

## Using Traffic Calming to Manage **Speed** in Kent

### A Practitioners Guide to Vertical and Horizontal Deflections

**Note:**

This guide is primarily concerned with vertical and horizontal deflections, often used in traffic calming schemes. However, traffic calming covers a much wider spectrum of measures so practitioners must use this document in conjunction with the newly published "Traffic Calming Techniques" which covers that wide spectrum of possible measures.

The document was produced jointly between the KCC and Jacobs Babbie

March 2006

For further information contact:

Jim Pearce

Telephone: 01622 696857

Fax: 01622 221048

E mail: [jim.pearce@kent.gov.uk](mailto:jim.pearce@kent.gov.uk)

# Contents

	Page No.
Foreword	1
Executive Summary	3
Introduction	5
Chapter 1: Rationale	7
Chapter 2: The Effects of Vertical and Horizontal Deflections	10
Chapter 3: Scheme Promotion	13
Chapter 4: Priority Rating System	21
Chapter 5: Conclusion	24
Appendix 1: Design Constraints and Legislation	25
Appendix 2: Signs and Markings	28
Appendix 3: Lighting	31
Appendix 4: Detail Drawings	35
Appendix 5: Priority rating for environmental / quality of life schemes	42
Appendix 6: Detailed design and construction	44



## Foreword

The speed of traffic and the dangers that result are issues constantly raised by the public. In many areas the speed of some drivers leads to crashes resulting in death and injury. Even where injury crashes are not occurring the quality of life of those who live and walk by the road can be significantly reduced by the fear of excessive speed.

Some 15 years ago councils across the country began introducing road humps and chicanes, which when targeted at known crash sites produced significant reductions in both speed and casualties. As a result the use of road humps and chicanes is seen by many, particularly residents, as the only way to reduce that threat.

However, the introduction of road humps and chicanes can produce other problems and generate complaints from some road users. Consequently these measures may not always be the most appropriate solution, education, enforcement or alternative engineering measures might offer greater potential. Road humps and chicanes should therefore only be used when completely necessary, this will help to maintain their integrity, avoid antagonising some drivers, and complaints from the emergency services and bus companies.

This new publication is the county council's policy on road humps and chicanes. It provides clear guidance to practitioners on the design and implementation of schemes. It gives information on the legal requirements coupled with guidance and good practice. It sets out a requirement that all schemes are based on a clear and feasible objective, and that close monitoring of all schemes takes place. It should however be used as part of a wider range of speed management measures set out in detail in the recent County Surveyors Society (CSS) and Institution of Highways and Transportation (IHT) document "Traffic Calming Techniques" which covers a wider spectrum of speed management measures.



## Executive Summary

This document sets out how potential schemes should be assessed to ensure that where a scheme is required the right measure is suggested and has the backing of residents. It gives details of legislation and good practice.

- All schemes must have a clearly stated objective:
  - To contribute to casualty reduction
  - To reduce excessive speed
  - To improve environmental / quality of life issues
- Scheme promoters must ensure that all options are considered when assessing schemes. (KCC Policy)
- Road humps must only be used on roads with a 30mph speed limit or less (Highways Act 1980, Section 90E)
- Road Humps should not be used on A or B class roads (KCC Policy)
- All road hump schemes must comply with The Highways Act and The Highways (Road Humps regulations) 1999
- TA 7/96 states that the 1996 regulations make local highway authorities responsible for design and placement, so authorities will need to ensure that an adequate duty of care is exercised. This remains the case under the 1999 road humps regulations
- The guidance set out in TA 7/96 and other traffic advisory leaflets on road humps and chicanes should be considered
- The maximum height for a road hump in Kent is 75mm (KCC Policy)
- All schemes should be signed in accordance with the information and standards set out in Appendix 2 (Combination of Traffic Signs and General Directions 2003, & Kent Signs Policy)
- All schemes must be lit to the appropriate standard set out in Appendix 3 (Road Humps Regulations 1999), except in some 20mph zones

- Vertical and horizontal deflections are measures designed to maintain slow speed rather than measures to reduce speed (DfT guidance and KCC Policy)
- The emergency services and residents must be consulted (Highways Act 1980 section 90C, Road Humps Regulations 1999 Fig 3 and Traffic Calming Regs. 1999 Reg. 4) and involved at the earliest opportunity (KCC Policy)
- Residents must be made aware of the advantages and disadvantages of these schemes. (KCC Policy)
- Consultation must be clear using where appropriate 3D presentations, artists impressions and computer generated street scenes. (KCC Policy)
- Road hump schemes must be advertised (Highways Act 1980 section 90C)
- Schemes must be monitored and results reported annually to members (KCC Policy).

## Introduction

In 1994 Kent County Council published its Code of Practice on traffic calming (4th revision). The code set out details of the individual measures in use at that time with advice on best practice, details on scheme prioritisation and clear guidance on the justification for introducing traffic calming. Since then the measures have been refined and regulations relaxed allowing more schemes with greater innovation to be introduced.

If schemes are introduced without clear objectives and sufficient consultation there may be complaints about increased noise and pollution, delays to emergency service vehicles, and a view that these measures are anti motorist. However the huge benefits achieved in crash and speed reduction by many schemes cannot be discounted or ignored. It is important therefore that schemes are developed with clear objectives, the support of residents and the results carefully monitored. The benefits that result can then be pro-actively promoted.

The original code of practice made it clear that a scheme should only be developed if there were clear benefits to be achieved. This would primarily be the reduction of injury crashes and in particular those involving vulnerable road users. Evidence of excessive speed and vehicles using inappropriate routes to avoid congestion on main roads could also be reasons for introducing measures.

In January 2005 the CSS and IHT produced a new and comprehensive guide: "Traffic Calming Techniques" containing detailed information on the various measures, their effectiveness, and the problems that can be encountered. Its principle purpose is to guide the deployment of such measures as the solution to a problem and to assist in achieving a successful scheme.

This new publication will be of enormous benefit to all those involved in implementing these techniques. It provides in great detail the process and the various constraints surrounding the implementation of the measures. It gives examples of good and sometimes poor practice and alerts the reader to the potential problems that implementing schemes can bring. It also highlights a wealth of further reading for practitioners ensuring that schemes are implemented to the highest quality.

The publication of this document provides the opportunity to update KCC's Code of Practice. This new guide reaffirms the council's policy and sets out in detail how practitioners should assess potential schemes. If a scheme involving some form of physical speed management is required both this new policy document and the CSS / IHT document with all its resource information must be used to steer those involved in scheme design and construction to achieve the best scheme.



## Chapter 1: Rationale

### Background

The status of local authorities as the Highway Authority responsible for the provision of road safety remedial measures is set out in Section 39b of the Road Traffic Act 1988. This drives a wide range of activities focused on meeting national targets and Best Value Performance Indicators. In its capacity as the local Highway Authority, Kent County Council is committed to meeting the national casualty reduction target by 2010 i.e. to achieve a:

- 40% reduction in all killed and seriously injured casualties
- 50% reduction in killed and seriously injured children
- 10% reduction in all slight injuries

This target was set by Government in 2000 as a successor to the previous national casualty reduction target set in 1987 which was to achieve a one third reduction in road crash casualties by 2000.

Kent was successful in achieving that target and is progressing well towards achieving the current target well ahead of 2010. These achievements are the product of several combined factors, a major factor within these has been the introduction of traffic calming measures at appropriate locations.

### Traffic Calming and Casualty Reduction

Traffic calming is most effective when used in residential areas and provides benefits for those who are particularly vulnerable i.e. young and elderly road users and pedestrians and cyclists. Traffic calming is effective as a casualty reduction tool because it reduces traffic speed. As a result drivers have more time to stop or take other action, reducing the likelihood of crashes occurring. For crashes that do happen at these lower speeds the severity of any resulting injuries are significantly reduced.

- **95%** of pedestrians survive when hit by a vehicle travelling at 20mph
- **50%** of pedestrians survive when hit at 30mph
- **Only 5%** of pedestrians survive when hit at 40mph

Source: Department of Transport, 1996.

In built up and residential areas where children play and other vulnerable road users move around, we should promote speed choices that are well below the speed limit when appropriate i.e. 20mph in 30mph limit.

### **The Purpose of Traffic Calming**

Traffic calming is an intervention aimed primarily at reducing casualties and excessive speed. On occasions schemes have been implemented where the selection criteria had not been met, however, these schemes have been justified as they offered other benefits at that time. An “ethical” approach to speed management is vital, as KCC needs drivers to accept schemes as “bona fide” genuinely seeking to meet the stated objectives if their co-operation is to be expected. This document sets out a protocol that requires all proposed schemes to be submitted to KCC as the Highway Authority and that they should include clearly stated objectives.

The objectives for each scheme must be set out in a standard format to assist consistency in countywide monitoring and evaluation. These objectives must fall within one or more of the following: -

- To contribute to casualty reduction
- To reduce excessive speed
- To improve environmental and quality of life issues.

Chapter 4 of this document sets out a system by which 1 and 2 above can be prioritised allowing decisions on funding to be considered. Such schemes can then be tested against clear speed and crash reduction objectives. Proposals solely under objective 3 must be rigorously challenged requiring detailed justification for schemes and a plan for evaluation based on the stated objectives.

### **Aspects of Traffic Calming**

Measures may be implemented following periodic analysis of crash/casualty data that identifies locations where dangerous speed and inappropriate traffic movement have contributed to crashes and casualties. Alteration to the road layout may be necessary to achieve the necessary changes in driver choices and behaviour.

- By taking vehicles up and over humps and similar devices (vertical deflection)
- By taking vehicles through changes in direction through chicanes and/or road markings (horizontal deflection).

Whilst it is recognised that these measures have a direct “controlling” effect on driver behaviour, it also necessary for drivers to exercise “choice”. The very presence of traffic calming tells drivers that this is an area where vulnerable people need protection and that they are required to drive accordingly.

### **Signing and other street furniture**

As the local Highway Authority KCC are responsible for ensuring that highway works meet all necessary requirements at both design and construction stages. By its nature traffic calming requires drivers to change speed and often their direction. It is vital therefore that schemes are well lit and are supported by the highest standard of road signing. It should be recognised when considering traffic calming and other traffic speed management measures, that these will include increases in signing and other street furniture in the area affected by the scheme.

### **Removal or changes to existing Traffic Calming schemes**

Traffic calming and speed management measures are established features of the built environment and are viewed as a permanent solution to a given problem at the time of their design and build. However, if through monitoring it becomes apparent that a scheme is not fulfilling its potential, then a thorough review must be conducted and any remedial changes implemented. These remedial changes would include a range of options from improvements to existing measures, to the introduction of further measures through to the removal of measures if necessary. Such reviews should take account of policies and priorities that may have developed after the installation of a scheme e.g. a reduction of sign clutter.

It is important to note that all these changes would involve costs that might prove prohibitive when set against the anticipated benefit. In addition, the likely cost of complete removal of a scheme is such that it would lead to the exclusion of another scheme from the current programme of work. Therefore, with the exception of schemes that are creating hazards, complete removal is unlikely. Designers should seek opportunities to develop schemes in stages enabling trial periodic reviews and removal at an earlier stage if necessary.

### **Other casualty reduction measures**

Traffic calming is vital to KCC's commitment to casualty reduction, but it should be recognised as one element only. KCC works to reduce casualties through interventions delivered either directly or through various partnership arrangements. These include a diverse range of activities that can be categorised as follows:

- Education, Training and Publicity (ETP)
- Engineering
- Enforcement

Whilst each of the 3 E's is important, KCC's approach provides added value by recognising and developing the links between them and with other contributing agencies. An example of this is the Kent and Medway Safety Camera Partnership. This multi-agency project relies on publicity to educate the public about the benefits associated with an engineering measure.

### **The role of the driver**

KCC deploys traffic calming and other measures to fulfil its responsibility to provide a safe highway network. However, KCC's actions should not allow drivers to avoid their role in reducing, or being the cause of, road crashes and casualties. Whilst KCC recognises and works to address its responsibilities as the local Highway Authority, it remains the responsibility of all drivers to behave in a manner that complies with the law and is suitable for the prevailing conditions.

## Chapter 2: The Effects of Vertical and Horizontal Deflections

Vertical and horizontal deflections are not the answer to every problem. Their effect is limited by where they can justifiably and legally be used. Although they have a proven track record at reducing crashes and speed, these measures also produce problems, which could negate any benefits achieved by a scheme. This can be a particular problem if the reasons for a scheme are weak. Therefore the aims and objectives of a proposed scheme must be clearly stated and the disbenefits taken into account as schemes are developed.

### **ADVANTAGES OF VERTICAL AND HORIZONTAL DEFLECTIONS.**

#### **Crashes**

The effect on all types of crash can be dramatic when deflections are aimed at a specific crash problem. Some schemes in Kent produced reductions of over 60%, with pedestrian crashes being reduced by up to 78% with substantial reductions in severity. It should be pointed out however that these reductions result mainly from the introduction of vertical deflections and it appears that vertical deflections are likely to produce greater benefits than horizontal deflections.

#### **Speed**

Vertical deflections, in particular, reduce 85th percentile speed by as much as 10mph.

#### **Through Traffic**

Where it has been identified that drivers are using minor residential roads to avoid congestion on main routes then the introduction of deflections have reduced speed and flow.

#### **Noise and Pollution**

It has been shown that where a scheme reduces traffic flow and the design creates a constant slow speed on roads with no or very low HGV/ Bus content, then noise and pollution levels are reduced. However this may not always be possible and in some circumstances a disbenefit might result - see below.

### **DISADVANTAGES OF VERTICAL AND HORIZONTAL DEFLECTIONS.**

#### **Noise**

Traffic calming, particularly those schemes involving vertical deflection, can cause noise, particularly where the road to be calmed has a HGV / Bus content. In addition some drivers tend to accelerate away from each feature and this also creates noise, particularly at night. This point alone should not prevent the implementation of a scheme but it is important that residents are made aware of this when schemes are discussed.

**Pollution**

It has been shown that schemes can reduce traffic levels and as a direct result pollution levels can be reduced. However, as mentioned above, where a minority of drivers accelerate between features there can be an increase in pollution, but the net result in most cases would be either no change or a reduction in levels of pollution. The exception to this might be on an incline, which has bus and or HGV traffic.

**Emergency Services**

These measures are designed to produce slow speed and this can create delays in attendance times and discomfort to patients in ambulances. In relation to fire appliances, the jolting caused by road humps in particular can lead to equipment in side panels becoming loose and falling out onto operatives when the panels are opened. Where there are likely to be concerns from the emergency services and vertical deflections are the most effective intervention then speed cushions should be used.

**Buses**

Nationally there remains considerable concern by bus companies at the use of road humps on bus routes, and in Kent some companies threatened a removal of the service if road humps were introduced. Bus companies complained of increased journey times, complaints from passengers, and increased maintenance costs due to damage caused when travelling over humps. Although there was little substantive evidence to support these claims the KCC now advises that on all bus routes where vertical deflection is the only feasible option available to treat the problems then speed cushions should be used.

**Cyclists**

These schemes should be beneficial to cyclists because vehicle speeds are reduced and drivers should be more aware of other road users. Care must be taken, however, to ensure that measures do not create obstructions for cyclists. Wherever possible, by-pass lanes, separate cycle lanes or shared use facilities (footway/cycleway) should be provided.

**Lighting**

All physical features placed in the highway require lighting because they present, in some way, an obstruction to drivers. This cost must be included in the priority assessment of potential schemes. In rural areas this can be a major stumbling block in providing schemes, as some residents do not wish to "urbanise" their village with lighting.

**Loss of Parking**

This has been a recurrent theme from consultations and is a major concern of Kent residents. Loss of roadside parking spaces should be borne in mind when the outline design of any scheme is being prepared. Indeed schemes have failed because the parking issue could not be resolved.

### **Public Opinion**

In a number of cases people, or representative groups such as Parish Councils or Residents Associations, have had reservations about the effectiveness of a scheme once implemented. Speed reductions suggested at exhibitions or in leaflets should be based upon the professional experience of the planners and engineers concerned with the scheme. This should be very clearly stated with the objectives of the scheme, as the public may have a far too optimistic view about the extent of speed reduction. Some drivers may also see measures, particularly chicanes, as a challenge to their driving skills, and actually increase speed. Whilst they are a very small minority, their actions nevertheless are more noticeable to residents and can generate some criticism, especially in the first few weeks after implementation. Clear monitoring of the actual effects of each scheme is therefore a vital element of each proposal.

### **Transference of Traffic**

Some schemes may transfer traffic onto parallel routes and this must be considered carefully when planning any scheme. Where a scheme seeks to return through traffic to a major route there could be increased delays on this route and an increase in crashes, which may negate the savings achieved within the area covered by the scheme. Furthermore, drivers may completely change route and penetrate areas well away from the treated area. The monitoring of some of KCC's first schemes showed that there was no evidence to prove that transference problems have taken place, and there was little information nationally on this subject. This remains the case and so further studies will be needed. It is therefore essential that during the planning stage of any scheme that a route hierarchy is established with measures specifically selected on the basis of the role of each road.

## Chapter 3: Scheme Promotion

### Introduction

A systematic approach to the analysis and implementation of these schemes is needed in order to ensure that they are built to the correct standard, in the correct places and with the support of local residents. At the outset the aim of the scheme should be established. That should be to:

- Contribute to casualty reduction
- Reduce excessive speed
- To improve environmental and quality of life issues.

Four other questions will need to be answered as schemes develop: -

1. Are vertical or horizontal deflections the most appropriate solution to meet the objective of the scheme, would other measures be better?
2. Have consultations indicated support from the emergency services, and residents?
3. Is the scheme technically acceptable to the Highway Authority?
4. Does the scheme have sufficient priority to be recommended for funding?

IF THE ANSWER TO ANY OF THE ABOVE IS “NO”, AND DIFFICULTIES CANNOT BE RESOLVED, THEN THE SCHEME SHOULD BE ABANDONED.

In order to ensure that the most appropriate schemes are implemented, a flow diagram of the steps to be undertaken for developing schemes is shown in Fig 1.

### Step 1. Preliminary Assessment

There are a number of stages to the preliminary assessment and it should not be pre-supposed that suggested measures are appropriate for a particular situation.

Initially an assessment of the following should be carried out whether the request for a scheme has come from within the KCC through crash analysis, or from a request from the public, parish council, or member:

- A detailed analysis of the crash records over the preceding three years
- Speed measurements as described in Chapter 4
- An estimate of the levels of through traffic
- An appraisal of environmental issues

If these studies show that measures of some kind are needed, careful thought should be given to what those measures should be and whether they would be fit for purpose. It is possible that a low cost safety engineering measure can achieve the desired effect or that an education or enforcement programme should be instigated. It is not unusual, for instance, for traffic calming to be requested by the very people who are largely contributing to the perceived problems, in this situation an education and information campaign might be the best approach.

Physical features often move traffic to other “untreated” nearby roads. If this is not acceptable (because they are minor roads or for other reasons) then they must be included in the study. An area of interest needs to be carefully defined, therefore, to ensure that such traffic migration is controlled. In some cases, only a single road will need to be treated; in others, the area could cover a whole estate. However if the scheme becomes too large the cost is likely to produce a low priority. In such circumstances the whole scheme should be reconsidered, including possible alternatives.

It is important, therefore, to establish a route hierarchy, both within and around the area of interest. This will help to ensure that through traffic removed from the area is put onto suitable roads and that traffic moving through the area is channelled onto particular routes by the use of slightly less restrictive measures.

The effects that a scheme would have on the following groups need to be considered at the outset. If it is clear that one or more of these groups would be adversely affected then deflections may not be the best option.

- Kent County Constabulary,
- Kent Fire Brigade,
- Kent Ambulance NHS Trust,
- Bus Companies,

An outline priority assessment should then be carried out to see if the funding of the scheme could be justified. If there is little prospect of funding, because the achievable benefits are low or the estimated cost is high, then the scheme should be rejected.

In carrying out this preliminary priority assessment the following aspects should be included in the cost of the scheme:

- \* Improvements to signing requirements (see Appendix 2) and to lighting (see Appendix 3) can form a significant part of the cost of a scheme, and so should be estimated at this stage. In addition the removal cost of any existing signs or street furniture that will not be required by the new scheme should be included.
- \* The condition of the highway should be checked as in certain circumstances roads may require resurfacing or, if 'Give Way' control is to be introduced, skid resistance levels might need to be increased.

- \* An appropriate level of public consultation should be decided and the estimated cost of exhibitions, leaflets, letter drops and other aspects included in the total scheme cost. Consultation, particularly with residents or residents groups, is recognised as a key issue, and an estimate of officer time on this essential element must be carried out so that sufficient resources are made available.
- \* Consideration of the “street scene” should also be considered to see if there is scope to carry out environmental improvements. Although it should be noted that the higher the scheme cost the lower the priority assessment might be and care needs to be taken not to jeopardise funding on this issue.

Only if this preliminary priority rating indicates that KCC funding is likely should a scheme proceed to outline design stage.

## **Step 2. Outline Design and Estimate**

Providing the previous requirements have been considered then an outline design of the scheme should be commissioned. A design brief of the requirements of the scheme should be prepared. Detailed discussions should take place followed by site inspections between the outline designer and the traffic planner. However, if the original promoter of the scheme was a residents group or a parish council then their early views could be canvassed at the site inspection, although it must be made clear that at this stage there is no guarantee of funding. The local member should be informed of any such meeting.

The outline design of a scheme should not be a simple sketch, and must be produced at a level capable of being shown at public exhibition. Driveways, positions of new streetlights, signs and street furniture and any environmental enhancements must be included. This level of detail is also required in order to estimate the schemes cost. This will be used in producing a priority rating and, therefore, in determining whether it is likely to gain funding.

## **Step 3. Advise Local County Member and Co-Chairman**

If the scheme is likely to be successful in a bid for funding then the public consultation process can begin. Before this the local County Member, if not already aware from stage 2 and the Co-Chairmen should be informed and invited to attend any planned exhibition(s), as should appropriate District Council Members.

## **Step 4. Outline (Stage 1) Technical Approval / Safety Audit.**

### **Step 5. Priority Rating**

The scheme's priority should now be assessed after obtaining the latest information on crash and likely speed reduction levels, which will be dependent on type and spacing of measures. This will ensure a consistency of approach to the prioritisation of schemes seeking funding from the small improvements budget. It is essential that for a scheme to pass this point the priority assessment should produce a number high enough to give considerable optimism that funding will be forthcoming, as once in the public domain it is extremely difficult to withdraw a scheme.

### **Step 6. Consult emergency services and bus operators**

Although an early assessment of the likely views of the emergency services and bus companies will have been considered during Step 1 it is important that their views are now sought officially and any alterations made before the public consultation begins.

### **Step 7. Public Consultation**

It has been proven that consultation is a key element in providing a successful traffic calming scheme, but the problem is who and when. If a scheme appears to be fully designed the public will feel that consultation with them will be irrelevant, as the council has "already made up its mind". However, public expectations should not be unrealistically raised as a result of inappropriate consultation. Therefore public consultation should not take place until a basic design is prepared, safety audited and funds have been allocated. Public consultation should aim to identify the needs of local communities as its main priority. Processes beyond this point should aim to meet those where possible. KCC will continue to review and develop its consultation process to improve engagement with the public.

Once a scheme has been designed to a point where it can be discussed with residents then arrangements should be made to discuss those plans with them locally. It is important at this stage to see if a representative group of residents can be identified to take the scheme through the various stages up to and beyond implementation. They should also be made aware of the funding implications.

Consultation, whether through leaflet or exhibition, should endeavour to give residents a clear understanding of the measures likely to be used. This should include 3D images; artist's impressions or computer generated street scenes. Plans should also include details of signs and other street furniture.

At the first meetings residents should be made fully aware of the negative aspects or effects of the scheme such as noise and loss of parking. The result of this consultation may mean that the scheme needs substantial changes. In extreme cases, however, the scheme may need to be abandoned as the changes may prove to be too costly or impractical and the possibility of this outcome must also be

made known during the consultation.

If there is strong opposition from residents to the implementation of a scheme, then unless there are likely to be substantial crash saving benefits, particularly to pedestrians and cyclists, such objections should be accepted and the scheme abandoned.

### **Step 8. Report Results of Consultation to Members**

If, during the consultation stages, strong objections (which cannot be resolved) have been received but, because of potential crash savings benefits it is felt that the scheme should proceed, then the scheme should be referred to the JTB. Details of the scheme, the reasons for it, the estimated cost, the expected benefits, and the results of the various consultation stages should be included in the report. If the scheme requires the publishing of a TRO then there are likely to be formal objections when the TRO is advertised and Member approval will be required if the objections are to be overruled. The way such orders are advertised along with the statutory requirement to advertise the introduction of vertical deflections needs to be improved.

### **Step 9. Report To Members**

All schemes, which require funding, should be included in a bid for funds from the small improvements budget. Schemes, which are successful in their bid for funding, will be included in a report to the Joint Transportation Boards (JTB) and then on to the Highways Advisory Board (HAB), seeking HAB endorsement and priority before submission for funding.

Schemes failing to achieve funding should be reassessed and submitted for future years.

If the scheme has a high cost, typically over £100,000, then funding would probably need to be phased over a number of years. In such cases, if the scheme needs to be viewed as a completely integrated treatment over an area, then the scheme priority should be assessed as a whole. If, however, there are discreet phases, which can “stand alone”, then separate priority assessments should be carried out for each phase.

### **Step 10. Detailed Design**

The detailed design should be prepared and a final estimate produced. This will in some cases require a full survey of the road to be treated, as problems have occurred when Ordnance Survey plans have been used for detailed design, only to find once on site that road widths do not correspond to those on the plans, leading to obvious difficulties.

### **Step 11. Stage 2 Technical Approval / Safety Audit**

**Step 12. Advertise TRO**

Traffic Regulation Orders should now be made for all those schemes, or parts of schemes that require them; road hump schemes should be advertised (Highways Act 1980). Objections must be reported to Members.

**Step 13. Inform Public of Intention to Start Work on Site**

It is important that having consulted the public they are then informed when construction is about to take place. They should be told how long the job will take and given contact names and telephone numbers.

**Step 14. Construct Agreed Scheme**

**Step 15. Pre Opening (Stage 3) Safety Audit**

**Step 16. Monitor and Report Findings**

Although early schemes were closely monitored it appears that as more schemes were implemented monitoring reduced. However at the same time the regulations on the use of deflections eased and with the concerns now being voiced about the use of deflections it is clear that the monitoring of all schemes is as important as ever. It is particularly important to ensure that both success and failure are equally well documented to give accurate advice to practitioners developing future schemes.

**Therefore the Highway Authority will monitor all new schemes involving vertical or horizontal deflections in Kent.**

Where the schemes principle aim has been crash and speed reduction then the monitoring should be as follows:

Crash checks at 1 and 3 years after implementation.

Speed checks at 6 months and two years (these should be 7 day, 24 hour counts) consistent with those taken during the schemes assessment. These checks will also provide traffic flow data so that any change in traffic patterns can be assessed.

Schemes not based on crash reductions will have been implemented with a clear objective, and monitoring to assess the effectiveness of that objective must be built into the scheme at the outset and followed through after implementation.

To carry out the monitoring successfully the Divisional Office will need to put in place a system that enables accurate recording of scheme start and finish dates and the final cost of the scheme, including consultation costs and an assessment of staff time. Details of the “before” and “after” study

should then be set out in a case study along with information on the consultation process. Most importantly the case study should assess whether the original objective of the scheme was achieved. This should be done using the SMART technique:

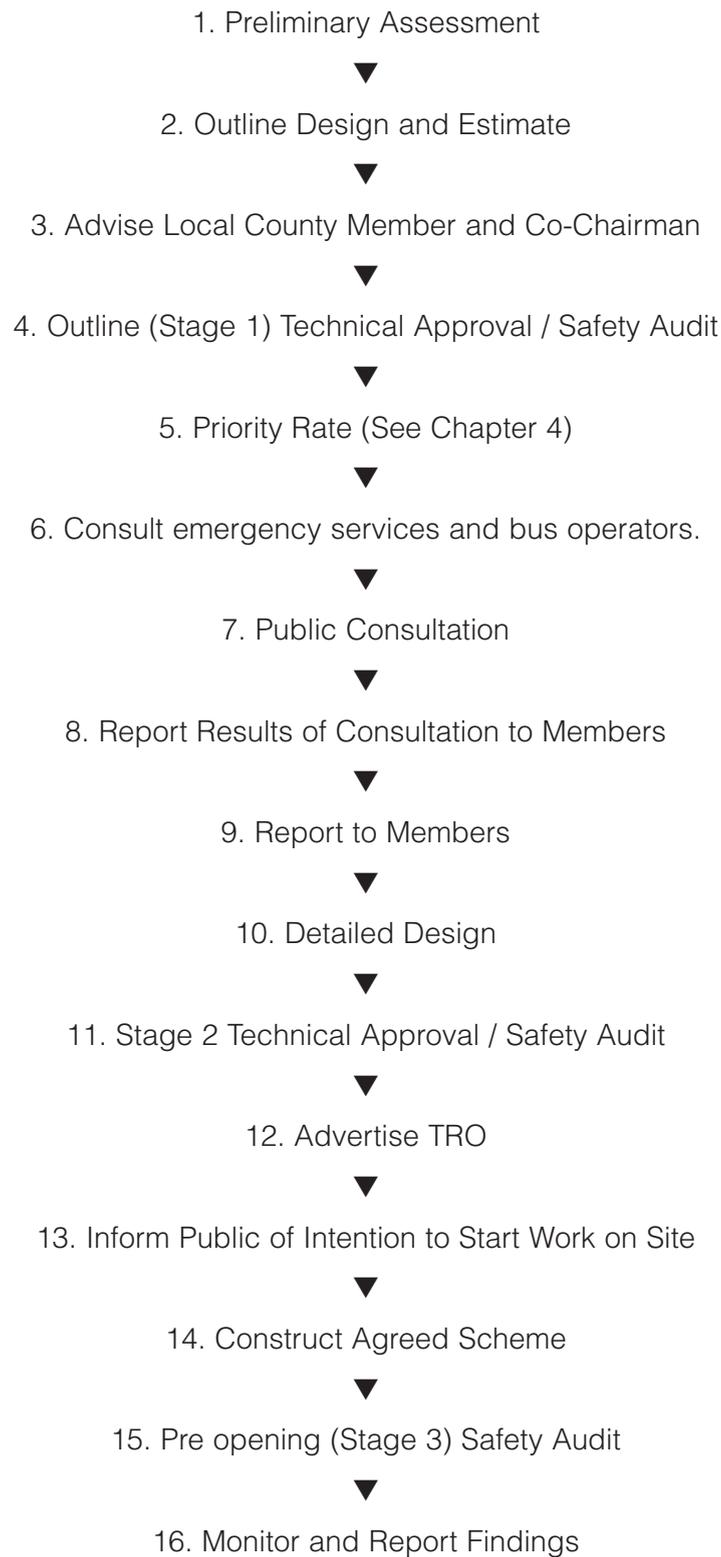
- Specific
- Measurable
- Achievable
- Relevant
- Time bound

These studies will then form part of an annual assessment of these schemes produced for members and included as part of the Local Transport Plan (LTP) process.

This monitoring will also provide information that may lead to the modification, or in extreme circumstances the removal, of a scheme.

This annual report will also be sent to Road Safety to assess where improvements to schemes and processes might be necessary.

Figure 1. FLOW CHART (Schemes wholly or partly funded by the County Council)



## Chapter 4: Priority Rating System

With the many competing requests for funding all highway engineering schemes must compete in a consistent manner for those funds. This section sets out to produce a system for prioritising schemes involving vertical and horizontal deflections where the principle aim of the scheme is crash and excessive speed reduction.

Currently the priority of Crash Remedial Measures (CRM) in the Small Improvement programme is calculated by taking a single year crash savings estimate, dividing this by the cost of the scheme, and multiplying the resultant figure by 100. This is, in effect, a first year rate of return. Traffic calming schemes are funded from the same budget as CRM's and should therefore be assessed on a similar basis.

The corner stone of the rating system needs, therefore, to be the potential of the scheme for saving crashes. Traffic calming schemes can also reduce high speeds and through traffic, and the crash prevention potential of these factors needs to be taken into account.

### **Crashes**

Studies of crash records at road hump schemes in Kent have shown that average crash reductions of 60% have been achieved. Pedestrian crashes have on average fallen by 78%, with all other crashes reducing by an average of 50%.

This clear difference between pedestrian and other crashes is recognised within the priority assessment formula, so that with pedestrian crashes a savings factor of 80% is used (rounding up from 78%) with 50% being used for all other crashes that could be saved by introducing a traffic calming scheme (see formula set out at the end of this chapter).

Horizontal deflections and other measures used as traffic calming schemes in Kent have not produced such a clear saving as vertical deflections. This may be because the schemes are less well used and have a wider range producing very different results in both speed and crash savings. For assessment purposes therefore a judgement should be made of the likely reduction in crashes that could occur. Where no information is available the 30% reduction level associated for many years with Kent's CRM's should be used for priority assessment purposes.

### **Speeds**

High traffic speeds generate a large number of complaints. Enforcement of speed limits is a matter for the Kent Police who can, however, rarely give the standard of cover that fully placates residents who consider that they are suffering from this problem. Traffic calming measures have the potential to

control the speed of traffic 24 hours a day. Experience in Kent indicates that any form of vertical obstruction would reduce speeds to about 30mph. Moreover, once the road has been treated, this releases the Police to increase enforcement in other problem areas where traffic calming may not be possible.

Reductions in speeds, therefore, need to be included in the rating system. A speed check of the road in question will have been taken during the preliminary assessment, and an average 85th%ile can therefore be calculated. If this is greater than 30 mph then there is the prospect that speeds will reduce to this level.

Early studies of Kent schemes indicated that many of the roads treated had "before" 85th percentiles of about 40mph, which had subsequently fallen by 10mph after implementation. To include speed savings benefits within the prioritisation formula it has been concluded that a speed reduction from 40 to 30 should equate to one half of a personal injury accident, with higher speed reductions achieving greater savings and lower speed savings having the opposite effect. However, as the speed of traffic can vary due to weather conditions or other factors, speed reductions of less than 3mph are unlikely to occur as a direct result of traffic calming and such low levels should not therefore be included in the speed savings section of the prioritisation formula.

### **Measurement of Speeds**

Ideally, speed measurements should be carried out on more than one day. The minimum requirement is that measurements should cover both morning (07:00 to 09:30) and evening (16:30 to 19:00) peak periods, and an off-peak period of at least three hours during the day and evening. Although a full week's data is preferred, which would give a clear indication of the effects of the scheme when "after" data is collected.

### **Through Traffic**

Through traffic also generates complaints. It can be between zero and 90% of the traffic flow on a residential road. Traffic calming can reduce it but the displaced traffic is faced with increased journey times and delays. Further increases in traffic flow elsewhere could ultimately lead to increased crashes (crash migration) on the alternative routes. The benefits of traffic calming in this regard are, therefore, not clear.

The correct assessment of the proportion of through traffic could also be both time consuming and costly and may result in subjective assessments being made.

For these reasons through traffic relief has not been included in the calculation for priority assessment. The impact of through traffic will, however, be looked at by the Traffic Planning Teams when assessing the outline proposals of any new scheme.



## Chapter 5: Conclusion

It is interesting to note that despite 10 years of experience in this sometimes controversial subject much of the basic advice contained in the KCC's own code of practice published in 1994 remains true today. Deflections are effective at crash and speed reduction but great care is needed when considering them as there are disadvantages and this could outweigh the benefits of any scheme, resulting in dissatisfaction and, in extreme cases, request for removal.

It is therefore vitally important that in considering what measure should be introduced all aspects of education, enforcement, and engineering are considered. A clear objective should be produced which sets out the basis of how the scheme will be assessed and monitored. This will ensure that schemes are fully justified and acceptable to the public and drivers and that they produce significant improvements for the residents of Kent.

**This document supersedes all previous KCC documents on vertical and horizontal deflections. It is KCC policy and all practitioners will need to ensure that they put in place the necessary procedures to ensure that this policy is fully adopted.**

## Appendix 1: Design Constraints and Legislation

This section sets out advice on best practice based on current legislation, KCC policy and experience gained from schemes implemented in Kent and where appropriate elsewhere.

### **Legislation**

The main legislation concerning traffic calming is as follows:

The Highways Act 1980 as amended by the Transport Act 1981 and the Traffic Calming Act 1992, particularly Sections 90A to 90G.

The Highways (Road Humps) Regulations 1999, prescribes types and where road humps may be used.

The Traffic Signs Regulations and General Directions 2002. Prescribes appropriate signs and road markings relevant to traffic calming. Direction 16 of the General Directions, prescribes the spacing and type of speed reducing measures that are required if Diagram 674 (20mph zone sign) is to be used;

### **Highways Act**

All proposed road hump schemes must be advertised by placing notices in a local paper and the streets affected (Section 90C). The term "Road hump schemes" should be taken to mean any scheme, which includes vertical deflections over 25mm high (humps, tables and cushions).

Road humps, unless specially authorized by the Secretary of State, can only be used on roads where the speed limit does not exceed 30mph (Section 90E).

Proposals for other traffic calming measures as defined by the Traffic Calming Act and Traffic Calming Regulations do not need public notices but should be part of a consultation exercise.

### **Highways (Road Hump) Regulations 1999**

Road humps in 20mph Zones do not require signing other than the 20mph Zone signs at the start / entrance to the zone;

There is no longer a requirement as to the spacing or location of road humps other than they must be perpendicular to the direction of traffic. General guidance is that they should not be more than 100m apart and in 20mph zones they will need to be closer: 80m for road humps; and 50m to 60m for speed cushions;

20mph zones are not required to be lit, however, local conditions must be considered to determine whether lighting would be appropriate;

Speed reducing measures, such as bends, junctions, etc. are no longer required in advance of road humps. However, it is important to ensure that vehicle speeds (85th percentile) at the first hump in a series are unlikely to be in excess of 30mph, however, it is still considered to be sensible, wherever possible, to have a speed-reducing feature in advance of the first road hump.

The height of a road hump must not exceed 100mm (KCC policy is 75mm maximum height) and must not be less than 25mm. A road hump, which falls outside these dimensions, could be regarded as an obstruction.

It should be noted that neither the Traffic Calming Regulations nor the Road Humps Regulations prescribe any vertical deflection that has a height between 15mm and 25mm. To use any device that might fall between these dimensions could be regarded as an obstruction and should not therefore be used.

#### **Further Guidance and Best Practice**

Although the following are not included in the 1999 Road Hump Regulations they represent best practice and are contained in the DfT's Traffic Advisory Leaflet TA/7/96. In addition this leaflet states clearly that local authorities will need to ensure that an **adequate duty of care** is exercised when designing and implementing schemes.

The first road hump in a series should not be positioned further than 40m from the first speed reducing measure.

When turning into a road which has road humps the first road hump should normally be encountered within 40m. However experience since 1990 has shown that these first two requirements have not always been easy to achieve, as the position of junctions, driveways and business premises cause difficulties in complying with these measurements. Departures from this guidance are acceptable but need to be considered with care and may need to be highlighted for safety audit.

The height of a road hump should not exceed 75mm. This is a Kent standard, which is below the 100mm maximum contained in road humps regulations. Monitoring of early schemes has shown that this lower height still produces effective speed and crash reduction whilst not adversely affecting vehicles in the way that the higher specification does. Many Highway Authorities also use this lower measurement.

The ramp slopes on table junctions and flat top humps should not exceed 1 in 15.

Road humps should not be placed on A or B class roads, or those classified as District Distributors, as these are routes that the emergency services would expect to be kept clear and would also have, by definition, high flows of buses and commercial vehicles.

Roads, which are to be treated with road humps, must be lit to the standards laid out in Appendix 3 of this document, which is consistent with the Highways (Road Humps) regulations 1999.

### **Horizontal Deflections**

The Department of Transport's 1999 regulations on Traffic Calming Measures gives information on the measures (not road humps) that can now be used without seeking special authorisation. These regulations do not include any requirements on spacing etc., as was given for road humps, but it is clear from schemes introduced so far that guidance is needed for these measures. The following guidelines should be used when developing schemes using horizontal deflections:

- Measures should not normally be further than 150m apart.
- Horizontal deflections may only be used where the speed limit does not exceed 40mph.
- All schemes must be lit to the standards set out in Appendix 3 of this document.
- Environmental street furniture placed on kerb build outs should not exceed 0.5m in height, (including any planting) particularly in urban areas.

## Appendix 2: Signs and Markings

### General

Traffic signs and road markings are important in providing road users with visual warning of the features to be negotiated. The appropriate use of traffic signs will encourage drivers to keep vehicle speeds at, or below, the prevailing speed limit.

It is important that any traffic signs or road markings are placed and used in accordance with the requirements of relevant legislation. It is also important to avoid unnecessary signing which can lessen the effectiveness and result in sign clutter.

Diagram numbers referred to in this Appendix are taken from the Traffic Signs Regulations and General Directions (TSRGD, current edition 2002). Useful guidance is also shown in Traffic signs Manual, Chapter 4 (Warning Signs) 2004 and Chapter 5 (Road Markings) 2003.

### Road Humps

The signing of road humps needs to conform to the requirements of the Traffic Signs Regulations and General Directions, the Highways (Road Humps) Regulations (currently 1999) and the Highways (Traffic Calming) Regulations (currently 1999). Further guidance is given in Traffic Signs Manual, Chapter 4 (Warning Signs) 2004 and Chapter 5 Road Markings) 2003.

Based on the above, signing and road markings for road hump schemes, other than in 20 mph zones, should be provided in accordance with the following:

- Diagram 557.1(TSRGD) with appropriate supplementary plates to Diagram 557.2, 557.3, or 557.4 must be used in advance of a road hump or the first in a series. In the case of traffic calmed area where features other than road humps are predominant, Diagram 883 may be considered.
- Diagram 557.1 must be reflectorised but is not required to be lit other than on a principal or trunk road.
- Individual signing of road humps in a series, where the road humps are not more than 150m apart, is not necessary.
- A humped Zebra, Pelican, Toucan or Puffin crossing need only be signed separately where the spacing between it and an adjacent hump is greater than 100m. In the latter circumstances signs to diagrams 543/547.8 or 544/547.8 must be used in advance.

- Diagram 1062 (TSRGD) must be used on all road humps. For round top and flat top road humps two markings on the approach side, per lane and for each direction should be used. In the case of speed cushions only one marking to Diagram 1062 should be used on the approach side. Where the speed cushion is centrally positioned the marking should be placed on both sides. Speed cushions should be constructed in a contrasting material (for example, red material on a black carriageway).
- Warning line markings to Diagram 1004(TSRGD) should be used across or through the humps to separate opposing traffic lanes or traffic lanes proceeding in the same direction. This will include speed cushions, unless one is situated in the centre of the carriageway. Where the carriageway is less than 5m in width, Diagram 1004 may be omitted and the triangles to Diagram 1062 should be centralized;
- Edge line markings to Diagram 1012.1(TSRGD) must be used with tapered edge round top or flat top road humps, to delineate the edge of the taper but should be omitted where Diagrams 1017 or 1018.1 are used. Edge line markings may be omitted at kerb to kerb road humps and speed cushions but their use should be considered to aid conspicuity in appropriate circumstances.

Within 20mph zones, signing should be kept to a minimum. Signs to Diagrams 557.1 or 883 are not required as the function of the 20mph zone signs, Diagram 674, is to warn that drivers should expect closely spaced traffic calming measures. Although it not mandatory to use the marking Diagram 1062 on individual road humps it is recommended that these should be provided in combination with diagram 1012.1, edge lines and diagram 1004, warning lines, if the zone is unlit or has lighting of a low standard.

Where 20mph speed limits are used, i.e. designated by signs to Diagram 670, any road hump signing must be in accordance with the paragraphs above.

### **Chicanes and Build-outs**

Where there are a series of these features, Diagram 883 (TSRGD) should be used in advance of the first in the series. If individual features require signing use Diagram 516 or 517.

It may be appropriate to establish a priority system. Normally, at the entries to the scheme, traffic in the outbound direction will have priority. After this, priority should be alternated.

Significant build outs in urban areas should have base light internally illuminated bollards on the leading edge, combined with hatched road marking taper, Diagram 1040.4. Alternatively, marker posts or bollards with reflectors conforming to Diagrams 560 or 561 may be used, particularly in rural areas. Care must be taken that any bollards with reflectors, and particularly those in ornate materials such as cast iron, conform to BS EN 12767 "Passively Safe Roadside Equipment" and "Signing on

Kent's Roads", to maximise safety of roadside equipment. Table 14.1 of Chapter 5 of the DfT's Traffic Signs Manual should be referred to for advice on appropriate taper dimensions. Hatched markings on the approaches to build outs or traffic islands can be enhanced by laying them on a coloured background. Conspicuity of build outs and chicanes can be enhanced by the use of edge of carriageway markings to Diagram 1012.1, or where waiting restrictions occur, Diagrams 1017 or 1018.1.

Where there is a priority system, the give way marking to Diagram 1003 should be used on the non-priority approach. Diagram 1023 may also be used. If considered necessary, and for additional warning, Diagrams 615/615.1 may be used in conjunction with Diagram 1003. In these cases signs to Diagrams 811/811.1 must be used on the other approach. It should be noted that the TSRGD does not permit Diagram 602, to be used at these locations.

Individual signing of chicanes or narrowings is not required in 20mph zones, signed at the entry by Diagram 674. In 20mph speed limits, where Diagram 670 is employed, signing should be in accordance with the paragraphs above.

### **Overrun Areas**

The dimensions for overrun areas need to be in accordance with Regulation 5 of Highways (Traffic Calming) Regulations. Signing is not normally required, as they should normally be constructed in contrasting material or colour, but in some cases delineation from the normal running surface may be achieved by the use of Diagram 1012.1. It is not appropriate to use any type of hatched markings across overrun areas as this may conceal them.

## Appendix 3: Lighting Policy for Vertical & Horizontal Deflections

### 1. Introduction

The only document that has made specific mention of lighting for traffic calming features is statutory instrument no. 1025 “The Highways (Road Humps) Regulations 1999”, where lighting is covered by sections 5 and 7.

It must be noted however that these regulations only cover road humps and do not make allowances for any of the other forms of traffic calming correctly used.

Also the definitions for lighting of road humps in section 5 is written to include just about every road lighting installation since the 1950’s in terms of the lighting standard acceptable.

### 2. The choice of Light Source

The choice of light source for traffic calming features should provide the degree of colour rendition necessary for driver navigation and pedestrian orientation. This is of particular consideration for vertical and horizontal traffic calming features and colour rendering will be considered within the discussions for the lighting of each of the three forms of traffic calming later in this document.

### 3. Horizontal Deflection Calming Features

Drivers approaching the feature need to be able to identify the feature concerned and its layout and be able to make such judgements as necessary concerning driver priority and the intended actions of oncoming drivers and how to safely navigate the feature.

#### (a) Lighting Requirements

The area under consideration is the locality of the particular feature and associated road markings. Where there is a significant distance between horizontal traffic calming features on a road, each may be regarded as a separate relevant area. In this case specific lighting for these features will only be in the immediate vicinity of the feature.

Where horizontal calming features are not more than 100 metres apart the feature and the road between should be regarded as one relevant area.

A source giving a good colour rendering is necessary to aid the motorist in the safe navigation of the feature and enable judgement to be made concerning driver priority and the actions of opposing

motorists, cyclists or pedestrians. It is considered that the light source used at the locality of the horizontal calming feature is different to that used on the adjacent highway. A change in light source to that used for the lighting of the highway is a method of drawing the motorist's attention to the feature.

**(b) Roads Lit to the CE or S Series of Lighting Classes**

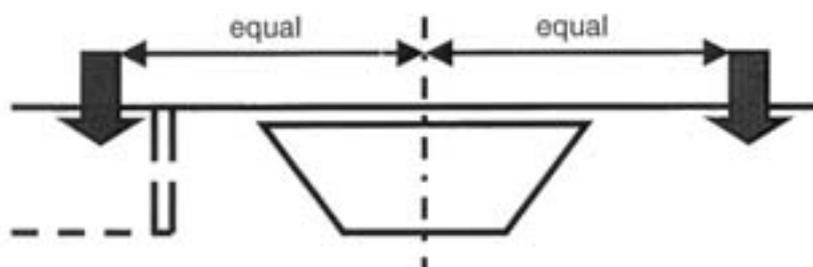
Where horizontal deflections are employed on roads where the basic road lighting would comply with either the CE or S series of lighting classes then the lighting level at the feature should be one class higher i.e. if the through road level is S4 then the feature should be lit to S3.

**(c) Roads Lit to the ME Series of Lighting Classes**

Where the horizontal deflection is employed on a road lit to the ME series then:

- i. level should be one class higher i.e. road is ME3, feature is ME2.
- ii. for roads with a viewing distance < 60m the choice of lighting level for the feature is taken from the CE series of lighting classes but one level higher i.e. road is ME3, feature CE2.

Column configuration. In order to ensure that the horizontal calming feature is adequately lit and to aid maintenance of the lighting columns it is recommended that the columns are ;located as shown below:



**4. Vertical calming features**

There are predominately three forms of vertical deflection techniques employed in the treatment of roads; they are round-top humps, cushions and flat-top humps.

Good contrast in materials should be used to form these features in so far as possible with the associated road markings being well maintained. The task of identifying these at night will be eased if contrasting material has been used to form the humps. Failure to see these features adequately can lead to vehicle damage.

**(a) Lighting for Round-Top Humps and Cushions**

Site surveys have shown that road humps will be adequately revealed to drivers if the road is lit to the appropriate standard, both for intensity and uniformity. Road humps should be adequately visible regardless of whether they are adjacent to columns or at the mid-span.

Road markings are likely to be the greatest contributor to the visibility of humps. However as mentioned previously, the choice of materials and colouring for humps will contribute to providing good visibility of the features.

**(b) Lighting for Flat Top Humps**

Observations have shown that pedestrians tend to believe, wrongly, that they have priority over the motorist.

This must then be a consideration from the lighting engineer's perspective and the lighting design should ensure that pedestrians on or near the hump can be seen.

It is recommended that the lighting level for these features on CE-class roads be increased by one level with a minimum lighting level of CE4. On S class roads the lighting levels in the locality of the feature should be increased by one level, i.e. S4 to S3 with a minimum level of S4. Where these features are installed with tactile paving then consideration should be given to the recommendations contained within ILE Technical Report no. 12 Lighting for pedestrian crossings.

**Column Positioning**

Where these features are located at junctions then the recommended BS5489 junction layout of columns should be used.

Where these features are used along the highway then the columns should be located equally either side of the feature in advance of the ramp face. Site inspections have shown that this is the most suitable location for ensuring maximum visibility for the table feature.

**5. 20mph Zones**

The Highways (Road Hump) Regulations 1999 clause 7 states that clause 5 does not apply in a 20mph zone i.e. road humps do not need to be lit. However it is the view of the county council that all traffic calming features in such zones should be illuminated to a consistent standard. In urban situations lighting should be provided. However, in some rural areas lighting may not be appropriate and so a scheme with no lighting can be considered. What must be avoided in either situation are inconsistent levels of lighting along a traffic calmed section of road. It would not be acceptable to allow dark patches in areas where traffic calming features are to be constructed.

## **6. Horizontal and Vertical Calming Features or roads with Existing Lighting**

As mentioned in the introduction the Highways (Road Hump) Regulations 1999 permit a wide range of lighting standards as being acceptable. It is therefore possible on an existing road to place a feature midway between 2 columns 38m apart, which will put the feature in a very poorly lit section of road.

In some cases it may be possible to replace the lanterns and greatly improve the lighting – although not necessarily up to current standards.

In the case of a road hump it may be advisable to site it directly under a column and replace the lantern at that location.

These installations will, of necessity, have to be assessed on a project by project basis taking into account the risk of leaving below standard lighting installation in a traffic calmed area.

Other factors may also affect the decision making process as, for example, the introduction of CCTV requires higher levels of lighting to operate efficiently at night so the combined needs of TC and CCTV would probably justify bringing the whole lighting installation up to current standards.

### **(a) Location of Equipment**

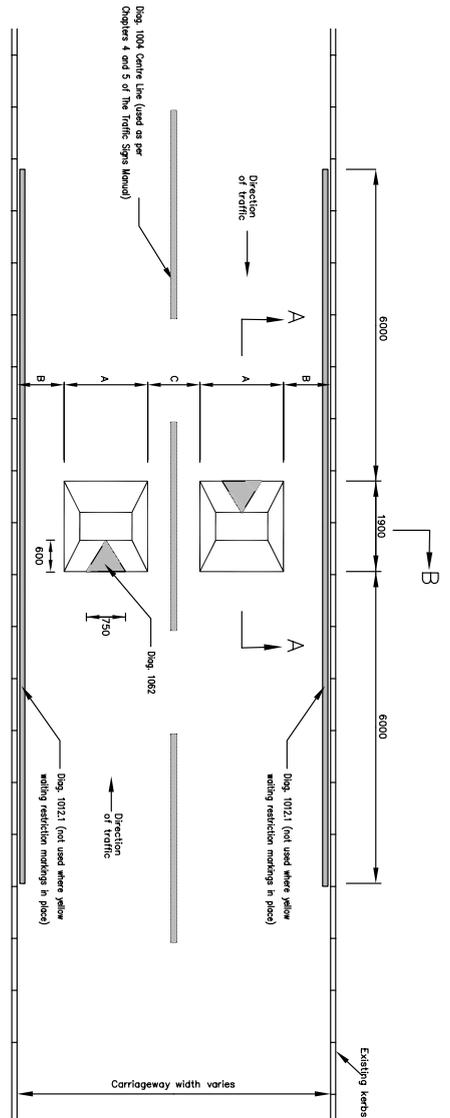
The design should ensure that access for maintenance and servicing is duly considered to cause minimum disruption to traffic. For such reasons the location of central islands and pinch points should be considered with respect to lighting columns. When the unit is being serviced by a tower wagon parked on the highway, safe passage of traffic without special traffic management should be a design consideration.

### **(b) Visibility**

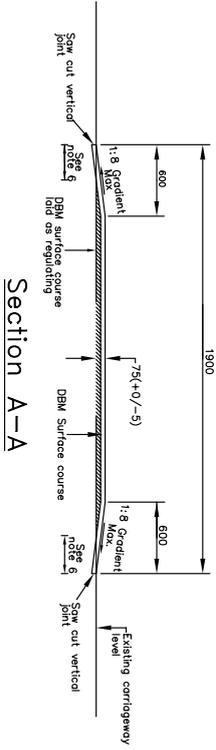
The night time visibility of a feature depends upon the amount of light, the colour of that light and the reflectance of the road markings.

It is therefore essential that both street light and lines are regularly maintained to ensure the safe passage of all road users.

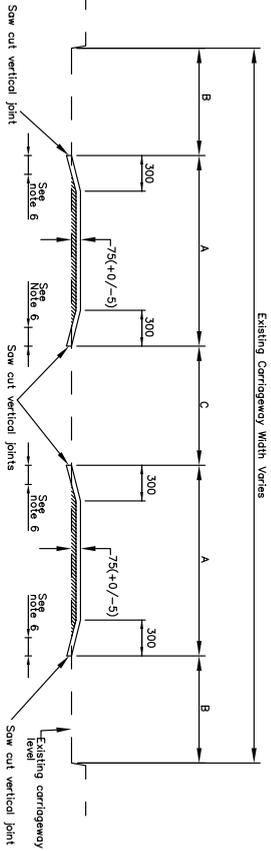




Plan



Section A-A



Section B-B

Cushion width and suggested spacings for two cushions for an existing carriageway width of 4.7m-6.8m

	Road Width	Cushion Width (A)	Channel Width (B)	Gap Width (C)
MAXIMUM	6.800	1.600	1.200	1.200
IDEAL	6.200	1.600	1.000	1.000
ACCEPTABLE	5.450	1.600	0.750	0.750
MINIMUM	4.700	1.600	0.500	0.500

Drawing Number

TC/2

Notes

- All dimensions are in millimetres unless otherwise indicated.
- All existing surfaces to be overlaid shall be cleared of all vegetation and any soil prior to overlay.
- Interfaces between bituminous materials shall be saw cut.
- Vertical faces of existing bituminous material shall be primed with bitumen. Existing horizontal or inclined surfaces to be overlaid shall be tack coated. Planed surfaces (cold milled) shall be treated with tack coat in the same manner as existing surfaces.
- Plane out (cold milled) existing pavement to key in wearing course.
- All Diagram numbers refer to "The Traffic Signs Regulations and General Directions 2002".
- All setting out is to be agreed on site with the Engineer.
- All carriageway markings are to be fully retroreflected.

Do not scale this drawing

Rev	Date	Checked



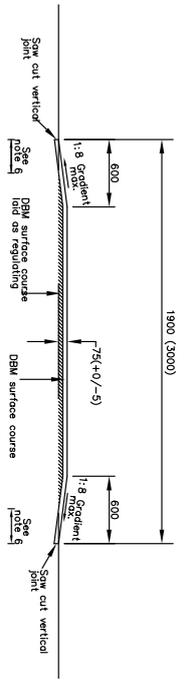
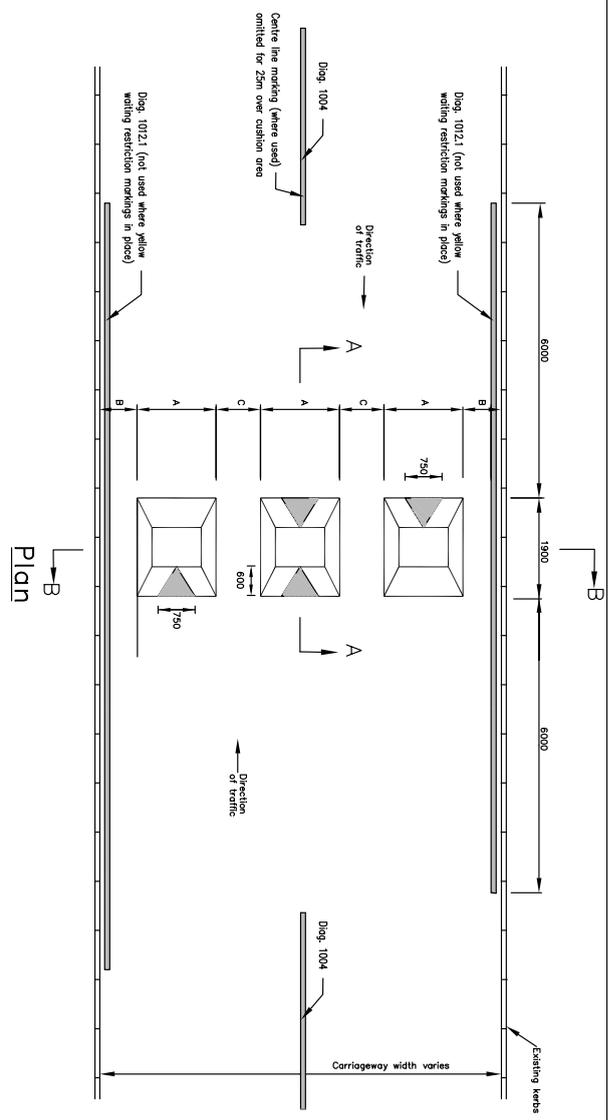
Kent County Council  
Strategic Planning

Traffic Calming  
Guidance Note

Standard Detail  
Showing  
Double Cushion Layout in  
Flexible Construction

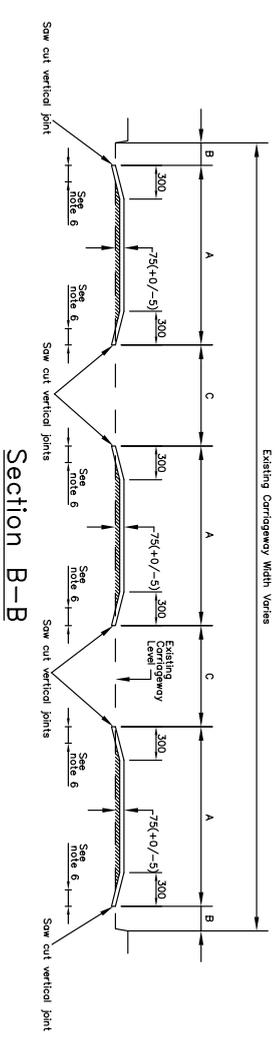
Drawing No.	TC/2	Date	June 04
Scale	Not to Scale	Drawn	KTY
	Checked	BS	Approved
		GW	

Copyright reserved  
Babtie Group Ltd  
Miller House, Lower Stone Street  
Maldstone, Kent ME15 6GB



Question width and suggested spacings for three cushions for an existing carriageway width of 6.8m-9.5m

Road Width	Cushion Width (A)	Channel Width (B)	Gap Width (C)
MAXIMUM 9 600	1 600	1 200	1 200
IDEAL 8 800	1 600	1 000	1 000
ACCEPTABLE 7 600	1 600	0 750	0 750
MINIMUM 6 800	1 600	0 500	0 500



Drawing Number

TC/3

Notes

- All dimensions are in millimetres unless otherwise indicated.
- All existing surfaces to be overlaid shall be cleared of all vegetation and any soil prior to overlay.
- Interfaces between bituminous materials shall be saw cut.
- Vertical faces of existing bituminous material shall be primed with bitumen. Existing horizontal or inclined surfaces (cold milled) shall be tack coated. Planed surfaces (cold milled) shall be treated with tack coat in the same manner as existing surfaces. Plane out (cold milled) existing pavement to key in wearing course.
- All Diagram numbers refer to "The Traffic Signs Regulations and General Directions 2002".
- All carriageway markings are to be fully re-reflectrised.
- All setting out is to be agreed on site with the Engineer.

Do not scale this drawing

Rev	Date	Checked

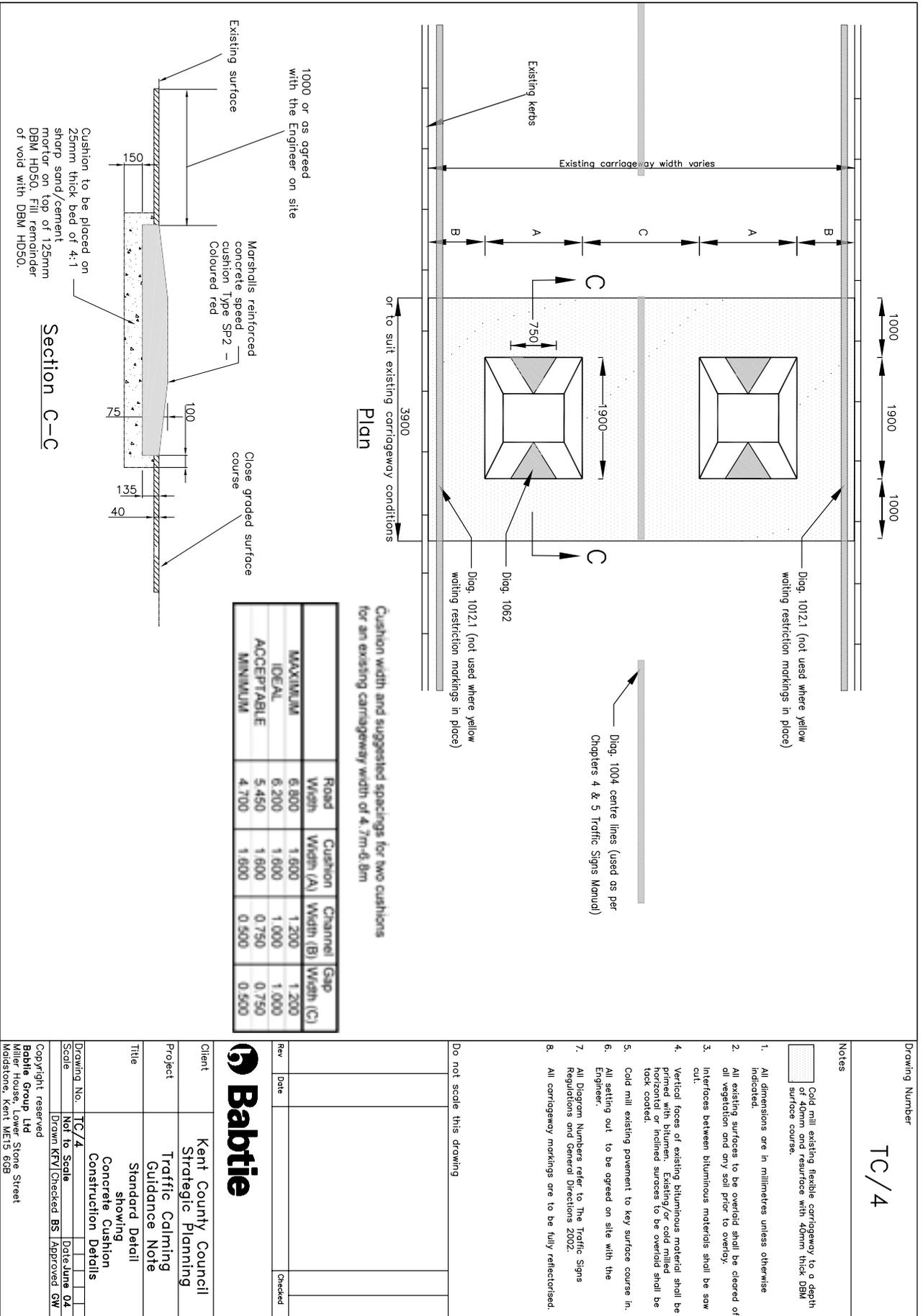


Client: Kent County Council  
Project: Strategic Planning  
Title: Traffic Calming Guidance Note

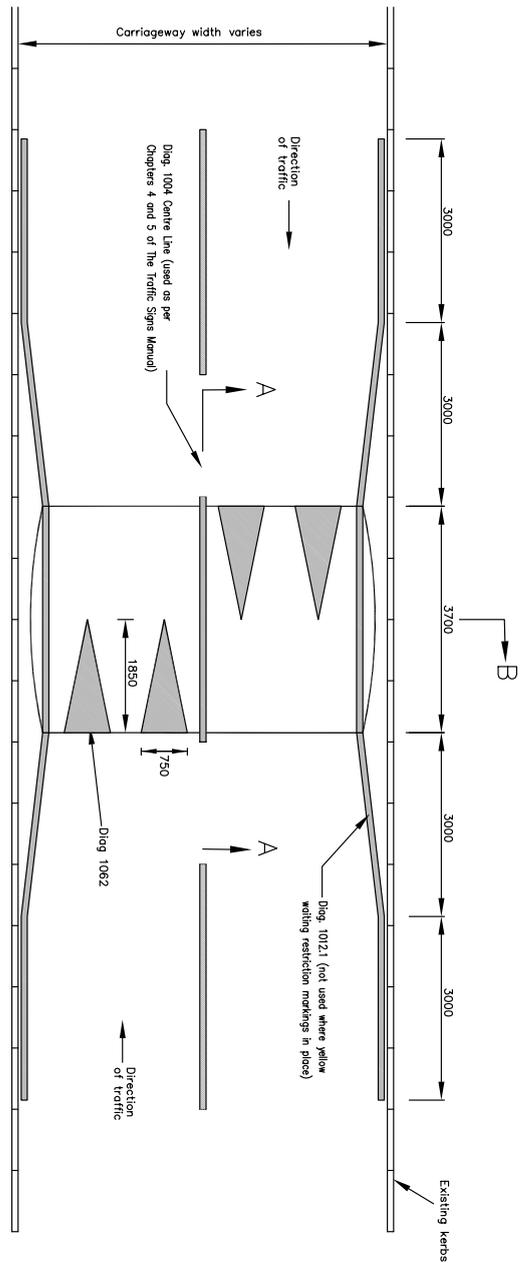
Standard Detail  
Showing  
Triple Cushion Layout in  
Flexible Construction

Drawing No.	TC/3	Date	June 04
Scale	Not to Scale	Drawn	KTV
	Checked	BS	Approved
		GW	

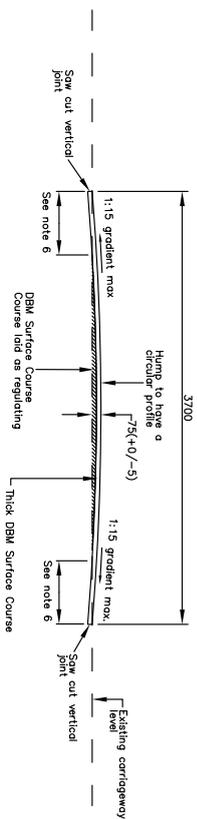
Copyright reserved  
Babtie Group Ltd  
Miller House, Lower Stone Street  
Maidstone, Kent ME15 6GB



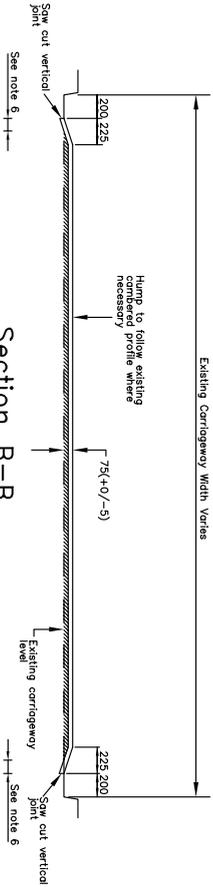
A3



Plan



Section A-A



Section B-B

Drawing Number

TC/5

Notes

1. All dimensions are in millimetres unless otherwise indicated.
2. All existing surfaces to be overlaid shall be cleared of all vegetation and any soil prior to overlay.
3. Interfaces between bituminous materials shall be saw cut.
4. Vertical faces of existing bituminous material shall be primed with bitumen. Existing horizontal or inclined surfaces to be overlaid shall be tack coated.
5. Placed surface (cold milled) shall be treated with tack coat in the same manner as existing surfaces.
6. Plane out (cold milled) existing pavement to key in wearing course.
7. All diagram numbers refer to "The Traffic Signs Regulations and General Directions 2002".
8. All carriageway markings are to be fully reflectorised.
9. All setting out is to be agreed on site with the Engineer.

Do not scale this drawing

Rev	Date	Checked



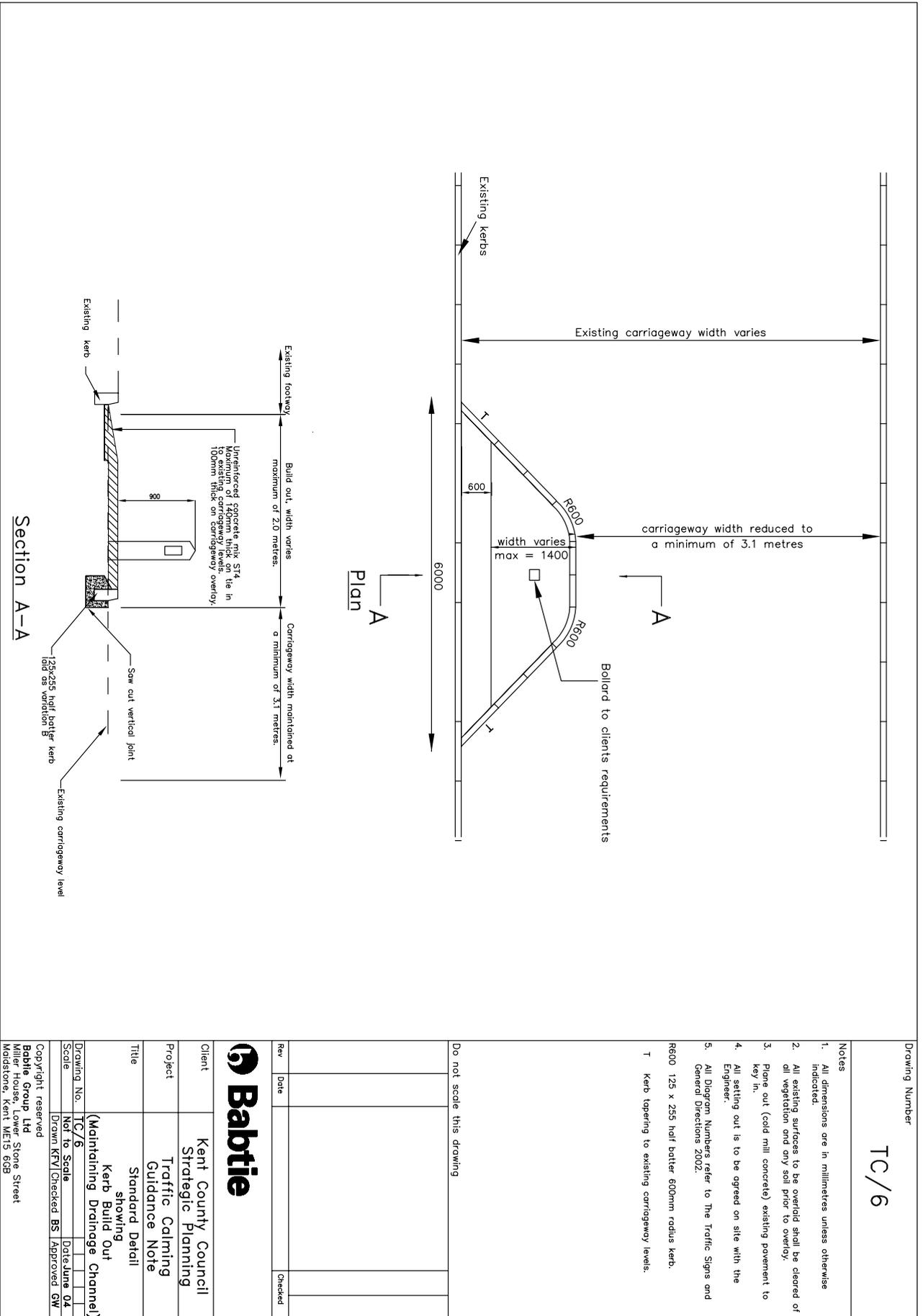
Kent County Council  
Strategic Planning

Traffic Calming  
Guidance Note

Standard Detail  
showing  
Round Top Road Hump  
in Flexible Construction

Drawing No.	TC/5	Date	Issue
Scale	Not to Scale		04
	Drawn KTV   Checked BS   Approved GW		

Copyright reserved  
Babtie Group Ltd  
Miller House, Lower Stone Street  
Maldstone, Kent ME15 6GB



A3



## Appendix 5: Priority rating for Environmental / Quality of Life Schemes

### 1. **Personal Injury Crashes**

Investigate 10 year crash record to see if current record suggests low blip  
Seek local resident / member / police information on damage only incidents.

### 2. **Speeds**

Check current speed profile at average and 85th percentile levels; are these in excess of ACPO intervention levels?

### 3. **Traffic Flows**

Are traffic flows increasing, are base figures available?

Can an estimate of "rat running" be produced?

What is the cause of that "rat running" and can it be relieved at source.

Would the intervention of traffic calming create greater problems on the main road network?

How much extra distance will drivers have to travel to avoid traffic calmed roads or areas?

### 4. **Pedestrians and Cyclists**

Is there information to suggest that more people are walking / cycling, or would walk / cycle, if traffic calming were introduced?

Are the current, or planned, safe routes to school or walking buses using the roads where traffic calming is suggested?

### 5. **Education / Enforcement**

Could either or both of the above produce the improvements that an engineered solution would produce?

### 6. **Residents**

Has the problem of traffic been raised by more than one resident?

Do surveys suggest that the majority of residents favour an engineered solution?

### 7. **Site conditions**

Does the road layout suggest that traffic calming would be a suitable measure?

## 8. Previous

Have these problems been raised before? What action, if any, was taken?

Using the above headings it should be possible to present a clear picture of the objectives that a scheme that would not be funded from the crash remedial budget would have. An assessment of the relative priorities of these schemes could then be made to ensure that the schemes that would produce the highest benefit are funded first.

## Appendix 6: Detailed Design and Construction

### **Introduction**

The construction of any scheme plays an important part in the public perception of it and so everything should be done to minimise any inconvenience that might arise. Many difficulties can be avoided by careful consideration at the detailed design stage, in the programming of the work and through the contract. There are also many opportunities during these stages for providing the public with positive information about the scheme and its progress, and thoughtful use of these opportunities can help to avoid unnecessary conflict. Conversely, a disregard for the people affected by the construction of the scheme can lead to a negative perception of the scheme, which might not have otherwise developed.

Difficulties with the construction itself can also arise if issues such as tolerances are not properly addressed in the context of a specific scheme or if the contractor cannot reconcile design requirements with the situation on the ground. Every effort should therefore be made to ensure that design specifications are made in the full knowledge of existing highway conditions.

The detailed design should take into account the future maintenance of the scheme, be it major or routine, and should not lead to undue traffic management problems or a scheme that cannot be kept clean and tidy.

### **Detailed Design**

There are many standards, specifications, and guidance notes issued on design and consultation throughout the industry and within KCC Designers must keep abreast of current thinking and must be able to show that decisions have been based on current design standards and an awareness of how the design will affect the end user.

Where a narrow carriageway is part of a scheme there will be less available surface for wheel tracks. The extra stress over a narrow, heavily trafficked strip will increase the rate of deterioration of the localised carriageway with rutting, cracking or spalling more likely to occur, stronger construction must therefore be specified to ensure long life. The position of manholes and carriageway boxes is critical as these must not be in the wheel tracks, but neither should any manhole covers be positioned where a motorcycle may run, especially on a bend.

In schemes for villages through which "wide load" routes may exist or, due to the rural nature of the area, there is a regular passage of wide agricultural vehicles, de-mountable street furniture can be used to good effect.

A table top junction, or any hump, needs to be constructed to precise tolerances across a carriageway which has been there some time and will have settled and rutted. It may be necessary to resurface the entire carriageway as part of the contract, or at least to reconstruct the carriageway for at least 2.0m from the edge of the new hump. This will enable the correct tolerances to be met along the base of the ramps and will also minimise the risk of the old carriageway failing from the extra wear and tear it will inevitably get from vehicles. It is imperative that the new section of carriageway is laid within the same contract, both for safety's sake and public perception. The scheme must not be left unfinished until a surfacing contract is undertaken at a later stage.

Maintenance should be carefully considered at the detailed design stage in order to avoid costly and inconvenient situations in the future. Any road narrowing will mean that maintenance issues such as gully emptying, the servicing of lamp columns, and repair work are more likely to require a road closure, careful design can, in many cases, avoid this.

The positioning of ducts or drainage runs is important to ensure that in the event that gullies get blocked by leaves and detritus, they can then be swept by a mechanical sweeper.

Variety is important in the choice of materials, as are environmental considerations, but the replacement of damaged items of street furniture can be made more easy by making certain that the client or the Divisional Manager has a list of suppliers and the items used. The use of 'specials' should be avoided wherever possible, as they will not be easily replaced when damaged.

### **Programming**

Local businesses are often affected by the implementation of a scheme; consultation on the planning of schemes is therefore vital to ensure that, for example, work which would disrupt Christmas is avoided. The programme of work is the contractor's responsibility, but the designer and Client must ensure that the contract documents specify any working conditions, which might minimise the inconvenience to residents, local business or the travelling public. Such conditions might include working time prohibitions, the maximum period a section of footway can be left excavated, the maximum length of any one excavation, and the use of temporary traffic signals. In certain circumstances, although this is not generally done, the contract documents can specify that certain work can only be done at a particular time or on, or by, a particular date.

Always consider the probable and the logical construction sequence and if an obvious problem is going to occur then, wherever possible, specify a solution within the tender documents. It is a fundamental requirement that road humps and chicanes are illuminated. The lighting should therefore be installed and connected earlier in the contract, or temporary lighting arranged, until the final connection is in place. Signing and lining should also be in place at an early stage.

The construction programme might also require road closures. Many traffic calming schemes involve narrowing the road so much that closure is the only solution for safe construction and their period and

duration must be carefully considered. Similarly, consideration should be given to closing a road for any resurfacing that is required if the available running lane reduces below 3.0m on a bus route or 2.75m on other routes.

Any traffic calming scheme should be protected against unwarranted excavation for a year by advertising the scheme in accordance with the procedures set down in the New Roads and Street Works Act 1991, this will avoid having a major scheme dug up by a statutory undertaker shortly after its completion.

### **Construction**

Once the detailed design, programming and contract stages have been completed and construction starts it must be assumed that all aspects of the design are correct. There may nevertheless be instances where there is some doubt about the design, in most cases this will be unfounded and anything that might appear unusual will be found to have been included for a specific reason. If there is any doubt, no changes should be made on site before referring back to the client.

The extent or impact that any item of construction will have on the surrounding carriageway surface should be carefully considered. On a footway it may be acceptable to “ramp up” or “tie in” a narrow strip alongside the edge of works, but on the carriageway that may not be acceptable, except perhaps alongside the kerb. It may well be necessary to include a much larger area of resurfacing to provide a proper, safe and enduring finished job. An example would be the construction of a mini-roundabout where for short term construction costs it would be cheaper to cut a slot and match the new asphalt hump in to the surface. This will lead to breaking up around the circumference leading to prolonged maintenance difficulties, delays and expense. A far longer lasting solution would be to surface the entire junction at construction.

Experience has shown that little supervision and monitoring is carried out of the finished levels even though these are strictly limited by contractual tolerances. Humps and tabletop junctions are limited in height but few checks are made to ensure conformity with the design and specification. Supervisors must check the setting out and final levels and make sure that errors are corrected. A template should be produced as a very simple and quick method of checking compliance.

### **Health and Safety**

The requirements of the New Roads and Street Works Act 1991 and the Health and Safety at Work Act concerning Safety Zones at road works must be met. The HMSO publication “Safety at Street Works and Road Works, A Code of Practice” concerning safety zones and safe methods of working should be followed. When working on a narrow road it may have to be closed unless speeds are restricted to below 10mph.

## Communication

The construction of any scheme can affect, either positively or negatively, the public support, which will have been gained during the outline design and public consultation stages. Information flow and continued consultation is very important in maintaining support, and lack of information can adversely affect public perception of the success of the whole scheme.

People should be kept informed of progress throughout the construction of the scheme and a planned programme of communication, taking note particularly of significant stages, should be agreed with the client at the outset. Variations might need to be made to this if there are any delays or if any changes have been made about which local residents and traders should be informed.

Prior to starting construction on site find out from the Client when the last piece of information was issued to the general public about the construction programme. Arrange for a letter drop to those immediately affected and consider whether it should extend to other side roads, or possibly a much larger area.

If the work is on a major distributor road then advance warning notices should be erected to warn drivers of the intention to start work and the length of contract. The telephone number of the Resident Engineer or Clerk of Works plus the address should always be clearly given as should the name and number of the contractor and his Agent or Site Manager. Care must be taken to ensure that any number given is one that will be answered and all queries must be dealt with properly and with understanding.

