

Carl Sargeant AC / AM
Y Gweinidog Llywodraeth Leol a Chymunedau
Minister for Local Government and Communities



Llywodraeth Cymru
Welsh Government

Eich cyf/Your ref P-03-162
Ein cyf/Our ref MBCS1723-12

William Powell AM
Chair Petitions Committee
Ty Hywel
Cardiff Bay
Cardiff,
CF99 1NA

24th April 2012

committeebusiness@Wales.gsi.gov.uk

Dear William,

I am responding to your request for details of the threshold number of accidents at which safety measures and/or monitoring is put in place.

We continually monitor our road network for collisions. This is done on an annual basis, to determine if any sections of road or individual locations are experiencing a higher than average number of collisions. Where fatal collisions occur, we undertake a detailed study to determine if there are any highway causation factors. We would also undertake a similar investigation following an incident resulting in a large number of seriously injured casualties. This process identifies whether there are potential sites for Local Safety Schemes.

The threshold for a Local Safety Scheme is given in a document called 'Guidelines for the Submission of Road Safety Schemes'. The document promotes consistency in developing road safety schemes. It includes a mechanism by which the developed schemes can be prioritised to ensure that those providing the greatest benefits are promoted.

I have enclosed a copy for your information.

I note that you have also asked for a copy of a statement on road accident prevention measures. I include a link to my recent announcement on new interim road safety targets and the development of a new road safety delivery plan for Wales.

<http://new.wales.gov.uk/newsroom/transport/2012/120123safety/?lang=en>

A handwritten signature in black ink that reads "Carl Sargeant". The signature is written in a cursive style with a long, sweeping tail on the final letter.

Carl Sargeant AC / AM

Y Gweinidog Llywodraeth Leol a Chymunedau
Minister for Local Government and Communities

Welsh Government Transport Wales

Guidelines for the Submission of Road Safety
Schemes

Originally produced April 2008 (Revised June
2009, August 2010 and October 2011)



Llywodraeth Cymru
Welsh Government

Contents

1	Introduction	1
1.1	<i>Introduction</i>	1
1.2	<i>Welsh Government Road Safety Strategy</i>	1
1.3	<i>Existing System</i>	4
2	Identification, Selection & Prioritisation	5
2.1	<i>General</i>	5
2.2	<i>Identification of Sites</i>	7
2.3	<i>Collision Site Priority Listing</i>	7
2.4	<i>Collision Investigation & Prevention Study</i>	8
2.5	<i>Consultation</i>	11
2.6	<i>Estimating Collision Cost Savings</i>	13
2.7	<i>Scheme Prioritisation</i>	14
3	Construction and Monitoring of Schemes	16
3.1	<i>Construction</i>	16
3.2	<i>Amendments to Inventory</i>	16
3.3	<i>Monitoring</i>	16
4	European Road Assessment Programme	18
4.1	<i>General</i>	18
4.2	<i>What is EuroRAP ?</i>	18
4.3	<i>Risk Rate Mapping</i>	19
4.4	<i>Performance Tracking</i>	19
4.5	<i>Road Protection Score (RPS)</i>	20

Appendices

Appendix A *Blank STATS 19 Form (separate file)*

Appendix B *Scheme Prioritisation Score Methodology*

Appendix C *Safety Scheme Monitoring Spreadsheet (separate file)*

Appendix D *Scheme Prioritisation Spreadsheet (separate file)*

1 Introduction

1.1 *Introduction*

This report provides guidance for the 3 Trunk Road Agents in Wales that will promote consistency in developing road safety schemes and presenting the proposals to the Welsh Government. It includes a mechanism by which the developed schemes can be prioritised to ensure that those providing the greatest benefits are promoted.

Specifically, the document contains a methodical approach to:

- Identifying routes and sites and establishing a site priority listing (i.e. those sites that will become the subject of formal investigation and report)

- Site investigation and conflict studies

- Consistency in preparing bid submissions

- Prioritising road safety schemes

The document also looks at the monitoring of completed schemes and provides a brief explanation of the European Road Assessment Programme.

1.2 *Welsh Government Road Safety Strategy*

In January 2003 the Welsh Assembly Government published the Road Safety Strategy for Wales with a vision to 'reduce real and perceived danger for all road and footway users in Wales'.

In its road safety strategy, the UK government set three main casualty reduction targets to be achieved by 2010; those targets, in percentage terms, were adopted by the Welsh Government and translated for Wales as shown in Table 1. Note: Targets are set relative to the annual average number of casualties in each category recorded between 1994 and 1998.

Whilst there are a wide range of measures and campaigns that have been/will be implemented in an attempt to achieve the published targets this document deals solely with the development of road safety schemes on the motorway and trunk road network in Wales. It identifies the considerations to be made, the level of investigation necessary and suggests a pragmatic approach to the preparation of a road safety scheme from the identification through evaluation, prioritising and submitting bids to implementation and subsequent monitoring.

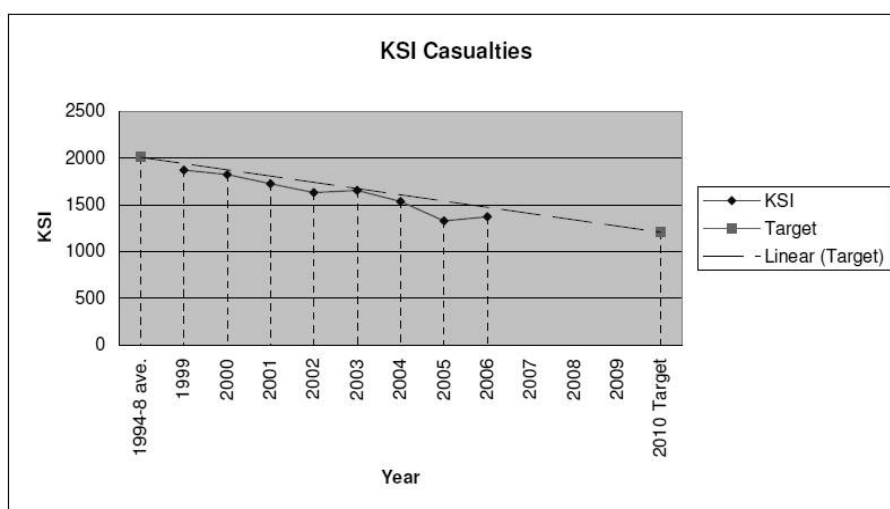
Table 1 – Welsh Governments’ Casualty Reduction Targets

Category	Baseline (1994 – 1998 average)	Current Position (2006)	2010 Target (Reduction in brackets)
40% reduction in the total number of Killed or Seriously Injured (KSI) casualties.	2008	1373	1205 (803)
50% reduction in the total number of children Killed or Seriously Injured (KSI) casualties. A child is defined as someone who is less than 16 years.	289	144	145 (144)
10% reduction in the rate of slight casualties per 100 million vehicle kilometres travelled	54	41	49 (5)

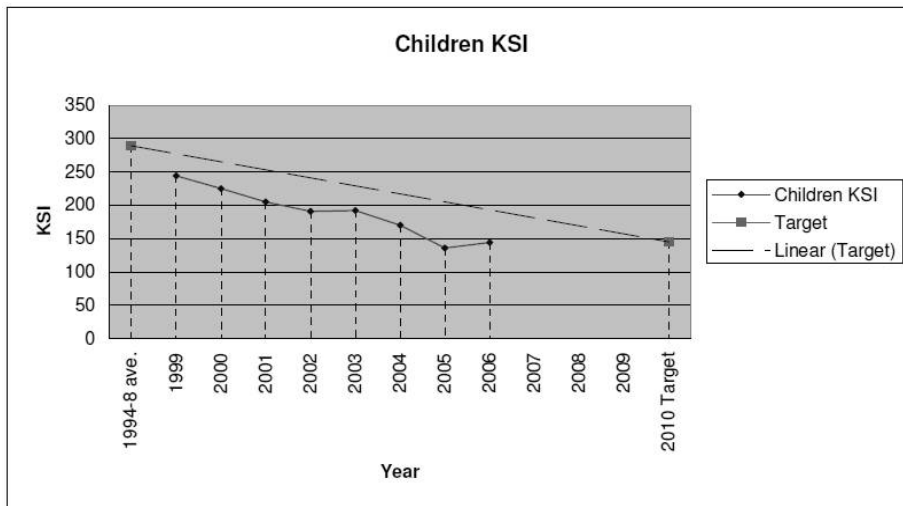
This information has been sourced from the [Welsh Government's website](#) which contains a full range of collision statistics for Wales including a breakdown of the figures provided.

Graphical representations of the progress being made in reducing collisions are shown on the following pages.

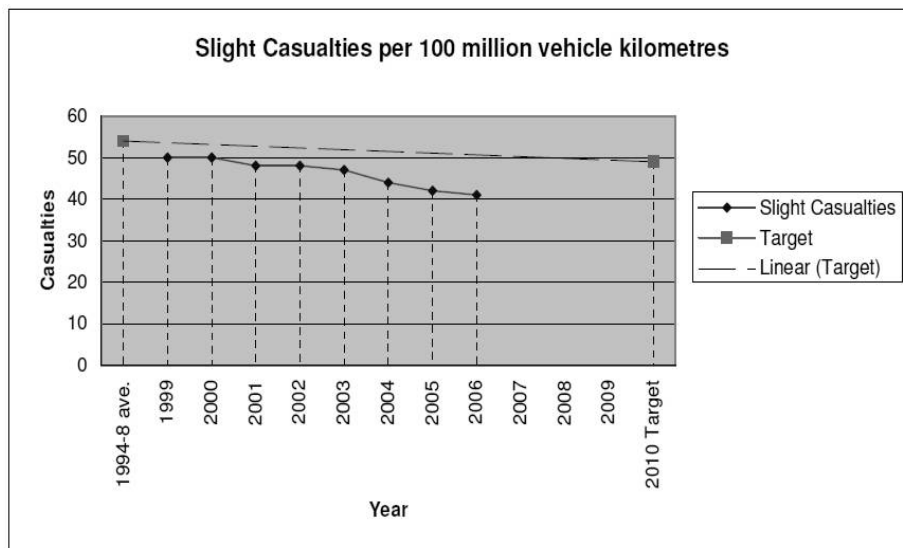
It should be emphasised that the figures contained within the table are those which were captured by the police and involved personal injury. Such details are usually captured at the scene by the police using the STATS 19 record form (see Appendix A).



The KSI casualties have reduced since the start of the strategy and despite a slight rise in 2006 is still tracking below the target line.



The progress in reducing the child KSI figure has been good, with the 2010 target having already been achieved despite a rise in the number of children killed or seriously injured in 2006 compared to 2005.



The number of slight casualties per 100 million vehicle kilometres has declined steadily since targets were set and is currently well in advance of the 2010 target.

It is encouraging that the actual figures for each of the targets are tracking below the target line proving the success of the measures that have been implemented to date with two of the three objectives for 2010 having

been achieved by 2005. Despite the fact that in 2006 there was a slight rise in the Killed or Seriously Injured numbers for children, as a whole the trend remains downward.

1.3 Existing System

Road safety schemes are engineering measures that are designed to reduce collisions and casualties at problem/risk sites. A completed scheme should represent the most cost effective method of reducing collisions at such sites and should, by definition, show a rate of return at those sites.

At the present time road safety problems can be identified through a number of sources:

- a. by using the facilities of the 'accident browser' within the Transport Wales Information System (TWIS) and/or independent database systems held either by the Trunk Road Agent or its partner authorities. A single, validated collision database, accessible by both Transport Wales and the Trunk Road Agents would remove dependence on local authorities and provide a substantial improvement to the current system. At the time of writing, fully populated collision records for several years have recently been imported into TWIS* and consultation with Trunk Road Agents during the coming months will determine the retrieval and analytical capabilities required;
- b. investigations into collision records i.e. STATS 19, or;
- c. through the knowledge held by the Welsh Government Route Managers and Trunk Road Agency staff.

Having identified a potential problem site the Trunk Road Agent analyses the situation and the collision records (STATS 19) of the site (or length of road) and, if appropriate, will establish a cost effective solution to remove or reduce the problem. Once a potential solution has been established and an estimate for the scheme prepared, bids are submitted electronically to Transport Wales who are subsequently supplied with the necessary supporting documentation.

However, at the present time, there is little consistency in investigating problem sites, presenting detailed analyses of the results and determining proposals to address the risks. Consequently comparison of the scheme proposals can be difficult.

There is a concern that, because of these variations, the available funding may not be channelled to those improvements that provide the greatest benefit.

The following chapters aim to overcome this problem by suggesting a methodology for approaching road safety investigations. Appendix B provides a system that will assist in prioritising scheme proposals.

*[*It should be noted that the data for South Wales area has been received directly from South Wales Police and has not been subjected to geographical validation.]*

2 Identification, Selection & Prioritisation

2.1 *General*

It is important that bids are submitted in a consistent format that will allow informed decisions to be made by Transport Wales in approving programmes of work. All schemes should be selected and developed using evidence-based decision making and a value for money approach.

Trunk Road Agents, Welsh Government Area and Route Managers have a good knowledge of the network and will be aware of the planned and ongoing activities that may affect the function of network. They are familiar with the routes for which they are responsible and will be aware of many of the problems that exist.

The following sections set out a methodical approach to identifying collision problems and to the development of road safety schemes as well as a means of scheme comparison.

Examples of Collision Investigation and Prevention (CIP) study reports for a route section and a cluster site are also provided and these demonstrate an appropriate methodology for developing road safety schemes. The Trunk Road Agents are not required at this time to provide detailed reports in support of each scheme bid, although the general process should ideally be followed in order to ensure that worthy schemes are promoted.

An approximate timetable for the annual identification of potential schemes is given on the following page.

Identification of Schemes and Report Preparation Approximate Timetable											
Activity	May	June	July	August	September	October					
Stage 1 - Identification of Sites											
Consider Existing Information (Scheme Requests & TRA Knowledge)	█										
Study Collision Patterns	█										
Accident Statistics Published		█									
Compare Site Specific Statistics with National & Regional Statistics		█	█								
Stage 2 - Collision Site Priority Listing											
Rank Schemes by 'link' and 'clusters'		█	█								
Meet Welsh Assembly Government Route Manager & evaluate Site Priority Listing			█								
Stage 3 - Investigate Potential Scheme											
Analyse Recorded Data				█							
Site Visit & Conflict Study				█							
Develop Scheme Options				█							
Summarise findings and produce scheme cost estimate					█						
Establish Recommendation					█						
Stage 4 - Prepare and Submit Bid to Welsh Assembly Government						█					

2.2 Identification of Sites

Requests for considering potential road safety schemes can originate from road users, residents, police, Welsh Government Route Managers or Trunk Road Agency staff. It is subsequently necessary to examine the available factual information that is held about each site and about similar sites along a route.

The assessment of the network should involve the study of collision patterns for a specified period (e.g. 3 years) according to location, circumstances and the vehicles and casualties involved and to subsequently compare them with national and regional averages [The national collision rates for different route types can be found in the most recent version of Road Casualties (Great Britain). The current criterion used for considering clusters has been 4 personal injury collisions in a 3 year period within a 100m radius. (The Rural Town and Village Trunk Road Initiative also introduced a second criterion to identify ‘town and village’ clusters, namely 4 personal injury collisions in 3 years within 500 metres)].

European Directive 2008/96/EC requires that reviews of the operation of the trans-European road network (TERN) are carried out at least every 3 years to enable the ranking of high accident concentration sections and the preparation of network safety rankings to identify, analyse and classify parts of the existing road network according to their potential for safety development and accident cost savings.

In addition to the above, statistical checks may be used to underpin conclusions in reports. Tests such as the Poisson test* or Chi Squared test* can be used to determine whether collision levels are due to random fluctuation or a real problem associated with the location. The Chi Squared test can also be used to compare the safety performance at a site before and after a scheme has been implemented (see also Section 4.3 Monitoring).

The relative size of the problems and the ability to tackle them must be assessed and suitable, cost-effective solutions devised and planned.

A further consideration is to interrogate maintenance records to identify whether a site has a history of repairs to traffic signs or other items of street furniture. This proactive approach may not contribute to the national casualty reduction targets but it could increase the benefit of undertaking a road safety scheme.

*[*Examples of these statistical tests can be found in several road safety publications, one of which is the RoSPA Road Safety Engineering Manual]*

2.3 Collision Site Priority Listing

The above exercises will generate routes, sections of routes and cluster sites that warrant further investigation. However, it is likely that the funding for such schemes will be limited as will the resources available to prepare reports to support schemes and bids. The list of sites identified for investigation may therefore need to be rationalised before any CIP studies (as described in Section 2.4) are developed.

The assessment procedure allows separate lists to be provided for routes, sections of routes and cluster sites. Sections of routes can be any length and may be ranked by considering the number of collisions per kilometre whereas for cluster sites it is suggested that a radius of 100m diameter is used and ranked simply by the number of collisions at each site. The period considered for the analysis should be the same for each list and should be a minimum of 3 years although 5 years would provide more collisions for investigation and probably lead to more robust conclusions.

It is recommended that the results are compared with national trends and analysed accordingly.

European Directive 2008/96/EC requires that Trans-European road network (TERN) sections showing higher priority according to the results of the ranking of high accident concentration sections and from network safety rankings are evaluated by means of site visits guided by a number of elements.

The results of these initial exercises should subsequently be discussed between the Welsh Government Route Manager and the Trunk Road Agent who can use the opportunity to introduce any background information that is available about the sites. A decision may then be made to determine which of the sites will have scheme proposals developed.

2.4 *Collision Investigation & Prevention Study*

A CIP study should be undertaken for each of the routes, route sections and cluster site locations identified by the Collision Site Priority Listing (see Section 2.3). The number of locations that are chosen to progress, however, shall be commensurate with the funding available for such road safety schemes although initially a sufficient number of sites should be chosen to produce an extended programme containing priority schemes along with a number of reserve schemes.

Any proposals that are not approved for completion in one year should become the subject of a further similar study in the following year(s) to confirm, or otherwise, their potential effectiveness and should be compared with those sites/schemes being considered for the first time.

The level of detail involved in any CIP study should reflect the range of collision types involved and the site layout rather than simply numbers of collisions. There are a number of sources where collision data is available that will assist in analysing collision relationships i.e. the electronic 'accident browser' facility held in TWIS at Transport Wales, independent databases or the STATS 19 records database that is held by the police authority; the systems should be complimentary. Access to this STATS 19 data is usually available through unitary authorities although direct access for the Trunk Road Agents would be beneficial and, as indicated in Section 1.3, progress is being made towards that goal.

Site visits to those sections on the Trans-European road network (TERN) showing higher priority according to the results of the ranking of high accident concentration sections and from network safety rankings should be carried out by an expert team with at least one member demonstrating experience or training in road design, road safety engineering and accident analysis.

Analysis of the recorded data may provide certain links/comparison in some of the following areas:

total number of vehicular collisions at specific sites or along specific routes

causation trends relative to other areas

type of collisions (shunts/lane change/ loss of control etc.)

when collisions are occurring (time/day/month)

where collisions are occurring (bends/ junctions etc.)

visibility (sightlines or obstructions)

driving conditions (weather conditions, traffic volumes, lighting etc.)

single or multi-vehicle collisions

road layout and condition

Vehicle type, was it towing/articulated?

Pedestrians involved? Children/vulnerable users?

Any other factors appropriate to collisions

The conclusions that are drawn from this analysis are very important as they will set the foundation for the road safety scheme.

The records of each scheme being developed could include:

a site description and plan (with collision locations and details of the personal injury collisions);

photographs identifying key aspects of the site. These will provide a visual record of the current situation and contribute to a better understanding of the site layout for anyone reading/appraising the report.

analysis of collisions – numbers, types (shunts, turning movements from major road/minor road, overtaking, single vehicle etc.), times/dates, contributory factors, vulnerable road users involved, route rates* compared to ‘norms’** where appropriate, summary of STATS 19 or similar database details (print outs of detail should be included within an appendix). It is important when considering the STATS19 records that they are read in conjunction with the collision description to confirm the exact location is that indicated by the grid references and that the information provided is not contradictory;

$$[*\text{Collision rate (per 100 million vehicle km)} = \frac{\text{Number of personal injury collisions} \times 10^6}{\text{Days in period} \times \text{AADT flow} \times \text{length of route}} \times 100$$

**Data source for ‘norm’ comparisons should be specified and could be:

- i) Default COBA (Cost Benefit Analysis) 11 rates;
- ii) Road Casualties: Wales" / "Reported Road Casualties Great Britain";
- iii) “Norms” published by Welsh Government to support Value Management / Skid resistance scheme process; or
- iv) “Norms” calculated by Trunk Road Agent for local / regional routes.]

a site visit summary presenting the information determined at a site inspection. The site visit will establish the condition of the infrastructure (carriageway, surfacing, safety fencing, road markings, footways, pedestrian crossing facilities, street lighting, signage) and the layout of the site (junction/roundabout operation, sharp bend, changes on gradient); if possible a comparison should be made with the current design standards;

a conflict study to observe the decisions being made by drivers in negotiating the ‘problem’ area. A résumé of observations and traffic conditions should be noted. The study should be undertaken at an appropriate time having taken account of any pattern in collisions data i.e. time of day, weather conditions etc.;

potential scheme options (and possible limitations/disadvantages). If there are a number of realistic options an indicative ‘First Year Rate of Return’ (FYRR) (see Section 2.6) estimation will be needed for each option;

a summary of findings of the investigation.

a recommendation – clearly defining a single measure or a package of measures to mitigate the risk;

a detailed scheme cost estimate;

Appendices/Addenda containing STATS 19 data, stick diagrams, detailed scheme proposals and Scheme Prioritisation Score (SPS).

The elements of evaluation for the expert team undertaking site visits on the Trans-European road network (TERN) include the records referred to above as well as a reference to possible previous reports on the same road section and the analysis of the possible accident reports.

Priority of potential scheme options/remedial treatments on the Trans-European road network (TERN) sections should be given to the following measures paying attention to those presenting the highest cost-benefit ratio:

removing or protecting fixed roadside obstacles;

reducing speed limits and intensifying local speed enforcement;

improving visibility under different weather and light conditions;

improving safety condition of roadside equipment such as road restraint systems;

improving coherence, visibility, readability and position of road markings (including rumble strips), traffic signs and signals;

protecting against rocks falling, landslips and avalanches,

improving grip/roughness of pavements,

redesigning road restraint systems,

providing and improving median protection,

changing the overtaking layout,

improving junctions, including road/rail level crossings,

changing the alignment,

changing width of road, adding hard shoulders,

installing traffic management and control systems,

reducing potential conflict with vulnerable road users,

upgrading the road to current design standards,

restoring or replacing pavements,

using intelligent road signs,

improving intelligent transport systems and telematics services for interoperability, emergency and signage purposes.

2.5 *Consultation*

Before embarking upon detailed scheme design it is often prudent to consult/liaise with the local community (and other interest groups) to confirm that their concerns are considered and appropriately accounted for within the scheme. This action is more important when considering schemes that will affect residents, particularly in urban areas. The exercise will at worst identify issues that may not have been previously known

or have been overlooked. At best it will reinforce the views and opinion of the Trunk Road Agent in promoting the scheme.

The size of the consultation exercise must, of course, be proportionate to the size of the proposed scheme.

The exercise will also create important community links that could become beneficial when appraising the success of a scheme and when considering any future proposals for that (or another) area.

2.6 *Estimating Collision Cost Savings*

The following formula provides the First Year Rate of Return (FYRR) in respect of collision cost savings:

$$\text{FYRR \%} = \frac{\text{Annual collision Savings} \times 100}{\text{Scheme cost}}$$

For the purposes of calculating a Scheme Priority Score (see Section 2.7 and Appendices B) the value attributed to preventing a collision should be obtained from the most recent DfT published figures (currently £96,706 – DfT TAG Unit 3.4.1 Table 4a, April 2011). The value that is appropriate to use from the table is the value for 'All' road classes from the 'Average cost per injury accident including an allowance for damage only accidents'.

It has been recognised that recent predictions of collision savings have often proved to be excessive and is considered to be a result of basing the estimates on all historic data available. It is possible that the majority of very simple schemes that can affect particularly large collision savings have already been identified and addressed. These schemes gave very large FYRR values which are unlikely to be repeated. As a consequence estimates of collision saving potential for current schemes are very unlikely to achieve such high FYRR values as their predecessors.

Table 2 (below) indicates the ranges of likely collision savings for a number of more typical collision reduction measures and assumes that the correct treatments have been applied. The percentages shown are the likely savings in the number of collisions that are being addressed by the reduction measure indicated. These have taken account of Monitoring of Local Authority Safety Schemes (MOLASSES) data, Royal Society for the Prevention of Accidents (RoSPA) training data and collision saving information from 'Roads and Traffic in Urban Areas'.

Table 2

Collision reduction measure	Potential Collision Saving (%)
Anti-Skid surfacing	20 - 40(50 in wet)
Area Traffic calming	20 - 35
Crossing schemes	15 - 30
Cycling schemes	15 - 25
Junction Improvement	20 - 35
Lighting	15 - 20
Refuges	15 - 30
Road Marking Improvement	5 - 15
Roundabout Improvement	20 - 50
Speed camera alone	10 - 20
Speed limit (no calming or camera)	15 - 25
Traffic signals	10 - 25
Traffic calming (vertical & Horizontal)	20 - 45
Traffic Signs	10 - 20
Turning lanes	20 - 35
Visibility Improvements	15 - 30

This list is not exhaustive. The monitoring of road safety measures at sites following remedial actions will update and refine the list of expected savings and provide for greater accuracy in the future. For consistency in making bids it is suggested that when using the table the lower potential collision saving percentage indicated in the table shall be used.

The worked examples of developed schemes (see CIP reports) use the information from Table 2 above.

2.7 Scheme Prioritisation

Each study will present a case for the development of a road safety scheme. It is important that the schemes promoted are those which represent the most effective and best value for money and consequently, each proposal needs to be assessed equally against the others. Appendix B explains the methodology (a simplified version of the Value Management Process) that will be applied to determine scheme priority. **A Scheme Prioritisation Score (SPS) spreadsheet has been developed that will automatically make the calculation and this is provided to Trunk Road Agents along with these guidelines. A completed spreadsheet shall be submitted to support each future scheme proposal [It should be noted that**

additional supporting information may on occasions be requested by Transport Wales to justify any anticipated collision savings]

There are four factors that are taken into account when calculating the Scheme Prioritisation Score. The factors are shown in Table 3 below along with the percentage contribution that each makes to the overall SPS score. Details of each of the factors are given in Appendix B - Scheme Prioritisation Score Methodology.

Table 3

Factor	Percentage of Score
First Year Rate of Return	50
Collision Severity Ratio	20
Casualty Severity Ratio	10
Other Impacts Value	20

3 Construction and Monitoring of Schemes

3.1 Construction

The procurement of works for schemes differs between Trunk Road Agents and these guidelines do not deal with this issue.

However, the completion of a proposed road safety scheme ‘on the ground’ does not mark the end of the process. The completion of construction work will trigger other procedures:

Inventory amendments as indicated in Section 4.2 and;

Monitoring process as indicated in Section 4.3.

3.2 Amendments to Inventory

Effective asset management is largely dependent upon the accuracy of the inventory information that is held. In order to ensure an efficient maintenance regime is operational it is important that regular updating of the asset information takes place. It is essential therefore to ensure that any changes to the network assets are recorded upon completion of any scheme i.e. street lights, traffic signs, vehicle restraints/safety fencing, kerbing and footways, soft estate etc. It is equally important that there are mechanisms in place for recording and reporting the changes and for amending the relevant maintenance contracts.

3.3 Monitoring

In order to measure the success of a scheme and to improve the process it is important to monitor the scheme against the objectives to assess its effectiveness.

That monitoring should help to determine:

the success of the scheme in contributing to casualty reduction

whether the scheme has fully achieved its objectives

whether any other parts of the network have been adversely affected by the implementation of scheme

whether any further improvements can be made to the scheme

whether any improvements can be made to the scheme evaluation/ submission process

The primary element against which the success of any scheme will be measured will be its contribution to reducing collisions. It is therefore prudent to evaluate the success of a scheme in the years immediately following its completion. A spreadsheet for such a purpose has already been developed by Transport Wales and is currently in use that allows the exercise to be undertaken. A modified version of the monitoring spreadsheet is provided alongside these guidelines and shall be populated by the Trunk Road Agents as the basis for future submissions. An SPS spreadsheet (see Section 2.7) shall also be submitted for each entry on the scheme monitoring spreadsheet.

In addition to monitoring individual scheme performance, this system can be used to aggregate scheme information and allow the regular assessment of the overall performance of the road safety scheme programme in terms of 'before' and 'after' collision performance. This monitoring will allow the achievement of overall targets and objectives relating to road safety schemes to be fully assessed.

The Chi Squared test can be used to compare data from a treated site with similar (untreated) sites, with a view to determining whether changes are statistically significant. Confidence levels indicate whether a real change in collisions has taken place.

Any poor performance of a scheme should prompt a more detailed examination of collisions at the site to ascertain the reason(s) why the scheme has not produced the expected savings. Even if a scheme has achieved the expected reduction in collision numbers it does not necessarily follow that it has been a complete success. It is therefore, often advisable to confirm that no consequential problems have been generated as a result of the scheme.

4 European Road Assessment Programme

4.1 *General*

The European Union has set a target to halve the annual number of fatalities on Europe's roads by 2010. In 2001 there were 50,000 deaths on the roads of countries which today make up the European Union; this is the baseline on which the EU target has been set.

It is believed that tens of thousands of lives and serious injuries could be prevented every year by applying safety improvements to road layouts. Highway engineers may be aware that improvements can be made but currently lack the funding that is required. However, the public and their elected representatives do not yet understand the scale of the contribution that better road layouts can make, or what practical action to call for.

Wales, as indicated in Section 1.2 is showing considerable improvement in preventing collisions. In order to continually reduce the numbers of collisions and casualties in Wales it may soon be necessary to look at alternative systems to further drive the improvement, one system that is being developed and expanded throughout Europe is the European Road Assessment Programme (EuroRAP). The programme is currently being developed in approximately 20 countries, mainly across Europe but is also being applied in Australia and the USA.

4.2 *What is EuroRAP?*

EuroRAP AISBL is an international non-profit making association registered in Belgium whose members consist of motoring organisations and national and regional highway authorities. It has been developed with the technical advice of Europe's best performing road authorities and leading research laboratories and provides independent, consistent system to measure the safety of Europe's roads and to track how quickly effective improvements are being implemented.

Its aims are to:

- reduce death and serious injury on European roads;

- ensure risk assessment lies at the heart of strategic decisions on route management and improvements;

- develop partnerships between organisations responsible for a safe road network.

EuroRAP aims to provide independent, consistent safety ratings of roads across borders and has 3 protocols:

- Risk Rate Mapping (see Section 5.3)

Performance Tracking (see Section 5.4)

Road Protection Score (RPS) (see Section 5.5)

4.3 Risk Rate Mapping

Maps make it easy to identify the safest and most dangerous road sections within a region or country and, by comparing maps for different countries, comparisons of safety performance can be made. Each section of road is therefore colour coded into one of five bands according to the level of collision risk. The bands are low risk (pale green), low-medium risk (yellow), medium risk (orange), medium-high risk (red) and high risk (black).

A typical EuroRAP road section is 20 kilometres long, however, sections are modified to ensure that the links of roads selected are meaningful and distinct to road-users (i.e. start and end points are at identifiable locations) and have broadly similar characteristics along their entire length (such as single lane or dual carriageway). Some short sections of road and some that carry low traffic volumes are inevitable in the sample and are more likely than others to experience greater year-to-year variation in collision rate and are therefore more likely to change risk rating from one period to another.

It is important to note that risk maps based on collision rates do not show the extent to which the behaviour of a specific road-user might result in the risk being higher or lower than the average. They also do not show the extent to which the road-user can make a mistake, and recover from it without serious injury. What they do illustrate is the risk of an individual road-user, or to the community as a whole, being involved in a road collision, providing that they are behaving within acceptable boundaries of road use - for example, not intoxicated, not using a mobile phone, and obeying speed limits.

4.4 Performance Tracking

EuroRAP is able to monitor road safety conditions and determine those measures that are providing the greatest improvement. Results from performance tracking to date have shown that simple engineering measures continue to pay the highest dividends in reducing death and serious injury.

The EuroRAP process of tracking the performance of road sections has several stages:

data is initially analysed to identify those road sections which have shown a reduction in the number of collisions over time and those where there has been little or no change;

data for individual years is then checked to assess consistency of the patterns;

highway authorities are asked for information on remedial, enforcement or education measures that have been implemented that might explain the reduction in collisions.

An important part of the programme is that the process allows an element of international benchmarking to be undertaken by identifying and understanding differences in collision risk between countries. As with any benchmarking/ comparison exercise though its success is dependant upon the number of participants and the data that is available.

4.5 *Road Protection Score (RPS)*

The RPS is a scale for Star Rating roads. It assesses how well the roads protect the user from death or disabling injury in the event of an incident with the aim evaluating the safety that is 'built in' to the road through its design, in combination with the way that traffic is managed on it. Following assessment, each road is given a star rating (currently up to a maximum of 4 stars) depending upon the protection afforded if a crash occurs; a single star being poor and 4 stars being excellent.

Trials have recently been undertaken on a proportion of the network throughout Great Britain, the results of which were published in December 2007. The Welsh Government is currently giving consideration to extending the RPS surveys to provide full coverage of the trunk road network in Wales.

In addition to the above, this information-led system has the potential to compliment current methodologies by providing additional criteria for setting investigatory and intervention levels. The use of RPS scores can be seen therefore as a pro-active risk-based method with the potential to supplement the more traditional and re-active treatment of collision clusters and rates.

One important benefit of RPS is to provide risk-based information that is not readily available through collision histories. Furthermore for roads such as motorways and high class dual carriageways that have relatively uniform collision histories along their lengths, the RPS tool allows targeted identification of investment to reduce the overall casualty toll by mitigating the effects of future collisions before they happen.

Appendix A

Blank STATS 19 Form (separate electronic file)

Appendix B

Scheme Prioritisation Score Methodology

Appendix B - Scheme Prioritisation Score Methodology

Section 2.7 explained that each of the CIP Reports will present a case for the development of a road safety scheme and that it is important that the schemes promoted are those which represent the most effective and best value for money. This Appendix explains the methodology (a simplified version of the Value Management Process) that will be applied to determine scheme priority by scoring each of its contributory elements.

The calculation will determine a priority score for each scheme and will subsequently be used to compare them. The Scheme Priority Score (SPS) will be presented as a number between 1 and 10 to one decimal place and reflects the level of certainty in the supporting data. **It should be noted that the author of the CIP report will not be required to undertake the calculation described in detail below. Instead he/she shall insert the values associated with boxes 1 to 9 on the SPS spreadsheet. The spreadsheet shall be supplied to trunk road agents in electronic format to facilitate the calculation.**

The SPS is based on information using

- an estimated first year rate of return
- the level of KSI and serious collisions (Collision Severity Ratio)
- the level of KSI to other casualties (Casualty Severity Ratio) and
- the effect the scheme has on the immediate surroundings.

The Collision Severity Ratio and the Casualty Severity Ratio will provide definite values whereas the other factors rely on a level of subjectivity and estimation.

- a. The primary indicator is the **net FYRR**. Schemes with the highest net FYRR can be regarded as contributing most to the collision reduction targets (see Section 1.2) and consequently will contribute the largest proportion of the SPS i.e.50% i.e. it carries a maximum score of 5.

Scheme Prioritisation Score for Net FYRR

The contribution to the SPS will be between 0 and 5

For net FYRR values between 5% and 180% the score is calculated pro rata using the following formula:

$$\frac{(\text{FYRR} - 5)}{175} \times 5$$

A net FYRR values of 5% and below will score 0

A net FYRR values of 180% and above will score 5

- b. The secondary indicator is the **Collision Severity Ratio (SR)** – the number of collisions in which at least one person was killed or seriously injured as a percentage of the total number of collisions.

$$\text{Collision Severity Ratio} = \frac{\text{N}^{\circ} \text{ of Killed or Serious Injury Collisions}}{\text{Total N}^{\circ} \text{ of Collisions}} \times 100\%$$

This recognises the fact that the Welsh Government's safety target relates to reductions in collisions involving fatalities or serious injuries. The severity index can be distorted however where the number of recorded collisions are small. The scoring mechanism reflects this by only awarding sites with 5 or more collisions to contribute to the overall SPS. This includes the whole of the cluster site/link rather than the number of collisions the proposed scheme is expected to address e.g. a roundabout may have 7 collisions, 5 of which are at a single location and the others random. The proposed scheme is solely to address the main problem (i.e. 5 collisions) but the overall site has 7 collisions and it is the 7 that should be considered when calculating the Severity Index. This action will encourage the targeting of funds to route or route section treatments, but not at the undue expense of traditional cluster sites exhibiting high numbers of collisions. The collision severity ratio accounts for a proportion of 20% of the SPS i.e. a maximum score of 2.

Scheme Prioritisation Score for Collision Severity Ratio

The contribution to the SPS will be between 0 and 2

Schemes addressing less than 5 collisions shall record a Collisions Severity Ratio of 0

For a Collision Severity Ratio between 0% and 30% the score is calculated pro rata using the following formula:

$$\frac{SR \times 2}{30}$$

A Severity Ratio of 0% will score 0

A Severity Ratio of 30% and above will score = 2

- c. The third contributor is a **Casualty Severity Ratio (CR)** – the number of casualties who were killed or seriously injured as a percentage of the total number of casualties involved.

$$\text{Casualty Severity Ratio} = \frac{\text{N}^{\circ} \text{ of Killed or Seriously Injured Casualties}}{\text{Total N}^{\circ} \text{ of Casualties}} \times 100\%$$

This also recognises the fact that the Welsh Government's safety target relates to reductions in collisions involving fatalities or serious injuries. The casualty severity ratio accounts for a proportion of 10% of the SPS i.e. it carries a maximum score of 1.

Scheme Prioritisation Score for Casualty Severity Ratio

The contribution to the SPS will be between 0 and 1

For a Casualty Severity Ratio between 0% and 50% the score is calculated pro rata using the following formula:

$$\frac{CR}{50}$$

A Casualty Severity Ratio of 0% will score = 0

A Casualty Severity Ratio of 50% and above will score 1

- d. The fourth and final contributor to the SPS is **Other Impacts Value (OIV)**. This reflects the contribution that benefits other than economy (i.e. improved safety) make to the scheme. Table 3 below provides a list of other impacts which need to be assessed as beneficial, neutral or adverse. The OIV is the sum of the beneficial and adverse impacts (adverse impacts carry a negative value). The percentage of SPS is 20 i.e. the maximum score for OIV will be 2. If there are more adverse impacts than beneficial impacts then the net value will be negative and will therefore count against the scheme; the minimum score will consequently be -2.

Other Impacts Value

The assessment scores shown in the table have been used in the example following.

		ASSESSMENT SCORES		
		BENEFICIAL	NEUTRAL	ADVERSE
ENVIRONMENT	Noise		X	
	Local Air Quality		X	
	Landscape			X
	Townscape		X	
	Biodiversity		X	
	Water Environment		X	
	Physical Fitness		X	
	Journey Ambience	X		
SAFETY	Collisions (not included in calculation)	X		
	Security		X	
ECONOMY	Journey Times	X		
	Reliability	X		
ACCESSIBILITY	Severance		X	
	Access to the Transport System		X	
INTEGRATION	Transport Interchange		X	
	Land-Use Policy		X	
Totals		+3		-1
Net OIV		+2		

Scheme Prioritisation Score for Other Impacts Value

The contribution to the SPS will be between -2 and +2

For net OIV between -3 and +3 the SPS score is calculated pro rata using the following formula:

$$\frac{\text{OIV} \times 2}{3}$$

OIV of -3 and below will score -2

OIV of +3 and above will score +2

Example of Scheme Prioritisation Scoring

This example is based on a scheme for the introduction of right turning lane on dual 2-lane road. It is a scheme predicted to deliver a net FYRR of 70%. One and a half collisions predicted to be saved in opening year. The Severity Ratio over previous three years is 25% and there were 3 seriously injured out of the 10 people involved in the collisions (i.e. Casualty Ratio = 30%). The Other Impacts Value of the scheme is taken from the Table 3 (i.e. +2 since 'Collisions' is not counted).

$$\text{FYRR Score is given by } \frac{(\text{FYRR} - 5)}{5} = \frac{(70 - 5)}{5} = 1.86$$

175

175

SR Score is given by $\frac{\text{SR} \times 2}{30} = \frac{25 \times 2}{30} = 1.67$

CR Score is given by $\frac{\text{CR}}{50} = \frac{30}{50} = 0.60$

OIV Score is given by $\frac{+2 \times 2}{3} = \frac{+4}{3} = 1.33$

Total SPS = 1.86 + 0.60 + 1.50 + 1.33 = 5.46 , rounded to 5.5

Appendix C

Safety Scheme Monitoring Spreadsheet (separate excel spreadsheet)

Appendix D

Scheme Prioritisation Spreadsheet (separate excel spreadsheet)