Survive

Safe Use of Roadside Verges
In Vehicular Emergencies

April 2000

THE INSTITUTION OF CIVIL ENGINEERS

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RAC Design 2000

The SURVIVE Report

on Hard Shoulder and Roadside Safety

THE INSTITUTION OF CIVIL ENGINEERS

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Contents

Contents

1.0 Executive summary
- 1.1 Background
- 1.2 Recommendations

2.0 Introduction
- 2.1 Background
- 2.2 Objectives
- 2.3 Scope
- 2.4 Associated organisations
- 2.5 Research methodology

3.0 Previous research
- 3.1 Summary findings of TRL report on Accidents on motorway hard shoulders and efforts to improve safety.

4.0 Current research and activity
- 4.1 Survey of organisational response to health and safety legislation.
- 4.2 Police survey of motorway hard shoulder incidents
- 4.3 Hard shoulder usage
- 4.4 "Near miss" reports
- 4.5 Use of mobile phones
- 4.6 Location information
- 4.7 Regional initiatives

5.0 Research into strategic plans and other documents
- 5.1 Integrated Transport White Paper
- 5.2 Highways Agency Toolkit
- 5.3 Technological solutions

6.0 Conclusions

7.0 Recommendations

1.0 Executive Summary

1.1 Background

1.1.1 This report has been produced by the Hard Shoulder and Roadside Safety Group (the Group), consisting of representatives of organisations and government agencies with an interest in and a responsibility for the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway.

1.1.2 The objective of the Group was to examine and report on the key issues surrounding hard shoulder safety and to make recommendations to improve the safety of people working on the road and of the general motoring public. The findings contained in this report are based on a review of past, current, new and strategic research into roadside safety, particularly where these impact on hard shoulder working.

1.1.3 The work of the Group was prompted by the number of fatalities and serious injuries to recovery operatives. At the same time, a number of initiatives and processes from disparate stakeholder groups indicated a need for a co-ordinated and structured approach to hard shoulder safety.

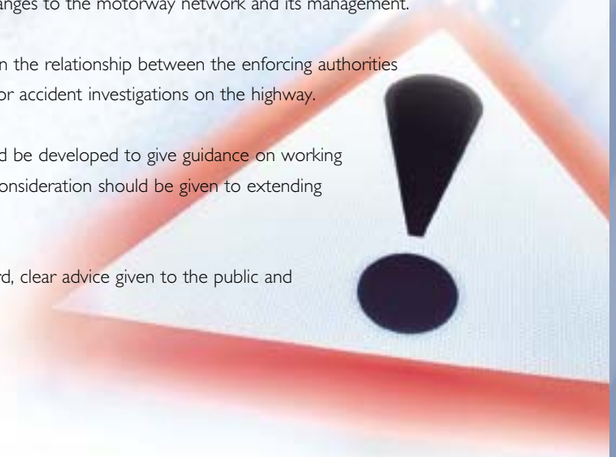
1.2 Recommendations

1.2.1 Government policy and strategy needs to be open and accessible to all in relation to proposed changes to the motorway network and its management.

1.2.2 Clarification is needed on the relationship between the enforcing authorities that hold responsibility for accident investigations on the highway.

1.2.3 A British Standard should be developed to give guidance on working on the hard shoulder. Consideration should be given to extending this internationally.

1.2.4 There should be standard, clear advice given to the public and widely disseminated.



Executive Summary

1.2.5 There should be standard, nationally publicised education for the public into the correct use of the hard shoulder and the emergency telephone system.

1.2.6 The motor and recovery industries should introduce common standards of training and competency assessment, ideally self-regulatory.

1.2.7 Vehicle lighting legislation and practice should be standardised and should differentiate between breakdown, rescue, recovery and emergency vehicles and those requiring warning lights for some other reason.

1.2.8 The principles of best practice vehicle conspicuity in relation to markings should be standardised in response to research findings and applied where appropriate.

1.2.9 There should be a national body to assess proposed technological innovations in an open manner.

1.2.10 In pursuance of "joined up thinking" and its consequences, cost benefit analysis of extending motorway lighting and rumble strips, found to improve safety, should be open and in the public domain.

1.2.11 Research and public consultation with interested parties regarding safety aspects of the motorway environment should be extended.

1.2.12 information exchange between emergency and recovery organisations should be in a common format, though not necessarily a common medium.

1.2.13 Those responsible for making changes to motorway network information such as marker posts and emergency telephone boxes should be responsible for informing those who use such information of any changes.

1.2.14 Use of the hard shoulder by breakdown, rescue and recovery vehicles for the accessing of incidents needs to be formalised. Some of the Group felt that there should be more flexibility of use and permission but this is at odds with the current policy of the Association of Chief Police Officers.

2.0 Introduction

2.1 Background

2.1.1 In 1998 six vehicle recovery operatives were killed. Two on the live carriageway and four on motorway hard shoulders during the course of their work compared with an annual average fatality rate of two. (Ref IVR)

2.1.2 The Automobile Association (AA) and RAC Motoring Services (RAC) have lost operatives, both employees and contracted breakdown operators. The AA called a meeting of interested parties and subsequently funded the project with RAC.

2.1.3 The motorways that are the subject of this report are trunk roads, the responsibility for which rests with the Secretary of State and are managed by the Highways Agency. Enforcement issues are the responsibility of the Police. The Health and Safety Executive has no advisory nor enforcement role in road safety, with the exception of certain journeys involving the carriage of dangerous goods.

2.1.4 There is no single body or group responsible for managing research and implementing changes that relate to the safety and health of people using a motorway. Responsibility is currently split between the Highways Agency and several DETR departments.

2.1.5 On average each year 250 people are killed or injured in incidents on motorway hard shoulders. (Ref. TRL report PR/TT/082/99 Table 7, Section 3.0)

2.1.6 The average cost of a motorway fatal collision has been taken to be £1M. (Ref. 1991 report by TRL). This does not include associated cost of delay to other road users.

2.1.7 The cost of a delay of one hour, to a haulier, resulting from a motorway collision currently stands at £250 per vehicle. In cases where the delivery times are critical, the costs can be very much higher than this (Source: Road Haulage Association).

2.1.8 Due to the commonality of problems the AA and RAC commissioned a jointly funded project to review the management of improvements to hard shoulder and of a high speed dual carriageway verge operational practices.

2.1.9 This project was a review of procedures and training for both organisations. Some of the results of this review are incorporated herein but otherwise that initial piece of work is outside the scope of this report.

2.1.10 During the aforementioned initial review there was a recognition that many of the possible mechanisms for improving health and safety on the hard shoulder are outside the control of the recovery organisations alone. Therefore the AA and RAC decided to fund further research involving government agencies.

2.1.11 The Hard Shoulder and Roadside Safety Group (the Group) was set up to provide a high level forum to provide strategic guidance on the best way forward. The members of the Group and their affiliations are listed below

Sir Peter Baldwin KCB MA FCIT(Hon) FIHT CIMgt (Chairman)

Peter Francis, Highways Agency DETR

Rosalind Roberts, Health and Safety Executive DETR

Alan Street, Assistant Chief Constable (O)
Devon and Cornwall Constabulary ACPO

Keith Bailey, ACPO

John Bennett, Cheshire Police Motorway Unit ACPO*

Chris Macgowan, Society of Motor Vehicle Manufacturers

Robert Huxford Institution of Civil Engineers

Alistair Cheyne Automobile Association

Steve Dewey Automobile Association
(Working Group Chairman)*

David Bizley RAC Motoring Services

Andrew Reeve RAC Motoring Services*

Liz Bennett Habilis Ltd (Technical Secretary)*

David Padfield, Department of Transport DETR (Observer)

*Indicates members of the Working Group, WG1

2.1.12 This document is the report of the work of this Group.

2.1.13 The Highways Agency fully supports those recommendations in the report directed at improving safety on the hard shoulders of motorways. The recommendations on wider issues are not necessarily representive

2.2 Objectives

2.2.1 The primary aim of the HSRG Group was agreed as:

The promotion of safety of people working on the road, and of the general motoring public.

2.2.2 The objective set by the Group was to examine and report on the key issues surrounding hard shoulder safety and to make recommendations for change.

2.3 Scope

2.3.1 The Group has restricted the scope of this report to the consideration of the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway.

2.3.2 Safety and health in the circumstances of work on the fabric of carriageways or related structures, or their equipment constitute special issues in their own right that should be dealt with in a separate arena.

2.3.3 The Group was formed in March 1999 and set itself a twelve month completion target for publication of this report. The Group set up and directed a working group (WG1) responsible for the day to day management of the project.

2.4 Associated organisations

2.4.1 A number of other bodies have expressed interest in the work of the Group and provided input to the work of the Group. A list of such organisations and companies is in the supplement to this report, at Appendix 2)

2.4.2 These bodies have not been kept informed of the day to day progress of the Group. Their involvement was seen to be more appropriate following the publication of this report.

2.5 Research methodology

2.5.1 The Group has been primarily concerned with data collection and decided to approach the study in the following manner:

- reviewing previous research;
- examining current activity; and
- considering strategic plans and related documents

that impact upon the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway.

2.5.2 The research was composed of the following components:

Previous research (See section 3.0 below)

- A review by the Transport Research Laboratory for the Highways Agency entitled "Accidents on motorway hard shoulders and efforts to improve safety" (Ref. TRL Project Report PR/TT/082/99, Reproduced in the supplement to this report, at Appendix 3).

Current activity (See section 4.0 below)

- Advice given to employees and the public by various organisations;
- Police survey of motorway hard shoulder incidents;
- "Near miss" reports;
- Use of mobile phones; and
- Regional initiatives.

Strategic plans and other relevant documents
(See section 5.0 below)

- The Integrated Transport White Paper;
- The Highways Agency Toolkit; and
- Technological safety solutions.

3.0 Previous Research

This section covers the report commissioned by the Highways Agency entitled "Accidents on motorway hard shoulders and efforts to improve safety." 1999 (The full report is in the supplement to this report, at Appendix 3 - this incorporates information from STATS 19, statistical information contained within police collision reports)

Executive summary of the report (Taken verbatim from the Report)

> This review of investigations into accidents on motorway hard shoulders has been commissioned by the Traffic, Safety and Environment Division (TSE) of the Highways Agency and is being undertaken by the Transport Research Laboratory (TRL).
>
> The aim of the review was to examine studies of ways to make it safer for those who need to stop (and work) on the hard shoulder in the course of their work (ie breakdown vehicles etc). It encompasses previous work undertaken, safety measures, and engineering measures that may reduce the potential for accidents. The study does not look into the activities associated with maintenance of the motorway.
>
> The background to the study relates to a recent number of fatalities in quick succession on hard shoulders, and therefore a need to examine safety aspects of such stretches of roadway. To arrive at this goal, the study examines the nature of the UK road network with emphasis placed on the significance of motorway sections. It looks at the development of the road network both in terms of physical size and in terms of traffic carried. The trends in, and nature of, road accidents are also considered so as to determine patterns in accidents and how they relate to travel on the motorways.
>
> The report then focuses on incidents occurring in relation to hard shoulders on motorways, again looking at patterns and frequency of such accidents. This establishes the relationships and trends necessary to justify the concern that has been growing over safety on the hard shoulders. Finally, consideration is given to measures that may help to reduce accident rates and severity, drawing on studies both in the UK and USA.

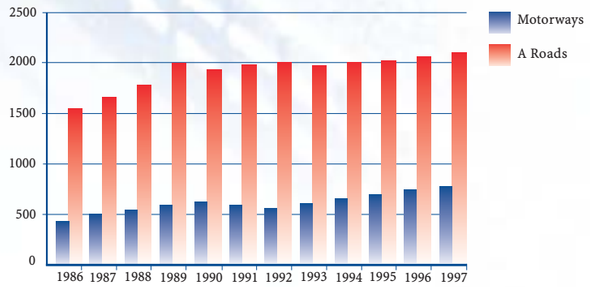
Reference is made in the conclusions in the TRL report to the following data included in that report:

TRL Table 2 (part of) Traffic volumes in 100 million vehicle kilometres

Source: Road Accidents Great Britain 1997 DETR, TSO Publications

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	% change for period
Motorway	408	501	545	590	616	610	610	633	667	709	737	785	92
A Roads	1596	1681	1789	1992	1944	1974	1992	1973	2002	2025	2078	2089	31

Traffic volumes 100 million vehicle kilometres



TRL Table 3 (Part of) Collision rates

Source: Transport Statistics Great Britain (1998) DETR, TSO Publications

Number/rate per 100 million vehicle kilometres

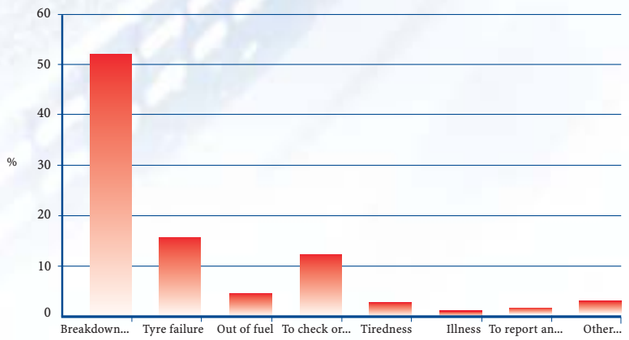
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Motorways / A (M) roads:											
Fatal	212	216	193	183	178	191	159	135	154	153	159
Fatal and serious	1349	1285	1335	1347	1187	1149	1138	1118	1153	1100	1204
All severities	5526	5648	6409	6687	6289	6630	6863	7225	7392	7787	8678
Rate	11	11	11	11	10	11	11	11	10	11	11
Built-up roads A Roads:											
Fatal	11296	1267	1257	1192	1053	919	849	792	692	709	741
Fatal and Serious	18142	17733	17228	16049	13930	12955	11688	11804	11645	11184	11012
All severities	81632	82756	86510	84016	76709	75773	74774	76059	73981	74407	75735
Rate	115	112	108	106	96	95	95	95	93	91	95
Other roads:											
Fatal	1143	1094	1140	1125	1033	938	798	750	746	733	669
Fatal and Serious	22191	21776	21710	20955	18045	17077	15469	16041	15578	15120	14369
All severities	98529	101626	107038	106950	97750	96556	93763	96643	95735	98464	98888
Rate	111	110	99	100	92	92	87	85	82	83	84

TRL Table 5 Hard shoulder use

Source: Rutley (1987)

Reason for stopping	Percent
Breakdown, overheating, broken windscreen	56
Tyre failure	17
Out of fuel	4
To check or adjust mirrors, lights or wipers	14
Tiredness	2
Illness	1
To report an accident	2
Other	4

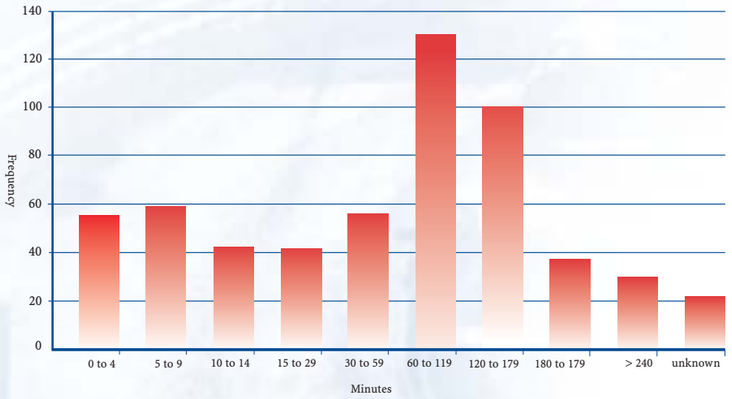
Hard shoulder use



TRL Table 6 Duration of stops

Source: Rutley 1987

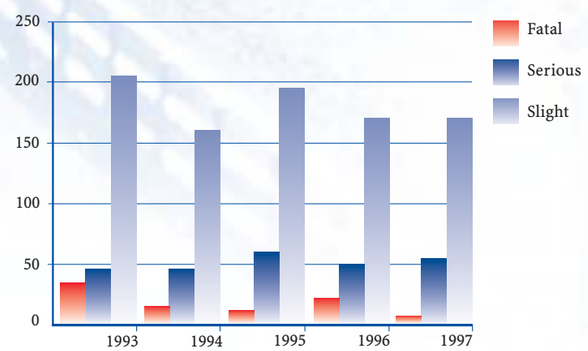
Duration of stop (minutes)	Observed Frequency
0 to 4	54
5 to 9	59
10 to 14	47
15 to 29	44
30 to 59	56
60 to 119	130
120 to 179	100
180 to 239	37
>240	33
unknown	22
Totals	582



TRL Table 7 Hard shoulder casualty rates

Source: Summersgill I er al "Safety on hard shoulders on D2 and D3 motorways" (1998) TRL Unpublished report PR/TT/069/98

Severity of injury	1993	1994	1995	1996	1997	Total
Fatal	38	17	15	21	10	101
Serious	44	46	64	51	63	268
Slight	208	165	191	178	178	920
Total	290	228	270	250	251	1289

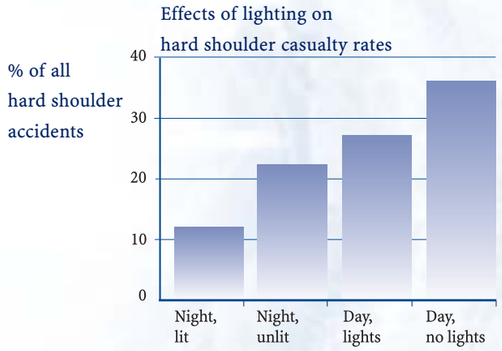


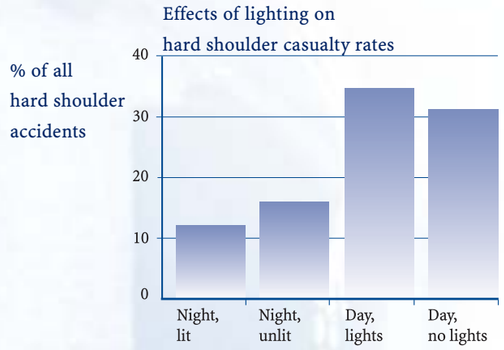
TRL Table 13 Casualty rates for various road conditions

Source: Summersgill I er al "Safety on hard shoulders on D2 and D3 motorways" (1998) TRL Unpublished report PR/TT/069/98

	Percentage by condition							
	Weather		Road surface		Lighting			
Accidents	Rain	Snow/ fog	Wet	Snow/ Ice	Night, lit	Night, unlit	Day, lights	Day, no Lights
Hard shoulder	13.6	2.8	34.7	3.1	12.7	23.1	26.7	35.3
Non-hard shoulder	15.9	2.9	35.2	2.4	13.5	15.6	36	31.7

(**Explanatory Note** Figures are given for both the table above and the graphs below for the particular condition stated. Thus 12.7% of hard shoulder accidents occurred at night when the road was lit compared with 23.1% of hard shoulder accidents when the road was unlit and 13.5% of non hard shoulder accidents occurred at night when the road was lit compared with 15.6% when the road was lit).





The report also makes reference to a number of safety measures that have been proposed over recent years. Some of these have been trialled in practice. These include the following:

- Escape stairs;
- Pedestrian refuges;
- Vertical concrete barriers;
- Provision of lay-bys;
- Coloured hard shoulders;
- Widened hard shoulders at emergency telephones; and
- Vehicle refuges at emergency telephones.

Conclusions

Conclusions of the TRL report
(Taken verbatim and as numbered in the Report)

8.1 Between 1986-1997, motorway traffic increased by 92%. Over the same period, fatal/serious accident rates for motorways have only fallen slightly whereas they have fallen much further for other road types. On motorways, all accident severities have risen, while for other road types the rates have remained constant. It has also been shown that as Average Annual Daily Traffic (AADT) rises, so does the frequency of hard shoulder stops and the duration of stops.

8.2 Rutley found that there were a large number of stops in the 1-3 hour band, indicating higher proportions of hard shoulder users under increased risk exposure.

8.3 TRL report E159C/HL showed that most accidents on the hard shoulder appear to involve parked vehicles being hit (67 percent of all hard shoulder accidents), with 10 per cent of all hard shoulder accidents involving pedestrians being hit. Most accidents seem to be caused by a vehicle veering off the main carriageway, therefore indicating a loss of concentration as being the main reason for the accident.

8.4 The report also identified that on hard shoulders, incidents classed as fatal were very common with 39 per cent of parked vehicle accidents having pedestrian involvement being classed as fatal.

8.5 Studies have been carried out in a number of countries, with most work having been completed in the UK and the USA. Hard shoulder laws differ greatly between countries, and an element of caution is therefore recommended when comparing data sets from one country to another. However, there seem to be common themes in terms of cause of accident and factors affecting the frequency of accidents.

8.6 There seems to be a problem of lack of awareness of hard shoulder procedures as set out in Sections 249-252 of the Highway Code. Increased awareness would surely bring about improved safety performance and reduced risk exposure, even without major investment in engineering features for hard shoulders.

8.7 There have been numerous ideas put forward regarding safety features in hard shoulders. These have included:

- Staircases/steps
- Seating
- Shelters/refuges
- Signing
- Colour-coded road surface

8.8 There have been trials of some of these features, but many have fallen out of favour for a variety of reasons, including cost and practicality, and also because of concern that improved exits from the motorway also provide potential entry for attackers of hard shoulder users of the hard shoulder - especially lone women.

8.9 The most effective engineering feature introduced so far seems to be 'rumble strips'. These are white lines incorporating raised ribs, and are now common as an edge marking and there are indications that such features have dramatically reduced the number of accidents on the hard shoulder in recent years. The percentage of hard shoulder accidents has fallen from 5 per cent to 2 per cent since the introduction of rumble strips in 1984

8.10 The number of motorway accidents is not directly proportional to the mean daily flow; rather the number depends on flow raised approximately to the power of 1.6 (for total motorway accidents). As noted by Summersgill (1988), hard shoulder accidents were found to increase in an approximately linear fashion with both carriageway length and flow. Accidents on the hard shoulder cluster about the emergency telephones in the same way as vehicle breakdowns.

8.11 There are strong indications that providing safer hard shoulders would promote unnecessary usage in some cases, thereby increasing accident risks.

4.0 Current Research and Activity

This whole section describes the various pieces of research undertaken, and information collected, during the project to obtain definitive information and trends concerning the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder, or verge of a high speed dual carriageway.

4.1 Survey of organisational response to health and safety legislation (JF Lee Report)

4.1.1 The Health and Safety at Work etc Act 1974 demands, inter alia, that the work place is safe and healthy for all, so far as is reasonably practicable.

4.1.2 The Management of Health and Safety at Work Regulations 1992, and now 1999, put an absolute duty on employers to assess risks and control those risks appropriately, developing a safe system of work. Where risks are significant they, together with their control procedures, must be recorded.

4.1.3 The hard shoulder of a motorway or verge of a high speed dual carriageway is not usually a workplace when used as an emergency refuge by members of the public or as a running lane for emergency access. It becomes a workplace as soon as any rescue or recovery services attend an incident. This means the Act and Regulations referred to above also become applicable in these circumstances. Enforcement is, however, not clearly defined.

4.1.4 All emergency services and recovery operators should have written procedures in some form that deal with the management of the severe risks to which their staff are exposed during their work activities. These procedures should also include measures to protect the public during work activities.

4.1.5 Before emergency or recovery operatives reach the incident site there is usually an opportunity to give telephone advice to the public to improve their safety. Some organisations take advantage of this, others do less or nothing, perhaps preferring to wait until their expert staff arrive to assess the specific circumstances of each incident.

4.1.6 The Group collected written material from a wide range of organisations covering the following:

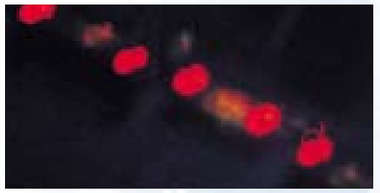
- Risk assessments
- Codes of Practice
- Safe Systems of Work
- Advice to Staff; and
- Advice to the Public

4.1.7 The material was reviewed by **John Lee**, a former senior Health and Safety Executive inspector with knowledge and understanding of the legal and technical implications of the study data and results. A report was prepared and is available in full at the supplement to this report, at Appendix 4.

4.1.8 During this piece of research the following data was received and analysed:

- BSI BS 7121-12:1999 Safe Use of Cranes Part 12 Recovery vehicles and equipment
- The Highways Agency Staff Site Safety Manual - "Staff visits to highways open to traffic" Jan 1999
- Roadside Safety Group - Safe Roadside Working "Life on the Edge" 1&2
- The Standard National Motorway Manual for Police Officers.
- The Automobile Association - various documents
- RAC Motoring Services - various procedures
- The Association of Vehicle Recovery Operators (Draft only)
- Associated Tyre Specialists Ltd

4.1.9 Other stakeholders were approached but either did not respond or did not have written procedures they were happy to pass across.



4.1.10 The main findings of this piece of research were:

- advice given to the public is inconsistent. This advice appears as published documents and as verbal guidance, frequently by phone;
- advice to lone females is misleading as they are at more risk from being struck by traffic than they are from attack; and
- advice to operatives is more difficult to define specifically as conditions can vary significantly. In particular there are differences between attending a breakdown and attending a collision.

4.1.11 The main conclusions of this piece of research were:

- public information needs to be standardised. A suggested eleven point standard set of instructions is listed within the report and is reproduced below;
- Park your vehicle as close to the left hand edge of the hard shoulder as possible
- Angle front wheels towards nearside verge
- Switch on your hazard warning lights
- In poor visibility switch on side lights
- Get out of vehicle using nearside doors
- If you have pets with you keep them safe in the car.
- Lock all doors except front passenger door
- Walk to nearest phone indicated by arrows on post
- Face oncoming traffic while on the phone
- After phoning for assistance return to car and wait on the bank or nearby land on the other side of the safety barrier if safe to do so
- If on your own, and you feel threatened, return to the car and wait in the front passenger seat with the doors locked until you feel it is safe to return to the embankment
- advice to lone females should state that there is more chance of danger from a hard shoulder accident than from attack;
- variations in guidance given to operatives for similar circumstances should be avoided. The particular example cited is the fend position; and
- provision of and adherence to bespoke training is essential.

4.2 Police survey of motorway hard shoulder incidents

4.2.1 Prior to this research the only reliable information on hard shoulder incidents and collisions related to those involving injury. There is currently no requirement for the Police to record non-injury collisions. However, anecdotal information suggested that the overall number of hard shoulder incidents is much higher and further research was required to establish a figure.

4.2.2 A three-month survey was conducted by all police forces with a motorway policing responsibility. Information was requested, via a questionnaire (Appendix 5 of the supplement to this report), on all motorway incidents where one or more of the vehicles involved left the motorway via the hard shoulder.

4.2.3 Five hundred responses were received and forwarded to the Transport Research Laboratory for analysis on behalf of the Highways Agency for the Group.

4.2.4 Executive summary of the draft report
(taken verbatim from the draft report)

Hard shoulders on UK motorways enable drivers to pull over to the side of the road, in an emergency, without disrupting the flow of traffic, and also give access to emergency services trying to reach the scene of an accident when there are queues on the motorway.

Between June and September 1999 the Highways Agency instigated a questionnaire survey of drivers stopped on the hard shoulder to determine reasons for stopping on the hard shoulder and, where vehicles were there as a result of an accident, the circumstances in relation to:

- Prevailing natural conditions such as light and weather;
- Features of the road;
  - Lighting;
  - Gradient;
  - Curvature;
  - Type of road surface;
  - Hard shoulder features (colour of surface, presence or absence of rumble strips);
  - Road works;
  - Speed limit;
- Driver characteristics;
  - Age;
  - Sex;
  - Illness;
  - Any evidence of drug or alcohol intoxication, fatigue or distraction;
- The journey;
  - Journey purpose (work, social or leisure);
  - Time and date of accident;
  - Time elapsed between last break in driving and the accident (for work-related journeys);
- The vehicle.

The main findings from this study were as follows:

i) The majority (70%) of vehicles stopped were cars. Sixteen percent were goods vehicles (HGV and LGV in equal proportion). Only 2% each of motorcycles and PSV were reported.

ii) Three hundred and sixty vehicles (77% of the total) had stopped on the hard shoulder as a result of accidents. Twenty-four of these had been involved in collisions with vehicles already on the hard shoulder. Vehicles hit while on the hard shoulder had been there for an average of just over 11 minutes and, in two cases, for as little as 10 seconds.

iii) Of the 360 accidents recorded 11.1% involved death or serious injury, 41.4% resulted in minor injuries and, in 47.5% cases there were no personal injuries.

iv) Five point six percent of the accidents occurring on wet roads resulted in fatalities, compared with 2.9% on dry roads.

v) Five percent of accidents reported as having occurred in visibility of less than 1,000m were fatalities. The corresponding figures for 1,000m to 9,000m and "unlimited" visibility are 3.7% and 2.4% respectively.

vi) A time profile of stops on the hard shoulder throughout the day indicates a steady build up of these occurrences from the early morning to 18.00h.

vii) Nearly 8% of accidents reported at night involved fatalities, compared with 1.5% in daylight.

viii) There were no fatalities in accidents reported as having occurred in the vicinity of road works. This is likely to be due to reduced traffic speeds in these instances and, perhaps, higher driver attention.

ix) Eight point three percent of accidents reported as having occurred on concrete surfaced roads involved fatalities, compared with 2.8% on tarmac.

x) All 12 fatalities occurred where the speed limit was 70mph. However, numbers were too small to demonstrate a statistically significant relationship between accident severity and speed limit. It should be also be borne in mind that this is a study of hard shoulder incidents on motorways and the figures are therefore not a true representation of incidents on other roads where speed limits of lower than 70mph are in force.

xi) Accidents, as indicated by fatalities, were most serious on downhill curves.

xii) There was evidence of alcohol/drugs intoxication in the case of 18 drivers (5%) of those stopped on the hard shoulder as a result of accident. One third of all the alcohol/drug-related accidents involved death or serious injury.

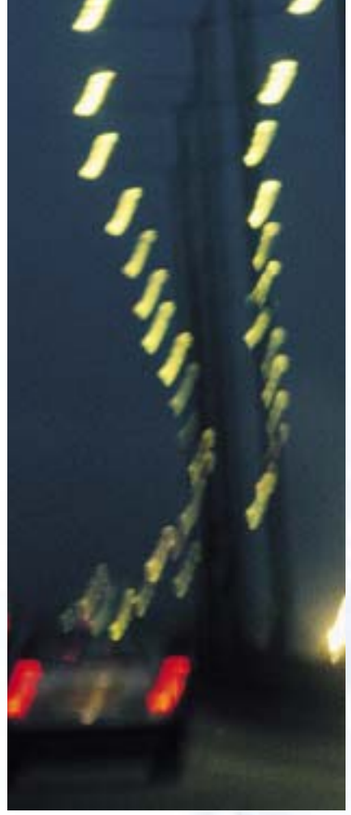
xiii) Reported accidents in which driver fatigue was evident were proportionally more prevalent between midnight and 06.00h. One hundred and forty (40%) such accidents occurred in work-related journeys.

xiv) No clear relationship was indicated between the time elapsed between taking a break and the accident and the severity of the accident in work related journeys.

xv) Evidence that fatigue or intoxication by drugs or alcohol impair driver concentration is supported by the fact that driver distraction was associated with 28.6% of cases involving intoxication and 12.5% of cases involving fatigue, compared with only 7.3% where neither intoxication nor fatigue was involved.

xvi) No marked difference, with respect to accident severity, was noted between cars, HGVs and LGVs.

xvii) Mechanical defect was associated with 13.1% of all recorded accidents. This was the case in 24.1% involving LGVs, 11.2% with cars and 4.0% with HGVs.



4.3 Hard shoulder usage

4.3.1 Anecdotal evidence from the motoring organisations and the police indicates that there are inconsistencies in permission being granted to motoring organisations and recovery operators regarding the use of the hard shoulder to attend incidents. Some police forces allow liveried recovery operators to use the hard shoulder in heavily congested traffic in order to facilitate hard shoulder clearance to allow access for emergency vehicles. Others do not.

4.3.2 In situations where a vehicle towing a caravan or trailer has broken down, then the caravan or trailer can also be removed by any recovery operator as long as it is capable of being moved. However, if the caravan or trailer itself has broken down or is immobilised and the towing vehicle is unaffected, then it is currently classified as 'goods'. In these situations only recovery operators with an Operator's Licence ("O" Licence) are allowed to carry out the removal. This requirement for specially licensed recovery operators to remove broken down / immobilised caravans or trailers can cause delays in relation to clearing of the hard shoulder.

4.4 "Near miss" reports

4.4.1 Various well-established pieces of research indicate that there is a pyramidal relationship between fatalities, major accidents, minor accidents, non-injury accidents and near misses. There is a cogent argument for reducing the number of near miss incidents in order to reduce the number of actual accidents. For this reason many industries attempt to manage near misses, treating them as robustly as accidents.

4.4.2 For many industries near misses are difficult to capture as operatives are not eager to report incidents, possibly based on procedural infringements, that have not caused actual harm. For those working on the hard shoulder the problems are exacerbated by the fact that every passing vehicle can be construed as a near miss incident for those working at the side of the carriageway.

4.4.3 None the less both the AA and the RAC have judged it worth while to try to capture as much of such information as possible and instigated a near miss reporting system.

4.4.4 During the trial period, June, July and August 1999, a total of 31 near misses were reported on motorways.

4.4.5 Of these, 15 involved a vehicle driving or swerving onto the hard shoulder, narrowly missing an operative, 9 were due to some other aspect of poor driving, 4 were due to shedding of loads or vehicle parts and 3 were as a result of an accident in adjacent lanes.

4.4.6 The details of some of these reported showed in several instances a disregard by drivers of the safety of other road users. One lorry driver was reading a paper, two cars were having a race, two drivers stopped to ask patrols for directions, one of them stopping in the inside lane. There seemed to be a greater incidence of near misses involving drivers towing trailers or caravans and also in locations where the hard shoulder was narrower than usual. However, there is insufficient data to draw any significant statistical conclusions.

4.5 Use of mobile phones

4.5.1 Despite an increase in the number of motorway breakdowns and collisions (Ref TRL Project Report PR/TT/082/99, Table 3, Appendix 3), statistics obtained from police control rooms covering motorways show a decline in the use of the roadside emergency telephone to report such incidents. The Highways Agency has developed an improved version of the motorway emergency telephone and work is in hand to upgrade existing telephones (Ref Highways Agency Toolkit). Information from government sources giving advice to the public is available but its availability may not be widely known.

4.5.2 Both AA and RAC carried out an assessment of the number of telephone calls made to them from motorways using mobile phones as opposed to emergency telephones. Over a three month study period the research concluded that approximately 50% of such calls were made directly to the motoring organisations thus circumventing the motorway emergency procedures as recommended in the Highway Code. Further research has concluded that this figure of 50% has already increased to over 60%.
The importance of this relates to:

- control of incident;
- speed of response; and
- quality of advice to the public.

4.5.3 Emergency calls made on the 999 number are centrally managed and may be taken by a controller in an area that is unfamiliar with location of the reported incident. The public are required to decide which emergency service should be called (fire, police or ambulance). No guidance is given to the public on this.

4.6 Location information

4.6.1 There is no defined process for updating the police or motoring organisations of changes or additions concerning:

- ERT positions and numbers,
- marker post numbers and positions,
- junction number and positions etc

4.6.2 There is no common format relating to information collected by emergency services and motoring organisations in response to telephone calls, nor is such information suitable in content for unambiguous and clear transmission between organisations.

4.7 Regional Initiatives

Over the study period the working group (WG1) was made aware of a number of regional initiatives concerning roadside safety and related topics. A non-exhaustive list follows:

4.7.1 Vehicle Recovery Link hosted a meeting to discuss hard shoulder safety. This was attended by a wide range of commercial organisations and government agency representatives.

4.7.2 Police forces across the Midlands (ACPO Number 4 Region) launched a month long motorway hard shoulder campaign in October 1999. This received good local press coverage.

4.7.3 DETR published a leaflet "A Guide to Safer Motorway Driving".

4.7.4 Rear facing red flashing lights are allowed on some categories of vehicles, but not recovery vehicles. Some police forces currently permit their use by contracted recovery operators to enhance safety.

4.8 Other relevant matters

Anecdotal evidence from various members of the Group indicates that there is a significant and potentially dangerous variation in the suitability and conditions of breakdown, rescue and recovery vehicles being used, particularly by local operators.

5.0 Research into Strategic Plans and other Documents

This section describes the strategic plans and other relevant documents identified by the Group concerning the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway.

5.1 Integrated Transport White Paper

5.1.1 In 1998 the Government published a White Paper on the future of transport entitled "A New Deal for Transport Better for Everyone". DETR published a full report: "The Government's Consultation on Developing an Integrated Transport Policy: A Report". In December 1999 the Transport Bill had its first reading. A briefing document was prepared by the Institution of Civil Engineers and is in the supplement to this report, at Appendix 7.

5.1.2 We would be remiss not to consider whether such strategic thinking, and prospective or possible strategies resulting from it, are likely to affect, for better or worse, the severity of the problem of safety on the hard shoulder as a working place or a refuge; and to affect also consideration of measures for mitigating that problem.

5.1.3 Whatever else the currency of the words "integrated transport policy" implies it cannot but imply a form of policy which is not already in place. But it also implies creditable recognition that an "integrated transport problem" is in place.

5.1.4 An element in that problem is that, demographically, the number of households in these islands is set to increase over the first quarter of this century. Another demographic trend has been, and may well continue to be, the migration from the big cities to the smaller towns, from smaller towns to villages (which may become larger) and from villages further into the countryside. Exercise of mobility and logistics shifts in character accordingly.

5.1.5 Separately but also in some relation with those demographic forces, the number of cars is set to increase; for example, as the proportions of women holding driving licences and owning cars as income earners and eventually as pensioners rise to equal the proportions of men who do so.

5.1.6 Information technology will have powerful effects. It may reduce the distinction between home and workplace; and reduce the propensity to commute among a population of working age, which in itself may be reduced by a mixture of demographic and potential economic and social factors. But, combining with the demographic influences mentioned in the two paragraphs above, it will increase the intensity of the task of logistical delivery by increasing the number of destinations to be served, and probably the number of vehicles on the road to serve them; that is, vans if not cars.

5.1.7 Greater use of railways for heavier loads in main streams will have logistical significance but not to reduce the scale of local delivery amongst factories, workshops, malls, high streets and habitations, by lorries of all sizes and vans again.

5.1.8 The processes of allocation of land use, of design of localities in and around the locations of new housing development and of redevelopment of older communities will attempt to reduce the need for mechanised mobility. But the scale of the problem of logistics will not thereby be greatly dented within decades; nor will the scale of provision required elsewhere for mobility.

5.1.9 Thus the absolute demand for use of fuel for transport will not be reduced by the demographic and information technology factors mentioned in paragraphs above. Yet the threat of global warming and the international undertakings to limit exhaust fumes on that account, together with risks to human health and features of the environment attributable to those same fumes, call both for switch to fuels which would be less harmful to the environment and directly or indirectly to humanity, and also for such increase in efficiency in their use that the total exhalation of harmful gases and particulates would be materially reduced. This requirement entails as a necessity a massive international effort in many forms of technological research, development and market led application.

5.1.10 There will need to be sustained assurance about the reality of that market. Mobility and delivery are not going to be forbidable even if the former may be discouraged by fiscal measures.

5.1.11 Policies to serve such various objectives as have been mentioned in paragraphs above will certainly require "integration" if they are to be efficient for their respective purposes. More than transport will be affected.

5.1.12 Against that background we are not to expect more and more road space. We are to expect, therefore, more enforced (that is, somehow, at some cost policed) distributional allocation of that space, perhaps differently at different times of day and night; for example, in urban environments, for public transport; and for lorries and vans; but still with cars as the massive residue of the problem, or the privately treasured cause of it.

5.1.13 Public levying of charges for road space and parking space is seen as potentially such a distributional measure. There are visible destinations for the proceeds of such levies; for example, in financing the public cost of infrastructure for service by privately financed public transport; for modifying road patterns and equipment for the protection of the environment and enhanced safety; or for provision for cycling and walking (in an environment which does not leave, or place, discriminatory obstacles to the mobility of disabled people) in safe separation from the vehicular traffic on roadways.

5.1.14 Allocation of space is a proposition on trial or in contemplation for motorways. It has to be reconciled with another proposition: That the transport service of the national economy, and of the regional economies within it, which is now uniquely and primarily provided by the motorway system, is reducible only at cost in the performance of those economies.

5.1.15 Minds turn to the matters sketched in the above paragraphs have not been occupied with deaths on hard shoulders. But their thoughts may never the less impinge. Tolls, if levied on motorway traffic, would tend to reduce total usage of the motorways below what it would otherwise have been at the time. But it would probably be greater than it is now; and; in consequence, the risk of collisions on the hard shoulder would be greater too. Moreover, concentration on the immediate subject of this report - safety on motorway hard shoulders - must not mask the implication for our concern with other roads that the traffic on those other roads, which the TRL report "Accidents on motorway hard shoulders and efforts to improve safety" quoted above shows are several times more prone to accidents of all severities than are motorways, would be greater than it would otherwise have been. The national record in road safety would be correspondingly impaired and the burden of it upon national resources would be increased.

5.1.16 On the other hand, tolls would have less effect on the habits of road users of the motorways who could pass on the cost of them to customers and remain competitive. The obvious category is vans not involved directly in international competition. But, as the TRL Report based on the police questionnaire records in point xvii of the main findings, the safety condition of vans is statistically inferior to that of cars and HGVs.

5.1.17 Distributional allocation of road space may be accomplished in due course more effectively by technologies now under development or scarcely envisaged. Speed limits on motorways may be not only varied so as to maximise safe mobility at different densities of traffic (whatever their causes) but also imposed by external electronic intervention in the control of traffic engines. Brakes may be activated by electronic reaction to sensed distance from another vehicle ahead. Such externally imposed disciplines to maximise potential practical performance, accomplished necessarily at cost in public infrastructure and in the price of vehicles, may yet produce dividends in reduced collisions and their cost in private and national resources. The Highways Agency of the future and its opposite numbers in the rest of the European Union, or most of it, may acquire such items for their "Toolkits".

5.1.18 Notwithstanding the above, collision between a stationary vehicle on a hard shoulder and a vehicle moving at motorway speed would not be materially mitigated by such means.

5.1.19 Our conclusion from this broad review of strategic influences which we should expect to impact in due course upon transport is simple: Collisions on hard shoulders constitute a problem, involving the gravity of death, which will continue to have to be tackled in itself in whatever changing conditions, as a matter of public and private duty. Hence the Action Plan that is being developed to add to this report and its appendices.

5.2 The Highways Agency Toolkit

5.2.1 First issued in January 1998 and subsequently updated in October 1999, the Toolkit is a compendium of techniques and innovative ideas for the better management of the trunk road network. The techniques and ideas cover a wide range, some of which are now established techniques, others have been piloted or are awaiting a first trial.

5.2.2 The potential of the Toolkit is not merely as a document illustrative of the Highways Agency's work, but also contributes to wider Government objectives to protect the environment, assist economic growth, integrating transport, improving safety, and improving accessibility.

5.2.3 Information on each of the techniques or ideas in the Toolkit is presented under four headings:

- The Problem
- The Solution
- The Benefits
- Status

This enables a possible use to be clearly focused while the status confirms the current state of implementation on the network be it a trial, pilot or established technique.

5.2.4 The Toolkit ideas complement the detailed guidance for designers contained in the Design Manual for Roads and Bridges (DMRB). The manual covers the standards together with advice on their application to which roads are designed to provide a safe and efficient network while protecting the environment.

5.2.5 The following ideas from the Toolkit are of particular interest to the Group:

- Supporting an integrated transport system:
  - research the whole programme
- Making use of the network
  - Standby vehicle recovery service
  - Hard shoulder crawler lanes
  - Conversion of hard shoulder at junctions
  - Traffic control centres
- Recognising environmental needs
- Picnic areas
- Improving road safety
  - Trunk road safety plan
  - Safety during roadworks
  - Speed cameras at roadworks
  - Motorway Incident Detection and Automatic Signalling (MIDAS)
  - Solar powered road studs
  - Wet night visibility road markings
  - New roadside emergency telephones

5.2.6 At the launch of the revised Toolkit it was stated that any changes in policy would not be made without wider consultation. It is not clear how this consultation fits into any work programme to introduce new strategies and technologies.

5.2.7 Some of the potential solutions could have an adverse affect on safety.

5.2.8 It is clearly wasteful for the Group to recommend changes in policy and guidance within the industry if there are to be strategic changes within Government that negate the effectiveness of such proposals.

5.3 Technological safety solutions

There are various possible technological solutions that may improve the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway. These are in varying stages of development and evaluation. Some may require changes in secondary legislation.

A list of some possible ideas and solutions is:

- Vehicle lighting - ICE Ergonomics have researched different light colours, particularly magenta, under different operating conditions. Any change will need a change to the Road Vehicle Lighting Regulations 1989.

- Vehicle conspicuity - The Police Scientific Development Branch (PSDB) have developed a set of principles for maximising vehicle conspicuity. This has led to the development of new livery for the emergency services consisting of large colour blocks to the sides of vehicles (Battenburg livery, subject to Crown copyright) and orange and yellow chevron markings to the rear. It has been recommended for use by all police forces and consideration should be given, where appropriate, for application to breakdown, rescue and recovery vehicles.

- "Shield" - (LASER activated audible and visual warning system). This is on trial and is still under development. A number of interested parties have bought units and are evaluating the system.
- Road studs - light emitting solar powered units are currently being evaluated for different applications.
- Lane guidance system for goods vehicles. This system gives an audible warning to drivers straying onto the hard shoulder.
- Retractable fencing which can quickly be run out to indicate to drivers that an obstruction is in the carriageway.
- Audible warning devices fitted to breakdown, rescue/recovery vehicles.

Conclusions

6.0 Conclusions

6.1 Traffic flows have increased 92% on motorways and 37% on all categories of roads over the period 1986 to 1997 (Ref. Road Accidents Great Britain 1997 (1998). DETR, TSO Publications).

6.2 Fatal/serious injury rates on all non-motorway roads have fallen significantly, whilst the rate on motorways remains at the same level. The severity of these motorway collisions has increased. (Ref. TRL Project Report PR/TT/082/99, Appendix 3).

6.3 Accident statistics are available only for injury accidents. Statistics are collected by the police. No single body or group is responsible for overseeing or monitoring accidents on the hard shoulder or indeed for carrying out investigations. The HSE is currently reviewing its relationship with the police in this respect.

6.4 There are differences in the instructions and codes of practice given to operatives when working on the hard shoulder or verge of a high speed dual carriageway. (Ref. Activities on the Hard Shoulder of Motorways and High Speed Carriageways - JF Lee Report)

6.5 Some organisations do not seem to give sufficient advice to operatives. (Ref. JF Lee Report)

6.6 Some organisations are not able to demonstrate that training of their operatives is effectively carried out and monitored. (Ref. JF Lee Report)

6.7 Members of the public are frequently unaware of the danger of stopping on the hard shoulder and of the importance of safe behaviour if such a stop is inevitable.

6.8 There is no motorway driving or hard shoulder safety education in the current practical driving test.

6.9 There are differences in the instructions and advice given to members of the public when they need to use the hard shoulder. Even when advice is available it is not disseminated effectively. (Ref. JF Lee Report)

6.10 Some organisations do not give any advice to the public. (Ref. JF Lee Report)

6.11 Regional initiatives would seem to indicate that the time is right for change and improvement on a national basis. (Ref. Regional initiatives section 4.7)

6.12 Despite government leaflets advising motorists to use emergency telephones (Mobile phones and driving) increasing use of mobile 'phones is impacting on the police's ability to control motorway breakdowns. (AA and RAC unpublished research)

6.13 Best practice aspects of conspicuity of vehicles and operatives has not been dealt with in a standard manner. (Ref. Technological safety solutions section)

6.14 Lighting of vehicles, in particular the use of red rear facing lights is not dealt with in a common manner. (Ref. Regional initiatives section 4.7 and Technological safety solutions section 5.3)

6.15 Future Government strategy with regard to the consultative process and subsequent implementation of issues regarding the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder or verge of a high speed dual carriageway is not clear.

6.16 There is in place a framework in which tensions between safety and other matters is considered.. There is no clarity with regard to the cost benefit analysis when there is a tension between safety and initiatives to improve or maintain traffic flows.

6.17 There is no focus for attracting funding for independent research or for management of hard shoulder safety within the UK or EU.

6.18 Research has shown that the provision of carriageway lighting on motorways reduces accidents on the hard shoulder. (Ref. TRL report PR/TT/082/99 Section 4.4 and Table 13 and TRL report PR-TT 176-99).

6.19 Research has shown the provision of rumble strips to be the most effective engineering feature introduced so far. (Ref. TRL report PR//TT/082/99) There is no indication that their size and form is optimum.

6.20 Evidence from the motoring organisations and police indicates that there are inconsistencies in policy and procedures regarding safe working practices at the roadside. An example of this is the differences in policy that currently exist concerning the use of hard shoulders by breakdown, rescue and recovery vehicles.

6.21 Requirements for recovery operators to have an "O" licence in order to remove broken down / immobilised caravans or trailers can sometimes delay clearing of obstructions from the hard shoulder.

6.22 Marker posts give important information to emergency and recovery operatives alike. Changes to the network may introduce changes to the post numbering. Such changes are not always communicated to the organisations needing this information.

6.23 Short sections of hard shoulders have been converted to running lanes on the approach to busy junctions. It is not always clear that a proper assessment of all the factors affecting or affected by such a change in use have been assessed.

6.24 Anecdotal reports from members of the group with international links indicate that other countries also share similar problems. No best practice model exists for European application.

7.0 Recommendations

There are a number of recommendations that will require changes in either primary or secondary legislation

7.1 The extension of motorway lighting, which has clearly been shown to reduce accident rates, to additional sections of the motorway should be considered. (See section 3 TRL report Table 13)

7.2 Rumble strips, which have been shown to improve safety, should be extended across the entire motorway network. (See section 3 TRL report 8.9)

7.3 Clarification is needed in relation to the role of the Health and Safety Executive and the Police in the investigation of work related hard shoulder accidents. It should be noted that steps are being taken to move this forward. (See section 4.1.3)

7.4 There should be standard advice given to the public regarding safety procedures on the hard shoulder. This should be disseminated in a variety of ways that should include driving test literature, Highway Code, DVLA/DSA/DETR literature, motoring organisation literature and police literature. In addition standard advice should be given verbally by organisations responding to breakdown or other emergency calls. The same advice should be displayed prominently on or in motorway emergency telephones.(See section 4.1.5, 4.1.11 and 4.5.1)

7.5 A common code of practice for the specific benefit of those people required to work on, a motorway hard shoulder, should be introduced as an industry standard in the first instance. This should be followed by a British Standard with consideration given to it becoming a European or international standard. This precludes traffic management schemes under the control of the Highways Agency. (See section 4.1.11)

7.6 There should be a national strategy and campaign to educate the public on the appropriate use of the hard shoulder. This should relate to behaviour on the hard shoulder and the correct use of the emergency telephones. It should seek to educate the public on risks and the potential consequences of accidents rather than simply instruct. The messages should be common and should be effectively targeted to the motoring public. (See section 4.1.11)

7.7 The motor and recovery industries should introduce common standards of training and other competencies relating to safety and health. These should be self-regulatory. A QA scheme similar to that for traffic management contractors may be the most appropriate way forward. (See section 4.1.11)

7.8 Use of the hard shoulder by breakdown, rescue and recovery vehicles for the accessing of incidents needs to be formalised. It should be noted that this is at odds with current Association of Chief Police Officers policy. (See section 4.3.1)

7.9 The requirement for recovery operators to have an "O" licence in order to remove broken down/immobilised caravans or trailers should be reviewed in order to facilitate the clearing of obstructions from the hard shoulder. (See section 4.3.2)

7.10 When receiving calls on mobile phones, directly from the public, all rescue and recovery organisations should be required to report incidents immediately to the police. (See section 4.5)

7.11 Motorway marker posts and emergency telephone boxes should be upgraded and maintained in a safe condition and safe location and information about any changes should be communicated immediately to emergency and recovery organisations. (See section 4.6.1)

7.12 There should be a common format for the passage of information between the emergency and recovery organisations relating to motorway incidents, including breakdowns. (See section 4.6.2)

7.13 There should be clear requirements in relation to vehicle lighting including coloured beacons, strobe lights and rear flashing lights. These should distinguish between recovery or emergency vehicles and other vehicles fitted with warning beacons. (See sections 4.7.4 and 5.3)

7.14 There should be clear national minimum standards for the suitability and condition of breakdown, rescue and recovery vehicles. (See section 4.8)

7.15 There needs to be clarity of intent from Government in relation to policy issues before recommending or implementing any changes that affect the safety and health of those people required to work on, or who stop in the course of their journey on, a motorway hard shoulder. (See section 5.2.6)

7.16 Use of the hard shoulder as part of the carriageway, even on a temporary basis, should be formally assessed against other options in an open manner before it is introduced. (See section 5.2.5)

7.17 Further research and a more open consultative process with interested parties regarding changes to the motorway environment is required. Feedback should be provided. (See sections 5.1 and 5.2)

7.18 The principles of best practice vehicle conspicuity in relation to markings should be standardised in response to research findings. (See section 5.3)

7.19 There should be a central and open assessment process for the evaluation of technological innovations. This should be centrally funded. (See section 5.3)