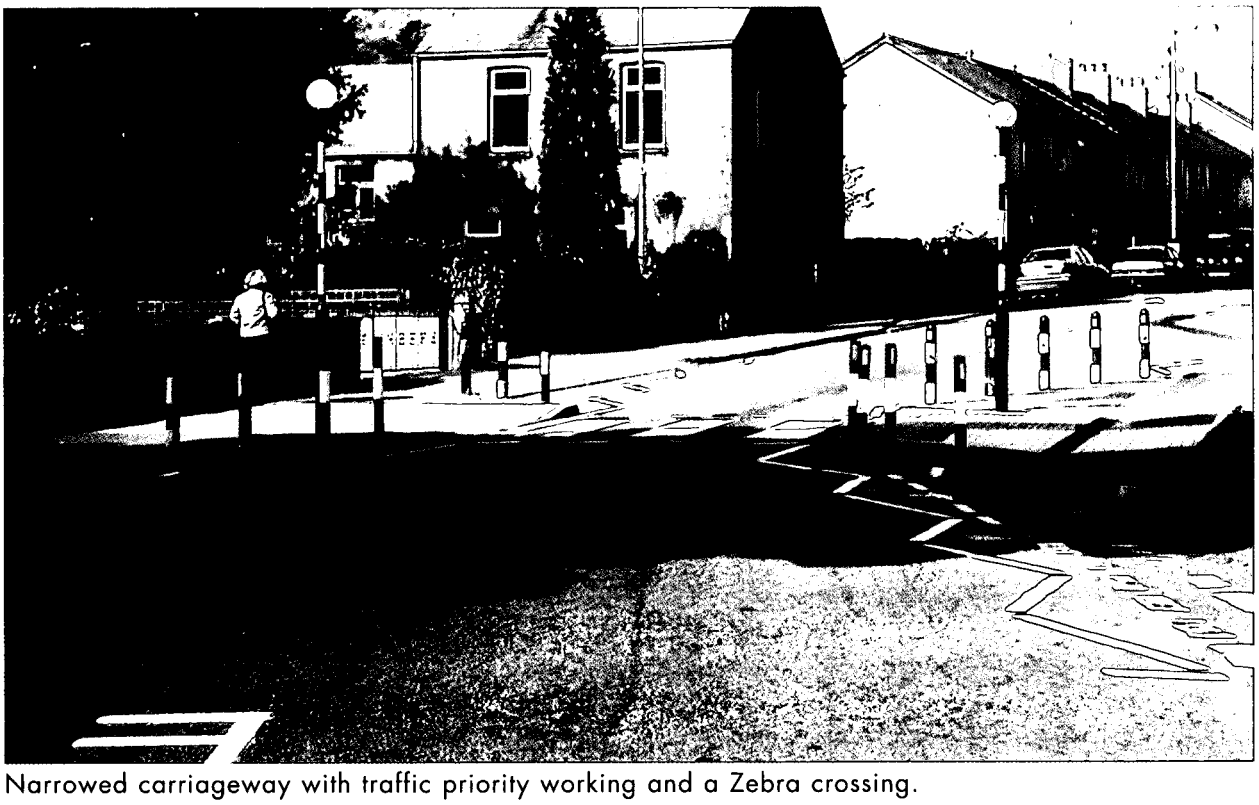
CONTACT: MALCOLM GRAHAM ☎ 01926 412650 E-MAIL: malcolmgraham@warwickshire.gov.uk
AUTHORITY: WARWICKSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Rural village.
Road Type and Speed Limit:	B4027 Coventry Road: 30mph speed limit. B4027 Broad Street: 30mph speed limit.
Scheme Type:	Vehicle activated signs and road markings.
Length of Scheme in Total:	1.12km.
Costs:	Total cost £13,500. The Fibre Optic signs cost £3,176.53 each.

Plan of Brinklow Village centre – shows location of 30mph roundels and a vehicle activated sign.

8 Tongwynlais, Cardiff
20mph zone, narrowings, Zebra crossings and gateways



Narrowed carriageway with traffic priority working and a Zebra crossing.

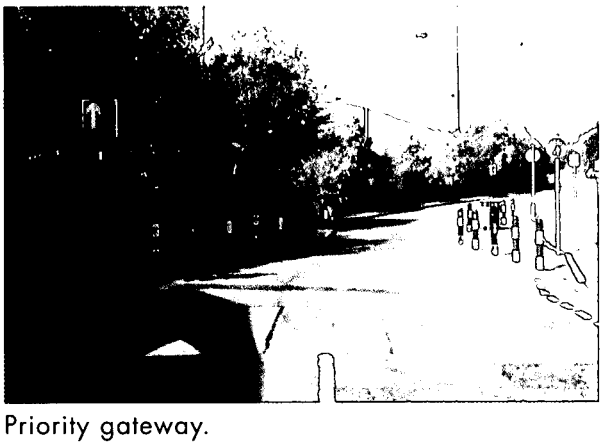
Implemented: "Narrowings: March 1994 and a 20mph zone was added in July 2002.

Background: Tongwynlais is a small village on the on the edge of the Valleys and on the Cardiff end of the narrow Taff Gorge. It attracts visitors from outside the area because of the unusual Castle which towers on the hillside above. The major concern of the residents was the amount of speeding traffic through the quiet village; and the safety of pedestrians.

Need for Measures: To slow and reduce traffic and make provision for safer pedestrian crossing points.

Measures Installed: Eight sets of speed cushions, two narrowed priority zebra crossings and two gateways.

Special Features: Formalisation of footway in front of garage.



Priority gateway.

Consultation: School, church, emergency services, Bus Company and residents, by means of letters and public exhibitions.

Monitoring	Accidents (PIA)	Speeds (85%)	Traffic Flow (two way 24hr hour flow
Before	2 in 3 years	39	11,900
After (1992–1995)	2 in 3 years	37	11,700

Other Comments: The scheme has been reasonably effective in reducing speeds and traffic flow, with the majority of residents very happy with the outcome.

Contact: Mark Foweraker ☎ 029 20873303
Authority: Cardiff City Council

Technical Data

Location Type:	Village including primary school, adjacent to historic tourist attraction..	
Road Type and Speed Limit:	Semi-urban classified road: 30 mph.	
Scheme Type:	20 mph zone. Speed cushions. Narrowed zebra crossings. Village gateways.	
Length of Scheme in Total:	0.8km.	
Dimensions:	Cushions	
	Height:	100mm
	Width:	1600mm
	Length:	3500mm
	Narrowed zebra crossings	
	Height:	100mm
	Width:	3650mm
	Length:	24.0m
Materials:	Cushions:	Red Tarmac
Signs:	20mph zone:	Priority narrowing. Zebra crossing.
Lighting:	Steel columns.	
Costs:	£60,000.	

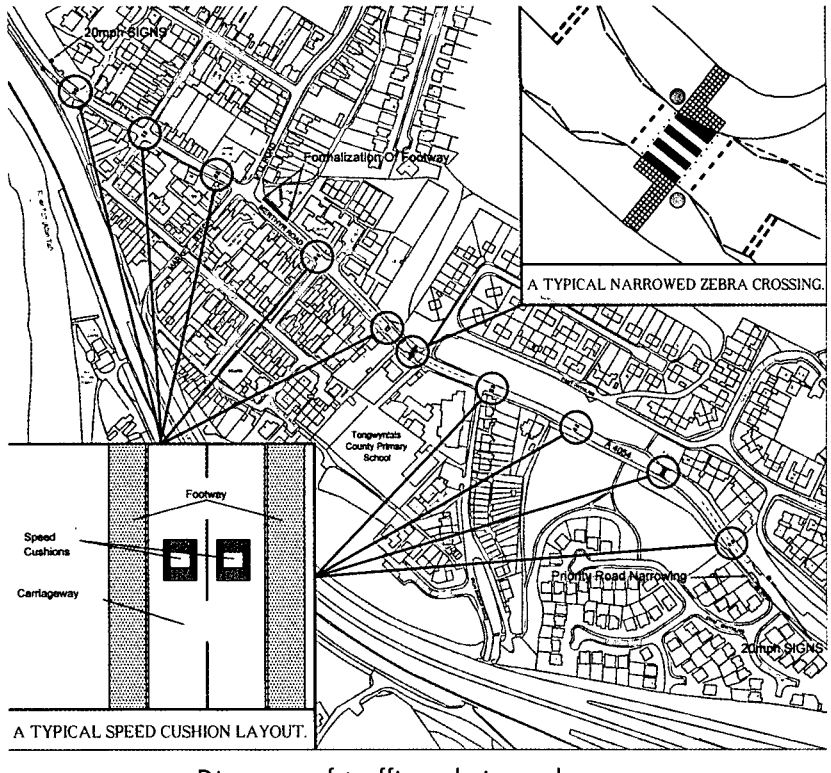


Diagram of traffic calming scheme.

9 Filleigh Village, South Molton, North Devon

gateways, speed limits, road markings

Approach to village from Barnstaple.

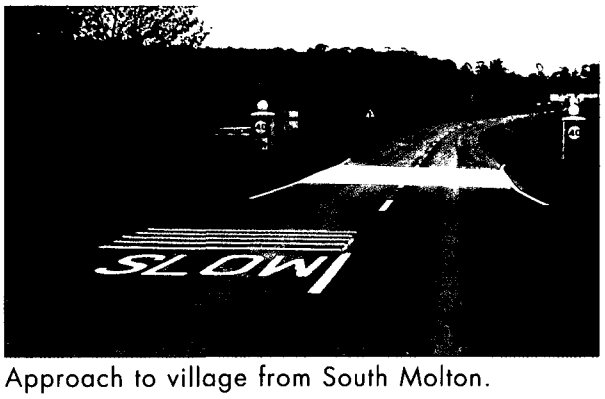
Implemented: January 2002

Background: Filleigh, a small rural village, was by-passed 12 years ago (it was a former trunk road). It has a school, homes and parkland adjacent to the route. Traffic speeds have long been a concern, especially near a road junction. Expansion of a large local business provided the opportunity to address problems.

Need for Measures: Traffic speeds and accident history.

Measures Installed: Gateways, 30 and 40mph speed limits, signs and road markings.

Special Features: The gateways were designed to reflect the estate building style of the Castle Hill Estate.



Approach to village from South Molton.

Consultation: Detailed consultation was undertaken with the police, school, residents, estate manager and local businesses.

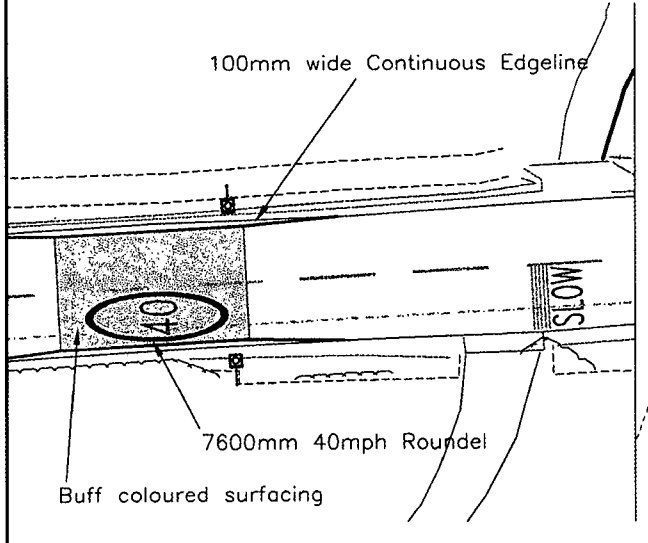
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (16hr)
Before	2 in 5 years	38	2,000
After	none	37	no change

Other Comments: Although speeds have not reduced as much as hoped, the community are happy with the changes and accident figures have reduced. Recently temporary interactive speed warning signs have been used at either end of the village to reinforce the speed message.

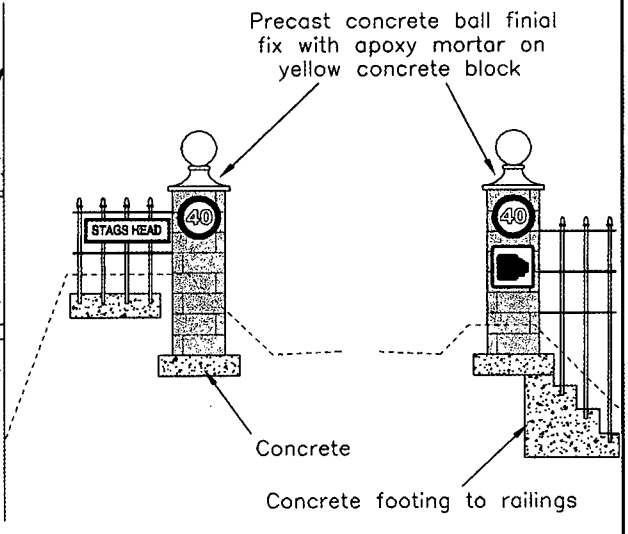
Contact: David Netherway ☎ 01271 388582 E-mail: D.Netherway@devon.gov.uk
Authority: Devon County Council

Technical Data

Location Type:	Rural village.
Road Type and Speed Limit:	Classic C Road (former trunk road), no previous speed limit.
Scheme Type:	Gateways and speed limit with signing.
Length of Scheme in Total:	2km.
Materials:	Special concrete blocks with steel fencing for gateways and coloured surfacing. (See drawing and picture).
Signs:	30mph and 40mph signs, speed limit roundels, road markings.
Lighting:	None.
Costs:	£10,000 part funded by S106 Agreement with development.



Detail of road narrowing.



Detail of Gateway feature.

Detail of traffic calming measures at Filleigh Village.

10 Crawley Road, Horsham, West Sussex
cycle bypass, give ways, priority workings

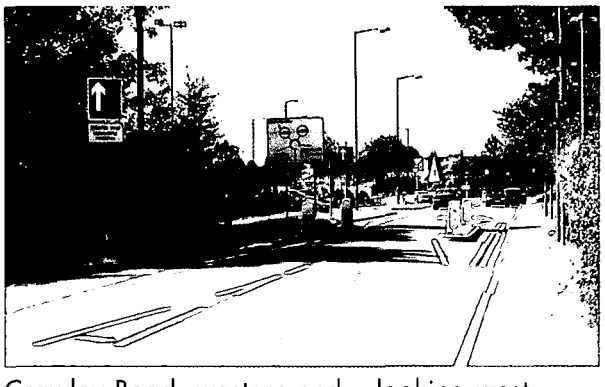
Crawley Road, eastern end – looking east at road narrowing with priority.

Implemented: June 2000.

Background: Crawley Road is a busy route which links Horsham Town Centre with the A264 (route to Gatwick Airport). However, it is a residential road with shops, other commercial businesses and communal buildings situated along it, a high number of pedestrian and other vulnerable road users and a high personal injury accident record.

Need for Measures: The measures were intended to address the speed of vehicles and thus the safety of pedestrians and other vulnerable road users. The measures are intended to slow vehicles without causing a migration of vehicular trips to surrounding residential roads. The aim is for drivers to revert to the primary routes leading out of Horsham in this area (Harwood Road, B2195).

Measures Installed: This scheme was originally designed to have road humps, however very strong lobbying from the local Parish Council and bus companies meant that this type of feature was not included in the scheme, and "priority", give way, type features were used.



Crawley Road, western end – looking west (road narrowing).

Consultation: There was full consultation including all statutory consultees and there was also a very close liaison with the Parish Council. There was also a small exhibition for local residents to attend.

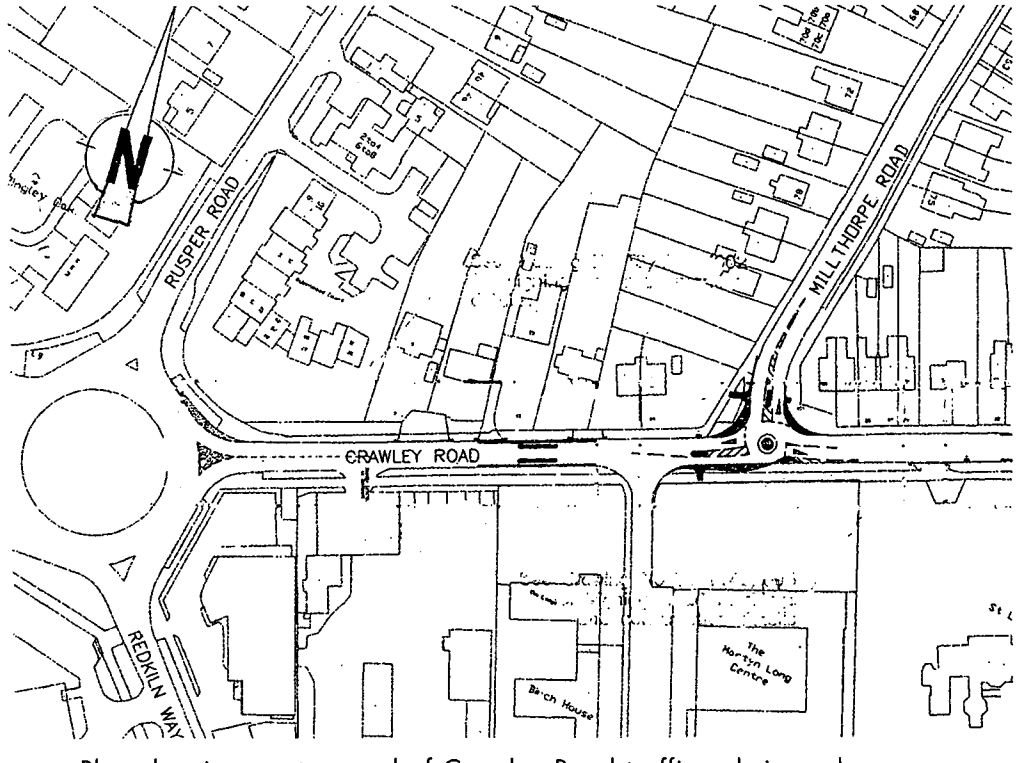
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (12hr)
Before	16 in 3 years	31	7,100
After	11 in 25months	24	6,838

Other Comments: There has been, and still is on occasion, a strong dislike to the use of the priority build-outs in this scheme. Whilst monitoring figures show that conditions as far as speed, flow and the number of serious accidents have decreased, the total number of accidents has not, but the pattern has settled down with greater familiarity.

Contact: Alex Sharkey ☎ 01243 777746 **E-mail:** Alex.Sharkey@west sussex.gov.uk
Authority: West Sussex County Council

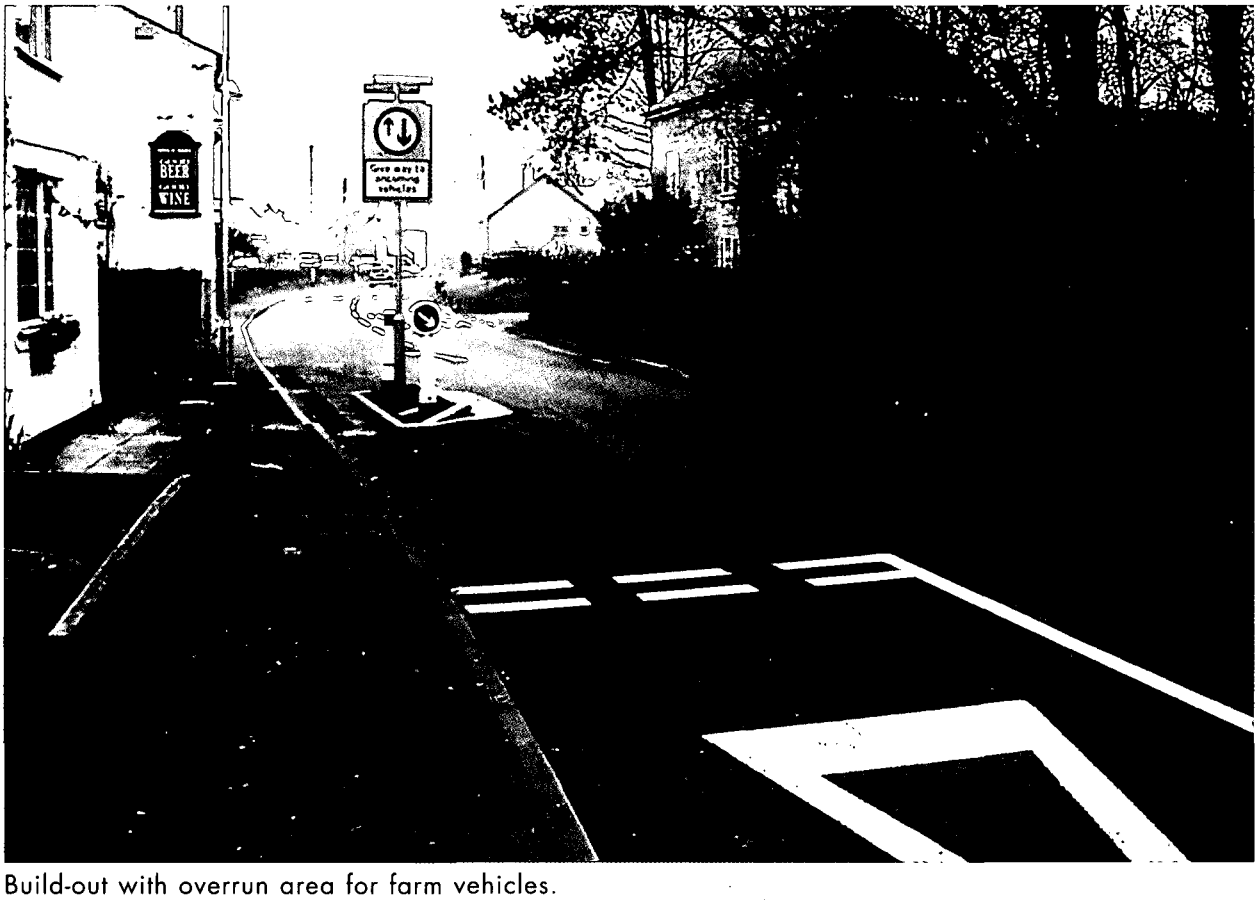
Technical Data

Location Type:	Residential with unclassified roads containing local shops and amenities for the general community.
Road Type and Speed Limit:	Residential 30mph.
Scheme Type:	The scheme depends on horizontal deflection of traffic by creating slim traffic islands (allowing for cycle bypass), give ways and priority workings.
Length of Scheme in Total:	1km.
Dimensions:	Road narrows to 4m between the double slim islands give way features and 5m on the priority working slim islands.
Materials:	Basic materials: Basic kerbs, blacktop for all features.
Signs:	All traffic signs comply with TSRGD.
Lighting:	Some lighting columns were altered to give enhanced lighting by new features.
Costs:	£83,100.



Plan showing western end of Crawley Road traffic calming scheme.

11 Northwich Road, Warrington
"Trief" kerbs, build-outs, narrowing



Build-out with overrun area for farm vehicles.

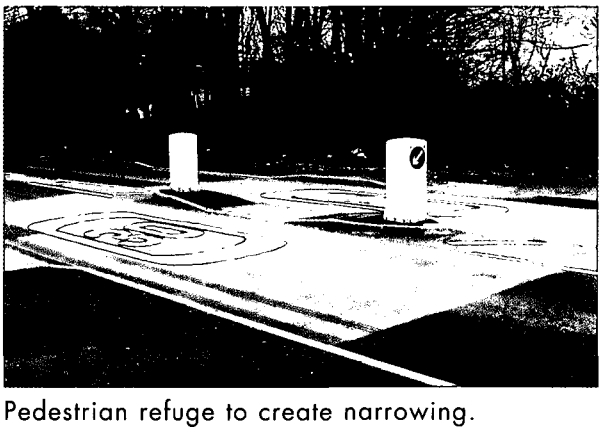
IMPLEMENTED: February 2002

BACKGROUND: The A559 connects Northwich with the M56 motorway and is parallel to the M6. In peak periods it is used as an unofficial alternative route to the motorway. The area is largely rural with isolated communities along its length.

NEED FOR MEASURES: A long campaign by the local community to remove HGV's from the road and reduce the speed limit. Speed limit was reduced in 2000 to 30mph, but monitoring showed the 85%ile speed to be in excess of 40mph.

SPECIAL FEATURES: Overrun areas included at the narrowing to accommodate large farm machinery .

CONSULTATION: Consultants worked with residents, the Parish Council and the emergency services.



Pedestrian refuge to create narrowing.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (24HR)
BEFORE	2 in 3 years	40.6	9,501
AFTER	2 in 30 months	32	8,933

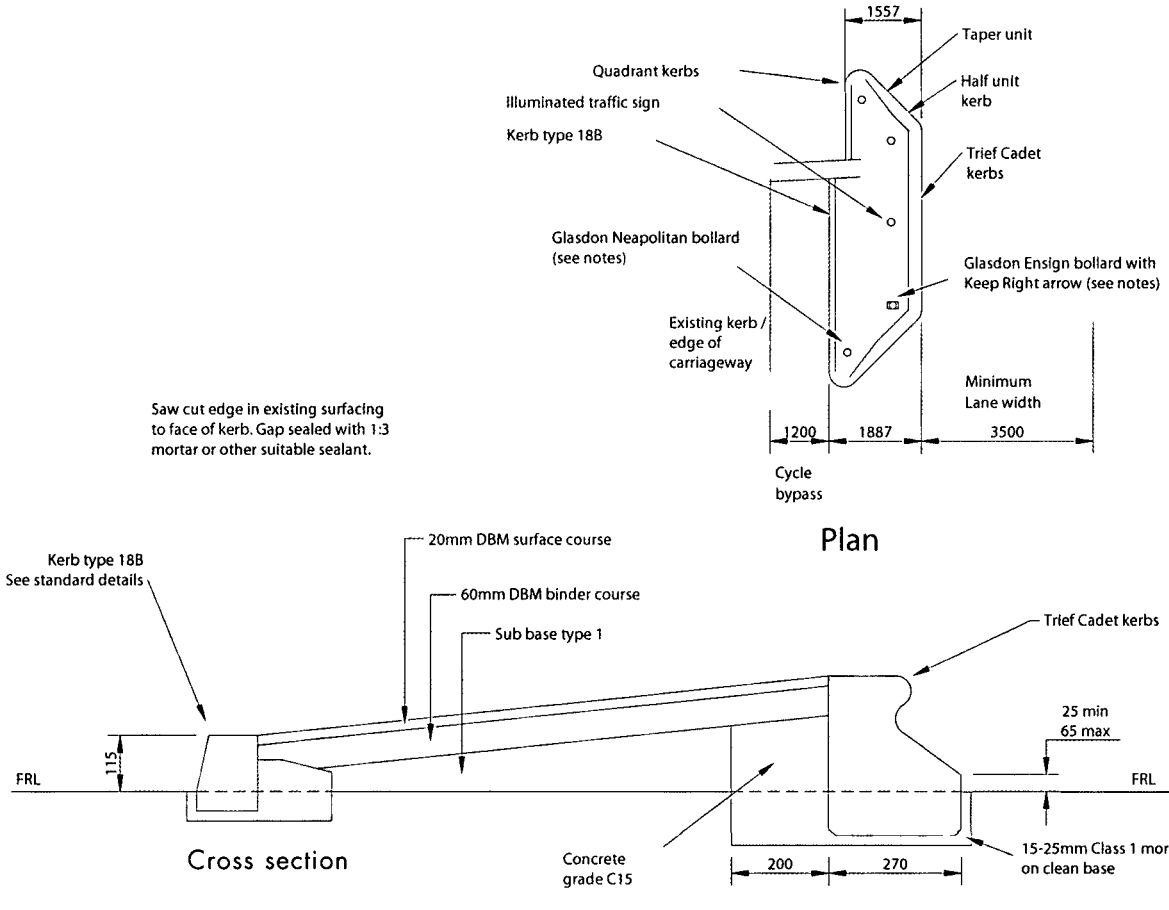
OTHER COMMENTS: Adverse comments from commuters using the road, complaining that they had to go slower! A survey of residents' views is being undertaken.

CONTACT: S HALEWOOD ☎ 01925 442634 E-MAIL: shalewood@warrington.gov.uk
AUTHORITY: WARRINGTON BOROUGH COUNCIL

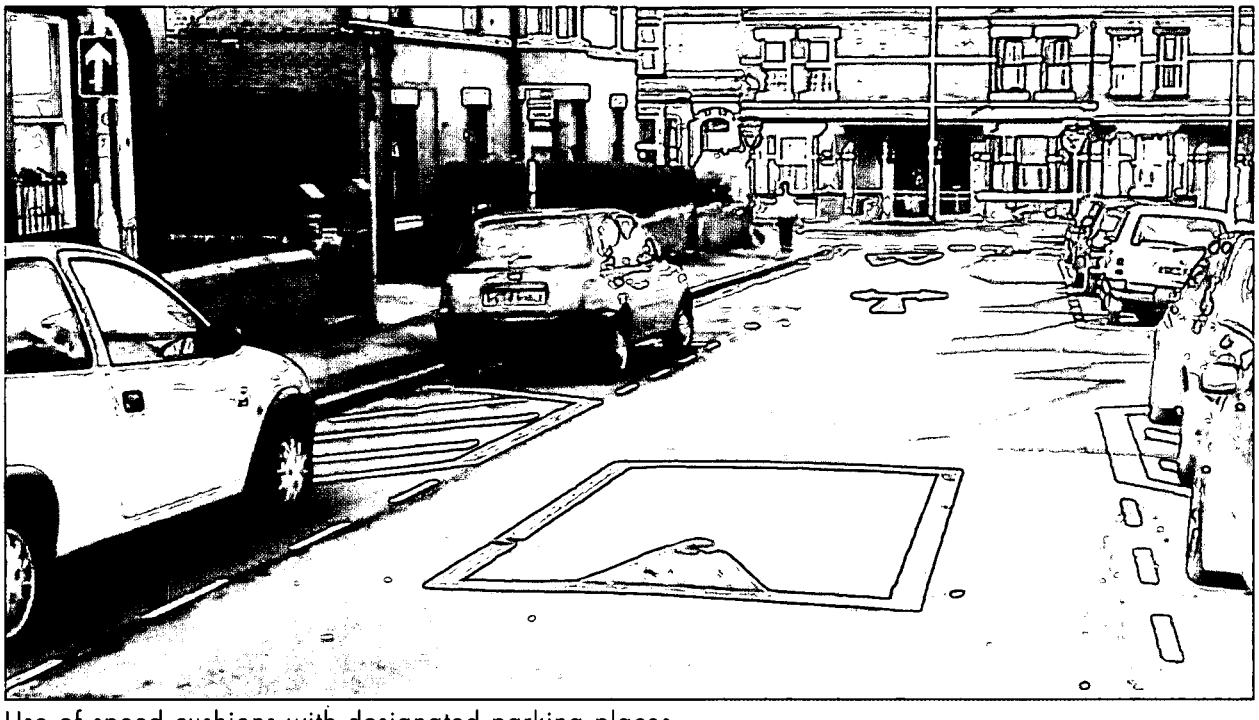
Technical Data

Location Type:	Rural village.
Road Type and Speed Limit:	Narrow single carriageway 30 mph. "A" road and a bus route.
Scheme Type:	Two priority workings and three central islands.
Length of Scheme in Total:	0.8Km.
Dimensions:	Traffic islands: 6m x 1m, lane width 3m Lane width at priority build-out: 3.5m with cycle bypass.
Materials:	Trief cadet kerbs to build outs and islands. Overrun areas included to accommodate large farm machinery.
Signs:	Diag 615, priority to oncoming vehicles.
Lighting:	New street lighting provided. SON-T on 8m columns.
Costs:	£40,000.

Details of buildout



12 Delamare Street (B5074), Winsford, Cheshire
mini-roundabout, speed cushions, speed tables



Use of speed cushions with designated parking places.

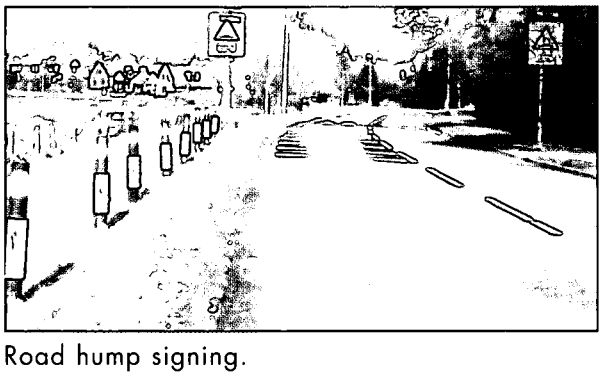
Implemented: February 1999

Background: This is a busy urban classified road with a 30mph speed limit, it is also a route for abnormal loads. There are residential properties, shops and a school, and concerns were expressed about the number of accidents and the volume of traffic.

Need for Measures: Accident history and volume of traffic.

Measures Installed: Mini roundabout, speed cushions and speed tables.

Special Features: The speed tables were surfaced with red "imprinted" asphalt. The measures had to accommodate multi-axle "abnormal load" vehicles.



Road hump signing.

Consultation: Major public consultation with an exhibition and leaflets.

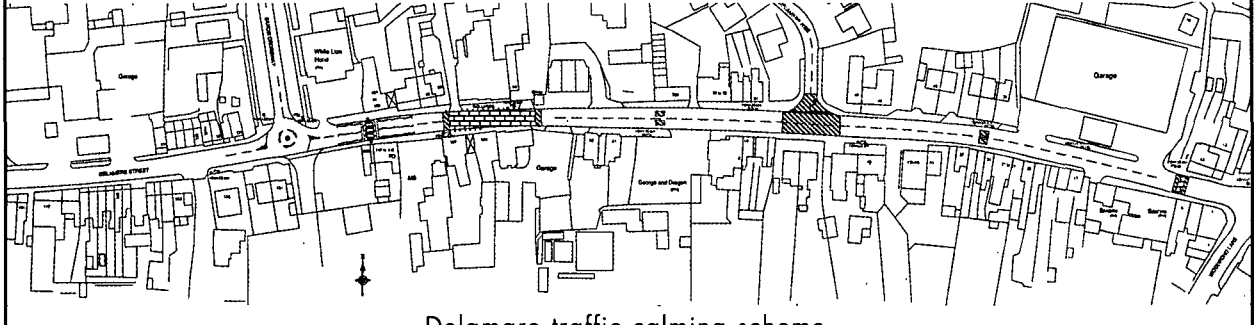
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (12hr)
Before	12 in 3 years	none taken	none taken
After	4 in 3years	none taken	none taken

Other Comments: The scheme has been successful at reducing accidents along the main length of the scheme. The mini roundabout was originally installed to comply with the Road Hump regulations 1990. However, due to site constraints the design was substandard and resulted in a couple of PIAs in a relatively short time period. It was subsequently removed and replaced by a gateway. The use of "Imprint" surfacing has generated complaints from some local residents about increased noise.

Contact: D Hughes ☎ 01244 603575 **E-mail:** hughesdg@cheshire.gov.uk
Authority: Cheshire County Council

Technical Data

Location Type:	Shopping street, school , some residential.	
Road Type and Speed Limit:	Urban classified B5074 road: 30mph.	
Scheme Type:	Mini-roundabout[1], speed cushions and speed tables. [1]Subsequently removed due to development of accident problem.	
Length of Scheme in Total:	420m.	
Dimensions:	Cushions:	1.6m, speed tables varying lengths, maximum 33m.
Materials:	Cushions:	Mastic Asphalt.
	Markings:	Thermoplastic.
	Speed Table:	Hot rolled asphalt , surfaced in red "Imprint".
Signs:	In accordance with TSGR&D.	
Lighting:	No specialist lighting.	
Costs:	Approx £50,000 total scheme, £24,000 for "Imprint".	



Delamare traffic calming scheme.

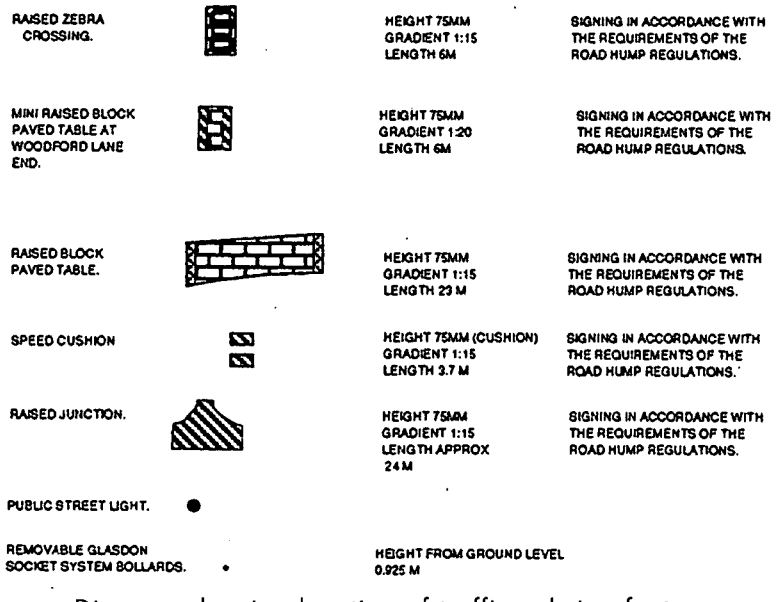


Diagram showing location of traffic calming features.

13 North Norfolk Quiet Lanes National Demonstration Project
quiet lanes scheme

Quiet Lanes enable a variety of road users to enjoy the countryside and access local facilities.

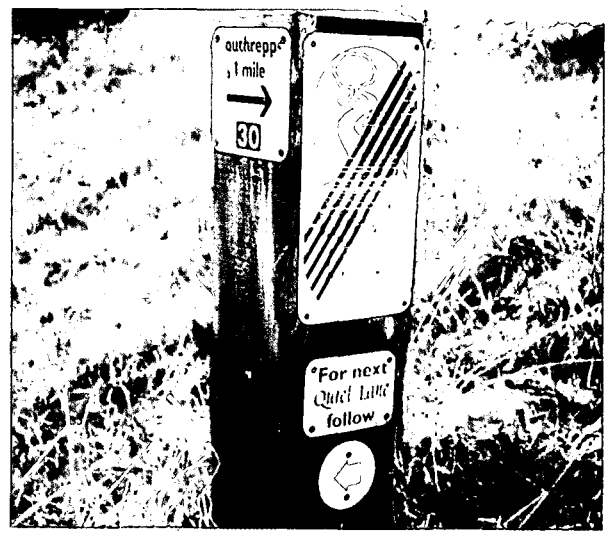
Implemented: March 2000.

Background: An area of minor rural roads (generally very narrow with low traffic speeds and flows) and intermittent small villages. No segregated provision for non-motorised users and very low numbers of these using the network. Traditional traffic calming measures were not considered suitable for reasons including their impact on the rural environment, and the cost of implementation across such a large area. Vehicle restrictions were not considered suitable due to enforcement problems and the environmental impact of the associated signing.

Need for Measures: Lack of alternatives to the private car for many in the project area. This, combined with a desire to increase walking and cycling, led to the aim of creating a network of country lanes for use by walkers, cyclists and equestrians as well as by motor vehicles. The community expressed concerns about the speed and volume of traffic on non-segregated routes. There was also a national recognition of rising traffic levels in rural areas.

Measures Installed: High level of community involvement intended to develop ownership and education to achieve "share the Quiet Lanes with care" behaviour. Sign audit to remove unnecessary signs, alterations to the area-wide signing to direct traffic away from the network, and entry signs. Associated village gateway works.

Special Features: Intensive community involvement from network identification through to project



Quiet Lanes exit sign and waymarker on post.

implementation achieving a very high level of support for the scheme. Ongoing community involvement beyond scheme implementation to maintain awareness of Quiet Lanes. Ongoing verge maintenance programme to enhance biodiversity in the network.

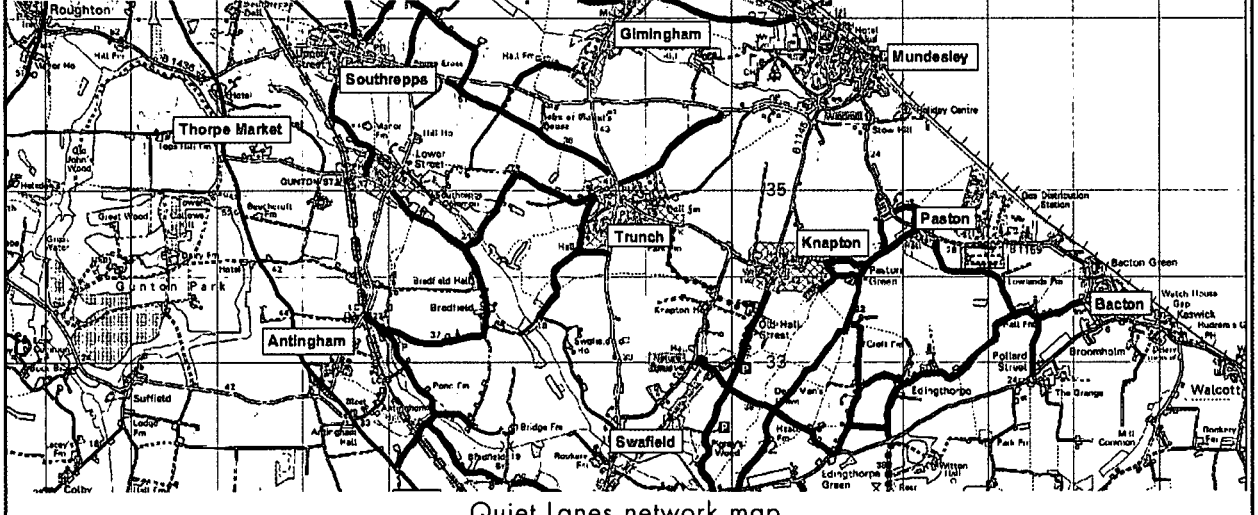
Consultation: Key stakeholders were identified at the project inception and met regularly to develop the Quiet Lanes concept and provide a steer for the project. The general public were involved through a number of community events and interactive workshops used to explain the principles of Quiet Lanes and to help develop a suitable network.

Monitoring	Traffic Flow 2 way 24hr		Mean Speed	
	Quiet Lanes	Control Roads	Quiet Lanes	Control Roads
Before (1998/9)	1,964	4,266	30.4	34.4
After (2002/3)	1,832	4,433	30.2	34

Contact: K Davison ☎ 01603 228853 E-mail: keith.davison@norfolk.gov.uk
Authority: Norfolk County Council

Technical Data

Location Type:	Rural.
Road Type and Speed Limit:	Mostly narrow country lanes where national speed limit applies.
Scheme Type:	Quiet Lanes network
Length of Scheme in Total:	59km.
Dimensions:	On much of the network the roads are too narrow for two cars to pass with high banks or hedgerows on either side. The absence of a verge could deter non-motorised users.
Materials:	Specially authorised signs were mounted on wooden posts 200mmx200mm and 1700mm in length (1100mm above the surface).
Signs:	The entry signs were specially designed in conjunction with the local community to minimise the environmental impact on the lanes. The final design received special authorisation from the Department for Transport. This sign has been received well by the local community although some respondents felt the sign is too small to be easily seen by drivers. Careful siting of the signs is required to ensure they are visible to drivers and are not obscured by vegetation growth. Finger post signs were introduced as part of the Quiet Lanes scheme to direct through traffic by main roads avoiding the Quiet Lanes.
Lighting:	No additional lighting was installed.
Costs:	Costs for this project were high as the concept of a Quiet Lane had not been developed. A second scheme currently being implemented is expected to cost circa. £16,000.



Quiet Lanes network map.

Other Comments: The low speeds on the Quiet Lane network have been maintained and there have been some reductions in traffic flow when compared to control roads. There remains strong support, but the local community was split when asked whether the scheme was working. The use of Quiet Lanes by non-motorised users varied greatly with no clear pattern emerging and the weather appearing to be the main controlling influence. After scheme implementation, there were some declared positive changes in behaviour and some respondents who felt the lanes were safer, however a number of respondents still reported fear concerning speed of vehicles.

More Recent Schemes

RESIDENTIAL

Case Studies 14-44

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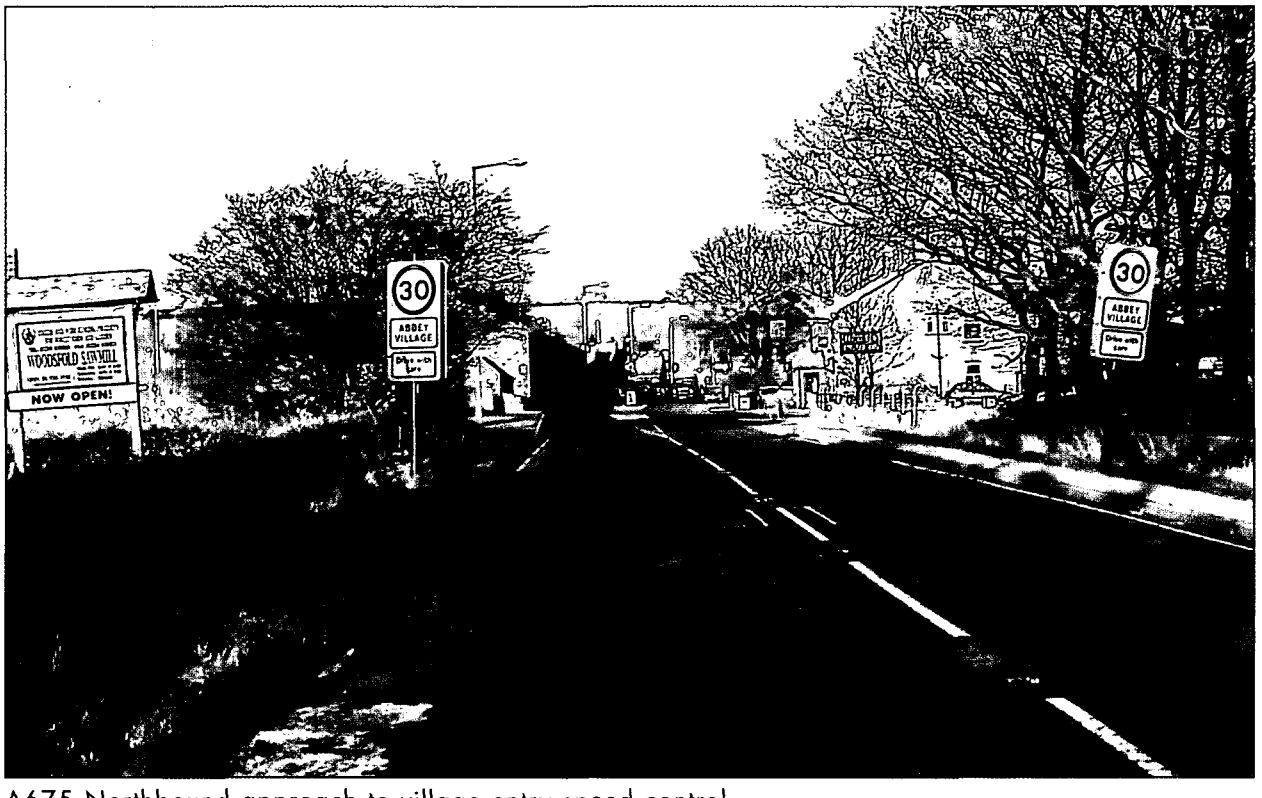
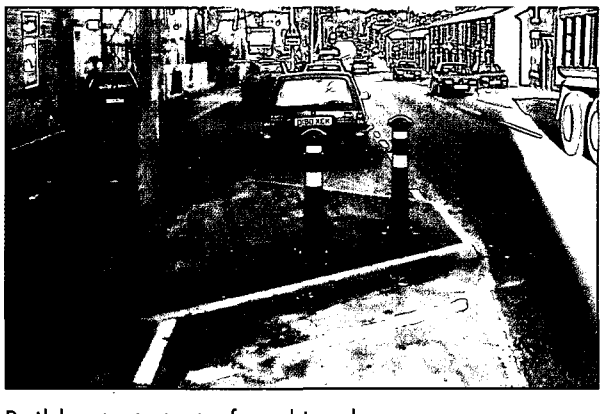
14 Abbey Village, Lancashire
speed bars, hatching, build-outs



A675 Northbound approach to village entry speed control.

Implemented: May 1997.
Background: This scheme formed part of the county council's VISP, (Village Speed Control Programme), which aimed at reducing vehicle speeds through villages by the introduction of low cost measures.
Need for Measures: To reduce vehicle speeds through the village.
Measures Installed: 30mph speed limit, provision of gateway signs, kerb build-outs, tranverse speed bars, pedestrian refuges.
Special Features: 4-6mm high speed bars in red textureflex, red textureflex overlaid with white hatching.
Consultation: Lancashire County Council, police, Chorley Borough Council, parish council, bus companies, cycling groups, local residents (letter).



Build-out at start of parking bay.

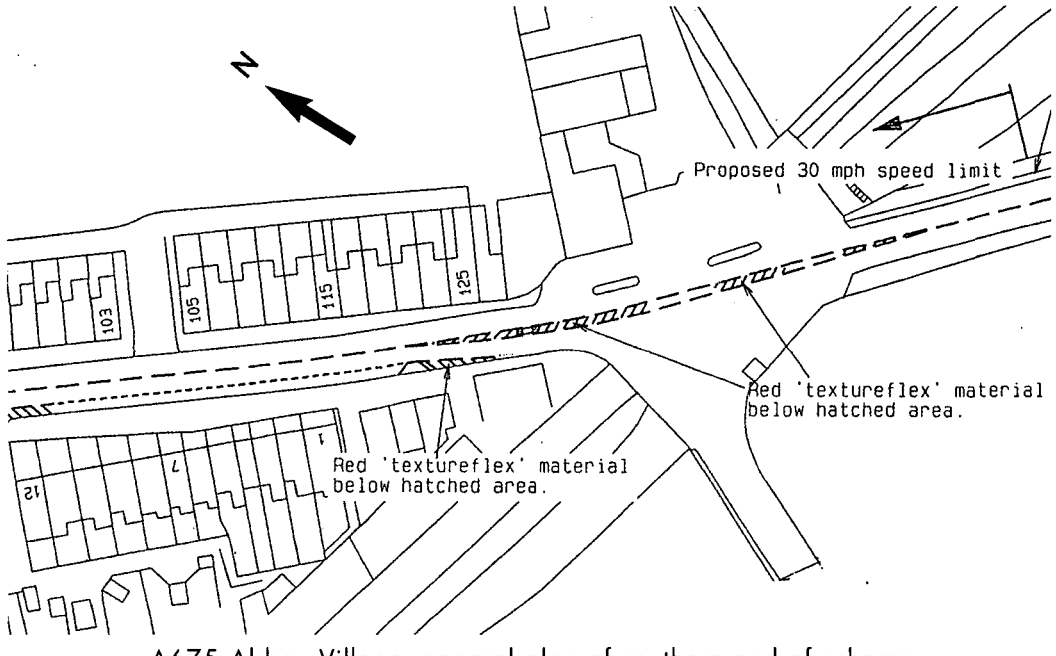
Monitoring	Accidents (PIA)	Speeds (85%ile)	Traffic Flow (weekday AADF)
Before	5 in 3 years	41	4,077
After (2000-2003)	5 in 42 months	35	5,156
	*Recent child fatality see "Other Comments"		

Other Comments: Although initially successful, recent accidents, including a fatality, have led to a call for further measures and an extension of the scheme along the whole of the A675 (between M65 and Bolton).

Contact: Adrian Hanks ☎ 01772 532237 E-mail: adrian.hanks@env.lancscc.gov.uk
Authority: Lancashire County Council

Technical Data

Location Type:	Main road through village.	
Road Type and Speed Limit:	Rural, classified 30mph.	
Scheme Type:	Gateway treatment and VISP measures.	
Length of Scheme in Total:	460m.	
Dimensions:	Pedestrian refuge:	1.2m.
	Shadow parking:	2m.
	Extension to footway:	2m wide.
Materials:	Bar markings:	Red textureflex.
Signs:	Diags 556, 511, 670.	
Lighting:	Existing.	
Costs:	£29,000.	



A675 Abbey Village, general plan of southern end of scheme.

15 Litchdon Street/Trinity Street area Barnstaple, Devon

20mph Zone with road humps

Entry to the 20mph Zone.

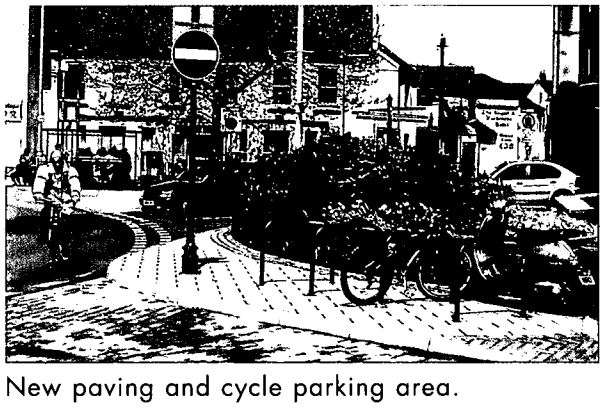
Implemented: April 2001.

Background: The area is one of narrow streets and terraced housing with a high proportion of elderly people, close to the town centre. Rat-running and the speed of traffic had long been a cause of concern.

Need for Measures: To reduce traffic speeds, reduce rat-running and improve the quality of life.

Measures Installed: A 20mph zone with road humps over nine streets.

Special Features: The entry gateway features were designed to enhance the conservation area. The scheme incorporated cycle parking, tree planting, improved pedestrian facilities and high quality paving.



New paving and cycle parking area.

Consultation: Extensive consultation with public meetings, exhibitions, questionnaires and a dialogue with the residents of elderly peoples' homes in the area.

Monitoring	Accidents (pia)	Speeds (mph)	Traffic Flow (12hr)
Before	4 in 5 years	22	typical street 200-500
After	none	19	no change

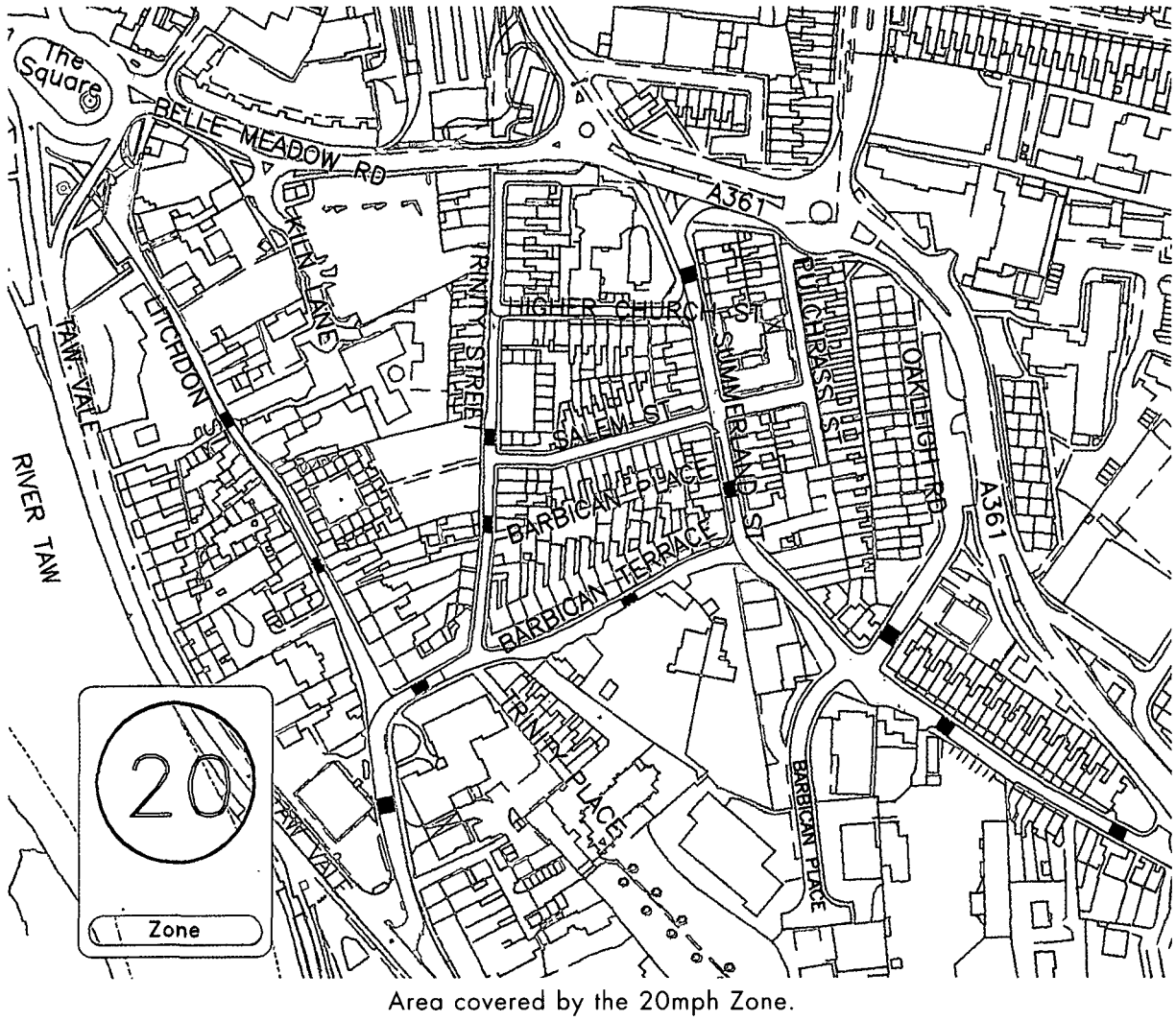
Other Comments: The project has been well received with no modifications since its completion.

Contact: David Netherway ☎ 01271 388582 E-mail: dnetherw@devon.gov.uk
Authority: Devon County Council

RESIDENTIAL

Technical Data

Location Type:	Urban residential.
Road Type and Speed Limit:	Residential 30mph.
Scheme Type:	20mph zone with road humps.
Length of Scheme in Total:	Six town centre residential streets.
Dimensions:	75mm road humps with 1:15 gradient.
Materials:	Bituminous macadam road humps. High quality paving. Granite setts.
Signs:	20mph signs at zone entry mounted on special posts.
Lighting:	No special lighting.
Costs:	£59,000 mainly in gateway features.

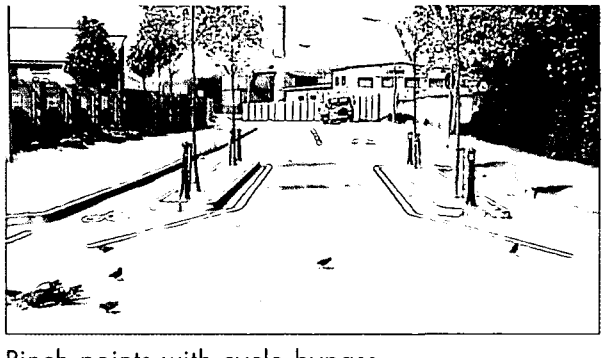


Area covered by the 20mph Zone.

16 Island Street Area, Belfast
pinch points, chicanes, road humps and raised junctions

One-way chicane with cycle bypass.

Implemented: September 1999.
Background: The road carries a mixture of commercial, local and through traffic. It is bounded by residential properties and industrial units with a playground and a Church close by.
Need for Measures: Accident history, excessive through traffic, extreme local concerns.
Measures Installed: Two pinch points, two chicanes and other features on main road. Road humps and raised junction on side roads.
Special Features: Cycle facilities and landscaping are provided at each feature.
Consultation: Full legal consultation was carried out including letters to all Industrial units along route and residents' group meetings. Residents rejected the provision of round top road humps at an early stage for the main road due to anticipated noise and vibration. Residents, local representatives and local schools were actively involved in tree planting. No objections were received from emergency services.



Pinch points with cycle bypass.

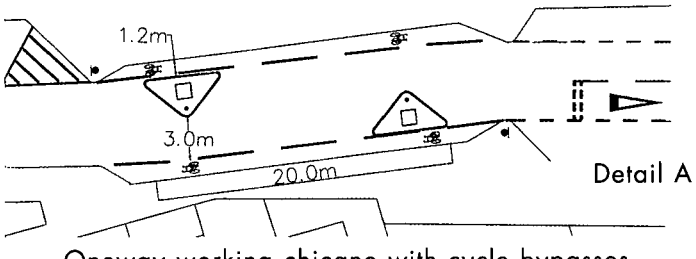
Monitoring	Accidents (PIA)	Speeds (mph) 85%ile	Traffic Flow (24hr flow)	%age HGV
Before	5 in 5 years	37.3	1,807	7.2%
After (2000-2002)	1 in 3 years	34.7	1,971	3.6%

Other Comments: Residents were concerned over the safety element of planting trees on the build outs as they anticipated children would climb the trees thereby creating a danger to themselves and motorists. The trees selected for planting had a 2.0m clearance at the base and they have been allowed to develop free from vandalism. Residents are content with the measures provided.

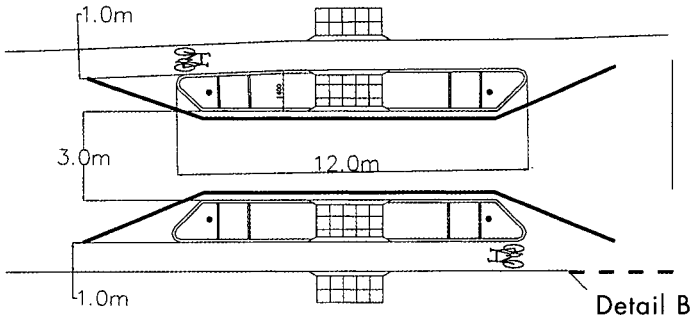
Contact: Girvin Miskimmin ☎ 02890 253027 E-mail: girvin.miskimm0in@drdni.gov.uk
Authority: Northern Ireland Roads Service - Department for Regional Development

Technical Data

Location Type:	Edge of Town Centre.	
Road Type and Speed Limit:	Urban Classified:	30mph.
Scheme Type:	Chicanes, pinch points, priority junctions and cycle bypasses.	
Length of Scheme in Total:	400m.	
Dimensions:	Pinch points measuring 10 & 12m long reducing carriageway to approximately 3.0m wide. Chicanes measuring approximately 20m long reducing carriageway to 3.0m and 3.5m.	
	Cycle by passes:	1.0m to 2.0m wide.
	Road humps:	4.1m long flat topped road humps 80mm high of varying width.
	Raised junction:	20m long, 5m into side road (100mm height)
Materials:	Chicanes and pinch points:	Precast concrete kerbing (100mm upstand) with asphalt infill.
	Ramps:	Flat topped in standard asphalt construction. Steel and aluminium bollards/
Signs:	Regulatory signs:	Diag 557.1, 557.3.
	Priority junction signs:	Diags 811 & 615.
	Road markings:	Diags.1003, 1004, 1010, 1023 & 1040.4.
	Cycle markings:	Diags 1004, 1057.
Lighting:	No alterations were required to existing lighting.	

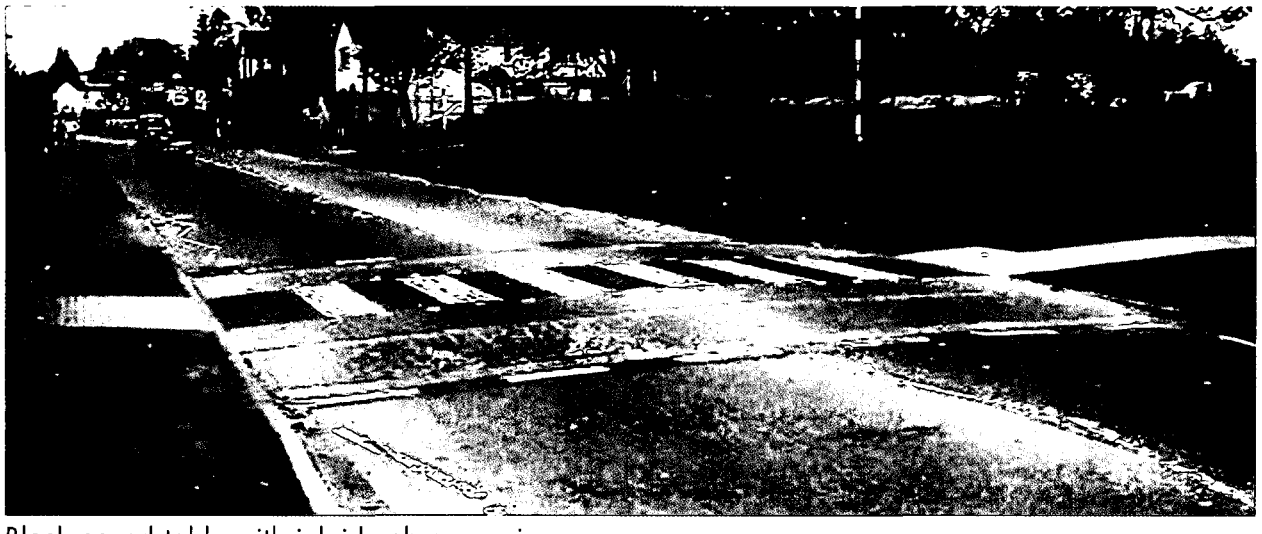


Oneway working chicane with cycle bypasses.



Pinch points with cycle bypasses.

17 Meadow Road, Catshill, Bromsgrove, Worcestershire
humped zebra crossing



Block paved table with inlaid zebra crossing.

IMPLEMENTED: June 1999.

BACKGROUND: Requests for traffic calming along Meadow Road had previously been refused primarily because of its "B" class status and the relatively low personal injury accident rate, which was comparable with other similar roads in the area. However, the presence of two schools was always a cause for concern and the "Safer Routes to School" initiative, together with its associated funding, enabled physical traffic calming measures to be given serious consideration.

NEED FOR MEASURES: The scheme was designed to promote the County Council's sustainability policy by improving road safety in the community and encouraging a greater public environmental awareness during the course of the school journey.

MEASURES INSTALLED: The initial proposal consisted of a full traffic calming scheme for approximately 500m with a mini-roundabout at either end and a series of five verticals in between. However, the consultations favoured a more simple isolated calming feature incorporating a zebra crossing on a 75mm high speed platform. Even though the use of a single feature is not generally recommended it was agreed to pursue this approach with the addition of high impact advance signing.

Advance warning sign with high visibility backing board.

SPECIAL FEATURES: This was the first significant "Safer Routes to Schools" scheme in the County and the existing two school gates were combined and resited to line up with the new crossing point.

CONSULTATION: All emergency services supported the proposal. The local bus company raised no specific objection. The reduced scheme received high levels of local support and politically the proposal was welcomed and approved.

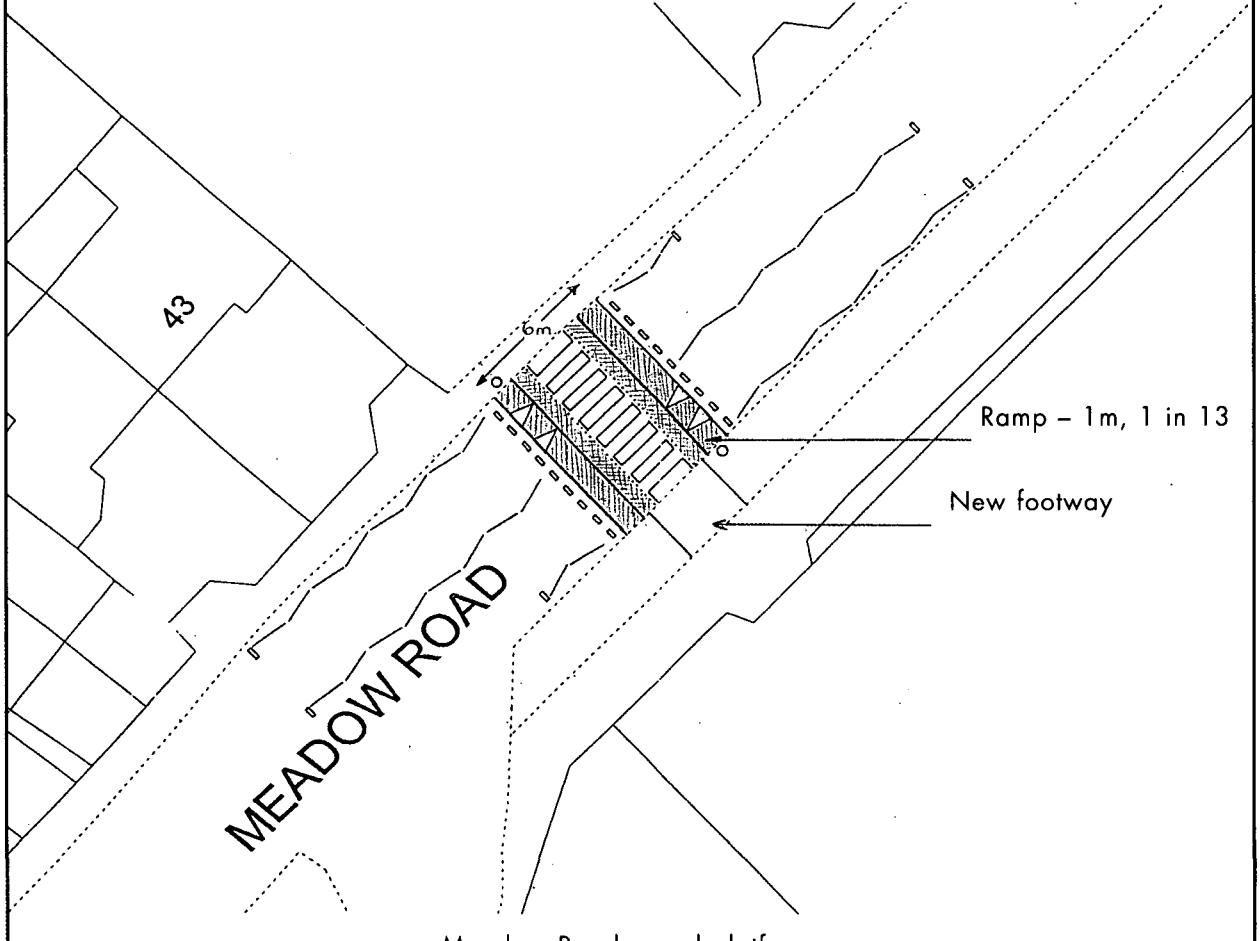
MONITORING	ACCIDENTS (PIA)	SPEEDS (85%ILE MPH)	TRAFFIC FLOW (24HR)
BEFORE	2 (unrelated)	38	n/a
AFTER	1 (unrelated)	28-29	9,000

OTHER COMMENTS: Although a small scheme, it has resulted in a 9-10mph reduction in speed and a concentration of pedestrians crossing at the calmed location.

CONTACT: BOB STURMY ☎ 01905 766815 E-MAIL: bsturmy@worcestershire.gov.uk
AUTHORITY: WORCESTERSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Residential, two local schools.
Road Type and Speed Limit:	Urban classified "B" route: 30mph.
Scheme Type:	A single, raised, flat top hump incorporating a Zebra crossing.
Length of Scheme in Total:	Single feature.
Dimensions:	75mm platform height, 6.0m in length.
Materials:	Red concrete block paviours with black/white inlays to form Zebra crossing strips and 50m of buff high friction surfacing on each approach.
Signs:	Extensive warning signs in advance of the crossing and hump.
Lighting:	No change.
Costs:	Less than £20,000.



Meadow Road speed platform.

18 Cheadle, Staffordshire

flat top humps, junction tables, puffin crossings, raised zebra crossing

Speed table at entrance to high school.

Flat top humps on The Birches.

Implemented: March 2002.

Background: The scheme was provided as part of a "Safer Routes to School" initiative, implemented as part of Staffordshire's Local Transport Plan. Travel surveys carried out in schools in June 2000 indicated an average 40% car usage for the school run to the Primary Schools.

Need for Measures: The objectives of the scheme are to provide a safer road network for the local community by reducing the number of road accidents; and to encourage pupils and parents to walk and use public transport.

Measures Installed: Flat top road humps and junction tables, a raised Zebra crossing, two Puffin crossings and various footway improvements.

Special Features: The area include three primary schools, two high schools and one sixth form centre within a 400m radius in a residential area to the south of Cheadle Town Centre. The school catchment areas are severed by the busy A521 and the A522. Road hump height reduced to 65mm and length increased to 7.8m on Station Road for the large number of school buses that use this route. Tactile paving used at dropped crossings and at pedestrian crossings to assist the disabled. "At grade" crossing points were also provided. Included in a programme of Safer Routes to School schemes, the authority is aware of the importance of good public consultation and provision of information in relation to the success of a scheme. The authority aims to: find out why people do not walk/cycle; propose measures to mitigate against actual and perceived "dangers"; make residents aware of why the scheme is being implemented, and ensure their views are taken onboard, and keep people informed.

Consultation: Travel surveys were carried out in the schools in the initial stages of the project.A Steering Group of local representatives met regularly to guide and monitor the progress of the scheme. Every school pupil (approximately 2,500) received a *Safer Routes to School* leaflet detailing the scheme in August 2001. The emergency services and bus companies were consulted prior to the final design. Statutory consultation was carried out for road humps, pedestrian crossings and Traffic Regulation Orders. The reaction to the scheme has been favourable both before and after implementation.

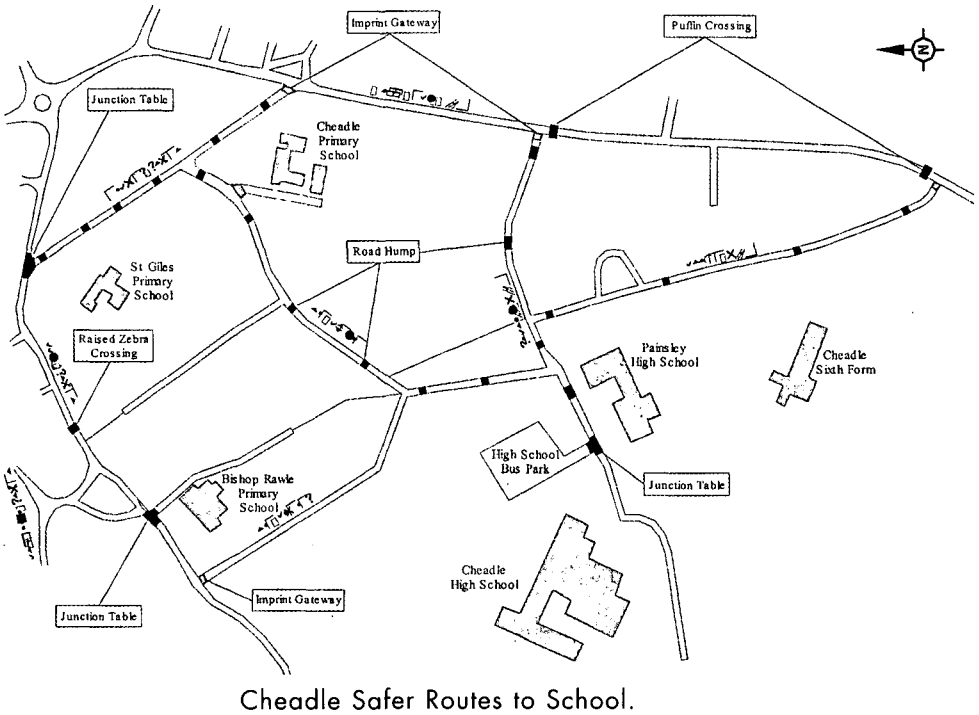
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (24hr 2 way)
Before	7 per annum	38 (main roads) 29 (residential roads)	8,400 (main roads) 1,300 (residential roads)
After	none available	none available	none available

Other Comments: Travel surveys were carried out in the schools prior to the formulation of the design to ascertain the reasons children did not walk to school. A Steering Group of local representatives met regularly throughout the scheme to guide and monitor progress. Once the preliminary design had been completed, questionnaires were mailed to all 350 residents affected by the road humps. Only two people raised any objection to the scheme. A "glossy" leaflet was produced for all pupils indicating the results of the school surveys, the aims of the scheme and the proposed measures to be implemented. Press releases were issued at each major stage of the project.

Contact: Mary Anne Raftery ☎ 01785 276697 **E-mail:** maryanne.raftery@staffordshire.gov.uk
Authority: Staffordshire County Council

Technical Data

Location Type:	Residential.
Road Type and Speed Limit:	Urban class "A" road and residential unclassified roads: 30mph.
Scheme Type:	Flat top humps and junction tables on residential roads, a raised Zebra crossing, various footway improvements and two Puffin crossings on the A522.
Length of Scheme in Total:	1.5km.
Dimensions:	Road humps Height: 75mm. Length: 4.5m. Ramp: 1:12. On the bus routes the height was reduced to 65mm and the length increased to 7.8m
Materials:	Humps: Medium temperature asphalt. Gateways: Red "Imprint".
Signs:	600mm road hump warning triangles Diag 557. 600mm humped Zebra crossing Diags 544, 541.5.
Lighting:	Lighting improvements included Whitecroft 2600 series lanterns, with high pressure sodium lamps. Raised Zebra uses Whitecroft Vectra X pedestrian crossing lights with metal halide lamps.
Costs:	Total cost £160,000.



Cheadle Safer Routes to School.

19 Welland Vale Area, Corby, Northamptonshire

20mph zone. cushions, humps, tables

Lloyds Road, Corby – entry to 20mph Zone.

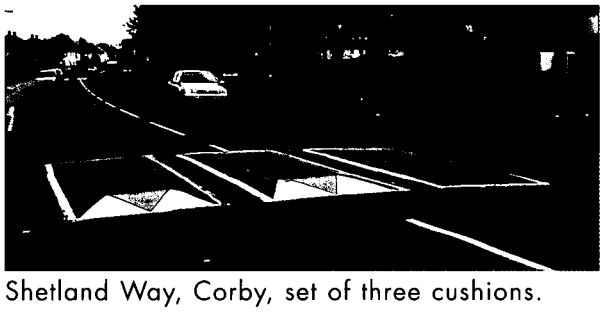
Implemented: July 2001.

Background: The Welland Vale area has a very high accident rate, 96 injury collisions were reported in the three year study period. The accidents included 36 child casualties of which two thirds were pedestrians and one third were pedal cyclists.

Need for Measures: To provide safer routes to school, to reduce inappropriate speeds and to target a large area to combat "rat run" routes.

Measures Installed: 20mph zone with associated traffic calming features including: road humps, speed cushions, speed tables, pedestrian refuges and Zebra crossings.

Special Features: This is an extensive scheme covering a mix of private and public housing and a small conservation area. The fire service had major reservations about the effect of the scheme on their response timings. This resulted in design changes to the scheme and the introduction of the 20mph zone on a temporary basis.



Shetland Way, Corby, set of three cushions.

Consultation: Local surveys, three public exhibitions and leaflets were all undertaken. Reactions were generally favourable though attendance was poor. Since implementation, there has been a petition arguing against the extent of the scheme but supporting a 20mph speed limit at accident black spots and near to schools.

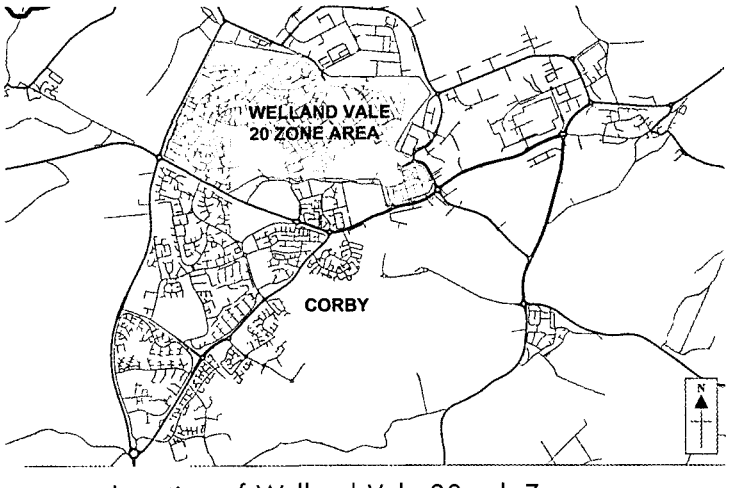
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	96	n/a*	n/a*
After	54	n/a*	n/a*
*no data available			

Other Comments: In the authority's experience 1.7m is the optimum width for cushions. Be aware that although a policy for routes had previously been agreed with the emergency services, the sheer scale of this scheme has caused problems and objections regarding response times. A petition with 200 signatures has been received, arguing against the scheme although the organisers appreciated the reasoning behind the measures. They supported 20mph limits at accident black spots and in the proximity of schools. There have been requests for repeater 20mph zone signs within the area and general comments that certain features have been built too high (usually caused by a depression immediately in the vicinity of the feature). There have also been comments stating that certain areas were missed in the leaflet distribution.

Contact: Ian Boyes ☎ 01604 236 962 **E-mail:** iboyes@northamptonshire.gov.uk
Authority: Northamptonshire County Council

Technical Data

Location Type:	Residential area including conservation area.
Road Type and Speed Limit:	Mainly unclassified: 30mph.
Scheme Type:	A small SRB scheme funded by Corby BC was combined with the traffic calming works. Funding for the scheme was from Accident Reduction, Safe Routes to School and Corby BC SRB budgets.
Length of Scheme in Total:	Approximately 5km^2.
Dimensions:	Cushions Length: 4.8m. Height: 75mm. Width: 1.4m or 1.7m. Roll over humps Length: 3.7m Height: 75mm. S ramp tables: 2.5m ramps. Height: 75mm. Ramps gradient: 1:12. Height: 75mm.
Materials:	Roll over humps, tables and S ramps 25mm 45/10 high stone content asphalt wearing course over a base course of 50mm of 20mm dense bitumen. Cushions: Perimeter row of 200x100x60mm modular blocks bedded on 15mm M45 type mortar. All wearing course black with buff modular blocks.
Signs:	Diags 674/675 denote start/end of zone.
Lighting:	No new street lighting employed.
Costs:	Total: £370,000.



Location of Welland Vale 20mph Zone.

20 Ashdown Drive/Weald Drive, Tilgate, Crawley, West Sussex

20mph zone, humps, refuge islands/chicanes

Ashdown Drive – raised junction with 20mph Zone.

Implemented: September 1996.

Background: This is an extensive, high density, residential area with a serious accident problem along Ashdown Drive and Weald Drive due to speeding vehicles.

Need for Measures: The features employed consisted of road humps with a 20mph zone and refuge islands/chicanes within the existing 30mph speed restrictions. The object of the scheme was to contain speeds within 30mph in the general area of Tilgate and further slow vehicles to 20mph or under, when passing the shopping parade where there is a predominance of pedestrian movements.

Special Features: This scheme was one of the first in West Sussex to incorporate a 20mph zone.

Weald Drive – refuge island.

Consultation: Full consultation procedures were carried out covering statutory consultees plus other groups in the area and culminating in a two day exhibition in a local school.

Monitoring	Accidents (PIA)	Speeds (mph)		Traffic Flow
		Within 30mph	20mph	
Before	28 in 3 years (5 serious)	31.8	25.7	7,800
After	11 in 3 years (1 serious)	26.6	15.8	6,150

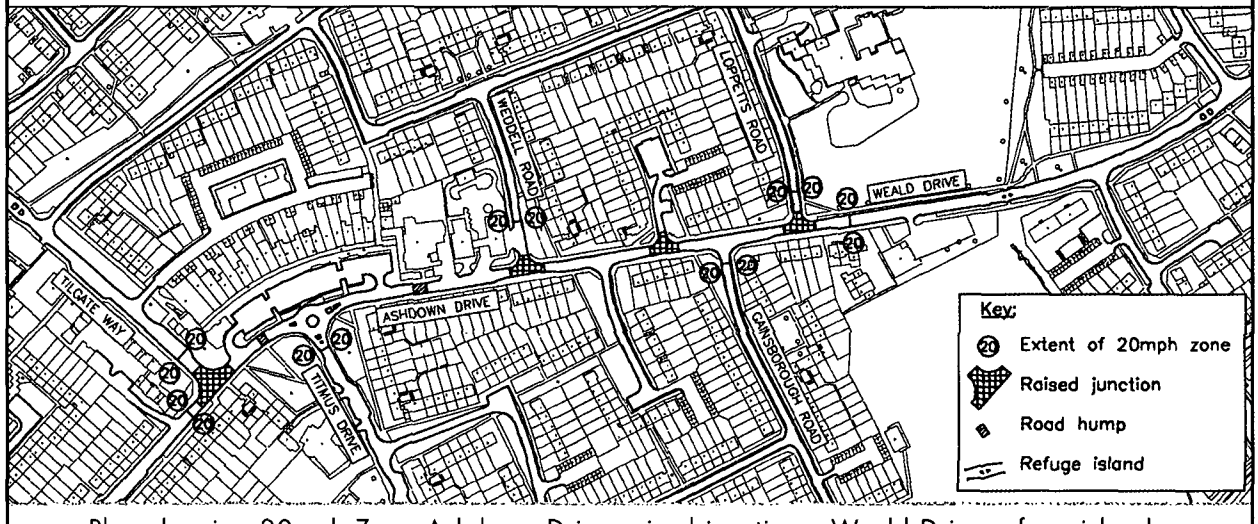
Other Comments: In general this scheme has been effective in reducing vehicle speeds in the shops and other communal buildings and has been well received by the local residents. This was partly due to the contractor working effectively and efficiently and at least on one occasion helping positively in a local school project. Inconvenience to residents was minimised during the construction period.

Contact: Alex Sharkey ☎ 01243 777746 E-mail: Alex.Sharkey@westsussex.gov.uk
Authority: West Sussex County Council

RESIDENTIAL

Technical Data

Location Type:	This scheme is within a residential area with associated schools and a large parade of shops. Ashdown Drive and Weald Drive also lead to the Tilgate Country Park, which is a large leisure area well used by the general public.
Road Type and Speed Limit:	Ashdown Drive and Weald Drive are,unclassified residential local distributors with direct frontage access to most dwellings. The existing speed limit for this residential area is 30mph.
Scheme Type:	The scheme uses a range of different traffic calming devices, including chicanes, road humps, realignment due to build outs at junctions and protected parking bays.
Length of Scheme in Total:	The total length of road incorporating these features in this area is 4km. (Ashdown Drive/Weald Drive: 2.7km, Titmus Drive: 0.5km, Loppetts Road: 0.4km, Tilgate Way: 0.4km).
Dimensions:	Road Humps: 1m slopes, 6m plateau and 75mm high. Refuge islands: Various widths depending on which chicane design (1.3m to 2.0m width).
Materials:	Typical kerbs, blacktop and textured imprint for slopes to humps within the 20mph zone and as surrounds to the mini roundabouts central domes.
Signs:	All signs were in accordance with TSRGD.
Lighting:	Existing with minor upgrading of the lighting at the new mini roundabouts.
Costs:	£516,215.00.



Plan showing 20mph Zone Ashdown Drive raised junctions; Weald Drive refuge islands.

21 Douglas Housing Estate, Dundee
gateway markings, build outs, cushions, central islands

Balunie Avenue – after traffic calming was installed.

Implemented: April-August 1998.

Background: Douglas Housing Estate lies on the periphery of Dundee. Prior to the introduction of traffic calming, the Douglas area had the worst injury accident rate in comparison with other housing estates throughout the City. There are two main roads which run the full length of the scheme: Balunie Avenue located within the central area, and Balunie Drive on the northern outskirts. Most accidents were occurring on Balunie Avenue, which almost bisects the community.

Need for Measures: To reduce the number and severity of accidents, most of which involved pedestrians.

Measures Installed: Changes of priority, mini-roundabouts, deflection islands, road humps on potential "rat-runs" with road cushions on bus routes, recessed on-street parking to provide improved visibility at more prominent crossing points with build-outs and central islands.

Special Features: Gateway markings using red texturing and "dragon's teeth" road markings.

Balunie Avenue – prior to traffic calming.

"Children warning" road markings on approaches to schools. Both required authorisation from the Scottish Office (1997).

Consultation: Extensive consultation was carried out. Scheme proposals were discussed with community groups, public exhibitions were also held, inviting comments prior to finalisation of plans. Formal consultation was carried out for the installation of road humps/road cushions, including all affected frontagers.

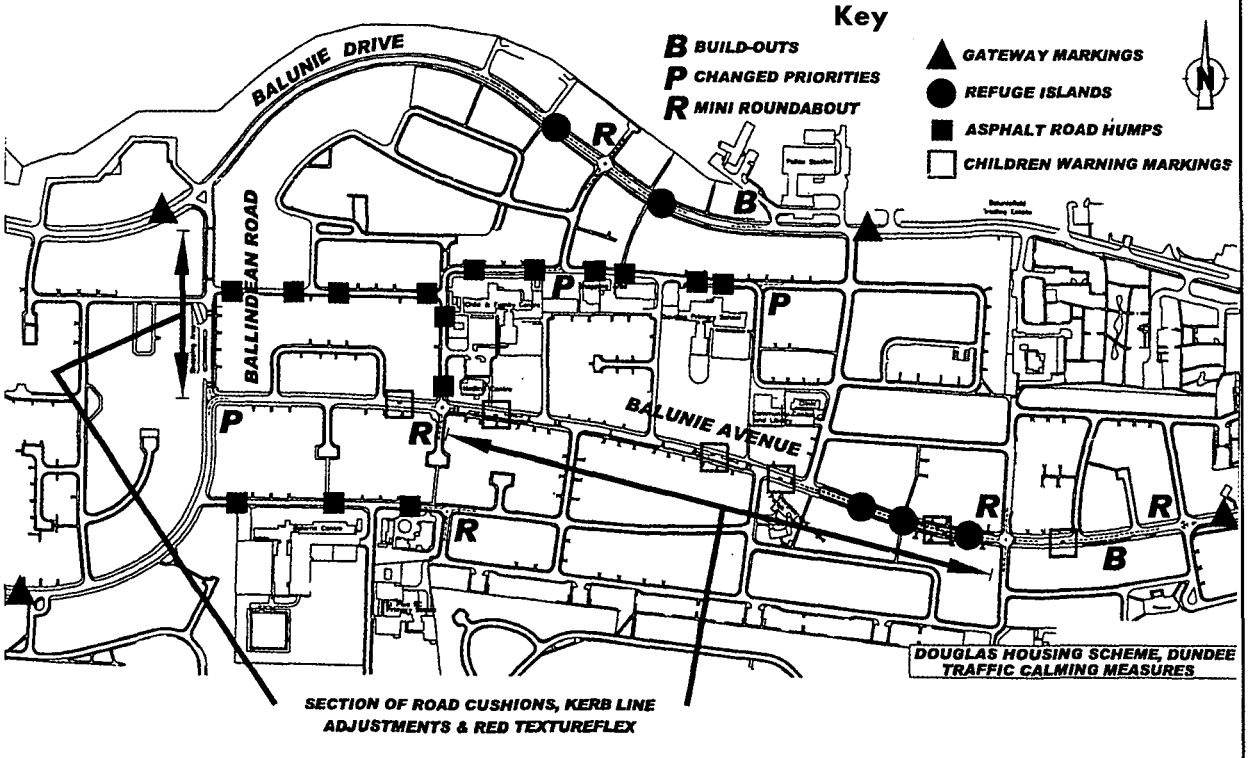
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	16.5 in 3 years	27	24,550
After	7 in 3 years	22	22,260

Other Comments: The volume of through traffic, speed of traffic and number of accidents have all been reduced in the area since the introduction of traffic calming measures.

Contact: Graham Harris ☎ 01382 433090 E-mail: graham.harris@dundeecity.gov.uk
Authority: Dundee City Council

Technical Data

LOCATION TYPE:	City peripheral housing estate.	
ROAD TYPE AND SPEED LIMIT:	Urban classified: 30mph.	
SCHEME TYPE:	Area wide traffic calming with road cushions, traffic islands, recessed parking, mini roundabouts, children warning markings, build-outs, road humps.	
AREA OF SCHEME IN TOTAL:	Approximately 0.5km^2.	
DIMENSIONS:	Round top humps:	90mm high, 3.7m long.
	Round top humps:	75mm high, 3.7m long.
	Square road cushions:	75mm high, 1.9m long.
MATERIALS:	Asphalt road humps. Rubber cushions.	
SIGNS:	Road humps:	Diag 557.1, 557.2, 557.3, 557.4.
LIGHTING:	Improved from low pressure sodium lighting to high pressure sodium lighting. Illuminated bollards on central islands.	
COSTS:	£350,000.	



Location and type of traffic calming measures.

22 Davies Road, Evesham, Worcestershire

narrowings with marked priorities, refuges

Use of priority narrowing at the west end.

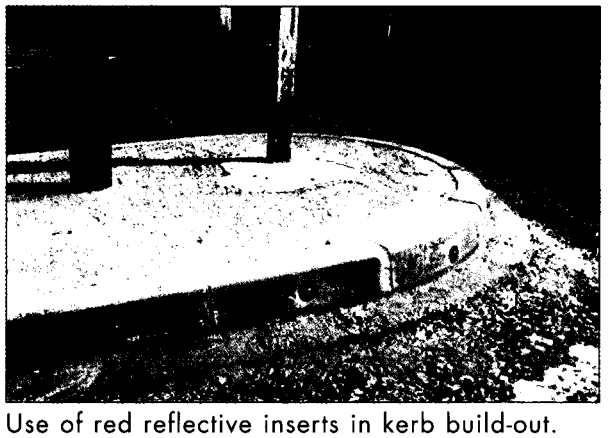
IMPLEMENTED: April 1995.

BACKGROUND: Davies Road formed a useful link between the A44 Oxford Road and the A435 Cheltenham Road on the southern outskirts of Evesham avoiding several sets of traffic signals and pelican crossings. The accident rate, together with the high 85th %ile speeds justified the inclusion of this location on the (then) Hereford and Worcester County Council's Special Projects Teams Traffic Calming Priority list.

NEED FOR MEASURES: To reduce the high accident rate.

MEASURES INSTALLED: Reductions in road widths/provision of overrun areas at roundabout junctions at either end of the route. Three prioritised narrowings with an alternating pattern of give-ways. A large central pedestrian refuge at the site of the school crossing patrol. The narrowing of the carriageway to 6.1m at the existing pelican crossing.

SPECIAL FEATURES: This was the first "horizontal" scheme with priority signing arrangement in the area.



Use of red reflective inserts in kerb build-out.

CONSULTATION: All emergency services supported the proposal. No response was received from any of the four bus companies consulted. Evesham Town Council and Wychavon District Council both supported the proposals with requests for extensions to the scheme. The Local Member approved the works and the only information given to the public was a small press release issued to the local newspaper.

MONITORING	ACCIDENTS (PIA)	SPEEDS MPH	TRAFFIC FLOW (24HRS)
BEFORE	7 in 3 years	40	6,851
AFTER	1 in 9 months	34	5,768

Although the initial "after" study appeared encouraging, continued monitoring of PIAs revealed eight accidents in the first full 36 month. period with that total being equalled in the following 36 months. Two accidents were recorded in 2001 with a similar number being recorded in the first six months of 2002. As a result of this some modifications were undertaken (see next page).

CONTACT: BOB STURMY ☎ 01905 766815 E-MAIL: BSturmy@Worcestershire.gov.uk
AUTHORITY: WORCESTERSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Urban residential route.
Road Type and Speed Limit:	Local distributor: 30mph.
Scheme Type:	Single way narrowings with priority alternating at each feature.
Length of Scheme in Total:	720m.
Dimensions:	Narrowed sections 10m long with carriageway width of 3.0m.
Materials:	Standard concrete kerbs with concrete infill. Retro-reflective red/white recycled plastic bollards.
Signs:	600mm dia Keep left/right signs to Diag 610 erected on build outs. Priority signs to diag 615 and 811 erected on each approach to the build outs.
Lighting:	Minor modifications to existing system.
Costs:	£36,000.

Other Comments: The initial response to the scheme was good with drivers generally appearing to be prepared to give way to oncoming vehicles. However, drivers attitudes changed particularly at one feature and there were instances of minor collisions within the narrowed areas. Several letters were received and articles of a critical nature appeared in the local press.

The original scheme is still in place with modifications introduced in January 1996. The priority of the western most feature was reversed and five 30mph speed limit roundels laid at strategic locations along the length of the road. Once again this modification was made at the instruction of the Local Member and no further consultations were made with local residents. The accident saving from this scheme did not fulfil expectations and the public reaction, apart from the early days, has been one of indifference and finally hostility to the scheme.

A more detailed accident analysis revealed an unusually high (45%) number of accidents during darkness and more recently a series of "Reflecto 360" reflecting road studs have been laid on the approaches to the features together with reflective inserts being applied to the vertical faces of the kerbs. This measure is seen as a last chance to save the scheme and a further 12 month monitoring must be allowed to quantify any improvements that the new measures may bring.

23 Munster Road, Fulham, London
raised Zebra crossings, speed cushions, refuge islands, hatching, gateway

Raised junction at Munster Road/Mablethorne Road.

Zebra crossing near junction of Munster Road and Bronsart Road.

Implemented: September 2001.
Background: Munster Road is one of a small number of north-south running roads in the Fulham area.
Need for Measures: The relatively high vehicle speeds and points of conflict along the route needed to be reduced. In addition a reduction in the level of accidents, particularly at the junctions on Munster Road was required. Pedestrians also encountered difficulties in crossing Munster Road and needed measures to assist them.
Measures Installed: Raised zebra crossings, speed cushions at zebra crossings and pedestrian refuge islands, hatched road markings, mini-roundabout, raised junctions and gateway treatments.
Special Features: A wide variety of measures have been installed along the whole length of the road to provide a number of varying designs to help reduce the speed and number of vehicles using the road. The raised junctions are intended to help reduce the high levels of personal injury accidents recorded on Munster Road. In addition, raising the profile of the pedestrian facilities should aid pedestrians.
Consultation: Statutory consultees, representatives of user groups and affected frontagers.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (12hr)
Before (Sept 2001)	27 in 3 years	33	667
After	5 in 3 years	22	676

Other Comments: The scheme has been effective in reducing the speed of traffic; and provided accident savings giving a first year return rate of 56%. It has also helped pedestrians to obtain precedence over vehicle flow and a number of safer and more emphasised crossing points were installed as part of the scheme.

Contact: Tom Finnegan-Smith ☎ 020 8753 333411 **E-mail:** Tom.finnegan-smith@lbhf.gov.uk
Authority: London Borough of Hammersmith & Fulham

Technical Data

LOCATION TYPE:	Urban residential, local shops.
ROAD TYPE AND SPEED LIMIT:	Local Access Road: 30mph.
SCHEME TYPE:	Five raised junctions, pedestrian islands, two raised Zebra crossings, amendments to two Zebra crossings, a mini roundabout and speed cushions supplementing the pedestrian refuges.
LENGTH OF SCHEME IN TOTAL:	1400m.
SIGNS:	Diags: 557.1 , 557.2, 557.3 and 611.1. Markings: hatching and centre.
LIGHTING:	Repositioned lamps to highlight kerb build-outs.
COSTS:	£210,000.

Notes:

Logitudinal Ramp Width - A = 400mm
Transverse Side Width - B = 175mm
Lay With Hot Rolled Asphalt

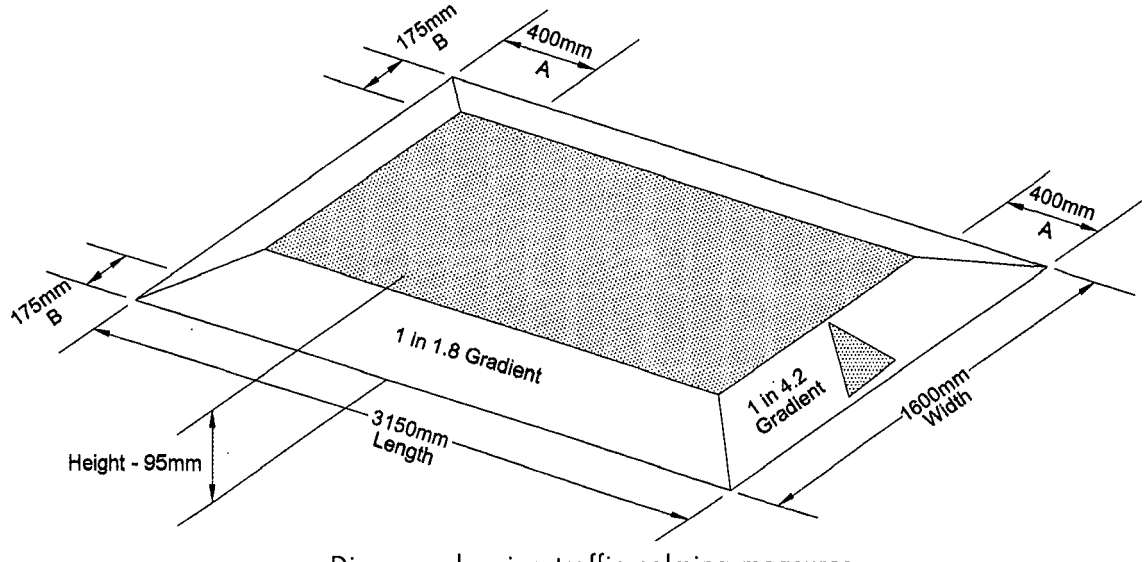


Diagram showing traffic calming measures.

24 Bristol Road, Gloucester, Gloucestershire
cycle lanes, build outs, refuge islands

Traffic flow and designated parking after implementation of new measures.

Implemented: Summer 2000.

Background: Following the route of the Roman Road into Gloucester from the South, Bristol Road is a relatively straight single carriageway road with a 30mph speed limit along its whole length. A mixture of industrial, retail and residential properties fringe the route. The residential and retail frontages are mainly located on the northern section which is where the majority of on-street parking takes place. The Sharpness Canal runs parallel to Bristol Road, this restriction limits the frequency of crossing points, both pedestrian and vehicular, although the canal is bounded by industry. The width of the carriageway fluctuates along its length between 7.3 and 8.5m. Bristol Road is an important transport corridor as it carries the majority of the traffic from the south, including a large residential area, to and from Gloucester. Bristol Road carries significant HGV flows, mainly serving the adjacent industrial and retail areas.

Need for Measures: To improve the facilities for vulnerable road users - especially cyclists, reduce traffic speeds, improve safety and encourage alternative modes of transport rather than the car.

Measures Installed: Reduced traffic lane widths, cycle lanes, build outs, refuge islands, vehicle activated warning sign.

Traffic situation before measures introduced.

Special Features: The many residential and retail premises rely heavily on the existing on-street parking. Use of "build outs" helped formalise this and together with the provision of on-carriageway cycle lanes helped deter inappropriate overtaking. Lane widths as narrow as 2.75m were used. Footway build outs and refuge islands help pedestrians cross. A vehicle activated sign warns motorists exceeding the 30mph limit.

Consultation: Extensive consultation was undertaken (see leaflet), with residents' groups, emergency services and other representative bodies.

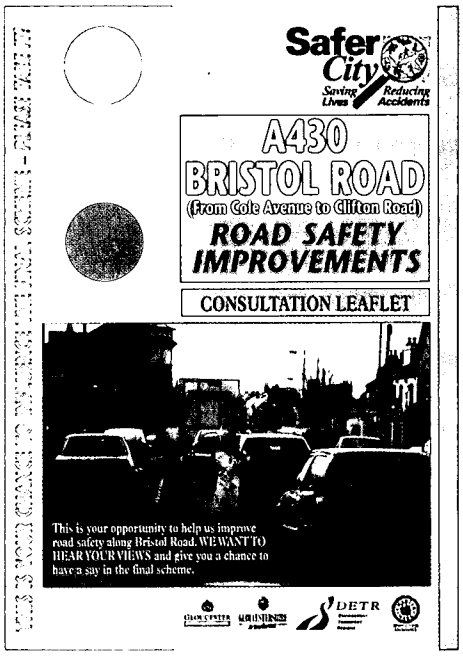
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before (1997-1999)	86 in 3 years	33	16,500
After (2001-2002)	63 in 2 years	31	no change

Other Comments: There are some points where HGV's have to encroach into the cycle lane if there is another large vehicle coming in the opposite direction. The narrow cycle lanes have attracted adverse comment but it was thought better to have a continuous lane than an intermittent facility. Although this scheme has been generally accepted, its effects on speed and accident reduction have been disappointing.

Contact: Andrew Parker-Mowbray ☎ 01452 425612 **E-mail:** aparkerm@gloscc.gov.uk
Authority: Gloucestershire County Council

Technical Data

Location Type:	Urban, residential.
Road Type and Speed Limit:	Urban single carriageway: 30mph.
Scheme Type:	Chicanes, pinch points, priority junctions and cycle by-passes.
Length of Scheme in Total:	3.5km.
Dimensions:	Width between 7.3 and 10.5m.
Materials:	16 low voltage lights and enhanced reflective signs were used. The supplier has now resolved early problems with the lights and the reflective signs have proved clearly visible, even in adverse conditions. Cycle groups have commented that the coloured surfacing has resulted in transverse ripples which are noticeable to racing cycles.
Lighting:	No alterations were required to existing lighting.



A430 Bristol Road consultation leaflet.

25 Finlay Road, Gloucester, Gloucestershire

cycle lanes, hatching, refuge islands

One of the refuge islands on Finlay Road.

Implemented: Summer 1997.

Background: Finlay Road is a wide single carriageway road with a 40mph speed limit and was part of the original A38 Gloucester ring road. Generally it is fronted by residential properties which are set back behind wide highway verges. The generous width of carriageway of 12.5m meant that inappropriate overtaking frequently occurred in both directions, resulting in situations when the traffic was four-abreast across the carriageway. The wide carriageway and overtaking opportunities also contributed to excessive speeds This length of the ring road also provided a significant barrier to pedestrian movements with just a single controlled crossing situated at its mid point.

Need for Measures: High traffic speeds and irresponsible overtaking made this road a barrier between residential areas.

Measures Installed: Use of cycle lanes, hatching and refuge islands.

Special Features: The introduction of cycle lanes and refuge islands has been aimed at reducing the vehicular traffic lanes to 3.5m. Pedestrian refuges are installed at a spacing of 100m.

Consultation: Extensive consultation with residents' associations, frontagers, emergency services, bus operators and cycling groups.

Monitoring	Accidents (pia)	Speeds (mph)	Traffic Flow
Before (1994-1996)	14	44	Nth bound 14,000 Sth Bound 13,000
After (1998-2002) (See Other Comments below).	26	38	Nth bound 14,500 Sth Bound 12,000

Other Comments: The scheme was well received by the public and traffic speeds have reduced from 45mph to 38mph. However, recorded accidents have not reduced since the scheme was introduced. Immediately following introduction of the scheme road users tended to drive aggressively behind any vehicle travelling at or below the speed limit. With time this behaviour has reduced as drivers are now accepting the measures.

Contact: Andrew Parker-Mowbray ☎ 01452 425612 E-mail: aparkerm@gloscc.gov.uk
Authority: Gloucestershire County Council

Technical Data

LOCATION TYPE:	Urban residential.
ROAD TYPE AND SPEED LIMIT:	Wide single carriageway: 40mph.
SCHEME TYPE:	Round narrowing using cycle lanes and pedestrian refuges.
LENGTH OF SCHEME IN TOTAL:	1km.
MATERIALS:	Traditional except for: Low voltage illuminations to bollards to remove need for ducted road crossings; no illumination of keep left signs on refuge islands; enhanced reflective material used; red surfacing to cycle lanes using red stone chippings set in a cold applied resin base.
COSTS:	£163,000.

Finlay Road cycle lane introduced with lane markings and central hatching.

26 "Safer City" project, Gloucester
speed cameras, cycle lanes, refuges, gateways, speed humps/cushions

Gateways.


Speed hump.


Bus lanes.


SPECS camera system.

Examples of measures used in the "Safer City" project.

This was a major project using a city wide approach in various locations throughout the city.

Implemented: Between 1996 and 2001 as a demonstration project funded by the Department for Transport.

Background: The aim was to take a city wide approach to reducing road casualties by at least one third. The "urban safety management" approach considers safety for the whole area and involves use of a very wide range of urban management techniques.

Need for Measures: To reduce traffic speeds, to manage traffic onto the right roads, and to reduce road casualties.

Measures Installed: These included: gateways, anti-skid surfacing, speed cameras, speed humps/cushions and tables, cycle lanes, pedestrian crossings, cycle crossings, refuge islands, road markings and signing.

Special Features: The steps involved in the development of this scheme were:

- determine an "ideal" road hierarchy;
- identify accident problems;
- assess performance of the network and"inappropriate" routes;
- produce a strategy for safety management;
- set objectives for each sub-area;
- effective consultation, and
- monitor effectiveness.

Consultation: This involved formation of a "Safer City Forum" consisting of voluntary groups, transport operators, emergency services and disabled groups. Frequent press releases and post campaigns helped keep residents informed of progress.

Monitoring	KSI Accidents (pia)	Speeds (mph) 85%ile	Traffic Flow (24hr flow)
Before (1991-1995)	52	-	-
After (2001-2003)	37	-3.2	-2.0%*

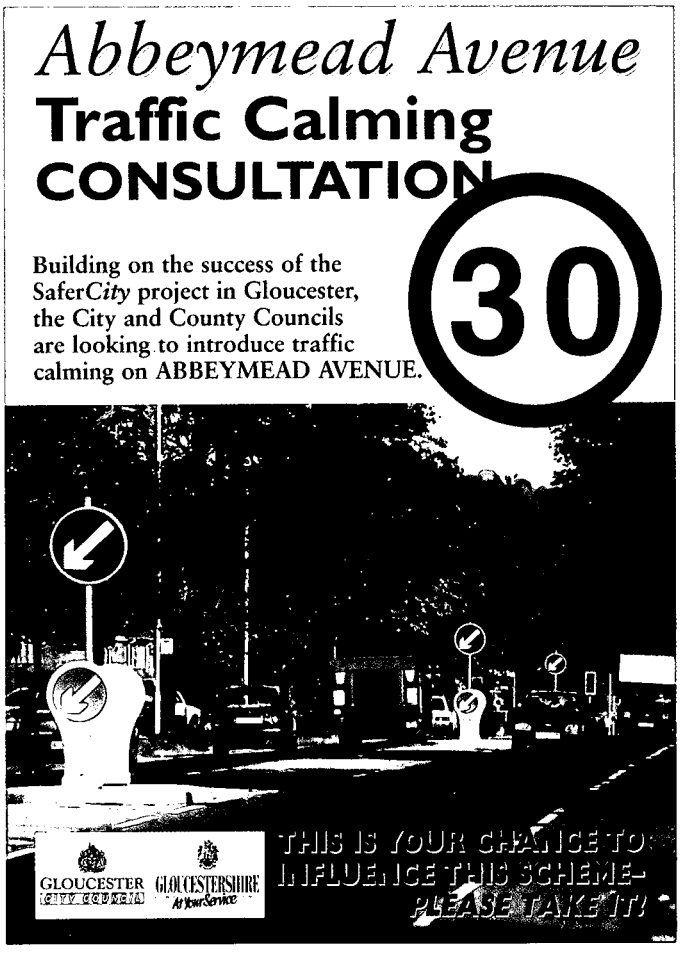
*These figures represent overall reductions for the schemes.

Other Comments: Introducing traffic calming to so many areas in a relatively short period did cause some residents to react against the project. Some residents wanted the more severe road humps and speed cushions whilst others felt the calming was too onerous. Major maintenance and seven repairs had to be co-ordinated with other work. Priorities were determined using a "worst first" approach. For more details on this project refer to TRL Report 589 *Gloucester Safer City: Final Report 2003* A Mackie and P Wells.

Contact: Andrew Parker-Mowbray ☎ 01452 425612 E-mail: aparkerm@gloscc.gov.uk
Authority: Gloucestershire County Council

Technical Data

Location Type:	City wide.
Road Type and Speed Limit:	Generally 30mph.
Scheme Type:	"Urban safety management" using many different techniques.
Materials:	9,500m^2 of anti-skid surfacing at eight locations. Seven speed camera sites (with number plate recognition) 350 vertical deflections (humps, cushions, tables) 12.5km of cycle lanes Eighteen Zebra crossings, six signal controlled crossings Many pedestrian refuges 20mph zones in Linden and Podsmead areas.
Costs:	£5m.



An example of the consultation material.

27 Lathom, Lowry Hill Lane/Hall Lane /Briers Lane/Ring O Bells Lane, Lancashire

mini roundabout, direction signs, carriageway markings

A5209 Lowry Hill Lane, junction with B5240 Hall Lane, looking west.

Implemented: March 2000.

Background: At these junctions there has been a general problem concerning high traffic flows, high vehicle speeds and poor road safety.

Need for Measures: To reduce injury accidents and improve traffic conditions at the junction.

Measures Installed: Provision of mini roundabout with associated signing, pedestrian refuge, traffic island and cycle lane. New direction signs and carriageway markings throughout the length of the scheme.

Special Features: Skid resistant material, red textureflex surround.

Consultation: Lancashire County Council, police, West Lancashire District Council, parish council, local residents, cyclists.

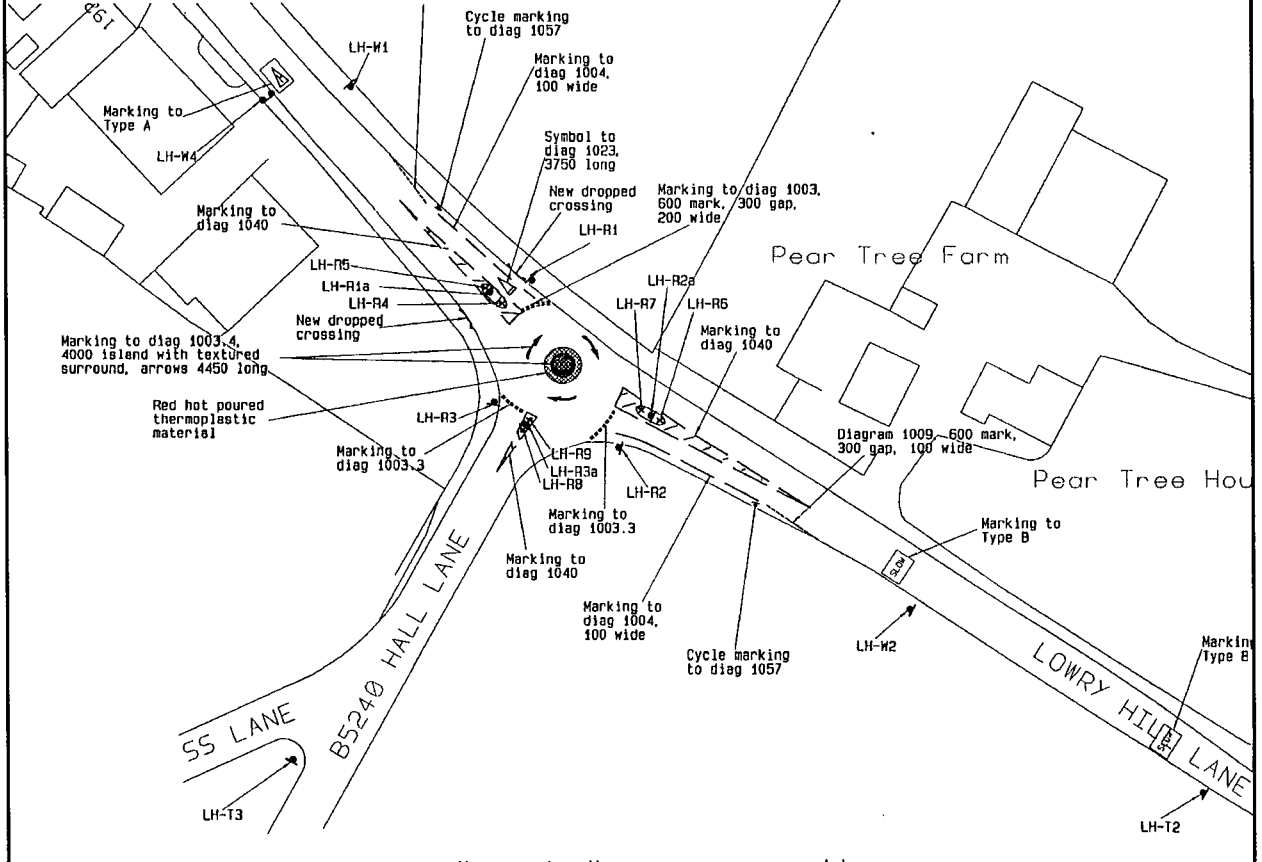
Monitoring	Accidents (PIA)	Speeds (85%ile)	Traffic Flow (wk av)
Before	7 in 3 years	42	6,866
After	2 in 3 years	35	6,720

Other Comments: This is a relatively inexpensive scheme that is (so far), a successful use of a mini-roundabout in a rural location with a 40mph speed limit.

Contact: Adrian Hanks ☎ 01772 532237 E-mail: adrian.hanks@env.lancscc.gov.uk
Authority: Lancashire County Council

Technical Data

Location Type:	Village local distributor road.	
Road Type and Speed Limit:	Rural, classified 40mph.	
Scheme Type:	One min roundabout.	
Length of Scheme in Total:	236m.	
Dimensions:	Pedestrian island:	1.8m radius.
	Cycle lane:	1.2m wide.
	Mini roundabout central island:	4.0m.
	Mini roundabout over-run:	1.0m.
Materials:	Mini roundabout:	White thermoplastic with red textured over-run.
	Pedestrian island:	Open-graded basecourse.
Signs:	Diags 602, 611.1, 610, 510, 7014, 512.1.	
Road Markings:	Diags 1024, 1003, 1023, 1010, 1004, 506.1.	
Lighting:	New lighting columns provided at mini roundabout.	
Costs:	£22,000.	



Lowry Hill Lane/Hall Lane, signing and lining.

28 The Methleys, Chapel Allerton, Leeds, West Yorkshire, Home Zone pilot

gateways, build outs, speed cushions, coloured surfacing

Methley Drive – entrance point to the Home Zone.

Implemented: September 2001.

Background: The area is home to a very strong community group, Methleys Neighbourhood Action, who have been instrumental in the national campaign for Home Zones. The area was submitted to DfT for inclusion in the pilot project and subsequently accepted.

Need for Measures: The main thrust of the community groups campaign was to make the streets more accessible to all members of the community and to make the car driver feel like a guest in the street. Whilst the presence of cars is accepted, the streetscape tries to send a message that the area is "different" and that drivers should modify their behaviour accordingly.

Measures Installed: Gateways, build-outs, speed cushions, coloured surfacing, shared surface and soft landscaping.

Special Features: Part of the main spine road is now a single surface with patterned block paving, large planted areas and trees.

New single surface with community planted trees.

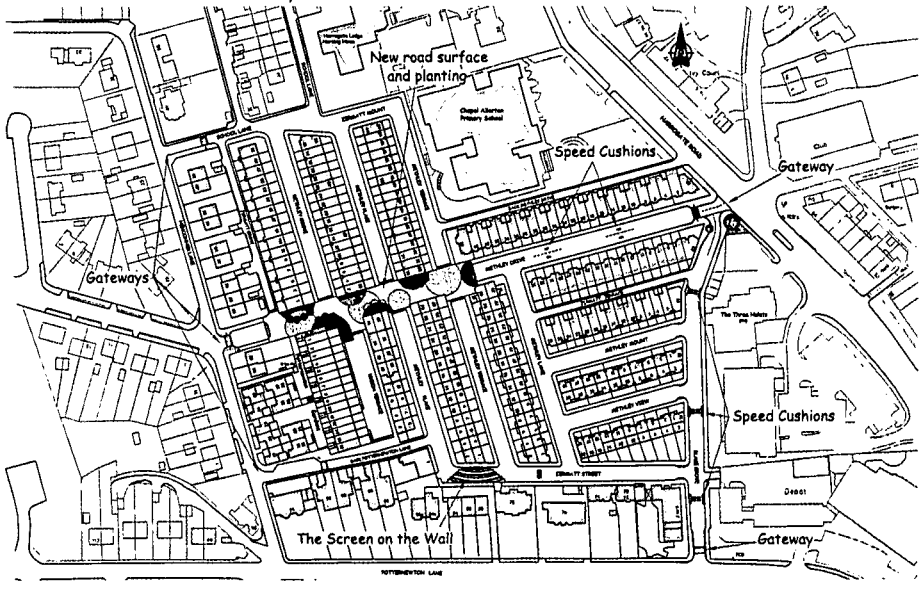
Consultation: Residents by questionnaire, newsletters, publicised exhibition and public meetings. There was also an Authority/Community Working Group, Ward Members were involved throughout, as were schools, and the emergency services.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (2 way 24hr)
Before	0 in 5 years	25/20	1,150
After (2001-2004)	0 in 3 years	19/14	960

Contact: Andy Merckel ☎ 0113 2477555 E-mail: andy.merckel@leeds.gov.uk
Authority: Leeds City Council

Technical Data

Location Type:	Residential, school.
Road Type and Speed Limit:	Urban unclassified; 30mph.
Scheme Type:	Home Zone; including gateways, speed cushions, shared surface and soft landscaping.
Length of Scheme in Total:	60,905m^2.
Dimensions:	1900x1750mm speed cushions; other features vary.
Materials:	Cushions in bitumen macadam. Build-outs in PCC kerbs. Single surface in PCC blocks, flags, bitumen macadam. Design incorporates hand made clay blocks with designs imprinted by residents. Tree guards and knee rails custom made to complement surroundings.
Signs:	20mph zone signs, Diag 674 and 675 at entrances, posts match other street furniture in style and colour.
Lighting:	Upgraded to 6m low-pressure sodium. General light levels improved.
Costs:	£266,645.



The Methleys Home Zone proposals.

Other Comments: The local community made immediate use of their new streetscape by holding a series of events within the Home Zone. This commenced with various events to celebrate completion of the scheme. A comprehensive monitoring programme led by TRL and the Council was planned to assess the impacts of the scheme in detail, and reaction from local residents was extremely positive. Several communities in Leeds expressed an interest in developing a similar scheme in their localities after having seen the success in the Methleys. The Government provided funding for a second Home Zone in the Rawdon area of Leeds following a successful bid prepared by Leeds City Council through the Home Zones Challenge. The Methleys Pilot Home Zone demonstrates an excellent example of equal partnership working between the local authority and the local community. The processes adopted reflect the Council's commitment to local participation and have resulted in the development of an innovative and high quality scheme.

29 High Street (A607), Navenby Lincolnshire

kerb build-outs, bus stops upgrading, gateway signing, zebra crossing

Southern approach to village with gateway sign.

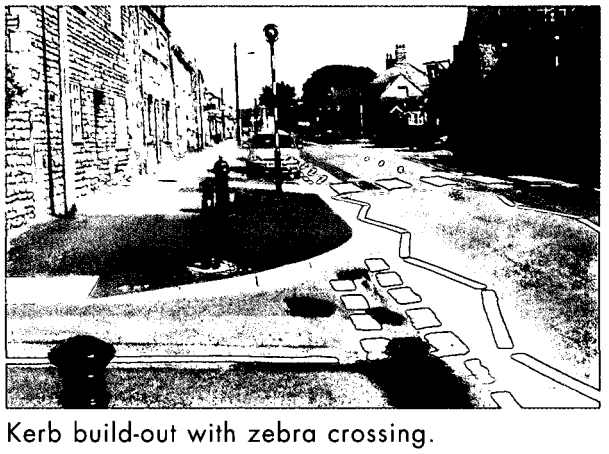
IMPLEMENTED: June 2002.

BACKGROUND: Navenby is situated 10 miles south of Lincoln on the A607, which is the main Lincoln to Grantham road. This busy road is a main link to the A1 and has a high volume of traffic throughout the day, especially at peak times.

NEED FOR MEASURES: Although this village had a 30mph speed limit, there was still a problem of speeding traffic through the village. Together with the volume of traffic, residents of the village were experiencing problems crossing the road, especially elderly residents.

SPECIAL FEATURES: The scheme also involved the upgrading of four bus stops, which were constructed using "high" bus stop kerbs to facilitate the low floor interconnect service buses which extensively use this route, and a number of other features.

CONSULTATION: Consultation took place between Lincolnshire County Council Highways, Navenby Parish Council, together with District and County Councillors. The area's MP was also kept up to date during the consultation period. Once the plans were finalised, they were put on display in the village office so they could be viewed by residents.



Kerb build-out with zebra crossing.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW
BEFORE	2 in 5 years	92% <40mph	8,106
AFTER	3	*	*

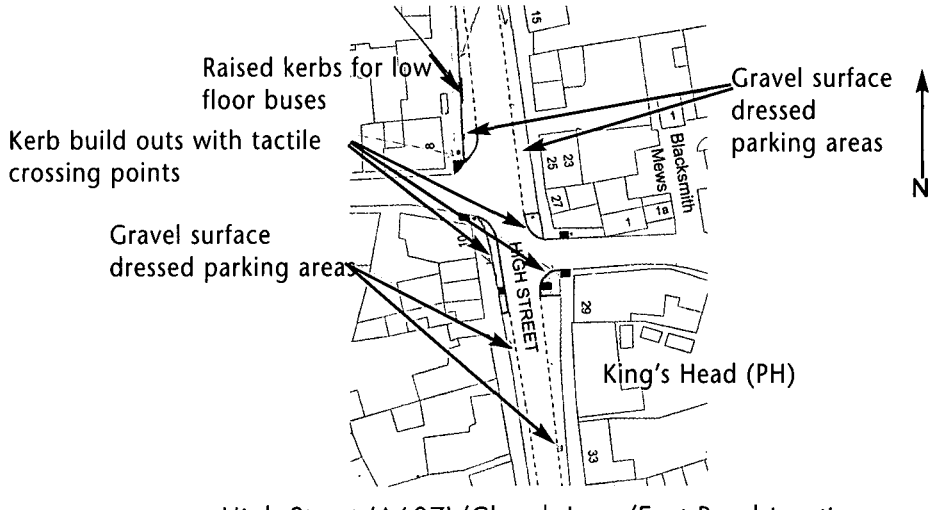
* After count due summer 2004.

OTHER COMMENTS: The scheme has received a very favourable response from local residents, as well as the district & parish councils.

CONTACT: NICK MARSH ☎ 01522 553048 E-MAIL: nicholas.marsh@lincolnshire.gov.uk.
AUTHORITY: LINCOLNSHIRE COUNTY COUNCIL

Technical Data

Location Type:	Navenby is situated approximately 10 miles south of Lincoln. The main road through the village is the A607, which is the main Lincoln to Grantham Road. This road is a main link to south Lincolnshire and the A1.
Road Type and Speed Limit:	The speed limit was, and still is 30mph. At present, both the north and south of the village is national speed limit. However, since the scheme has been implemented there are plans for a 40mph limit north of the village for 1/4 of a mile.
Scheme Type:	The scheme involved the construction of a series of kerb build-outs at various junctions to physically narrow the road, which has in turn created edge of carriageway parking, allowing easy parking for the local shops and residents. By reconstructing these junctions a wider footway has been created, with "buff" tactile crossing points being installed. A Zebra crossing has been constructed mid way through the scheme with anti skid approaches. Four raised bus stops to facilitate Interconnect service buses have been constructed.
Total Length of Road	1400m.
Dimensions:	The parking area is 1.8m wide denoted by intermittent lining (1m line – 1m gap).
Materials:	Tarmac (full construction). Kerbs. Buff tactiles: (for uncontrolled crossing points). Red tactiles: (for controlled crossing points). White lining: (for parking areas, edge lines, give way lines, centre lines. Electrical works (for zebra crossing).
Signs:	Gateway signs non standard.
Costs:	Total cost: £34,219.37 funded on a 50/50 basis between Lincolnshire County Council and Navenby Parish Council. Lincolnshire Road Safety Partnership also contributed £10,000 towards the scheme.



High Street (A607)/Church Lane/East Road junction.

30 Bettws Lane and Monnow Way Newport, South Wales

mini roundabouts, narrowings, flat top humps, round top humps

Block work, flat top hump with narrowing.

Implemented: Road Safety Education, Training and Publicity and Police Enforcement Campaigns implemented July 1987-July 1988. Traffic Calming measures implemented in six stages between January 1989 and May 1994.

Background: Bettws Lane and Monnow Way are both the local distributor road and main access road to a large residential estate known as Bettws on the outskirts of Newport. Bettws Lane is broadly a straight road through an open area and passing a large Comprehensive School. Monnow Way forms a loop around the estate and has many side road junctions. Whilst Bettws Lane is broadly level and straight, Monnow Way adopts a curving alignment with sharp gradients at various sites.

Need for Measures: To reduce the accident record, which included a high proportion of child accidents and some speed related accidents.

Measures Installed: The following features were introduced on Bettws Lane: eight pedestrian refuge islands sited to coincide with pupil movements; and a hatched median strip. On Monnow Way the following measures were introduced: six mini roundabouts, 11 ramped narrowings, one flat top road hump and three round top road humps.

Special Features: The Road Safety Education, Training and Publicity and Police Enforcement Campaigns formed an integral part of the overall package of measures introduced. The Campaigns were undertaken as the first stage of the overall project and proved to be highly effective in announcing the problems to the residents and preparing the public for the introduction of the traffic calming measures. The value of these Campaigns in the success of the overall scheme should not be under-valued.

Road narrowing at a junction.

Consultation: Public Displays, Public Launch of Road Safety Education, Training and Publicity and Police Enforcement Campaigns, work with children in local schools, Police, bus company, statutory public advertisement.

Monitoring	Accidents (pia)	Speeds (mph)		Traffic Flow
		Bettws Lane	Monnow Way	
Before	52 in 3 years	43	35	723 (peak hr)
After	14 in 3 years	35	12 at ramped narrowings 27 at mid-point between features	n/a

Other Comments: Although no "after" traffic flow data is available, there would have been little or no change due to the nature of the site and surrounding road layout.

Contact: Mike Tan ☎ 01633 244491 **E-mail:** mike.tan@newport.gov.uk
Authority: Newport City Council

Technical Data

Location Type:	Residential.	
Road Type and Speed Limit:	Urban classified unnumbered: 30mph.	
Scheme Type:	Whilst the whole length of both Bettws Lane and Monnow Way were treated, traffic calming features were concentrated at key areas to regularly break up vehicular speeds and patterns and cater for the needs of pedestrians.	
Length of Scheme in Total:	3,920m.	
Dimensions:	Pedestrian Refuge Islands:	Width 1.2m. Length 6m.
	Median Strip:	Width 1.4m
	Mini Roundabout:	Island diameter 4m. Inscribed Circle diameter 18m. Dome height 100mm. (1 Number)
	Mini Roundabouts: Inscribed circle diameter:	Island diameter 2m with a 0.75m annulus. 10m. Dome height 50mm. (5 number).
	Ramped Narrowings:	Build out length 16m. Build out Width 2m. (Build outs to both sides).
	Road Hump:	Length 6m. Road Hump width 3.5m. Ramp length 600mm.
	Flat Top Road Humps:	Length 6m. Height 100mm. Ramp length 600mm.
	Round Top Road Humps:	Length 4m. Height 100mm
Materials:	Pedestrian Refuge Islands:	Kerbing and asphalt. Annulus to Mini
	Roundabouts:	Blocks with flush kerbing.
	Ramped Narrowings:	Build-outs – kerbing and asphalt.
	Road Humps:	Blockwork.
	Flat Top Road Humps:	Ramps – blockwork. Infill – asphalt.
	Round Top Road Humps:	Asphalt.
Signs:	Road Hump warning signs to Diag 557.1. Road Narrows signs Diag 516 with Single File Traffic plate to Diag 518. Roundabout warning signs to Diag 510. Mini Roundabout signs to Diag 611.1.	
Lighting:	Lighting upgraded to 8m high columns with 100W SON lanterns.	
Costs:	£381,999.	

31 Llanyravon Way, Cwmbran, South Wales,

20mph zone, speed cushions, flat top speed table, refuge islands, coloured surfacing

Entry to the 20mph Zone.

Implemented: May 2001.

Background: Llanyravon Way is a residential local distributor road in the Llanyravon area of Cwmbran. There is a junior and infants School at a mid point on its length, with a Doctor's Surgery opposite and a local shopping centre at its south western end. The road is broadly straight, has an open aspect and falls gently towards its south western end. Caernarvon Crescent and Liswerry Drive are significant residential side roads to Llanyravon Way.

Need for Measures: To reduce the speed and volume of short cutting traffic.

Measures Installed: The following features were introduced on Llanyravon Way: eight sets of speed cushions in pairs (two in association with the pedestrian refuge islands), two sets of speed cushions in threes, two pedestrian refuge islands, one flat top speed table at school access and 20mph signing. On Caernarvon Crescent and Liswerry Drive nine sets of speed cushions in pairs were introduced on both roads. (Other lesser side roads were untreated)..

Llanyravon Way.

Consultation: Public Exhibition, work with children in local schools, emergency services, bus company, Community Council, statutory public advertisement.

Monitoring	Accidents (PIA)		Speeds (mph)		Traffic Flow	
	LW	CC	LW	CC	LW	CC
Before	3 in 3 years	1 in 3 years	35	23	6,776	n/a
After	0 in 1 year	0 in 1 year	20	22	3,550	n/a

LW= Llanyravon Way CC= Caernarvon Crescent

Other Comments: Reflective marker posts subsequently provided to both sides of features on Llanyravon Way at request of Police to highlight location, discourage parking and prevent drivers mounting verges. Pedestrian guardrail opposite school replaced as part of job.

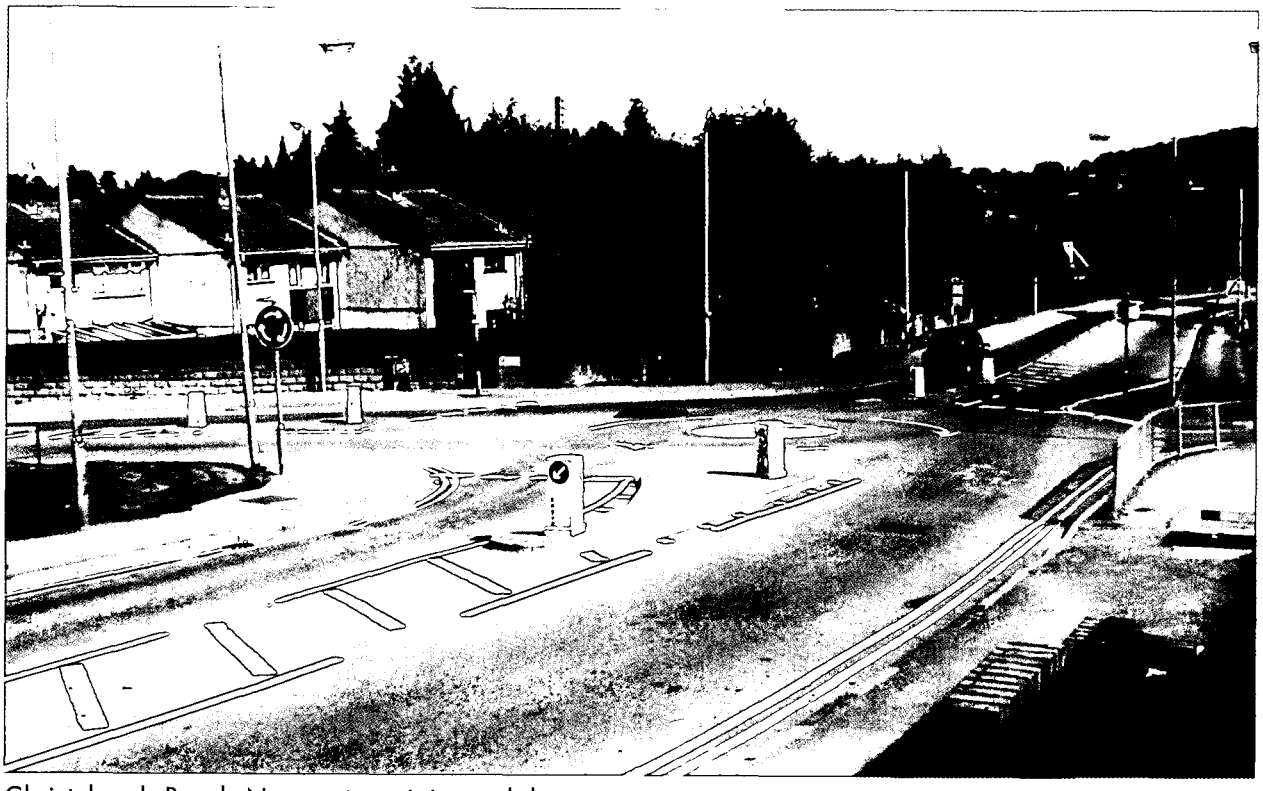
Contact: Kevin Mulcahy ☎ 01495 762200 **E-mail:** Kevin.Mulcahy@torfaen.gov.uk
Authority: Torfaen County Borough Council

Technical Data

Location Type:	Residential.	
Road Type and Speed Limit:	Llanyravon Way: Urban classified unnumbered: 30mph. Caernarvon Crescent and Liswerry Drive: Urban unclassified: 30mph.	
Scheme Type:	Whole length of Llanyravon Way and two abutting side roads (Caernarvon Crescent and Liswerry Drive) treated with traffic calming features supporting provision of 20mph speed limit zone.	
Length of Scheme in Total:	780m.	
Dimensions:	Speed cushions:	Height 75mm. Width 1.6 and 1.9m. Length 3.1m
	Flat top Speed Table:	Height 75mm. Width 7m. Length 18m. Ramp Length 600mm.
	Pedestrian Refuge Islands:	Width 1.3m. Length 4.6m with 2m pedestrian gap.
Materials:	Speed cushions:	Rubber and tarmacadam.
	Pedestrian Refuge Islands:	Rubber island blocks.
	Flat Top Speed Table:	Rubber ramps with bitmac infill covered in red coloured surfacing.
	Coloured Surfacing:	Green patches at terminal points. Red surfacing at pedestrian refuge Islands, on speed table and on approaches to central cushion of three cushion arrangement.
Signs:	Five 20mph speed limit zone signs to Diag 674. Five End of 20mph speed limit zone signs to Diag 675. Two x 20mph carriageway marking roundels at terminal points on Llanyravon Way.	
Lighting:	No change.	
Costs:	£59,779.	

32 Christchurch Road, Newport South Wales

mini roundabout, junction alterations, terminal narrowing, speed cushions



Christchurch Road, Newport – mini-roundabout.

IMPLEMENTED: June 1997.

BACKGROUND: Christchurch Road is a residential distributor road on the outskirts of the City of Newport. It provides access, both directly and indirectly, to a large residential area and to surrounding countryside. The road follows the natural topography of the landscape and has a number of side roads. At the western end of the treated length of road there was a four armed junction of unusual configuration.

NEED FOR MEASURES: To reduce the accident record, which included a number of speed related incidents.

CONSULTATION: Statutory public advertisement and presentation to neighbourhood meetings.

Christchurch Road, road narrowing.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (24HR AV)
BEFORE	8 in 3 years	n/a	5,100
AFTER	1 in 3 years	22	n/a

OTHER COMMENTS: Substandard height kerb and footway over part of the treated length of road had to be subsequently raised to prevent vehicles being driven on the footway to avoid the speed cushions.

CONTACT: MIKE TAN ☎ 01633 244491 **E-MAIL:** mike.tan@newport.gov.uk
AUTHORITY: NEWPORT CITY COUNCIL

Technical Data

Location Type:	Residential.	
Road Type and Speed Limit:	Urban classified unnumbered: 30mph.	
Scheme Type:	Central section of Christchurch Road treated with traffic calming measures and the Christchurch Road/St. Julian's Road/Clevedon Road junction modified to provide appropriate end to traffic calmed area and regulate movements at this junction. The following features were introduced: mini roundabout, junction alteration to provide T junction in lieu of Y shaped junction, 10 sets of speed cushions in threes 1 set of 4 speed cushions (1 in lay-by) and a terminal road narrowing with priority arrangements.	
Length of Scheme in Total:	850m.	
Dimensions:	Mini Roundabout:	4m diameter domed island with a 19m inscribed circle diameter.
	Junction Radii:	6m.
	Speed Cushions:	Height 75mm. Width 1.6 and 1.9m. Length 3.1m
	Terminal Road Narrowing:	Width 2.5m. Length 17m.
Materials:	Speed cushions:	Rubber.
	Terminal Road Narrowing:	Kerbing with asphalt footway surfacing.
Signs:	Three roundabout warning signs to Diag 510. 3 Mini Roundabout signs to Diag 611.1. 1 Give Way sign to Diag 602 at new T junction. 8 Road Hump signs to Diag 557.1 with plates to 557.2 or 557.3 as appropriate on approach roads and side roads. 1 Priority sign to Diag 615. 1 Priority from Opposite Direction sign to Diag 811.	
Lighting:	No change.	
Costs:	£140,000.	

33 Burnley Road, Padiham, Lancashire

cycle lane, refuges, hatching, build-outs

Burnley Road, looking west from Gawthorpe High School.

Implemented: May 1997.
Background: The Burnley Road Scheme is part of The Small Improvements Programme of Lancashire County Council. This site was chosen because it had the potential to save injury accidents.
Need for Measures: The aim of the scheme is to calm traffic and improve pedestrian and cycle safety.
Measures Installed: Cycle lane, pedestrian refuges, centre hatching, protected right turn, protected parking, footway build-outs, hatching alongside cycle lane, double yellow lines.
Special Features: Zebra crossing refuge enlarged.
Consultation: Lancashire County Council, police, Burnley Borough Council.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	27 in 3 years	no data	17,519
After	21 in 3 years	no data	17,236

Other Comments: The scheme has achieved a small reduction in accidents, both the number and severity of accidents involving cyclists have increased. After completion of the scheme, waiting restrictions were added on the approach to a length of solid central reserve following reports of damage only collisions.

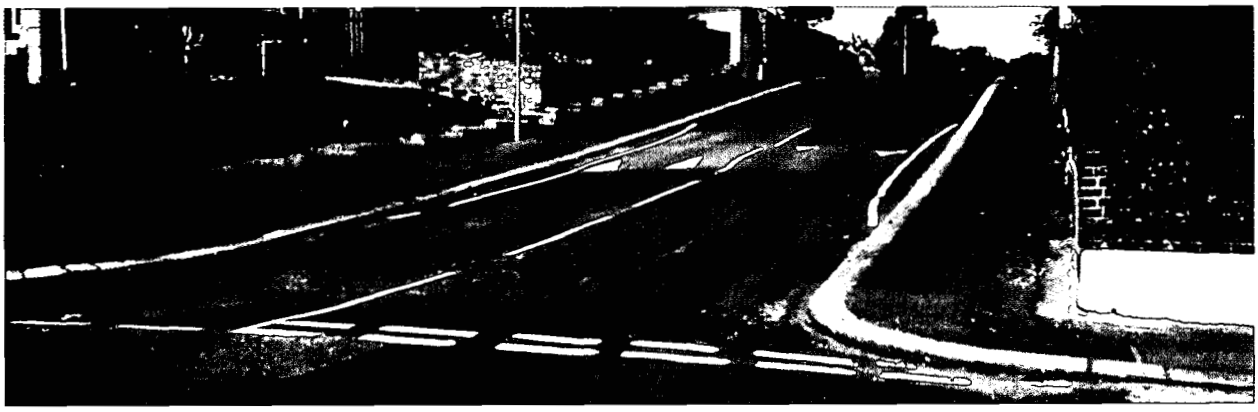
Contact: Adrian Hanks ☎ 01772 532237 E-mail: adrian.hanks@env.lancscc.gov.uk
Authority: Lancashire County Council

Technical Data

Location Type:	Residential and shopping area.	
Road Type and Speed Limit:	Urban, classified.	
Scheme Type:	Traffic calming.	
Length of Scheme in Total:	1.26km.	
Dimensions:	Refuge islands:	2m wide.
	Parking bay build out:	2m.
	Cycle lane:	1m wide.
	Cycle lane plug:	1m.
	Running lane:	3.5m.
	Hatched area between cycle lane and running lane:	1m.
Materials:	Red thermoplastic in right-turn lanes.	
Signs:	Road markings Diags 1010, 1018,1, 1004, 1038, 1040.2, 1040,4 1003, 1009.	
Lighting:	No changes.	
Costs:	£40,000.	

Looking west towards High School entrance.

34 Ralston Area, Paisley, Renfrewshire
gateway, road humps, build outs, signing



Alton Road – road hump.

Implemented: January 2001.

Background: Existing "access only" signs were becoming increasingly ineffective in this area. Residents raised the introduction of traffic calming measures as a priority. An initial trial was implemented at Newtyle Road, incorporating a speed cushion at either end of the road in an endeavour to attempt to deter through traffic from using the route. It became clear that the scheme required to be extended to the wider area and it is these subsequent measures that are outlined in this case study.

Need for Measures: To discourage the incidence of rat running through this residential area and improve safety for pedestrians, especially children.

Measures Installed: Gateway features, road humps, build outs and signing.

Special Features: The consultation and follow up survey allowed all road user groups to raise particular issues. Concerns relating to winter maintenance were raised and extra grit bins were provided to assist at locations with a steep gradient. Bollards aesthetically in keeping with the surrounding area were used for the gateway features.

Consultation: The Statutory consultation process was followed. Proposals were exhibited locally to allow the public to discuss the scheme. A number of objections were received and discussions took place with the involved parties to address the issues. In addition, Local Member involvement was strong, with newsletters being distributed to constituents, feedback from this allowed progress to continue. Further to the initial consultation a residents survey was undertaken in April 2002. A questionnaire was issued to over 400 households to gauge opinion on the effectiveness of the scheme. A 64% response rate was achieved.

Gateway signing.

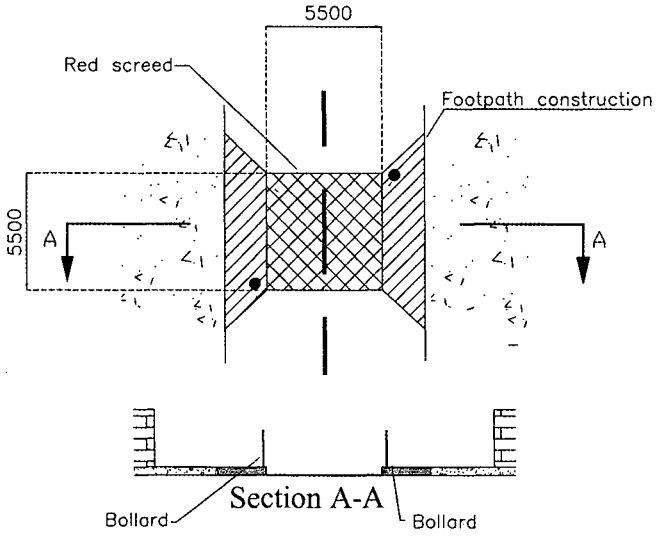
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	2	29 (average)	1,200
After	1	17 (average)	n/a

Other Comments: Understanding the needs of the customer and consulting before and after was a key factor in the success of the scheme. In addition, confirmation was gained that it is not easy to achieve the desired profile, as such humps are difficult to form. Consideration will be given to an alternative shape in any future work undertaken. Findings from the residents' survey showed that 91% of respondents considered that problems relating to speeding and "rat running" existed prior to implementation of the scheme. 83.5% were aware of the consultation process and 82% were in favour of the measures being introduced. A year after implementation, 82.7% are positive about the measures being in place.

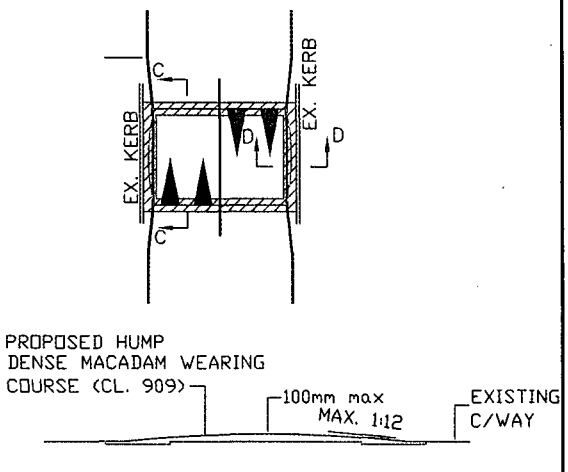
Contact: Scott Allan ☎ 0141 842 5811 E-mail: scott.allan@renfrewshire.gov.uk
Authority: Renfrewshire Council

Technical Data

Location Type:	Residential, urban fringe.	
Road Type and Speed Limit:	Unclassified: 30 mph .	
Scheme Type:	Road narrowing at gateways and "round topped" humps.	
Length of Scheme in Total:	1.5km.	
Dimensions:	Road humps (28):	Height 75mm (max). Width (variable 5.5 - 8.5 m). Length 3.7 m. Gradient 1:12 (max).
	Gateway features (6):	Pinch point 5.5m. Distance 30m (max).
Materials:	Road humps:	HRA.
	Gateway features:	Red screed.
Signs:	Humps signs to Diags 557.1 & 557.3. Road markings to Diag. 1061.1.	
Lighting:	Humps located near existing street lighting.	
Costs:	£40,000.	



Gateway Treatment.



Road humps detail.

35 Argyll Road Area, Ripley, Derbyshire

20mph zone, round top humps, junction narrowing, hcv restrictions

Argyll Road – looking north.

Implemented: Between October and December 2001.

Background: The seven streets (Outram Street, Havelock Street, Greaves Street, Stanley Avenue, Alfred Street and Booth Street) that make up the Argyll Road area lie to the east of Ripley town centre and are essentially residential with local shops on the periphery and some small employment. They total 1.9km in length and were subject to a 30mph speed limit. The roads were used as a shortcut to avoid travelling through the town centre between the B6441 Nottingham Road and B6179 to Swanwick.

Need for Measures: High speeds from vehicles taking shortcuts, particularly along Argyll Road leading to personal injury accidents and fear for safety. Road humps were installed along Argyll Road and the other streets to deal with displacement. Junctions were narrowed to deter traffic from entering.

A road hump in Argyll Road.

Measures Installed: 20mph Zone, 26 round top humps, two junctions narrowed, 7.5 tonne weight restriction and pedestrian dropped crossings provided.

Special Features: 20 mph zone created covering the seven streets.

Consultation: Local residents via letter drops, Emergency Services and Access Group. This resulted in some features being resited.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	4 in 3 years	32	n/a
After	0 in 7 months	20	n/a

Other Comments: The scheme has been a success, there are now reduced speeds, well within the target range with no adverse reaction from residents.

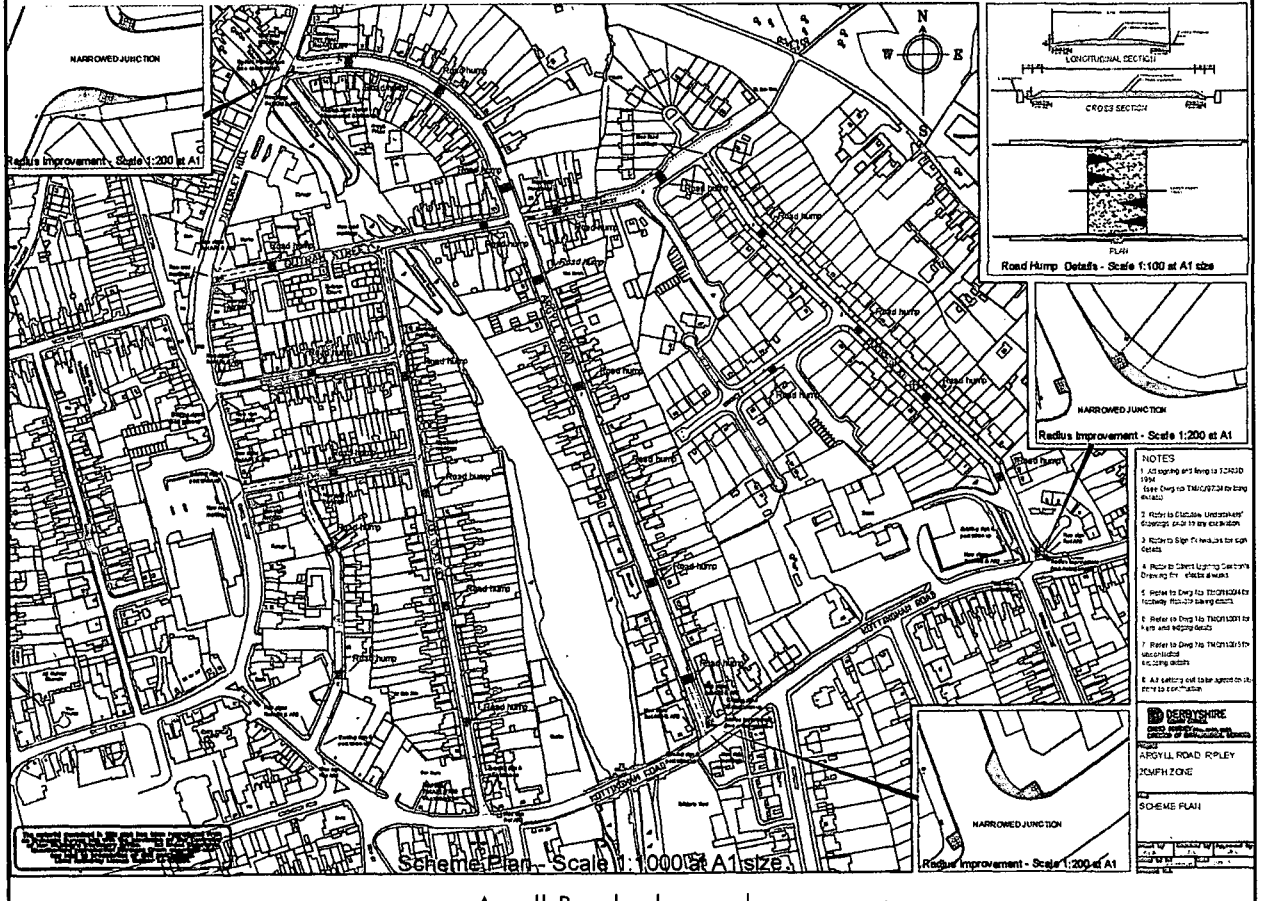
What Would We Do/Avoid Next Time: We would have preferred a more artistic design for the entry signs but there was no school etc where we could get interest for a competition. But existing ones serve their purpose.

Local Reaction: Seems good. 93% of respondents to consultation supported the scheme. There has been no adverse reaction to the scheme since its construction.

Contact: Pete Leigh ☎ 01629 580000 E-mail: : pete.leigh@derbyshire.gov.uk
Authority: Derbyshire County Council

Technical Data

Location Type:	Residential.
Road Type and Speed Limit:	Urban Non Classified, originally 30mph but now 20mph.
Scheme Type:	26 Round top road humps providing vertical deflection, junction narrowing and 20mph zone.
Length of Scheme in Total:	Seven Streets totalling 1.9km.
Dimensions:	Humps generally 75mm high x 3.7m long.
Materials:	Rolled asphalt humps, bitumen macadam carriageway.
Signs:	To be added.
Lighting:	No changes - but some illuminated signs.
Costs:	£24,000.



Argyll Road scheme plan.

36 Springfield and Upfield housing estates, Rugeley, Staffordshire

guardrail, cycle route, footway measures, subway lighting, refuges, narrowing

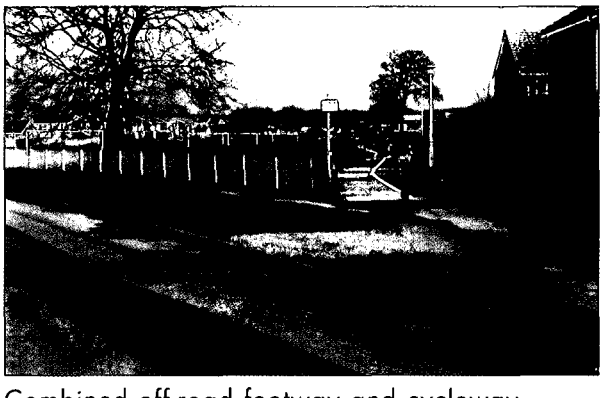
Traffic calming measures on Crabtree Way.

Implemented: Phase 1: December 2000-March 2001. Phase 2: 2001-2002.

Background: This socially deprived area was identified, from routine analysis of accident data, as suffering from significantly worse than average child accidents. Consultations with secondary Schools from across the County also revealed that Fair Oak high school had a high number of children who were driven to school as a direct result of local anxiety in relation to road safety. Detailed investigations showed that specific characteristics existed which justified £55,000 Local Safety Scheme (LSS) investment. A further £158,000 was made available from the *Safer Routes to School* (SRS) allocation of the Capital Budget for complementary measures to promote more sustainable transport choices and to improve the local environment.

Need for Measures: Required action to reduce the number and severity of road accidents. It was also intended that the traffic calming measures would help to discourage local car use, ie, rat-running through the housing estates and hence help to promote walking and cycling for local journeys including the "school run".

Measures Installed: Inside schools: guardrail, pedestrian crossings, cycle sheds. Outside schools: cycle routes and footway measures, subway lighting, mini island provision.



Combined off-road footway and cycleway.

Special Features: TSRGD road signs supported with road surface markings to same design; Implemented in association with local road safety education and cycle training.

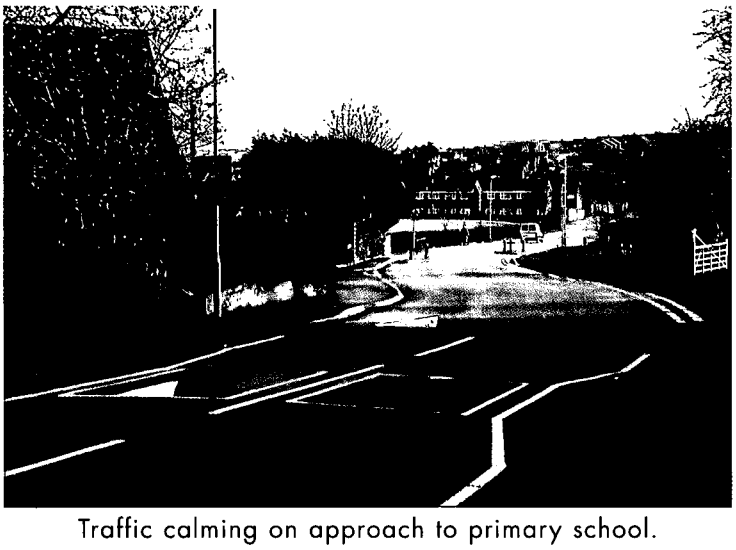
Consultation: Priorities established and traffic calming design brief prepared through consultation with Local Steering Group members. Letter drop to 2000 residences with questionnaire on use of traffic calming methods. Proposals drawn up and advertised in local press, library, on-street and through display events at school summer fairs and end of term school plays.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	10.2 per year (5 year av)	n/a	n/a
After	4 per year (3 year av)	n/a	n/a

Contact: James Bailey ☎ **01785 276573** **E-mail: james.bailey@staffordshire.gov.uk**
Authority: Staffordshire County Council

Technical Data

Location Type:	Residential.
Road Type and Speed Limit:	Housing estate with single carriageway minor road (C and D classification) on perimeter.
Scheme Type:	Main physical features are "speed cushions" with chicanes/narrowings. Also included are a mini island junction improvement, roadside signs (including speed limit gateways), road surface sign.
Length of Scheme in Total:	6km.
Dimensions:	Standard 75mm speed cushions.
Materials:	Road surfacing (regulating course); Standard specification road markings; coloured surfacing.
Signs:	Diags 545 & 546, 615 & 811, 602, 670, 557.1, 956 and 957.
Lighting:	Subway lighting.
Costs:	£55,000 for local safety scheme plus £115,000 for *Safer Routes to School* plus £74,000 for SRB. Total: £244,000.



Traffic calming on approach to primary school.

Other Comments: £10k was spent on subway lighting and the local feedback has been positive. Some early objections were received but they were about the effect on personal activities (eg, owner of a low floor MG motor car), not the principle of traffic calming. Proactive communication (press release about the scheme), comprehensive consultations, involvement of school children & use of a local steering group have given "ownership" of the scheme to the local community which has resulted in a positive approach and good uptake of the initiatives.

37 Sutton Avenue/Steyne Road, Seaford, East Sussex

mini roundabouts, Zebra crossings, refuges, narrowings

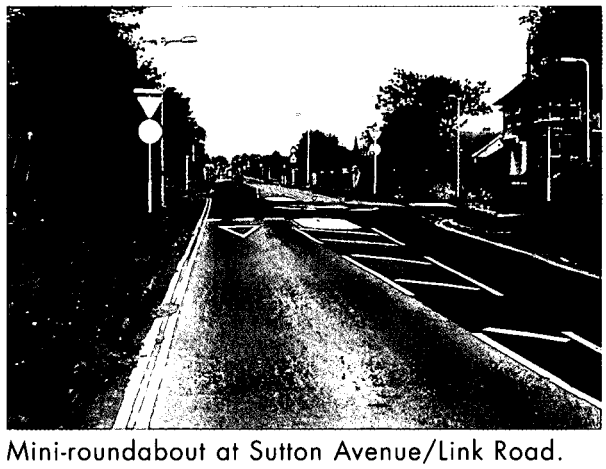
Mini-roundabouts at Sutton Avenue/Southdown Road.

IMPLEMENTED: Spring 2002.

BACKGROUND: A residential route containing a number of school sites and with a wide, straight, uninterrupted alignment which encourages its use as a link to the town centre and seafront avoiding congestion on the parallel main road (the A259). There are numerous crossroads and T-junctions giving access to the surrounding residential area. In 1999 it was found to have the highest priority for traffic calming in East Sussex, using the County Council's assessment procedure which takes account of factors such as crashes, vehicle speeds and flows, pedestrian and cycling activity, the level of development and the proximity of schools.

NEED FOR MEASURES: To reduce traffic speeds and improve crossing facilities, particularly near the schools.

MEASURES INSTALLED: Realignment of eastern junction to deflect vehicles entering from main road and prevent high entry speeds. Mini roundabouts to remove priority along route and improve side road access. Central islands to assist pedestrians and reduce carriageway width. Kerb build-outs to narrow carriageway and reduce speeds. Zebra crossings, some with narrowed carriageway, at identified pedestrian crossing points adjacent to schools.



Mini-roundabout at Sutton Avenue/Link Road.

SPECIAL FEATURES: Use of mini roundabouts as speed reducing features.

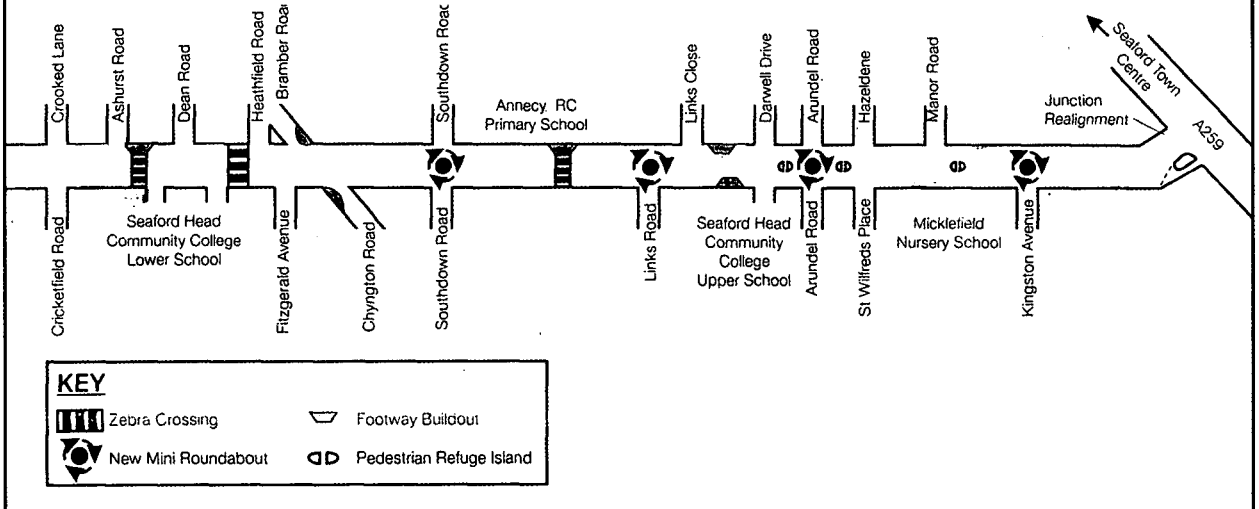
CONSULTATION: Initial consultations with emergency services and schools to develop options. Full public exhibition and consultation exercise on the options.

MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (24HR)
BEFORE	7 in 3 years	31	4,000
AFTER	5 (slight) in 19 months	27	4,000

CONTACT: SIMON CREW ☎ 01273 482106 E-MAIL: simon.crew@eastsussexcc.gov.uk
AUTHORITY: EAST SUSSEX COUNTY COUNCIL

Technical Data

Location Type:	Residential area.
Road Type and Speed Limit:	Urban "C" class: 30mph.
Scheme Type:	Crossings, narrowings and mini-roundabouts.
Length of Scheme in Total:	1.4km.
Dimensions:	Carriageway narrowed down to 5.5m at crossings.
Materials:	Concrete kerbs and islands.
Signs:	Appropriate warning and regulatory signs and road markings.
Lighting:	Upgraded to suit new layout.
Costs:	£230,000.

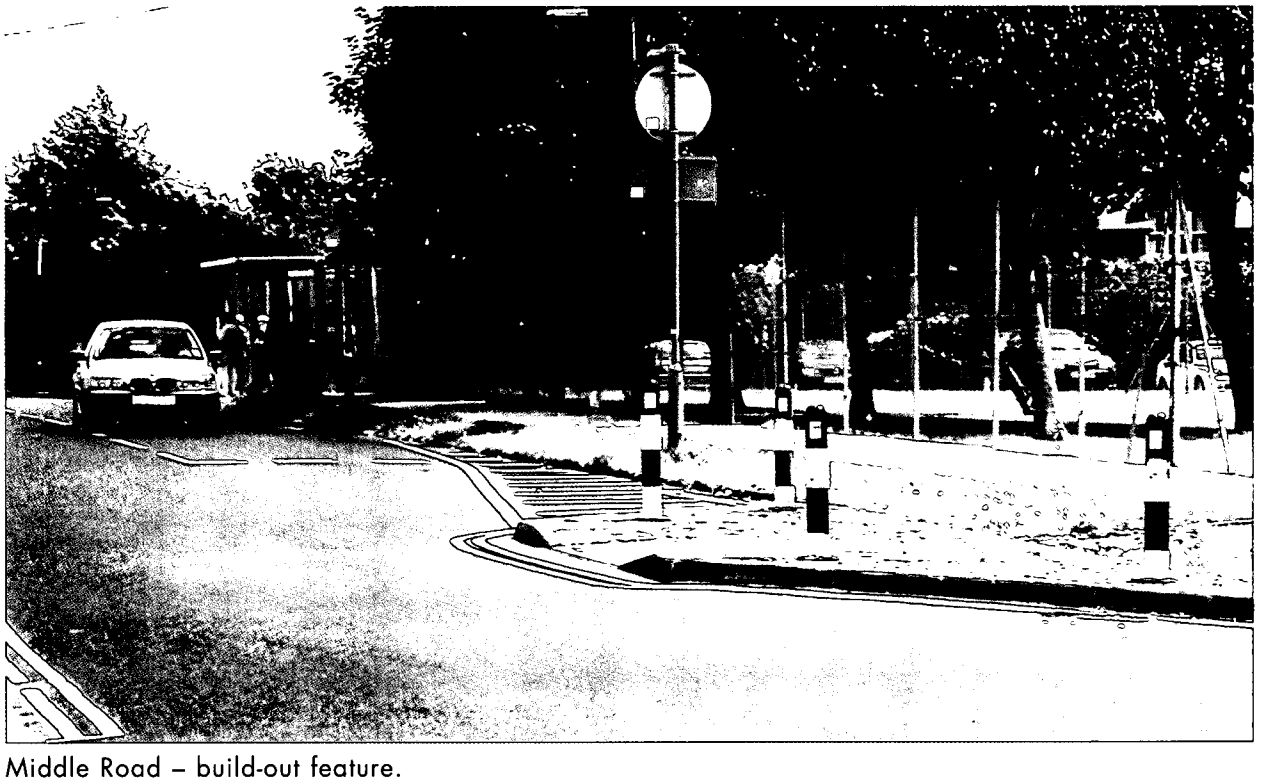


Sutton Avenue/Steyne Road – Phase 1 proposals.

Other Comments: Generally well received locally although compliance with roundabout priorities is an on-going cause of complaint. A further phase of measures will be considered in conjunction with the "Safer Routes to School" programme.

38 Middle Road/Stoney Lane, Shoreham-by-Sea, West Sussex

road humps, tables, mini roundabouts, build-outs



Middle Road – build-out feature.

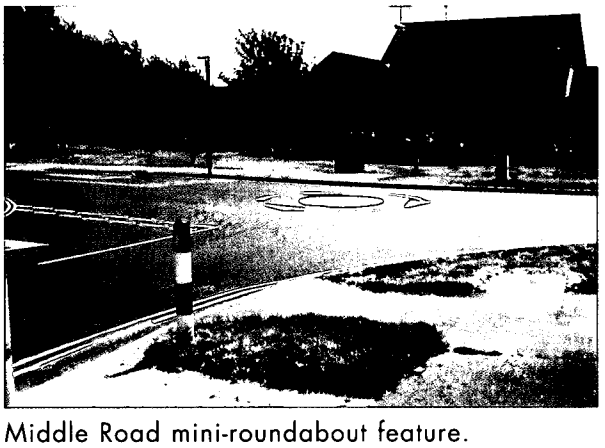
Implemented: May 1996.

Background: There was a long history of high speeds along Middle Road and Stoney Lane together with a poor accident record. This gave this area a high priority for the implementation of traffic calming measures.

Need for Measures: The measures and features were designed to address the problem of speeding along Middle Road and Stoney Lane, as both roads are in close vicinity to schools and pass through residential areas.

Measures Installed: This scheme utilised "build outs" some of which incorporated road humps as well as junction tables, further road humps and mini roundabouts.

Consultation: Letter drops were carried out canvassing an exhibition which lasted for two days and was held at the local school.



Middle Road mini-roundabout feature.

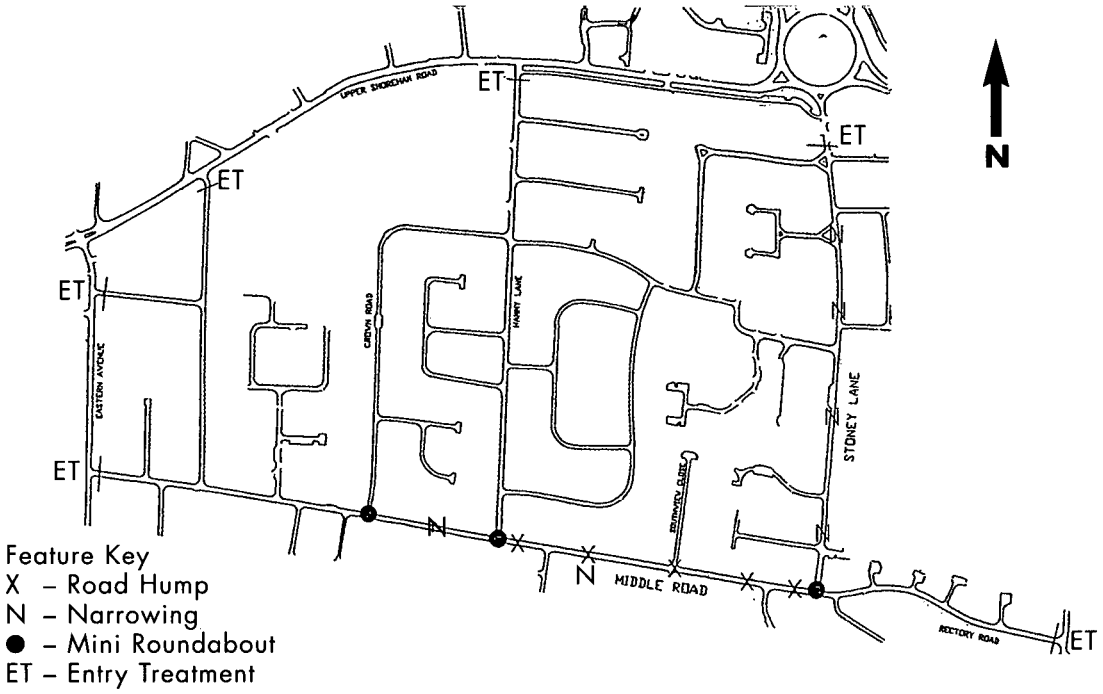
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	27 in 3 years	31	3,116
After	9 in 3 years	23	2,120

Other Comments: The scheme was well received and in general the features (build outs) appear to be properly used, that is, drivers do not appear to be provoked into getting to the build outs before oncoming traffic.

Contact: Roger Hobbs ☎ 01243 777746 E-mail: Alex.Sharkey@westsussex.gov.uk
Authority: West Sussex County Council

Technical Data

Location Type:	Residential area near to schools.
Road Type and Speed Limit:	Unclassified roads with existing speed limit of 30mph.
Scheme Type:	The scheme uses both vertical and horizontal deflections.
Length of Scheme in Total:	0.7km.
Dimensions:	Road humps Ramps: 1m. Plateau: 6m, 75mm high. Mini roundabouts Central dome diameter: 2m. Build outs: Leave 4m gap.
Materials:	Basic kerbs, hot rolled asphalt with imprint on ramps.
Signs:	Traffic signs used: priority workings, road humps, give way.
Lighting:	No changes to existing standard lighting.
Costs:	£107,000.



Plan showing position of traffic calming features used in Middle Road, Shoreham.

39 Broadwater Crescent, Stevenage Hertfordshire

humped Zebra crossing, mini roundabouts and speed cushions

Double mini roundabout used as an initial speed reducing feature.

IMPLEMENTED: July2001.

BACKGROUND: Broadwater Crescent is a busy local distributor "spine"road through the Broadwater area of Stevenage. It is a bus route with many junctions. A particular problem is the lack of off-street parking, many drivers park on the wide grass verges. The road looked like, and many drivers thought it was, a main road.

NEED FOR MEASURES: Unacceptable level of accidents. There were 34 accidents (three years to April 1999), with eight serious casualties. 13 accidents involved pedestrians, of which 11 were children. Seven shunts occurred, and four accidents involved bus passengers.

MEASURES INSTALLED: Phase1 concentrated on the accident areas. It consisted of eight mini-roundabouts, five humped zebra crossings, (two were converted from existing), five sets of speed cushions, extensive resurfacing, street lighting improvements and several planters to improve the environment and change the look of the road. Phase 2 was subsequently implemented by Stevenage Borough Council (see Plan).

Mini roundabout with humped Zebra crossing and extended bus stop.

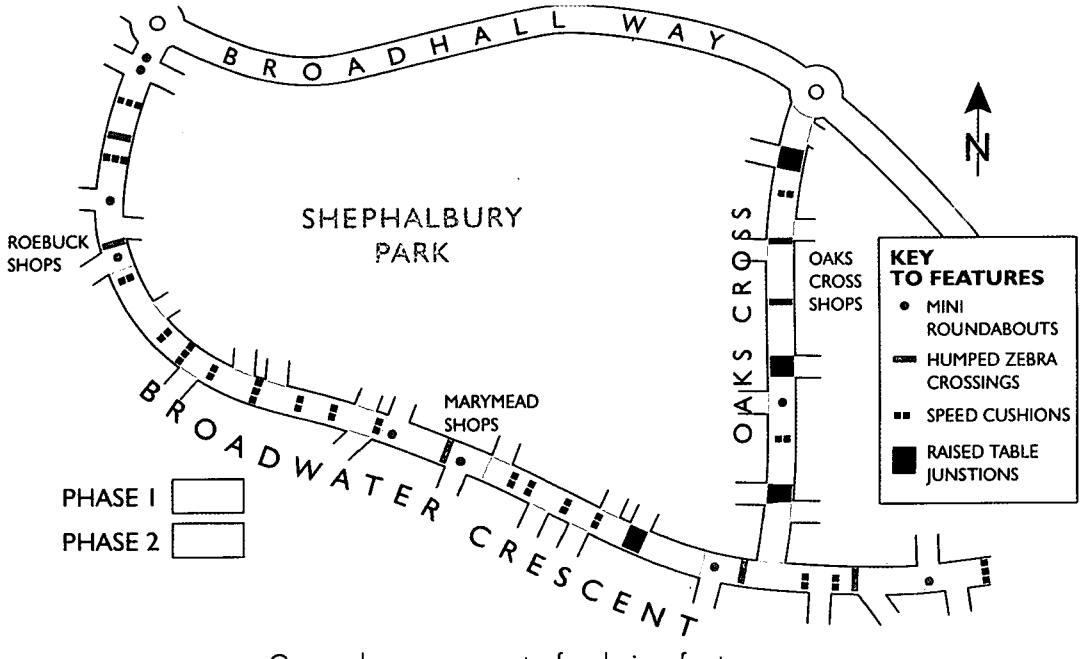
MONITORING	ACCIDENTS (PIA)	SPEEDS (MPH)	TRAFFIC FLOW (16HR)
BEFORE	11 per year (34 in 3 years)	36 to 38	7,200
AFTER	5 per year (9 in 23 months)	25 to 29	5,800

OTHER COMMENTS: The original gap between the speed cushions was 1.2m which was found to be too wide as many drivers chose to drive between the cushions. The cushions were subsequently enlarged, to 1.7m wide, to reduce the gap to1.0m. The scheme has been well accepted by residents who consider that it has definitely worked to reduce speeds and traffic flows (now using A602). Poor maintenance of shrubs was a problem, but now the Borough Council have replaced dead plants and carry out regular maintenance.

CONTACT: STEVE MOSSEY ☎ 01707 356276 E-MAIL: steve.mossey@hertshighways.org.uk
AUTHORITY: HERTS HIGHWAYS

Technical Data

Location Type:	Residential, shops, pubs, schools and buses.	
Road Type and Speed Limit:	Urban "C" road: 30mph.	
Scheme Type:	Flat top humped zebra crossings,mini-roundabouts and speed cushions.	
Length of Scheme in Total:	3.5km.	
Dimensions:	Height:	75mm.
	Width:	Varies.
	Length:	9m.
	Ramp Gradient:	1:20.
	Distance from Junctions:	Varies.
Materials:	Plateau and ramps:	Blacktop between raised kerbing, Red Asphalt for cushions.
Signs:	"Broadwater Safety Zone"and Hump signs.	
Lighting:	Replaced throughout with 8m tubular steel columns, fitted mainly with Philips SG5203/150T F POS1,150wSON-T.	
Costs:	£487,000 (Phase1) – including £127,000 for resurfacing, £90,000 for street lighting, and £64,000 for preliminaries.	



General arrangement of calming features.

40 Thames Ditton Area, Surrey

20mph zone, speed tables, speed cushions, roundabouts, banned turns

Roundabout treatment in conservation area.

New roundabout at Embercourt Road.

Implemented: January 2000.
Background: Thames Ditton is a small village near Hampton Court. The village centre is within a conservation area and the village is predominantly residential with a small number of local shops. There was a history of accidents at a major junction (Hampton Court Way/Summer Road) in this area. A feasibility study concluded that an area wide scheme would be most appropriate because of rat-running in roads near to the critical junction, through a conservation area.
Need for Measures: A continuing high accident record and rat-running through residential roads during peak hours.
Measures Installed: 20mph zone, speed tables, speed cushions, roundabouts, some banned turns.

Special Features: Earlier speed cushions had a width of 1.6m, which proved ineffective in slowing traffic. In this scheme widths of between 1.7m and 2.0m were used. Local residents campaigned for traffic signals and a Pelican crossing at one of the junctions. However, the County Council installed a mini-roundabout with refuges on the approaches and this have proved very successful.
Consultation: Leaflets were distributed and a public exhibition of the options was held. This led to design modifications and further public displays. Further consultation was undertaken with the emergency services.

Monitoring	Speeds (mph)		Traffic Flow	
	Inside village	Outside village	Inside village	Outside village
Before	32.7	34.4	7,711	4,998
After	24.7	27.1	6,110	3,765

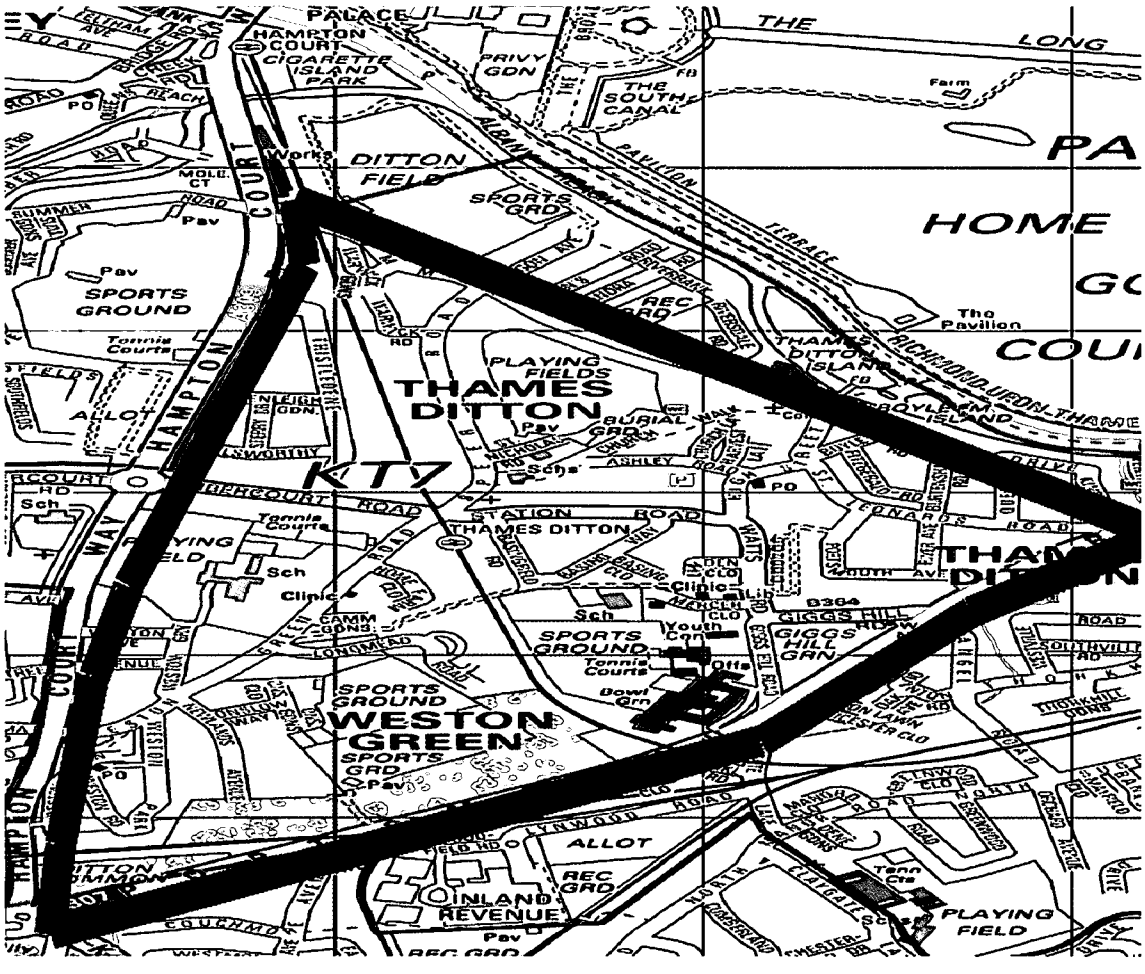
NB: Between 1988 and 1992, 19 accidents occurred at the Summer Road/Hampton Court Way junction. 62 accidents were recorded along Summer Road and St Leonards Road, the main rat-run. After implementation, within the monitored area the accident rate fell from 28(pia) in three years to four in two years.

Other Comments: The speed tables were constructed using by-pass channels for drainage. Junction table ramps were set back one metre from the main carriageway channel to reduce risk to cyclists and motorcyclists and assist visibility.

Contact: Frank Apicella E-mail: frank.apicella@surreycc.gov.uk
Authority: Surrey County Council

Technical Data

Location Type:	Urban, residential.
Road Type and Speed Limit:	A mixture of "B", "C" and unclassified roads, all with a 30mph limit.
Scheme Type:	20mph zone in the village centre, junction treatments, banned turns, pedestrian and cycling facilities, road humps, chicanes, refuge islands.
Materials:	All road tables and cushions were formed from hot rolled asphalt. Cushions used a steel formwork to ensure a consistent shape and profile.
Costs:	£350,000.



Plan of the measures at Thames Ditton.

41 Bridge Lane, Warrington, Cheshire

20mph speed limit, vertical deflection measures, humps

Bridge Lane showing "S" shaped humps on approach to a school.

Implemented: September 2002.

Background: Concerns expressed by residents about speed of vehicles and from pupils at school which frontages Bridge Lane during a travel plan initiative.

Measures Installed: Signed 20mph speed limit initially. Five "S" shaped approach humps introduced but bus operator refused to re-introduce half hourly service displaced during construction. Experimental waiting restriction introduced in September 2002 and buses re-introduced.

Special Features: Five "S" shaped approach humps (see photo above) with gradients highlighted in red high friction surface dressing.

Consultation: Local residents through a questionnaire; school through developing a travel plan; Parish Council; emergency services; bus operator, and formal advertising process.

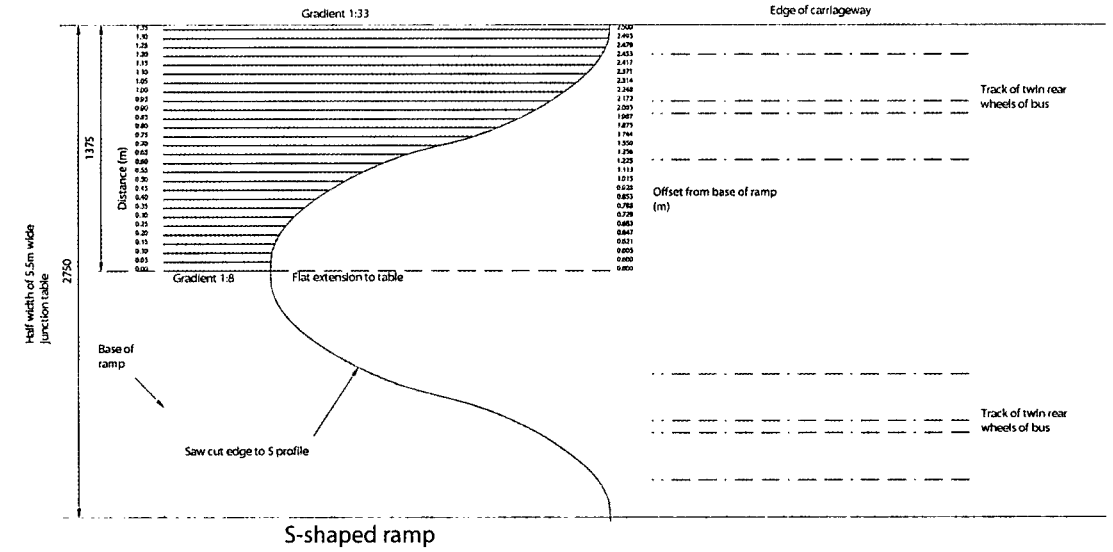
Monitoring	Accidents (pia)	Speeds (mph)	Traffic Flow
Before	0	32.4	3,419
After	0	21.5	3,173

Other Comments: A rear gate was also provided to the school which has spread the parking. A "walking bus" is now being considered. Dropped crossings and tactile paving are provided due to large number of elderly people in the area. The local reaction has been very positive. The waiting restrictions were marked the day before autumn term started and there were no negative reactions from parents who now park away from the school.

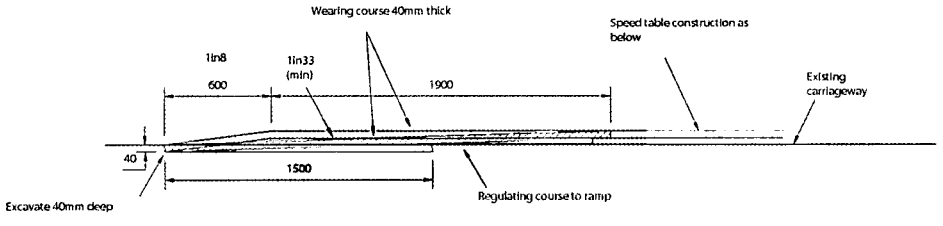
Contact: S Halewood ☎ 01925 442634 **E-mail:** shalewood@warrington.gov.uk
Authority: Warrington Borough Council

Technical Data

Location Type:	Residential through road.	
Road Type and Speed Limit:	Single carriageway, bus route: 30 mph.	
Scheme Type:	Five vertical deflection measures with shaped gradient within a 20mph speed limit.	
Length of Scheme in Total:	400m.	
Dimensions:	Ramp gradients:	1:8 (max. inner ramp) to 1:33(min. outer ramp) over 2.5m sinusodial shape.
	Ramp length:	12m toe to toe, 7m plateau length.
	Ramp height:	75mm on average.
Materials:	Block paviour (Jessups) side units colour brindle.	
	Plateau section:	HRA with red chippings.
	Ramp:	Mastic asphalt with red high friction surface dressing overlay.
Signs:	Children going to/from school, Diags 545, 546. 20mph speed limit.	
Lighting:	No change, at current standard.	
Costs:	£27,500.	



S-shaped ramp
Plan scale 1:20



Bridge Lane plan showing traffic calming measures.

42 Enfield Park Road, Warrington **narrowings, Zebra crossings**

Zebra crossing with improved lighting and narrowed carriageway.

Implemented: February 2002.

Background: The site is a district distributor road constructed by the former New Town Development Corporation. Widespread consultation identified difficulty in crossing the road which divided the community due to speed and volume of traffic; and to the lack of footways.

Measures Installed: The five Zebra crossings were implemented over a length of 0.9km, together with localised narrowings of the carriageway and the creation of new footway areas.

Special Features: The Zebra crossings included "Zebrasafe" Belisha beacons and direct lighting of the crossings to help motorists identify waiting pedestrians at night.

Consultation: Consultants worked with residents, the Parish Council and emergency services, through focus groups, a series of community meetings, questionnaires, local radio and advertising.

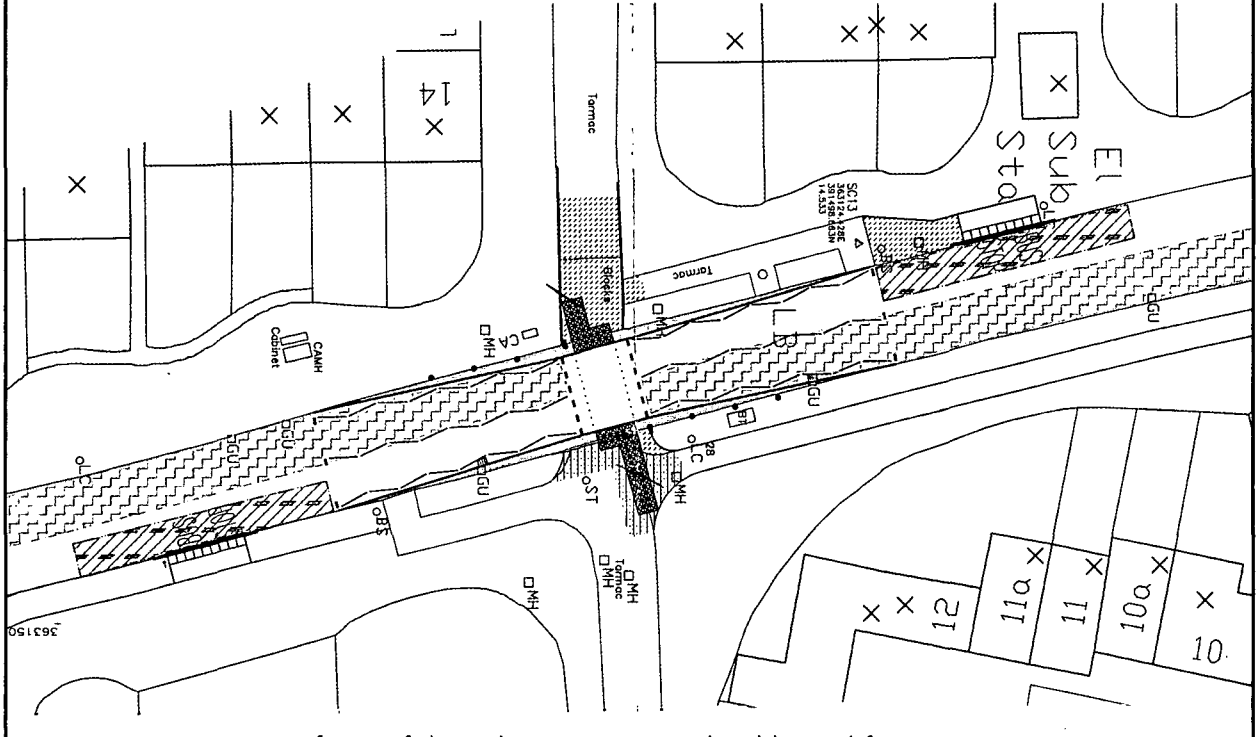
Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow
Before	19	39	3,189
After	2 in 10months	32 (at measures) 35 (between measures)	3,113

Other Comments: A useful outcome of the scheme has been increased walking to school.

Contact: S Halewood ☎ 01925 442634 E-mail: shalewood@warrington.gov.uk
Authority: Warrington Borough Council

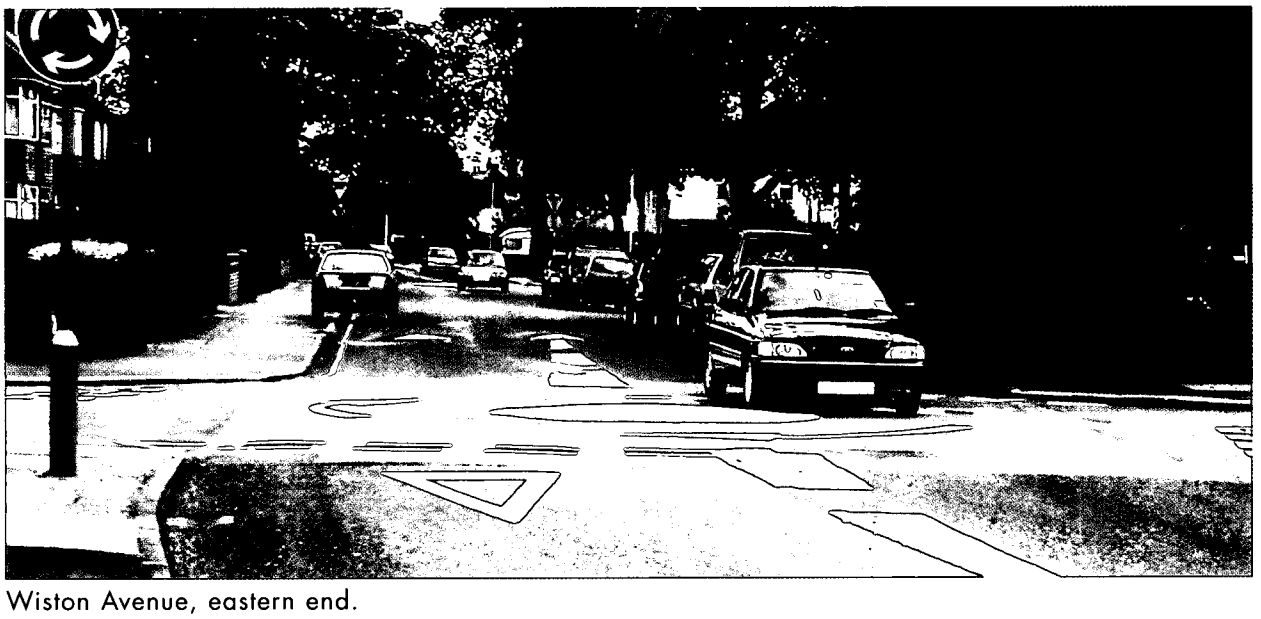
Technical Data

Location Type:	Residential.
Road Type and Speed Limit:	District distributor, bus route: 30mph speed limit.
Scheme Type:	Five Zebra crossings, localised narrowings, new footways adjacent to road, ATS at main junction, priority features on internal road which could "short cut" the distributor. 20mph zone on adjacent residential roads with no physical measures. Severe pruning of shrubs.
Length of Scheme in Total:	1.5km.
Dimensions:	Carriageway narrowed to 5.5m at zebra crossings.
Materials:	High friction surface dressing on approaches.
Signs:	Diags 516, 518, 615, 615.1, 610, 1003, 1023.
Lighting:	"Zebrasafe" Belisha beacons with internal illumination of posts and direct lighting of crossing.
Costs:	£110,000.



Layout of one of the Zebra crossings with additional footway areas.

43 St Lawrence Avenue/Wiston Avenue, West Tarring, West Sussex
mini roundabout, refuge, speed cushions



Wiston Avenue, eastern end.

Implemented: (Completed) July 2001.

Background: The scheme was highlighted as a through route which bypasses the main east-west routes in Worthing. However, there are residential properties and schools in the immediate vicinity. The scheme was required to contain the speed of through traffic and in doing so bring down the number and severity of accidents in this area.

Need for Measures: To reduce accident casualties and vehicle speeds.

Measures Installed: This was one of the first schemes in West Sussex to introduce speed cushions as the main feature in a traffic calming scheme. Other features incorporated in the entire scheme, which covered a greater area than the two avenues, were mini roundabouts and refuge islands.

Consultation: Full consultation was undertaken using letter drops to residents and culminating in an exhibition followed by an evening meeting. Most meetings seemed to only attract the negative points of view to the schemes. The scheme has, however, so far proved successful in reducing accidents.

Wiston Avenue, view from south.

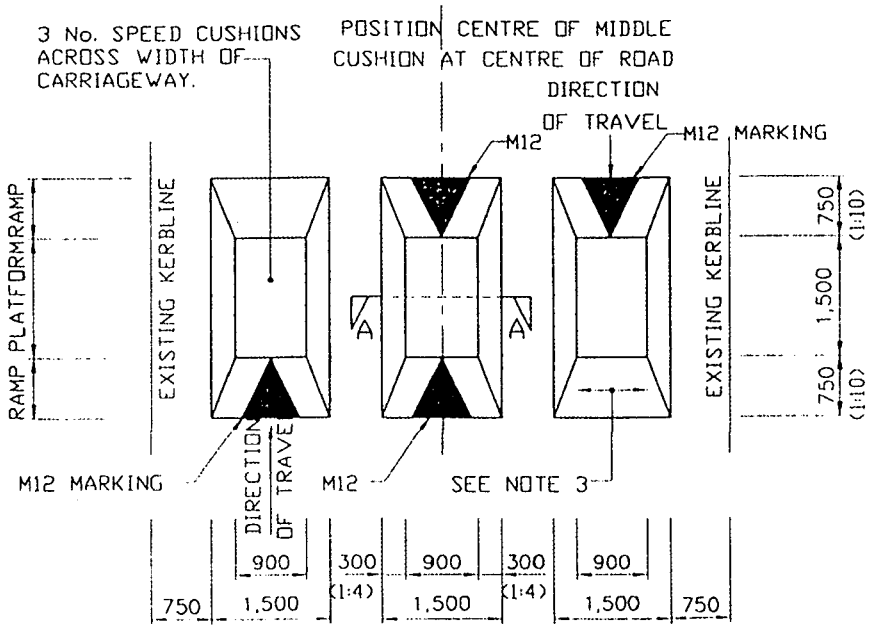
Monitoring	Accidents (PIA)	Speeds 85%ile(mph)	Traffic Flow
Before Wiston Ave	6 in 3 years	33	15% reduction
Before St Lawrence Ave	7 in 3 years	32.5	
After Wiston Ave	1 in 28 months	29	15% reduction
After St Lawrence Ave	1 in 28 months	28	

Other Comments: The scheme has contained the speeds of vehicles using both Wiston Avenue and St Lawrence Avenue. However, for future schemes which include speed cushions, a minimum width of 1.6m will be used as this will prove to give a more substantial feature to the driver and to enable vehicles with a slightly wider wheel base to "ride" the cushions rather than straddle them.

Contact: Alex Sharkey ☎ 01243 777746 E-mail: Alex.Sharkey@westsussex.gov.uk
Authority: West Sussex County Council

Technical Data

Location Type:	The roads are residential in character with adjoining schools and shops in the area.
Road Type and Speed Limit:	Unclassified roads with an existing 30mph limit.
Scheme Type:	The main physical features of the scheme are 14 sets of three abreast speed cushions, together with a mini roundabout and pedestrian refuges.
Length of Scheme in Total:	1.6km.
Dimensions:	Speed cushions: Lengths 3m, width 1.5m, height 75mm.
Materials:	Hot rolled asphalt.
Signs:	All signing complies with TSRGD.
Lighting:	Minor alterations carried out to existing street lighting.
Costs:	Total £115,000. Each individual speed cushion cost £200.



Speed cushion feature-layout.

44 Walpole Street, Garden Lane Area Chester

speed cushions, build outs

Road narrowings with speed cushion.

Speed cushions and designated parking.

Implemented: August 2000.
Background: Walpole Street is a residential road with a school and is part of an area used for "rat-running" to avoid traffic signals on the main road. It has had a number of accidents, is on a bus route and has extensive parking on both sides of the road.
Need for Measures: To prevent rat-running and reduce risk of accidents.

Measures Installed: Speed cushions, painted build outs, raised zebra crossing and speed tables.
Special Features: To maintain parking levels and accommodate buses, speed cushions were used in conjunction with build outs painted on the carriageway.
Consultation: An exhibition and leaflets.

Monitoring	Accidents (PIA)	Speeds (mph)	Traffic Flow (12hr)
Before	None recorded in 3 years	28-32*	3,166 (1996)
After	None since Aug 2000	24-26*	1,906 (2002)

*Typically

Technical Data

Location Type:	Residential, school.	
Road Type and Speed Limit:	Urban unclassified: 30mph.	
Scheme Type:	Speed cushions with hatched build-outs.	
Length of Scheme in Total:	205m.	
Dimensions:	Cushions 1.8m.	
Materials:	Cushions:	Mastic Asphalt.
	Marking:	Thermoplastic.
	Speed Table:	Hot rolled asphalt , surfaced in red "Imprint".
Signs:	Diag No: on speed table and Cushions in accordance with TSGR&D.	
Lighting:	No specialist lighting.	

Other Comments: Local reaction is generally positive and the area is due to be made a 20mph zone.

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Authority: Cheshire County Council

ANNEX 1
List of References & Other Useful Publications

A. References (from the book)

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2. *Guidance on Full Local Transport Plans*, (2000) – DETR, HMSO.
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13. Traffic Advisory Leaflet 3/93 *Traffic Calming Special Authorisations* – DoT.
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26. Traffic Advisory Leaflet 3/94, *Fire and Ambulance Services – Traffic Calming: A Code of Practice* – DoT.

27. Traffic Advisory Leaflet 1/98, *Speed Cushion Schemes* (1998) – DETR

28. Traffic Advisory Leaflet TAL 1/95, *Speed Limit Signs – A Guide to Good Practice,* (1995) – DoT.

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30. TRL Report 235, *Traffic calming – vehicle generated ground-borne vibrations alongside speed control cushions and road humps* (1996) – TRL Limited.

31. TRL Report 482, *The impacts of traffic calming measures on vehicle exhaust emissions* (2001) – TRL Limited.

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36. *Development of a Novel Traffic Calming Surface* – TRL Report 545 – TRL Limited.

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69. Traffic Advisory Leaflet TAL 4/91, *Audible and Tactile Signals at Pelican Crossings* – DoT.

70. Traffic Advisory Leaflet TAL 5/91, *Audible and Tactile Signals at Signal Controlled Junctions* – DoT.

B. Relevant Legislation

L1 The Crime and Disorder Act (1998).

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L3 The Local Government Act (2000).

L4 The Local Government Act (1985).

L5 The Highways Act (1980).

L6 The Transport Act 2000.

L7 The Road Traffic Regulation Act (1984).

L8 The Traffic Calming Act (1992).

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L10 Road (Traffic Calming) (Scotland) Regulations 1994.

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L12 Traffic Calming Regulations (Northern Ireland) 1995.

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L16 The Vehicles (Crime) Act 2001.

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L18 The Local Government and Rating Act 1997.

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C. Other Useful Publications

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NB: All DfT leaflets are available from DfT at: tal@dft.gsi.gov.uk


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