HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

Managed Motorways
All lane running
Interim Advice Note 161/13

An executive agency of the Department for Transport

INTERIM ADVICE NOTE 161/13

Managed Motorways
All lane running (MM-ALR)

Summary
This document gives requirements and guidance on managed motorway schemes implementing all lane running. It sets out the design parameters and the associated infrastructure and technology requirements.

Instructions for Use
This document applies to managed motorways all lane running schemes on the Highways Agency network. It supplements and amends:

TD 9/93	Highway Link Design
TD 19/06	Requirements for Road Restraint Systems
TD 22/06	Layout of Grade Separated Junctions
TD 27/05	Cross-Sections and Headrooms
TD 45/94	Motorway Incident Detection and Automatic Signalling (MIDAS)
TD 46/05	Motorway Signalling
TA 73/97	Motorway Emergency Telephones
HD 20/05	Detector Loops for Motorways
IAN 143/11	Supplementary Advice and requirements for the Provision for Non-Motorised Users and Accessibility during planning, design, construction and handover of Improvement Schemes
IAN 149/11	Existing Motorway Minimum Requirements

The following documents are not applicable:

IAN 111/09	Managed Motorways Implementation Guidance – Hard shoulder running
IAN 112/08	Managed Motorways Implementation Guidance – Through junction hard shoulder running

Amendments

The main changes from IAN 161 Version 1 (2012) are:

Clause reference ( )denotes 161/12 reference if different	***Summary of change***
-	Managed Motorways – All lanes running amended to Managed Motorways – All lane running.
1.1	Link to MM-ALR Concept of Operations 2013 inserted.
1.7	Clause clarified.
1.9	Amendment included to IAN 143/11 Supplementary Advice and requirements for the Provision for Non-Motorised Users and Accessibility during planning, design, construction and handover of Improvement Schemes.
1.12	New Clause and heading added regarding implementation of IAN 161/13
1.15 (1.14)	Reference to GD04/12 Standard for Safety Risk Assessment on the Strategic Road Network added.
1.16 (1.15)	161/12 Clause 1.15 deleted and marked as 'Not Used' in 161/13.
1.17 (1.16)	161/12 Clause 1.16 deleted and marked as 'Not Used' in 161/13.
1.18 (1.17)	Link to MM-ALR Generic Safety Report 2013 inserted. Last para in 161/12 Clause 1.17 deleted.
2.2	Last sentence deleted.
2.3 to 2.5	Heading 'Through Junction Running' inserted and clauses amended to reflect the CHE letter MANAGED MOTORWAYS – ALL LANES RUNNING - THROUGH JUNCTION RUNNING GUIDANCE, dated 3 August 12.
2.6	Heading 'Refuge Areas' inserted. Reference to breakdown removed
2.7	Clause deleted and marked as 'Not Used'
2.8	Figure 2.1 updated and footnote added to clarify that '*This diagram is indicative, and is intended to give a general overview of MM-ALR and is not a definitive layout.'* Primary change is the removal of offside variable speed limit signing and the addition of a note highlighting the signalling requirements in 7.22b.
2.9	2.9 bullet 1 – reference to speed limit deleted as compliance is wider than just speed compliance.
2.10	Insertion of 'must' 'an appropriate maintenance and repair strategy must be developed'
2.12	Clause clarified
2.14	Clause expanded to include the requirement for fixed taper points and remotely operated temporary traffic management signs. Link to 'Generic Safe Method for Placing TTM on MM-ALR.' added.
2.15	Clause deleted and marked as 'Not Used'
2.16	Clause clarified
2.17	Clause clarified
2.19	Heading 'Health and Safety File – information to be provided' added along with new clause 2.19
3.5	Clause clarified
4.6b	Requirement for a Departure from Standard replaced with the need to seek

Clause reference ( )denotes 161/12 reference if different	***Summary of change***
	endorsement from PSCRG.
4.6d	Clause added regarding nose ratio relaxations
4.6e	Clause added regarding combinations of relaxations in Clause 4.6 and the requirement for a departure from standard
4.7b	Requirement for a Departure from Standard replaced with the need to seek endorsement from PSCRG.
4.7c	Clause added regarding nose ratio relaxations
4.7d	Clause added regarding combinations of relaxations in Clause 4.7 and the requirement for a departure from standard
4.8	Clause deleted and marked as 'Not Used'
4.9	Clause marked as 'Not Used' and moved to 4.10. Heading inserted for 'Merge Overrun'
(4.10)	Clause moved to 4.13 and clarified in IAN 161/13
4.11 to 4.12	Clauses inserted for merge overrun.
5	Section heading renamed to 'Cross sections, headroom and roadside features'
5.3	Amendment to IAN 143 inserted. TD19 Clause 3.37 superseded
5.4	Hard strip requirements clarified. Requirement to tie a drainage channel to concrete pavement added.
5.5	Requirement for stabilisation methods added
5.7	Clarification regarding the location of longitudinal pavement joints in relation to wheel tracks. Longitudinal joints in the wheel track is no longer a Departure from Standard
5.10	Clarification regarding the use of unbound material in the central reserve. A departure from standard is also no longer needed.
5.11	Table 5-2 and notes, relaxation to 1000mm (note iv) inserted
5.11	Para below Notes i) to iv) clarified.
5.11	New para added above 'This supersedes TD 27 paragraph 4.11.13' to clarify set-back requirements in relation to ERAs
5.12	Requirement for rigid concrete barrier inserted. Clarification on VRS requirements for entry slip signals added.
5.17	Clause deleted and marked as 'Not Used'
5.18	Clause updated - marker posts must not direct users to ERTs unless there is a continuous hard shoulder between the marker post and the ERT.
5.19	Clause clarified
5.20	Last sentence deleted
5.22	Bullet 2 clarified
5.24	Clause clarified. Requirement for MSAs added.
5.25	Clause expanded to include stakeholder and environmental considerations.
5.27	'or immediately upstream of a steep gradient' added.
5.28	'or immediately upstream of a gradient greater than 2%' added. Requirement for PSCRG endorsement included.
5.30	Clause amended - if a vehicle restraint system is located adjacent to the ERT there is no requirement to provide access as per Figure 3.11 TD19/06, providing the ERT installation is designed for access over the restraint system - this supersedes TD 19 Clause 3.37
5.32	Requirement to locate ERTs opposite each other has been removed.

Clause reference ( )denotes 161/12 reference if different	***Summary of change***
5.37	Requirement for PSCRG endorsement included.
5.38	Clause expanded - a reduced pavement thickness, designed to 5msa, is acceptable. Concrete may be used for ERA construction provided sub-base drainage is maintained. This does not constitute a departure from standard but must be included in the DSR.
5.39	NP number added for ERA sign with SOS picture. TSRGD number added for advance SOS sign and further guidance added on sign location NP number added for 'Driver must use SOS phone and await advice to rejoin main carriageway' sign
5.42	SSD requirements clarified
5.46	Maintenance access from ERAs clarified.
5.47	Requirements for observation platforms and abnormal load bays added
5.48	Requirement for pavement (non ERAs) added
6.1	Clause clarified
6.2	Clause clarified
6.5	Clause expanded to include traffic counting and classification
6.9	Detector (non loop) siting requirements at sign sites – tolerance included
6.11	Clause deleted and marked as 'Not Used', detailed in 6.9
6.19	Last sentence deleted
6.21	'Must' changed to 'should'
6.23	'Longitudinal cables' deleted
6.26	HADECS cabinet requirements added. Clause expanded - looming in 600 cabinets must only be provided to support the equipment installed as part of an MM-ALR scheme.
6.27	Sentence added providing minimum requirements for ALMs.
6.30 to 6.34	CCTV requirements amended to include 'Full' coverage.
6.36 to 6.40	Clauses amended to clarify requirements for existing Ramp Metering sites
6.44	Clause clarified
6.46	Clarification on lighting removal and application of IAN 167.
6.48	Clause clarified and updated to reflect update to BS5489
6.49	Remote monitoring requirements clarified
6.50	Requirement for departure removed. Guidance added for lighting levels on the hard shoulder (where it is to be converted to lane 1) where there is existing lighting
6.51	Clause amended to allow power distribution designs to be done based upon actual loads and removes the need for minimum load requirements as defined in TA 77.
6.52	Clarifies the need that the Gantry Main Switch must isolate all mains voltage powered equipment on the gantry.
6.54	Last sentence deleted. Consideration of slot cutting feeders changed from a 'should' to a 'must'.
6.55	Clause deleted and marked as 'Not Used'
6.56	Clause updated to reflect the latest requirements for the risk assessment of metal assets.
7.3	Clause deleted and marked as 'Not Used'
7.4	Clause clarified regarding datum point of Type E Diverges and regarding

Clause reference ( )denotes 161/12 reference if different	***Summary of change***
	confirmatory signs.
7.8	'x' height requirement for existing and new driver location signs added
7.9	NP reference added
7.10	Removal of requirement for offside variable speed limit sign and clarification of 'x' height requirements. Confirmation that this sign is non prescribed, but nationally authorised. Clause expanded to allow co-location with 'no hardshoulder' sign
7.12	Requirements at MSA added. Removal of requirement for offside variable speed limit ends sign and clarification of 'x' height requirements. Details on sign location with regard to SI added. Confirmation that this sign is non prescribed, but nationally authorised.
7.13	Sign locations requirements expanded
7.14	New clause added regarding vehicle separation markings
7.19 (7.18)	Requirement for a minimum of 2 signals sites per link added. Requirement for link lengths in excess of 5km clarified.
7.20 (7.19)	Clause deleted and marked as 'Not Used'
7.21 (7.20)	Clause clarified
7.22 (7.21)	Definition of continuation and termination VMS added. Clarification on MSA requirements Clause expanded regarding the potential for re-using existing nose gantries.
7.23 (7.22)	Para b) added Para c) (ii) (was b in IAN 161/12) clarified. Para c) also states that signal gantries must not be positioned such that they span a ghost island. Para d) added – the requirement to locate signals in relation to defined fixed taper points.
7.25 (7.24)	Strategic variable message signing requirements clarified
8.1	Reference to IAN 164 added.
9.1 to 9.4	Clauses clarified
9.5	Guidance on split carriageways added
9.6	Clause deleted and marked as 'Not Used'
9.9	Clause clarified
9.10	Clause combined with Clause 9.13 and marked as 'Not Used'
9.11	Clause deleted and marked as 'Not Used'
9.16	Requirement for technical approval clarified
9.17	Requirement for technical approval clarified
9.18	Clause clarified
10	Heading changed to 'Environment'. Wholesale changes in this section
11.1	Heading changed to 'Drainage and water quality'. Requirements for 1in 5 and 1 in 100 year events where there are pavement area increases (e.g. ERAs or central reserve paving to accommodate the inclusion of a concrete barrier) Flow width clarification added - when checked for a 1 in 5 year storm the maximum verge side flow width, inclusive of hardstrips where present, must

Clause reference ( )denotes 161/12 reference if different	***Summary of change***
	not encroach more than 200mm (at 2.5% crossfall) into Lane 1. Where the crossfall is greater than 2.5% then the depth of water lying on the carriageway must not exceed 5mm. This supersedes HD 33 para 6.3, Bullet 3.
11.2	Clause clarified
15	References updated.

Table of contents

1 Introduction

Purpose

1.1 This Interim Advice Note (IAN 161/13) gives requirements and advice to all those designing Managed Motorway - All lane running (MM-ALR) schemes. It sets out the design parameters for MM-ALR and the associated infrastructure and technology requirements. In addition to this IAN, a companion document has been produced entitled MM-ALR Concept of Operations. This document provides, at a high level, guidance on the operational elements of MM-ALR and complements this Interim Advice Note, and can be found here:

http://www.dft.gov.uk/ha/standards/tech_info/index.htm

1.2 This document must be read in conjunction with GD01/08 Introduction to the Design Manual for Roads and Bridges (DMRB). The requirements given in this Interim Advice Note must be adhered to for MM-ALR schemes in England, to be constructed on the strategic road network, unless a departure from standard is approved.

1.3 Mandatory sections of this document are contained in boxes. If it is not possible to comply, a departure from standard must be agreed with the Highways Agency, unless an alternative process is identified within the black box text. The remainder of the document contains advice, explanation and guidance.

Scope

1.4 The managed motorways approach is a means of facilitating the dynamic control of traffic for congestion and incident management. To date, this approach has included hard shoulder running as a key feature. This allowed controlled use of the hard shoulder during times of heavy congestion or during incident management. The objective of this document is to introduce permanent conversion of the hard shoulder to a running lane, whilst retaining the ability to dynamically control traffic. This approach is defined as Managed Motorways - All lane running (MM-ALR) and the scope of this document is therefore limited to this type of operation. Hard shoulder running guidance is covered in a separate document.

1.5 This document must only be used where the resulting scheme has no more than 4 lanes in either direction on the main line. Advice must be sought from the Highways Agency Project Manager if more than 4 lanes are being considered.

1.6 The implementation of an MM-ALR scheme does not include the bringing forward of planned major maintenance, unless agreed by the Highways Agency Project Manager.

1.7 Where current structures, features or assets are fit for purpose, they must not be replaced for the sole purpose of meeting current standards or for future proofing. Other improvements, funded by the scheme, should only be considered if what is there now is not appropriate for continued use (for example, either unsafe in the context of MM-ALR or beyond economic repair). The asset management decision making method therefore follows a logical process:

1. the true condition of the asset is established to determine if it is fit for purpose.
2. if the asset is deemed fit for purpose, then it is reasonable for it to be retained.

3. if it is deemed not fit for purpose then there is another decision about removal or replacement.
4. does the replacement offer a reduction in safety risk due to reduced maintenance needs and can this replacement be considered reasonably practicable.

This decision should be taken in the normal way to justify renewal/upgrading, including referring to the relevant assessment standards and consultation with NDD.

1.8 IAN 161/13 must be used in conjunction with the following DMRB standards and varies requirements within them:

- TD 9/93 Highway Link Design
- TD 19/06 Requirements for Road Restraint Systems
- TD 22/06 Layout of Grade Separated Junctions
- TD 27/05 Cross-Sections and Headrooms
- HD 20/05 Detector Loops for Motorways
- TD 45/94 Motorway Incident Detection and Automatic Signalling (MIDAS)
- TD 46/05 Motorway Signalling
- TA 73/97 Motorway Emergency Telephones

These standards are referred to as "parent DMRB standards" within this document.

1.9 IAN 161/13 also varies the requirements within the following Interim Advice Notes:

- IAN 143/11 Supplementary Advice and requirements for the Provision for Non-Motorised Users and Accessibility during planning, design, construction and handover of Improvement Schemes
- IAN 149/11 Existing Motorway Minimum Requirements

1.10 The requirements and guidance within this document supersede or amend paragraphs within the parent DMRB documents and the IANs referred to above. Where this occurs, the superseded or amended paragraph is noted within the text. If the superseded or amended paragraph is not noted, and there is a difference in requirement between this document and the requirements of the equivalent parent DMRB standard or referenced IAN, the requirements and advice given in this IAN must take precedence.

1.11 This document has been developed for use on trunk roads managed by the Highways Agency where motorway regulations apply. Use of this document on roads in circumstances other than the above must be subject to approval from the relevant highway authority.

Implementation

1.12 This Advice Note should be used forthwith for all MM-ALR schemes provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress.

Lane referencing

1.13 The lane referencing used in this document is as follows:

Existing motorway	MM-ALR scheme
Hard Shoulder	Lane 1
Lane 1	Lane 2
Lane 2	Lane 3
Lane 3	Lane 4

Where a hard shoulder is retained as part of MM-ALR e.g. intra-junction where through junction running (TJR) is not proposed, the lane referencing system intra-junction will remain the same as the existing motorway.

Safety management system

1.14 Schemes must be implemented with an appropriate level of safety risk management in order to provide road users, road workers (including Traffic Officers) and third parties with adequate risk protection. Project safety risk management must be controlled by deploying an appropriate safety management system, so determining the activities that make up the safety management system is important for all projects.

1.15 Application of this document is based on the Agency's approach to safety risk and safety risk governance in fulfilling the requirement for safety risk assessment and management as appropriate for the type of project. This is achieved through the use of an appropriate safety management system. For MM-ALR schemes this must be in accordance with IAN 139 Managed Motorways Project Safety Risk Work Instructions and GD 04/12 Standard for Safety Risk Assessment on the Strategic Road Network.

Hazard risk scoring

1.16 Not used.

1.17 A hazard log based analysis has been undertaken on the generic design outlined in this IAN and reported in the "MM-ALR Generic Safety Report", which can be found on the Highways Agency website:

http://www.highways.gov.uk/knowledge/projects/managed-motorways-all-lane-running/

Design strategy record (DSR)

1.18 The departures from standard process provides an auditable record of the decisions made in providing a non-compliant solution. Use of this IAN and IAN 149/11 will eliminate the need for many of the departures from standard previously required for managed motorway schemes. As required by IAN 149/11, a DSR must be used to capture all the significant design decisions and ensures that departures from standard are not considered in isolation. It provides a single auditable record of the design decisions taken in developing a scheme.

1.19 A DSR must be developed as the design progresses, to demonstrate and record strategic and design constraints and decisions, with supporting evidence, in an auditable manner.

1.20 The DSR must be used to demonstrate that the existing accident record and operational and maintenance performance has been considered.

1.21 More information about the DSR process and a worked example can be found on the Highways Agency website:

http://www.highways.gov.uk/knowledge/projects/managed-motorways-all-lane-running/

Departures from standard

1.22 Notwithstanding the requirements given in this document, in some circumstances departures from standards will still be required. Existing features not to standard do not require the submission of a departure from standard.

2 Outline design and operational safety requirements

General

2.1 The Highways Agency's published aims are "safe roads, reliable journeys and informed travellers". A key element in achieving these aims is the implementation of managed motorways.

2.2 Permanent conversion of the hard shoulder to a running lane, along with the ability to dynamically control mandatory speed limits is a key aspect of MM-ALR as detailed in this IAN.

Through Junction Running

2.3 On an MM-ALR scheme, the permanent conversion of the hard shoulder on the main line to a running lane also applies intra-junction. Through junction running is the default junction arrangement for all lane running schemes, with the exception of motorway to motorway interchanges with free flowing link roads. Any alternative proposal (i.e. a lane-drop/lane gain arrangement) will require a compelling, evidence based justification. The assessment must be endorsed by the Project Safety Control Review Group (PSCRG) and accepted by the Roads Programme Steering Group (RPSG).

2.4 Operating a 4 lane motorway without a hard shoulder for long distances is a different experience for road users. It is important therefore to minimise, as far as possible, inconsistencies introduced along the route. With a lane gain/lane drop scenario, particularly if applied at consecutive junctions, long distance, strategic traffic, particularly HGVs, are likely to remain in lane 2. This behaviour reduces lane utilisation, preventing realisation of some of the benefits. The case for four lanes flowing through a junction is therefore not solely about the balance between traffic flows and capacity through the junction. It is also about reducing the need for lane changes before and after each junction and making the motorway easier for the road user to understand.

Where merging and diverging flows are high then this is likely to be reflected in the relevant hazards within the hazard log. This must be assessed and the merge layout reviewed to maximise the merging area.

2.5 At motorway to motorway interchanges with free flowing link roads, the volumes of traffic leaving and joining the motorway require a lane drop/lane gain arrangement, i.e. through junction running is not expected in this situation.

Schemes must consider the junctions at either end, defined as "terminal junctions". Where the adjacent section consists of 4 or more lanes, then the expectation is that TJR will be provided. Conversely, if the adjacent section is 3 lanes or less, then a lane drop/lane gain arrangement is the most appropriate transition, unless there is a scheme in the programme to increase an adjacent section to a 4 lane carriageway, when advice should be sought from the Highways Agency Project Manager.

Refuge Areas

2.6 Refuge areas must be included in the design, providing a place for vehicles to stop during an emergency, (see paragraph 5.14 for the definition of a refuge area).

2.7 Not used.

Outline design

2.8 The generic outline design for MM-ALR is illustrated in figure 2-1 below:

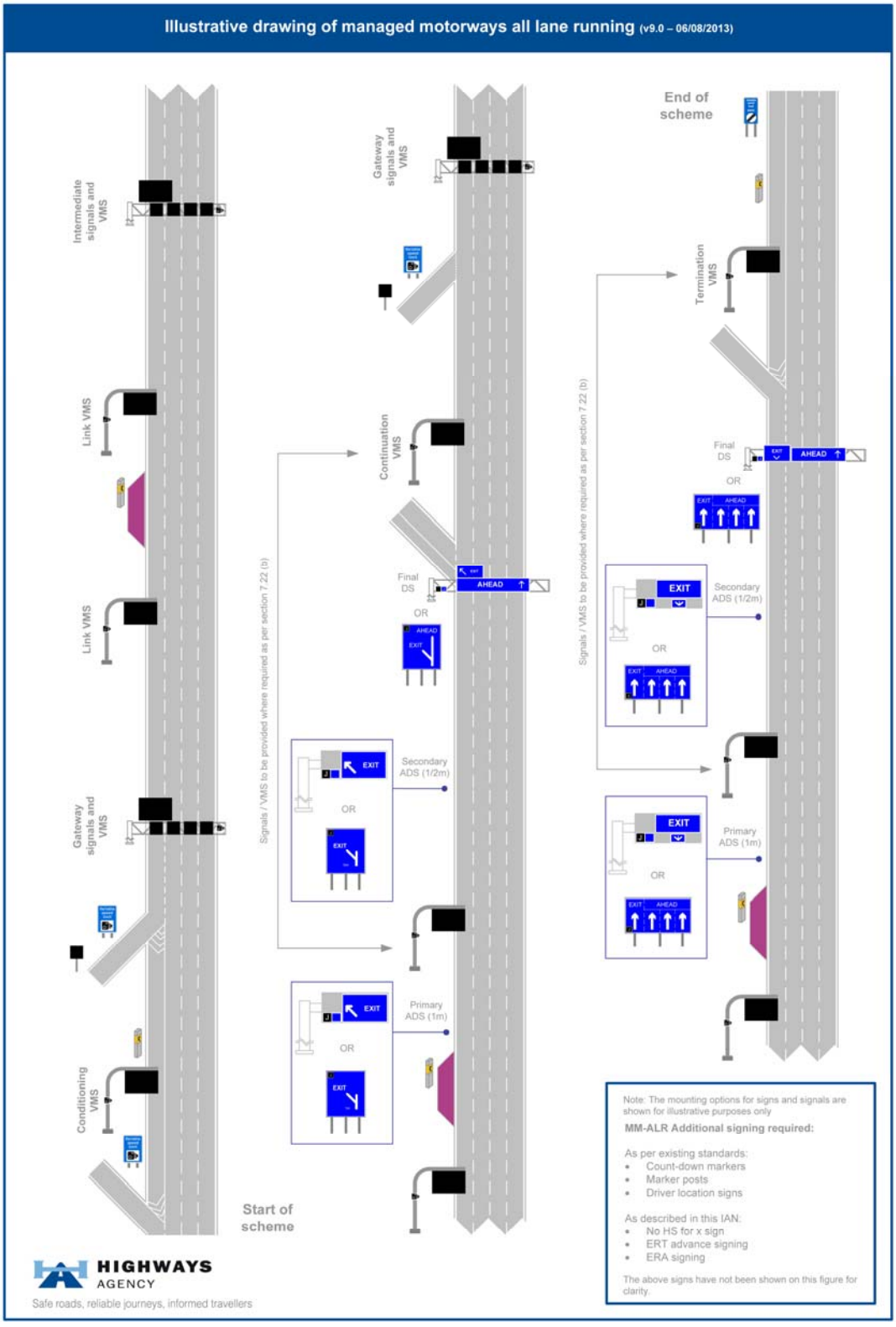


Figure 2-1: Illustrative drawing of Managed Motorways – All lane running
This diagram is indicative, and is intended to give a general overview of MM-ALR and is not a definitive layout.

2.9 The efficient operation of MM-ALR schemes is dependent on:

- compliant driver behaviour, and
- appropriate and relevant information being delivered to the driver at a timely rate, so as not to cause overload of information, or leave the driver in doubt as to what to do.

The infrastructure, technology and procedures put in place enables the network to be managed in a way that delivers a level of driver compliance necessary to support the delivery of performance benefits.

Maintenance

2.10 A MM-ALR scheme must be designed for maintenance (IAN 69) and an appropriate maintenance and repair strategy must be developed. This must place emphasis on the elimination and reduction of maintenance activities and risks.

2.11 The Construction (Design and Management) Regulations 2007 impose a statutory duty to reduce health, safety and welfare risks for, amongst other things, the maintenance of completed schemes.

2.12 The scheme design must reduce risks to road workers so far as is reasonably practicable. Information must be provided on any residual risks to those that will carry out construction or undertake maintenance and operations.

2.13 The Asset Maintenance and Operational Requirements (AMOR) and the Technology Management and Maintenance Manual (TMMM) set out the Agency's requirements in relation to the carrying out of maintenance and operational activities on the network. The Traffic Officer Manual will detail any changes in procedures required for operating MM-ALR.

2.14 With the permanent conversion of the hard shoulder to a running lane on an MM-ALR link, there will be no hard shoulder available for maintenance access or for the setting out of traffic management. All maintenance activities within a MM-ALR scheme must be carried out in a safe manner and are generally expected to be undertaken from either a designated area for maintenance or from a lane closure under traffic management. To minimise the impact of lane closures on network performance, the scheme should be designed to minimise maintenance activities requiring temporary traffic management. The majority of the residual maintenance is expected to be undertaken outside of peak periods.

Provision must be made within the design to support the deployment of post-implementation temporary traffic management. Fixed taper points (FTP) for temporary traffic management must be identified throughout the length of the scheme in accordance with the taper selection requirements stated in section D3.6 of Chapter 8 of the TSM and agreed with NDD. Any signs or signals provided for this purpose must be capable of being remotely operated. This provision does not require a departure from standard but the choice of equipment used must be agreed at PSCRG and the decision making process included in the DSR.

Additional information is provided in the MM-ALR Concept of Operations; with guidance on one potential solution provided in the document: 'Generic Safe Method for Placing TTM on MM-ALR.' and can be found at:

http://www.dft.gov.uk/ha/standards/tech_info/index.htm

Advice from the Highways Agency Project Manager should be sought regarding the specification for remotely operated temporary traffic management signs. Part 3 of Traffic Signs Manual Chapter 8 is being drafted and will expand on the existing guidance for works on wider carriageways D6.13.

2.15 Not used.

2.16 The DSR and maintenance and repair strategy statement must demonstrate that the road worker safety risks have been reduced so far as is reasonably practicable. This must include all temporary traffic management requirements for maintenance access. This is of particular importance for signals and their associated controllers, where there is a need to access lane signals in lanes 3 and 4, and the roadside controller at the same time. Detailed agreement must be reached with all relevant parties on the approach to maintenance of equipment and how this must be provisioned in the design. This must be recorded in the DSR.

2.17 Any proposal for the inclusion of access (including off network access) and/or maintenance hard standings for the purpose of facilitating the maintenance of assets or features must be justified, including safety risk and cost assessment and be submitted to the scheme Project Safety Control Review Group (PSCRG) for review and will be considered on the grounds of operational safety and whole-life cost. Following agreement by the PSCRG, this information must be submitted to the scheme Senior User for agreement and the relevant information included in the scheme Safety Report and DSR.

2.18 Further details and advice on the provision, siting and design of maintenance hard standings is described in TD 69/07 'The Location and Layout of Lay-bys and Rest Areas.'

Health and Safety File – information to be provided

2.19 The Designer is to provide sufficient information for the Health and Safety File to enable any future improvement or change of use of the constructed scheme to be undertaken with the consideration of the design assumptions and the safety objectives of the MM-ALR scheme as required under the direction provided by GD04/12. This is to ensure that the safety critical elements of the original MM-ALR scheme design are not compromised by future improvements or changes in use that was not anticipated as part of the application of this advice note. Documents to be incorporated are to include but not be limited to:

- Design strategy record
- Safety report
- Hazard log report
- Maintenance and repair strategy statement
- Operating regime

3 Highway link design

General

3.1 This section shall be read in conjunction with TD 9/93 (DMRB 6.1) Highway Link Design, and IAN 149/11 Existing Motorway Minimum Requirements.

3.2 The following paragraph in IAN 149 is superseded:
2.2.2

3.3 The following paragraph in IAN 149 is amended:
2.4.4

Design speed relaxations

3.4 The relaxations below Desirable Minimum for the following may be used in combination:

- stopping sight distance
- horizontal curvature
- vertical crest curves
- absolute minimum for sag curves
- superelevation

as described in TD 9 paragraphs 2.8 to 2.13 inclusive, 3.1, 3.2, 3.4 to 3.6 inclusive, 4.9 to 4.12 inclusive and 4.14 to 4.16 inclusive.

This supersedes TD 9 paragraph 1.24 and IAN 149 paragraph 2.2.2.

Road camber

3.5 A minimum distance of 3m in cross section must be provided between changes in crossfall or superelevation within any given cross-section, the exception is at slip road nosings where two changes in crossfall or superelevation are located on either side of the nose.

This amends IAN 149 paragraph 2.4.4, bullet point 4.

4 Layout of grade separated junctions

General

4.1 This section is to be read in conjunction with TD 22/06 (DMRB 6.2.1) Layout of Grade Separated Junctions and IAN 149/11 Existing Motorway Minimum Requirements. This section increases the scope of relaxations provided in TD 22, and gives requirements and guidance for modification of grade separated junctions and interchanges on motorways. Reference should be made to IAN 149 section 3, which details the relaxations that can be applied to reduce the footprint of the slip roads.

4.2 The following paragraphs in IAN149 are superseded:

3.1.3
3.3.2
3.3.3
3.3.4
3.3.9
3.3.10
3.3.11

4.3 The following paragraphs and figure in TD22 are amended:

2.30
figure 2/4.5
4.22

4.4 The upgrading of slip road layouts, where widening would be required, does not normally form part of the implementation of a MM-ALR scheme unless agreed with the Highways Agency Project Manager. In order to achieve the optimal junction layout on an existing motorway, a balance should be reached between what is required by TD 22 and what is achievable within the scheme constraints, whether physical (particularly the existing carriageway area) or value for money. This supersedes IAN 149 paragraph 3.1.3 and 3.3.11.

4.5 The layouts provided in TD 22 apply a consistency across the motorway network, and road users are familiar with the standard layouts. The provision of a substitute layout that differs from that derived from the use of TD 22 figure 2/3 MW and figure 2/5 MW, as described in paragraphs 4.6 and 4.7 of this IAN, is an acceptable relaxation. This supersedes IAN 149 paragraph 3.3.2 and 3.3.9.

Design of merges

4.6 If the appropriate layout cannot be provided in full within the scheme constraints, the layout may be amended by either of the following methods:

a) the Road Class in TD 22 table 4/3 may be relaxed to the 'Rural All-Purpose 120kph' as described in paragraphs 3.4.4 and 3.4.5 of IAN 149. This amends TD 22 paragraph 4.22. The DSR must record the Road Class adopted for each geometric parameter this relaxation has been applied to.

b) where constraints exist (physical, environmental, operational, or financial) the provision of a substitute layout that differs from that defined in TD 22 figure 2/3 MW may be used, and is an acceptable relaxation, with the exception of a merge Layout B or A as a substitute for a Layout F or G must be endorsed at the PSCRG.

The layouts derived from TD 22 figure 2/3 MW and any substitute layouts proposed must be recorded in the DSR. The DSR must also record the constraints on any given layout, justifying the proposal for a substitute layout, and any impacts the proposed layout will have on network performance and safety.

c) no departure is required for the use of Layout H as a substitute for a Layout F. This amends TD22 paragraph 2.30 and figure 2/4.5.

d) a nose ratio that differs from that defined in TD 22 Table 4/3 and TD 22 Table 4/4 is an acceptable relaxation. The proposed nose ratio achieved and the decision making process justifying the proposal and any impacts the proposed layout will have on network performance and safety must be recorded in the DSR. This relaxation may be used in combination with the relaxations listed in sections (a), (b) or (c) of this paragraph.

e) a combination of relaxations as described in 4.6 a) and b) for the geometric parameters and for the type of layout at the same location requires a departure from standard.

This supersedes IAN 149 paragraph 3.3.3 and 3.3.4.

Design of diverges

4.7 If the appropriate layout cannot be provided in full within the scheme constraints, the layout may be amended by either of the following methods:

a) the Road Class in TD 22 table 4/4 may be relaxed to the 'Rural All-Purpose 120kph' as described in paragraphs 3.4.6 to 3.4.8 of IAN 149. This amends TD 22 paragraph 4.22. The DSR must record the Road Class adopted for each geometric parameter this relaxation has been applied to.

b) the provision of a substitute layout that differs from that defined in TD 22 figure 2/5 MW may be used, and is an acceptable relaxation, with the exception of a diverge Layout C, B or A as a substitute for a Layout E and a diverge Layout A as a substitute for a Layout D. Either of these substitutions must be endorsed at PSCRG. The layouts derived from TD 22 figure 2/3 MW and any substitute layouts proposed must be recorded in the DSR. The DSR must also record the constraints on any given layout, justifying the proposal for a substitute layout, and any impacts the proposed layout will have on network performance and safety.

c) a nose ratio that differs from that defined in TD 22 Table 4/4 is an acceptable relaxation. The proposed nose ratio achieved and the decision making process justifying the proposal and any impacts the proposed layout will have on network performance and safety must be recorded in the DSR. This relaxation may be used in combination with the relaxations listed in sections (a) or (b) of this paragraph.

d) a combination of relaxations as described in 4.7 a) and b) for the geometric parameters and for the type of layout at the same location requires a departure from standard.

This supersedes IAN 149 paragraph 3.3.9 and 3.3.10.

4.8 Not used.

4.9 Not used.

Merge over-run

4.10 Paragraph 4.7.5 in IAN 149 does not apply as a MM-ALR scheme does not have a hard shoulder.

4.11 Entry slip roads at junctions with TJR must be assessed to identify an appropriate level of merge over-run provision. The inclusion of over-run provision will not require a departure from standard or aspect not covered by standard to be submitted. Over-run assessment and provision must be included in the DSR and endorsed by the PSCRG.

4.12 At TJR junctions, 'before monitoring' of the existing merges must be carried out, to assess whether drivers currently have difficultly merging. The RCC should also be consulted. Where issues are identified then the results from the over-run assessment must be compared against what has been observed to ensure that the proposed over-run provision is appropriate.

Layout within a junction

4.13 Between the diverge and merge of a junction (intra-junction), MM-ALR schemes may either have through junction running (i.e. four permanent running lanes within the junction, which is the default position) or a lane drop/lane gain arrangement. Paragraphs 2.3 to 2.4 provide information on the assessment of which layout to use.

5 Cross sections, headroom and roadside features

General

5.1 This section shall be read in conjunction with TD 27/05 (DMRB 6.1.2) Cross-Sections and Headrooms and IAN 149/11 Existing Motorway Minimum Requirements.

5.2 The following sections in IAN 149 are not applicable:

4.5.1
4.5.2
4.6.2
4.6.6
4.7
4.7.1
4.7.2
4.7.3
4.7.4
4.7.5
4.7.6
4.7.7
4.8.4

5.3 The following sections in IAN 149 are superseded:

4.6.1
4.6.4

The following section in IAN 143 is not applicable and as such does not require a departure from standard:

Section 3, 4th paragraph, 2nd sentence '*Where there are no Non-Motorised User issues, such as some motorway widening without impacts on side roads or public rights of way, a Departure from Standard for exemption from HD 42/05 should be applied for.'*

The following sections in TD27 are superseded:

4.11.13

The following sections of TD19 are superseded:

3.15
3.37

Verges, edge detail and omission of hard shoulder

5.4 MM-ALR utilises the full carriageway by permanently converting the hard shoulder to a running lane. Where there is no edge restraint, such as a kerb or drainage channel then a nearside 500mm hardstrip and 300mm offside hardstrip must be provided, as a minimum, for both flexible and rigid pavements. The nearside dimension may be relaxed to 300mm but must be endorsed by PSCRG. If a drainage channel is provided adjacent to a concrete carriageway then the drainage channel must be tied to the carriageway pavement. The omission of a hard shoulder does not require a departure from standard.

The requirement to hatch an emergency access width/hard strip does not apply where a hardshoulder has been converted into a running lane and a hardstrip is also provided

due to the available cross section. Where a hard shoulder is present on an entry slip road, this will need to be hatched where the width drops below 3m and the hatching should terminate at the entry datum point. Where a hard shoulder is present on an exit slip road, this will need to be hatched from the exit datum point to where the width becomes greater than 3m.

5.5 There must be no loose stone, or filter drain material within 1000mm of the trafficked edge of the carriageway edge line, proprietary methods of stabilisation may be used, the decision making process for the method of stabilisation must be recorded in the DSR.

Traffic lane widths

5.6 The minimum dimensions for traffic lane widths are given in table 5-1. These dimensions are for converting a 3 lane motorway with a hard shoulder to a 4 lane MM-ALR motorway and must be measured as per TD 27. This supersedes IAN 149 paragraph 4.6.1.

5.7 The hierarchy for increasing lane widths is to allocate additional width to Lane 2, then Lane 3 and finally Lane 4. This supersedes IAN 149 paragraph 4.6.4.

Re-locating the lane lines may result in the proposed wheel tracks moving over the existing longitudinal joints in the final solution. The impact on the joints in both the surface and the binder course, and mitigations must be recorded in the DSR. The longitudinal joints being located within the wheel track does not require a departure from standard.

Where the lane width is not equal to the standard lane width as specified in TD27 the location for the wheel tracks shall be in accordance with the requirements of SHW Clause 921 and centralised in the lane.

Lane 1 (m)	Lane 2 (m)	Lane 3 (m)	Lane 4 (m)
3.65	3.50	3.40	3.20

Table 5-1: Minimum dimensions for traffic lane widths

Central reserves

5.8 Minimum central reserve widths are as shown in table 4-1 of IAN 149.

5.9 Reductions in central reserve width must be applied as described in IAN 149 paragraphs 4.4.2 to 4.4.5.

5.10 If works are undertaken in the central reserve, the use of unbound material as the surface treatment should be avoided, and where it is included the material should be stabilised. The materials used must be agreed at PSCRG and the decision making process must be recorded in the DSR.

Vehicle Restraint System (VRS) set back

5.11 The set-back is the lateral distance between the traffic face of a safety barrier and as appropriate:

a) nearside: the back of the nearside hardstrip (greater than 600mm) or hard shoulder
b) nearside: the kerb face for roads without a nearside hardstrip (or hardstrip less than 600mm) or hard shoulder
c) nearside: the trafficked edge of the edge line for roads without a hardstrip (or hardstrip less than 600mm), hard shoulder or kerb.
d) offside: the trafficked edge of the edge line or the kerb face where there is no edge line

On the nearside where there is no hard shoulder and the hard strip is less than 600mm wide, then the setback must be measured from the trafficked edge of the edge line.

The minimum dimensions to be used are given in table 5-2.

Location	Desirable minimum set-back value(mm)	Available relaxations at sites described in footnotes
In verges with no adjacent hardstrip or hard shoulder (i.e. < than 600mm width hardstrip)	1200	Note (i), (ii), (iv)
In verges with an adjacent hardstrip or hard shoulder (i.e. >=600mm width hardstrip)	600	Note (iii)
Central reserves	1200	Note (i), (ii), (iv)

Table 5-2: Set-back

Notes
The Highways Agency may, where justified, consider relaxations to set-back as follows:

i. relaxation to 600mm for roads of speed limit 50mph or less (including temporary mandatory speed limits).
ii. relaxation to 600mm at existing roads with physical constraints (e.g. a structure) where it would be difficult to provide the desirable value.
iii. relaxation to 450mm will be permitted where it is considered necessary to position the VRS away from the edge of an existing embankment in order to provide support to the foundation.
iv. relaxation to 1000mm will be permitted where space is limited for extended lengths.

If the reduction in setback creates a forward visibility departure (below the relaxations allowed in Section 3), then a departure must also be submitted for the reduction in setback. The application of a relaxation in setback must be recorded in the DSR.

For the purposes of measurement of set-back, an ERA shall be treated as hard shoulder. This supersedes TD 27 paragraph 4.11.13.

Vehicle Restraint Systems (VRS)

5.12 The achievement of the road worker safety objective is likely to be reliant on the reduction of unplanned maintenance activities provided by the provision of the central reserve concrete barrier. A central reserve rigid concrete barrier must be provided on all MM-ALR schemes in accordance with TD 19, unless the road worker safety objective can be met by an alternative mitigation. A paved central reserve is the preferred option but this does not preclude the use of a soft central reserve, or a combination of both. An assessment must be made of the benefits/disbenefits of both options to establish the appropriate solution. The chosen construction type for the central reserve must be endorsed by PSCRG and recorded in the DSR. Where a paved central reserve is provided it may be desirable to provide a near side hard strip in excess of that described in section 5.4 if the cross section can support this.

If in an emergency a road user is unable to reach a refuge area, they may consider pulling their vehicle onto the verge. For this reason, although gaps between sections of VRS of less than 20m must be closed, larger gaps should not be closed.

This supersedes TD 19 paragraph 3.15.

At the top of slip roads where post mounted entry slip signals (ESS) are included within the scheme, the lack of protection by VRS, or for not providing the full lead in length, does not require a departure from standard. Each site must be assessed and the decision to either provide (including the amount of provision) or not provide a VRS and the decision making process must be recorded in the DSR.

5.13 Full height anchorages must only be used at ERA locations where VRS is required and, where there is insufficient room for a 10m full height overlap of VRS. They must not be used facing oncoming traffic, unless behind another restraint system.

Refuge areas

5.14 A refuge area is defined as a place (or facility) where drivers can stop in an emergency.

Appropriate refuge areas are:

- a motorway service area
- a hard shoulder on an exit slip/link road
- a hard shoulder within a junction (lane drop/lane gain only)
- a bespoke facility, such as an emergency refuge area (ERA)

5.15 The following features must not be considered formal refuge areas:

- maintenance hard standings, unless they meet the requirements presented in paragraphs 5.26 to 5.43
- verges
- hard shoulders on entry slip roads

5.16 Emergency roadside telephones (ERT) must only be provided at:

- a hard shoulder within a junction (lane drop/lane gain only)
- an emergency refuge area (ERA) - see paragraph 5.26 to 5.43

This amends TA 73 paragraph A2.2.

5.17 Not used.

5.18 Marker posts must not direct users to ERTs unless there is a continuous hard shoulder between the marker post and the ERT.

Refuge areas on links between junctions

5.19 On links between 'through junction running' junctions at least one refuge area must be provided, where the distance between the tip of the merge nose of the upstream junction and the tip of the diverge nose of the downstream junction is more than 1.5km. On link lengths greater than 1.5km where refuges are not proposed then it must be endorsed by PSCRG and recorded in the DSR

5.20 If the upstream junction is diverge only, this distance must be measured from the tip of the diverge nose.

Refuges on exit slip/link slip roads

5.21 The refuge, which may be a hard shoulder, must be a suitable length and width of bound surface and will wherever possible be an existing made surface that provides a safe area of refuge and can be safely entered and exited. The refuge area must be in the field of view of a PTZ camera. The decision making process regarding the location, layout and construction must be recorded in the DSR. No additional ERTs are to be provided on exit slip/link roads.

Refuges within a junction

5.22 The area within a junction may be considered a refuge area if:

- there is a suitable length and width of hard shoulder, that provides a safe area of refuge, that can be safely entered and exited. The decision making process must be recorded in the DSR.
- an ERT is provided next to the above area. The ERT should not be conspicuous from the slip roads so as to discourage pedestrians from crossing the carriageway. The ERT should be located away from the back of diverge nose where vehicles could overrun onto the hard shoulder.

5.23 Where there is no available hard shoulder within a junction, an ERA may be provided if the distance between the tip of the diverge nose and the tip of the merge nose is more than 1.5km and it satisfies the requirements of paragraphs 5.26 to 5.45. The ERA should be centrally positioned between the merge and diverge (subject to SSD mitigation requirements) and feature an ERT to discourage pedestrians walking from the ERA. The decision making process must be recorded in the DSR.

Frequency of refuge areas

5.24 Throughout an MM-ALR scheme, refuge areas must be provided such that a road user never has to drive more than 2.5km from a decision point to a refuge area. A decision point can either be an ERA or the nose of an exit slip. Between ERAs, the distance should be measured between the stopping area within each adjacent refuge area, e.g. not from the end of the tapers. Where an MSA, or a hard shoulder on an exit slip road

has been identified as a refuge area, the distance should be measured to the location where a vehicle can safely stop within the MSA or on the exit slip road hard shoulder. When measuring from these locations the distance should be taken from the decision point, i.e. the diverge nose to the next safe area of refuge.

5.25 The 2.5km distance may be extended where it can be justified on safety, cost, stakeholder and environmental grounds, and endorsed by the PSCRG. This must be recorded in the DSR.

Emergency refuge areas (ERAs)

5.26 ERAs may either be bespoke facilities or converted from an existing facility, for example a wide load bay.

5.27 ERAs on steep gradients or immediately upstream of a steep gradient should be avoided wherever practicable.

5.28 Where ERAs are located on gradients greater than 2% or immediately upstream of a gradient greater than 2%, the designer must determine that the frequency and presence of refuge areas is appropriate from a safety and network performance perspective. The decision making process must be endorsed by the PSCRG and recorded in the DSR.

5.29 An ERA must not be located between the ½ mile (or ⅓ mile) ADS sign and an exit slip road. This requirement is to prevent road users confusing the ERA for an exit slip road.

5.30 An ERT must be provided at each ERA. The ERT should be located next to the mid-point of the main stopping area of the ERA. If a vehicle restraint system is located adjacent to the ERT there is no requirement to provide access as per Figure 3.11 TD19/06, providing the ERT installation is designed for access over the restraint system.

This supersedes TD 19 Clause 3.37.

5.31 Access to the ERT must be provided for mobility impaired road users.

5.32 Where ERTs have to be staggered, then an assessment of the risk of pedestrians crossing the motorway must be undertaken and detailed in the DSR. Consideration should be given to appropriate mitigation. Where concrete barrier is installed the risk of pedestrians crossing the carriageway is reduced, as the concrete barrier acts as a mitigation removing the need to locate the ERAs and hence ERTs opposite each other. This supersedes TA 73 paragraph A2.2.

5.33 The design length for an entry taper should be 25m. If an ERA is unoccupied a driver will be able to use the stopping area, or potentially even part of the exit taper, to bring the vehicle to a standstill.

5.34 The design length for the stopping area should be 30m. This will provide room for multiple vehicles, in particular to allow an HGV to be recovered by an HGV recovery vehicle.

5.35 The design length for the exit taper should be 45m.

5.36 If space permits then the desirable width of an ERA is 4.6m, although the minimum permissible width is 4.0m. The decision making process must be recorded in the DSR. Notwithstanding this, the width of the ERA should be such that:

- any planned maintenance activities from the ERA can be carried out safely without traffic management in the live lanes.
- that a HGV parked at the end of the stopping area can rejoin the carriageway without encroaching into lane 2.

5.37 Where ERAs are located on gradients greater than 2% then the designer must determine that the above dimensions are appropriate, and whether any additional mitigation is required. The decision making process must be endorsed by the PSCRG and recorded in the DSR.

5.38 The ERA must be surfaced in accordance with HD36/06. The construction type should be the same as that of the adjacent carriageway but a reduced pavement thickness, designed to 5msa, is acceptable. Concrete may be used for ERA construction provided sub-base drainage is maintained. This does not constitute a departure from standard but must be included in the DSR.

5.39 Each ERA must have the following signs:

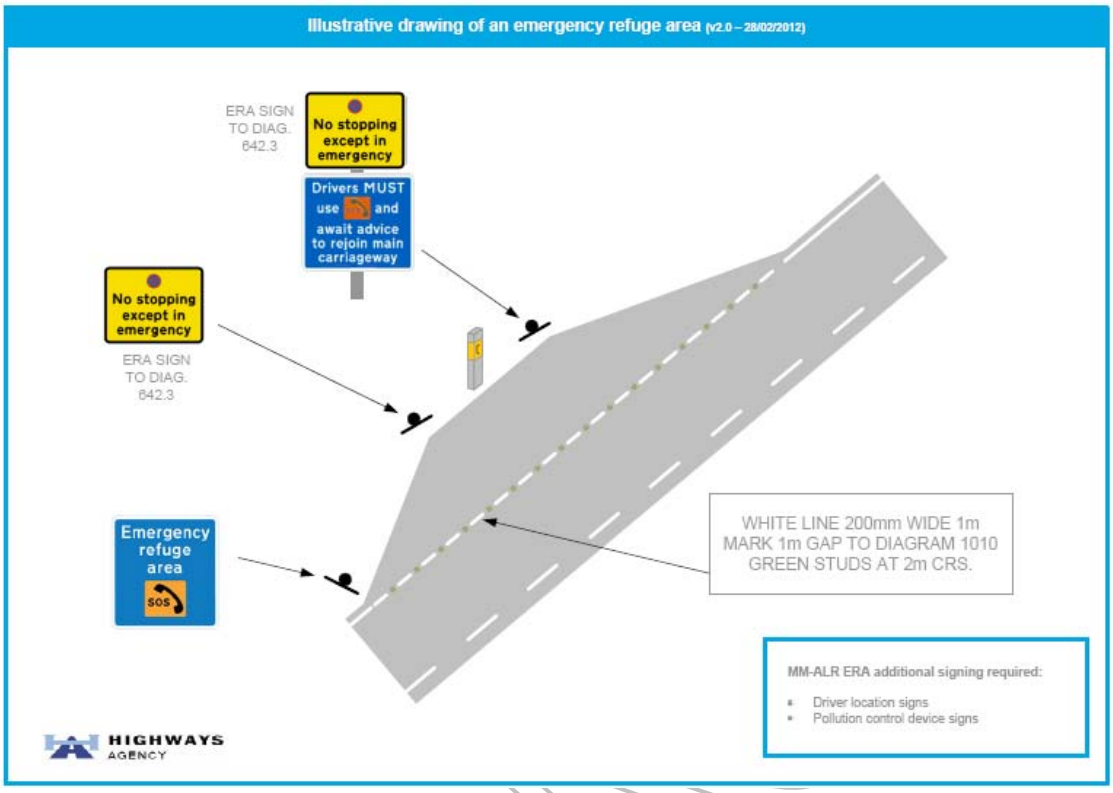
- "No stopping except in an emergency" (2 no.) TSRGD diag 642.3.

- NP 2938 "Emergency refuge area" with SOS phone picture (1 no.)

- TSRGD diag 2713.1 Advanced SOS phone signing must be provided ½ and 1 mile or $^{1}/_{3}$ and $^{2}/_{3}$ mile upstream of each ERT. Where it is difficult to place signs in accordance with the above combinations, then the distances may be varied in accordance with TSRGD Schedule 16, item 6.

- NP 2937 “Driver must use SOS phone and await advice to rejoin main carriageway” (1 no.)

- Driver location signs must be located next to an ERA, co-located with the existing distance marker post. If the distance marker post is not located in the ERA, then a supplementary driver location sign must be provided within the ERA. The sign should be clearly visible from the ERT.



5.40 No road markings are required within an ERA.

5.41 Between the ERA and lane 1, the carriageway markings must be to diagram 1010 and incorporate green road studs in accordance with Chapter 5 of the Traffic Signs Manual (TSM).

Stopping sight distance

5.42 Sufficient stopping sight distance (SSD) for vehicles entering and exiting the ERA is required. A one step relaxation below desirable minimum as defined in chapter 2 of TD 9/93 is acceptable and the proposed SSD must be recorded in the DSR.

5.43 The SSD shall be measured from the start of the exit taper, 2.4m back from the traffic edge of the 1010 edge line, to an object height of 1.05m. Entry SSD shall be measured from the centre of lane 1 to a point perpendicular to the ERT, 2.0m back from the traffic edge of the 1010 edge line, to an object height of 1.05m, measured at the midpoint of the full width section of the ERA.

Other issues

5.44 There is no requirement for lighting an ERA.

5.45 No monitoring loops or other detection system are required within an ERA, however the full extent of each ERA must be fully included within the field of view of a PTZ CCTV camera and the associated ERT must represent a minimum of 10% of screen height.

5.46 Maintenance access to equipment from ERAs is beneficial but considered to be of secondary importance to paragraphs 5.14 to 5.43 above and should be provided whenever the primary requirements for the preferred location are not compromised and can be justified in accordance with paragraph 2.17.

Observation platforms and abnormal load bays

5.47 Where an existing observation platform is present adjacent to an MM-ALR running lane, then this must be removed. Observation platforms should only be re-instated on an MM-ALR scheme if there is a strong justification following consultation with the users of the platform and other relevant stakeholders including NDD/TMD and VOSA. Where an observation platform is to be re-instated the layout of the platform should be in accordance with TA66/95, and should be co-located with an ERA. Observation platform proposals should be endorsed by the PSCRG.

Where an existing abnormal load bay is present adjacent to an MM-ALR link, then this must be closed off with a vehicle restraint system or removed unless provision can be made for safe and effective operation following consultation with NDD/TMD and other relevant stakeholders. Alternatively it could be reconfigured into an ERA. When this facility has to be removed an alternative suitable location should be provided following consultation with NDD/TMD and other relevant stakeholders unless it is agreed that the need for a facility can no longer be justified. Abnormal load bay proposals should be endorsed by the PSCRG.

Pavement (Non ERAs)

5.48 Structural assessment of the hard shoulder must be carried out before it is used as a running lane following the principles in HD29. A deflectograph survey no more than 3 years old must be used for the assessment, unless a Traffic Speed Deflectometer survey no more than 3 years old shows all of the data to be within category 1 or category 2 condition and there are no visible signs of structural deterioration such as rutting and longitudinal cracking. A visual inspection of the surface must also be undertaken, this may be via a HD video survey.

5.49 Where hardshoulder widening is required, the new pavement layer thicknesses should be designed in accordance with DMRB Volume 7 HD26/06 and IAN73/06 Revision 1. The same pavement layer thicknesses may be used for both bound and unbound materials. Care must be taken to ensure continuity of sub surface drainage. Equivalent materials should also be used to match those currently in place. Hydraulically bound mixture must not be placed beside unbound materials, where the continuity of sub surface drainage would be affected.

6 Technology

General

6.1 Where available through Highways Agency bulk purchase, roadside technology provided for MM-ALR must have the functionality to enable software to be upgraded, faults to be diagnosed and equipment reset, remotely. This will assist in minimising risk exposure to road workers, and traffic management costs, through reducing visits to the roadside.

6.2 Where existing technology is required to form part of an MM-ALR scheme it must be compatible with the transmission protocol implemented as part of the scheme. Where this existing equipment is not compatible it must be upgraded or replaced.

Vehicle detection system

6.3 This section should be read in conjunction with TD 45/05 and HD 20/05.

6.4 The following clauses in HD 20/05 are superseded:

3.9
3.11
3.12

6.5 A vehicle detection system must be provided, to include all running lanes, to support; traffic counting, classification, queue protection, VMSL and congestion management.

6.6 It is not the intention of this IAN to limit detector technologies that can be deployed in place of inductive loops.

6.7 Where non-loop based detection technologies are considered for MM-ALR scheme's vehicle detection system, it must not compromise the required functionality of that vehicle detection system. The technology must be approved for use for the required application(s) and documented performance capability must be provided. Advice of the Highways Agency Project Manager must be sought.

6.8 Positioning and spacing are the two steps that are taken sequentially in determining the locations of detector sites for the vehicle detection system. These are defined as follows:

a) positioning is determining the location of a detector site in relation to a signal; and
b) spacing is determining the location(s) of detector sites between signals

6.9 The objective is to position detectors where they are required to detect traffic queues. Where inductive loops are used, each signal site should have detector loops located 10m upstream of it; so that the signal settings relate as closely as possible to the traffic conditions. This signal is referred to as the 'reference signal' for those loops. If this cannot be achieved due to site constraints or as a result of design optimisation, then they must be provided within 50m upstream to 10m downstream of the reference signal.

6.10 Paragraphs 6.8 to 6.18 apply to inductive loops. They, however, also indicate the level of provision required should an alternative to inductive loops be used.

6.11 Not used.

6.12 Detector sites must be spaced as follows:

a) sites between reference signals must be spaced at regular intervals of 500m +100m/-200m
b) the overall average detector site spacing for a scheme must be 500m +50m/-100m

6.13 The detectors on exit slip roads must be provided ideally 100 metres downstream, but as a minimum not less than 50 metres downstream of the diverge tip of nose, or if provided, within 10 metres of exit slip signals.

6.14 For exit slip roads the following requirements should be considered:

a) that there is sufficient distance from the diverge tip nose to the detector site, such that exiting vehicles can safely stop without advance warning of a queue that is slightly short of the loop;
(b) that the detector is located at such a distance from the top of the slip (ideally at least 100m) that there is sufficient queue to justify setting a 'Queue on slip' message before it triggers; and
(c) where feasible they are cabled to the same cabinet as the nearest main carriageway detector site.

6.15 On entry slip roads, the detectors must be provided at a point downstream of entry slip signals and at a minimum distance of 100 metres upstream from the merge tip of nose. Where feasible they should be cabled to the same cabinet as the nearest main carriageway detector site. Detectors must not be sited downstream of the final lane gain or merge information signs.

6.16 Within motorway to motorway link roads, detectors must be provided at a minimum distance of 100 metres from the diverge and merge nose tips. Between these two sites the requirements in paragraph 6.12 apply.

6.17 Where provided, inductive loops must be located to ensure the maximum loop feeder length does not exceed a measured length of 200m.

6.18 Detector sites in the vicinity of junctions where ramp metering is to be installed or retained should be positioned in accordance with the guidance in MCH 2470.

Road user compliance

6.19 Each MM-ALR scheme must develop a compliance strategy. This will identify any enforcement requirements that need to be included in the scheme. In order to display variable mandatory speed limits a Statutory Instrument must be in place.

Site data

6.20 Site data must include the implementation of speed and flow threshold levels (rising and falling) for congestion management algorithms to set speed limit aspects.

6.21 Applications for site data changes should be made at least 1 year in advance of the requirement to allow for inclusion in the Software Maintenance Contractor programme.

6.22 MCH 1596 provides guidance on the procedures to be followed when planning and implementing changes to site data.

Transmission system

6.23 The existing transmission infrastructure and ducts, must be used wherever practicable. The philosophy adopted for the design of the transmission system must be logged in the DSR.

6.24 Early liaison must be carried out with the HA NRTS team and the NRTS contractor in order to ensure that the transmission system design meets the requirements of the scheme. The impact of the scheme on access and egress to transmission stations and other NRTS assets should be assessed early in the design process.

6.25 A guide to working with the NRTS Contractor (GYS/RGD/USG/0038) can be found on the NRTS website www.nrtsco.com.

Cabinets

6.26 With the exception of HADECS cabinets, all cabinets provided for MM-ALR must be those available from HA Bulk Purchase. A departure from standard must be sought if non bulk purchase equipment is to be used. Advice should be sought from the Highways Agency Project Manager for HADECS cabinet requirements.

Looming in 600 cabinets must only be provided to support the equipment installed as part of an MM-ALR scheme.

Ambient light monitors (ALM)

6.27 Ambient light monitors (ALM) must be provided at appropriate intervals to control the brightness levels for the VMS and lane control signals. As a minimum, ALMs should be provided at each gateway and intermediate gantry.

CCTV general surveillance

6.28 TD 17/85 and MCH 2530 provide information on CCTV general surveillance.

6.29 Pan tilt zoom (PTZ) CCTV coverage of the main carriageway, refuge areas and maintenance hard standings (where provided) must form part of a MM-ALR scheme.

6.30 PTZ CCTV cameras deployed for MM-ALR schemes must provide full coverage of the mainline carriageway running lanes, with no blind spots. This can be achieved by making use of the cameras pan, tilt and zoom capability where provided. The coverage must be such that an operator can interpret correctly the nature of each incident within the designed viewing range at all times of day and night, and in all ambient lighting levels whether the carriageway is lit or not, as they will be used to confirm the location of incidents on the main carriageway. To achieve this, at the extreme of the required coverage and maximum zoom, a 1.75m target should represent a minimum of 5% of screen height. Refer to paragraph 5.45 for the requirements for ERAs.

The designer must determine the locations of cameras required for daytime and night time conditions. This may be determined using an elevated CCTV survey that uses the low light camera supplied by the Highways Agency. Camera locations should be agreed

with the RCC.

6.31 The designer must consider whether existing PTZ CCTV cameras can be used to provide full coverage.

6.32 The location for the mounting of PTZ CCTV cameras is not stipulated and must be determined to provide full coverage (see paragraphs 6.30, 6.31 and 6.34) whilst taking into account environmental considerations, image stability, and whole life costs including providing adequate maintenance access. Where cameras are co-located with signals a shared foundation should be used where practicable.

6.33 Not used.

6.34 CCTV coverage must include refuge areas (except at Motorway Service Areas (MSAs)), ERTs, and maintenance hard standings (where provided).

6.35 Information must be provided to the operator so that they have confirmation of its reference number and geographic location.

Ramp metering

6.36 Existing ramp metering sites, within a proposed managed motorway scheme, must be re-assessed to determine if the criteria for ramp metering provision will be met following the implementation of the MM-ALR scheme. Advice is available from the Highways Agency's ramp metering task force.

6.37 If it is determined that, following the MM-ALR scheme implementation, the ramp metering site meets the criteria for provision the following actions must be carried out:

a) commissioning of new MIDAS outstation auxiliary link (OAL) if new or different MIDAS outstations are to be used for the ramp metering site
b) re-configuration of the ramp metering controller (RMC) to take account of changes to the MIDAS design
c) re-calibration of the RMC to account for changes in traffic conditions and road layout as a result of the managed motorway scheme implementation.

6.38 Should changes be required to either the ramp metering equipment and/or the road layout, then these need to be evaluated and assessed against the benefit of retaining the ramp metering site. If the cost of changes to the road layout and/or ramp metering equipment is greater than the economic benefit provided, then advice must be sought from the Highways Agency Project Manager to determine the extent to which the ramp metering site should be decommissioned or even removed. This should be a joint decision between the Highways Agency's Project Manager, the ramp metering task force and the NDD region concerned.

6.39 Not used.

Lighting

6.40 For MM-ALR schemes where the motorway is not currently lit, lighting shall not be considered.

6.41 Where it is identified that existing sections of lighting within a managed motorway scheme are no longer justified, the processes for removal of all lighting columns shall be

implemented. If this is not practicable without additional traffic management, then the lighting should be switched off until such time it can be removed in conjunction with other works.

6.42 Sections of lit motorway need to be assessed individually in order to ascertain as to whether they should remain lit. Schemes should be divided up in to sections as follows:

at junctions:

- 1.5 times the sight stopping distance to the give way line on the junction gyratory or intersection with a minor road
- the maximum length of slip road that can be lit without the need to light the main carriageway
- up to 300m upstream of the ½ mile ADS
- up to 300m upstream of the 1 mile ADS

on motorway links:

- the link length between up to 300m upstream of the 1 mile ADS of the upstream and downstream junctions.

6.43 Each section shall be assessed in accordance with the core TA 49/07 principles (of running costs versus predicted accident savings) to identify which sections need to remain lit. The data used for predicted accident savings to be applied in this case will only be the ones where the contributory factors (or absence of contributory factors) over the last 5 years of data give good reason to indicate lighting may potentially be beneficial (for example – excluding accidents involving drink, drugs, suicide, vehicle failures (e.g. tyre defects, brake failures), mobile phones, excessive speed, or compounded contributory factors such as following too close and too fast for conditions and swerved and sudden braking). If the evidence suggests the original justification for lighting may no longer be appropriate, the TA49/07 appraisal process will provide the evidence for this conclusion to support a risk based decision to remove lighting.

6.44 The TA 49/07 appraisal should consider or include the following:

- a BCR of 1.0 or greater shall be achieved in order to justify lighting.
- only accident savings of 24% on slip roads and 10% on the main carriageway shall be used unless substantive evidence to the contrary can be provided.
- a route lighting plan shall be developed that strikes a balance between operating the minimum length of lighting and avoiding excessive transitions between lit and unlit sections for the road user.

6.45 Where lighting is not economically justified, in accordance with the core TA 49/07 principles (or the fully compliant TA49/07 criteria are not achieved), advice from the Highways Agency Project Manager should be sought regarding lighting removal on an MM-ALR scheme. IAN167/12 provides a process for removal of lighting as it approaches the end-of-life. Many of the steps provided by this IAN can also be applied to the lighting removal with the introduction of MM-ALR. IAN167/12 supports a risk based approach to removal and monitoring. Applying IAN 167/12 does not require a 12 month monitoring period following a switch-off, where other works to the central reserve are required.

6.46 Where lighting is economically justified, through the Project Appraisal Process (PAR) as guided by TA 49/07, it shall be primarily designed for minimum on-road maintenance.

6.47 Where new lighting luminaires on existing columns are justified the minimum lighting levels shall be:

- ME3a (M3) where junction separation is >3km
- ME2 (M2) where junction separation is <3km (or equal to 3km)
- no area/section shall be lit as a conflict area

Use of high S/P ratio luminaires may allow increased flexibility for revised lighting levels when re-using existing column locations.

6.48 Where new lighting is justified and is to be installed, it must be:

- remotely controlled. That is, lanterns must be equipped with control gear compatible with a central management system (CMS) allowing remote diagnostics, dynamic dimming and switch off. Liaison with the maintenance service provider is required to identify whether there is an existing CMS system that can be adopted or modified, or whether a new CMS system is required to support the MM-ALR scheme.
- fitted with a light source that has a predicted life-time in excess of the electrical test interval, thereby reducing the requirement for non-scheduled maintenance visits.

6.49 In order to minimise costs, departures from the minimum lighting levels, overall uniformity and longitudinal uniformity shall be considered, if it results in use of the existing lighting, without alteration. Light levels up to 5% below requirement level and/or overall uniformity down to 0.39 and/or longitudinal uniformity down to 0.6 will not require a departure from standard but must be recorded in the DSR.

Lighting levels on the hard shoulder for MM-ALR using existing columns (where the hard shoulder becomes lane 1) may be lit at 1 cd/m^2 where longitudinal uniformity is greater than or equal to 0.6 without the need for a departure from standard. This should be recorded in the DSR. The decision on whether new lighting columns should be located in the verge or the central reserve must be endorsed at PSCRG and included in the DSR.

Power and communications infrastructure

6.50 There should not be a presumption that there will be a wholesale replacement of technology infrastructure as part of a MM-ALR scheme. Wherever practicable, existing power and communications infrastructure must be re-used.

The designer shall ascertain load requirements for equipment sites and the design of the power distribution network must reflect these requirements.

This supersedes Part 1 TA 77/97 Annex A, A6.6 Design - Equipment Loads.

6.51 Each type of electrical equipment on a gantry must be capable of being isolated independently from all other electrical circuits. This is to ensure that equipment such as CCTV, control signals, enforcement equipment and VMS units all work normally when sign lighting is switched off for maintenance. The Gantry Main Switch must isolate all mains voltage powered equipment on the gantry.

6.52 Super-span portal gantries must be capable of being isolated from either carriageway.

6.53 Cables for inductive loop detectors from the far carriageway must be routed via cross-motorway ducts where they exist and are proven. Where such ducts do not exist, consideration must be given to slot cutting across both carriageways.

Security

6.54 Not used.

6.55 The designer should consider, in conjunction with the Senior User, the vulnerability of MM-ALR schemes to metal theft and the impact this type of theft would have on the integrity of the scheme. Schemes must undertake a metal theft risk assessment to define and evaluate the risks they face from metal theft.

The risk assessment process should evaluate vulnerability based upon the attractiveness, remoteness, accessibility and removability of metal infrastructure locations. The impact should be assessed based upon the level of disruption, safety, cost and reputational impact that would be realised from thefts at these locations. The vulnerability and impact scores should then be combined to give a metal theft risk score for each metal infrastructure location. Based on the overall risk profile for a scheme, mitigation measures should then be selected and prioritised.

Mitigation measures should be selected and implemented, based upon best practice, in conjunction with the Senior User, to proportionately reduce metal theft risk, with a focus on those locations assessed to be high priority.

7 Signals and signs

General

7.1 This section shall be read in conjunction with TD 46/05 (DMRB 9.1.1) Motorway Signalling and IAN 149/11 Existing Motorway Minimum Requirements.

7.2 Variable message sign (VMS) and direction signs associated with a junction will normally be verge mounted, however where existing portal gantries are present then the designer must first consider re-using this existing infrastructure.

7.3 Not used.

Direction signing

7.4 Direction signs must be located as described in figures 5-8 to 5-12 in IAN 149, and to the tolerances contained therein. The datum point should be defined as 200m upstream of the start (tip) of the diverge nose for Type E Diverges in accordance with TD 22/06 and used for MM-ALR layouts. There is no requirement to provide gantry mounted confirmatory signs (TSRGD diag. 2908, 2908.1 or 2909) or confirmatory signs (TSRGD diag. 2910 & 2910.1), however if these are currently installed they may be retained and their location adjusted (where required) to reflect the changes introduced by the scheme.

7.5 The amount of information shown on ADS will be dependent on the junction type.

7.6 For direction signing, other than the final direction sign, verge mounted signing should be used to minimise the need to implement temporary traffic management for maintenance of the sign. Overhead direction signing (e.g. mounted on a cantilever) may be used where operationally it is considered more appropriate to do so. Factors that can influence this are:

- complex junction layout
- insufficient verge space for verge mounted signs
- physical site constraints, e.g. the horizontal or vertical alignment of the road would block forward visibility to a verge mounted sign
- very high traffic flows or high percentage of HGVs leading to the risk of sign obscuration

7.7 The signing strategy must be agreed with the Highways Agency, and recorded in the DSR.

Verge signs

7.8 Countdown markers, marker posts and driver location signs must be provided in accordance with existing Highways Agency standards and advice unless otherwise stated in this document. Existing driver location signs with an x-height of 115mm can be retained on an MM-ALR scheme. New driver location signs installed as part of an MM-ALR scheme may also have an x-height of 115mm.

7.9 A ‘Refuge areas for emergency use only’ (NP 2935) sign must be provided in the verge, downstream of the merge, at the end of each entry slip road, in a suitable location.

7.10 NP 409 'Variable speed limit' signs must be provided at all gateways to the scheme. On the mainline, link roads, and interchange links, signs should be placed as close as practicable to 250m in advance of the first VMS. On entry slip roads the sign should be located in the nearside verge before the nose taking into account the existing verge infrastructure. Where constraints prohibit the sign being located in the nearside verge then the sign may be located in the offside verge. Only one sign is required at each entry slip location. Only one sign in the verge is required on the mainline. NP 409 sign is shown below and is a non-prescribed sign that has been Nationally Authorised. It should be noted that NP409 (Variable speed limit) has a standard 'x' height of 250mm, with two permitted variant sizes of 200mm and 150mm.

Where space is limited it is acceptable to co-locate the 'Variable speed limit' sign with the 'No hard shoulder' sign. The total reading time for both signs should not exceed two seconds and the minimum clear visibility distance must be provided. The impact of other signs in front of and behind the co-located signs must also be taken into account.

7.11 Enforcement camera sign (TSRGD diagram 879) must be provided at each signalling location.

7.12 Non prescribed combined fixed "Variable Speed Limit ENDS"/national speed limit signs to NP 409.1 must be provided at the exit points from the scheme, on the mainline, link roads and interchange links. There is no requirement for this sign at motorway service areas. If there is a merge the combined fixed "Variable speed limit ENDS"/national speed limit signs should be placed just before the merge, and as close as practicable to 300m downstream of the termination VMS. If no merge is present at the exit from the scheme, the combined fixed "Variable speed limit ENDS"/national speed limit signs should be located as near as is practicable to between 200m and 300m upstream of the

next advisory signal, if the next advisory signal is more than 1km downstream the signing should be placed between 300m and 800m downstream of the termination VMS. The point at which variable speed limit ends must as reasonably practicable be signed to coincide with the defined point stated within the relevant Statutory Instrument. Only one sign in the verge is required on the mainline. The “Variable speed limit ENDS” (NP 409.1) has a standard ‘x’ height of 250mm, with three permitted variant sizes of 200mm, 150mm and 100mm. This is a non-prescribed sign that has been Nationally Authorised.

7.13 An information sign “No hard shoulder for XX miles” to TSRGD (diag. 820.1) must be provided on the main line at the downstream end of the intra-junction section entering an MM-ALR scheme and on all entry slip roads providing entry to an MM-ALR link. The distance shown must be measured from the start of the reduction in width/end of the hard shoulder to the point a full width hard shoulder is provided at the end of the MM-ALR scheme. The sign must be located as close as is practicable and in advance of the start of the reduction in width/end of the hard shoulder.

The sign must be located where it is sufficiently visible that vehicles requiring emergency use of the hard shoulder have adequate time to decide to pull over and still come to a stop before the end taper or decide to carry on. Also there is a need for the sign to be sufficiently visible from the hard shoulder that any driver of a vehicle which does not have enough space to accelerate and merge before the end of the hard shoulder can see this information. Readability is dependent on ‘x’ height and clear visibility distance. Where there is limited verge width (requiring a reduced ‘x’ height) or limited clear visibility due to a curve, bridge or other obstruction etc, it may be that the sign has to be located in advance of the diagram 1040.5 taper.

If there are space constraints, then it may be acceptable to co-locate the 'no hard shoulder' sign and the 'variable speed limit' signs as described in paragraph 7.10.

Where links switch between MM-ALR and non MM-ALR then the distance on the 'no hard shoulder for XX miles' sign should be to the start of the hard shoulder for the downstream non MM-ALR link. At the end of the non MM-ALR link a 'no hard shoulder for XX miles' sign shall be included for the downstream MM-ALR link. A 'no hard shoulder for XX miles' sign is not required intra-junction at non-TJR junctions.

7.14 Vehicle separation markings (chevrons) and their associated signs must not be used on sections of motorway with a variable mandatory speed limit.

Control signals

7.15 The following sections in IAN 149 are amended:

5.6.1
5.6.3
5.6.4

7.16 The following sections in IAN 149 are superseded:

5.5
5.6.6

7.17 At every signalling site the capability for variable message signing will also be provided. Where lane signalling is provided above each lane, a separate VMS must be co-located at the site; where carriageway signalling is provided, both this and the VMS capability will be integrated within one item of equipment, as shown on figure 2-1.
VMS deployed for MM-ALR must be capable of displaying the following which are relevant to the entire carriageway:

a) text messages
b) advisory speed limits
c) mandatory speed limits
d) lane control aspects
e) pictograms

These requirements do not apply to existing strategic message signs.

7.18 Lane signals (above each lane) and VMS must be provided 300m (+/-100m) downstream of the entry datum point, as shown in figure 2-1 at the "Gateway signals and VMS" location.

Lane signals deployed for MM-ALR must be capable of displaying:

a) advisory speed limits
b) mandatory speed limits
c) lane control aspects

7.19 A minimum of two signal sites per link (between the entry and exit datum points) must be provided. Dependent on the specific link characteristics, the second set of signals (on a link with only two signal sites) may either be above lane or carriageway signals. The selection of signal type for the second site shall be agreed with the PSCRG and recorded in the DSR. Where signal spacing is less than 600m to meet the requirement for two signal sites per link, a departure from standard is not required. The spacing between the signals should be broadly equal and the decision behind the spacing recorded in the DSR. Any other situation where signal spacing is less than 600m will require a departure from standard.

For link lengths between 5km and 6km measured from the gateway signal to the downstream Continuation/Termination VMS at the back of the diverge nose, an assessment is required to decide whether additional "lane signals and VMS" sites should be provided, as shown in figure 2-1 at the "intermediate signals and VMS" location. This assessment must be recorded in the DSR and decision endorsed by PSCRG.

If the link exceeds 6km then one or more "intermediate signal and VMS" sites must be provided. The distance between signals as described below must not be greater than 6km and should be located so that the spacings are broadly equal;

- gateway signal to the downstream Continuation/Termination VMS at the back of the diverge nose;
- gateway signal to a downstream intermediate signal;
- intermediate signal to the downstream Continuation/Termination VMS at the back of the diverge nose;
- intermediate signal to downstream intermediate signal.

The assessment described above must be recorded in the DSR and the decision endorsed by PSCRG.

7.20 Not used.

7.21 Elsewhere above lane signalling is not required, with the exception of locations with 5 or more running lanes (e.g. a parallel slip road on the approach to a junction). In these locations, above lane signalling and VMS must be deployed to meet the spacing requirements detailed in paragraph 7.23.

Paragraphs 7.18 to 7.21 replace IAN 149 paragraph 5.6.1 a) and b).

7.22 A VMS must be provided downstream of the diverge back of nose at a junction or interchange. Taking account of site constraints, the VMS must be provided as close to the diverge back of nose as practicable. With the exception of the terminal junction this VMS is defined as a Continuation VMS. At the terminal junction of a scheme this VMS is defined as the Termination VMS. This requirement does not apply to MSAs. MSAs are not considered a junction in terms of the provision of signing and signalling.

Where an existing gantry is present over the diverge nose then this may be used for VMS provision, instead of locating the signal downstream of the back of nose. Wherever practicable the VMS should be provided on the existing gantry in a location over the main carriageway that simplifies traffic management requirements for maintenance.

7.23 Spacing distances for control signalling/VMS:

a) at diverge junctions, carriageway signalling on a VMS must be located 300m (+/- 100m) upstream of the Primary and Secondary Advance Direction Sign (ADS). If these requirements cannot be met a departure from standard is not required however the reasons why must be detailed in the scheme DSR. Where existing portal gantries are present, the designer should first look to reuse this existing infrastructure, thereby co-locating the control signalling with the Primary, Secondary and Final Direction Signs.

b) signal spacing and visibility rules must be maintained on the approach to junctions, and where required, signals must be installed between the secondary ADS and the continuation/termination VMS.

c) mandatory control signals must be spaced between a minimum of 600m and up to a maximum of 1,500m apart, subject to the provision of a minimum unobstructed visibility of the signal as described in paragraph i), ii), iii) and iv) below. Signal gantries must not be positioned such that they span a ghost island, as this may cause inappropriate signals to be displayed to drivers.

i) in advance of the downstream signal for a distance of 350m.

This is consistent with minimum sight line to an EMI stated in TA 74, A4.3 signal visibility.

ii) in advance of the downstream signal for a distance of at least ½ of the proposed spacing. Where the distance between signals is less than 800m this requirement does not apply.

iii) in advance of the downstream signal such that the maximum distance between the upstream signal and the start of visibility of the downstream signal must not exceed 500m. Where a scheme design proposes non-visibility distances between 500m and 600m this must be endorsed by the PSCRG and recorded in the scheme DSR; a departure from standard must be submitted for non-visibility distances in excess of 600m.

iv) where the downstream signal is provided by a verge mounted VMS an unobstructed sight line must be provided for a minimum of 50% of the VMS sign face (right hand side); where it is provided by a lane signal an unobstructed sight line must be provided to all of the signal mounted over lane 1 (right hand bend) or lane 4 (left hand bend). The shortest sight line must be checked:

- from the centre line of the right hand traffic lane on right hand bends
- from the centre line of the left hand traffic lane on left hand bends
- from the centre point of any lane on straights or near straights

This amends IAN 149 paragraph 5.6.3.

d) In addition to the spacing requirements of paragraph 7.23 a), b) and c), provision must also be made to facilitate the use of control signals/VMS for signing temporary traffic management. The control signals/VMS must be positioned upstream of the fixed taper points (FTP) within the tolerances detailed below:

- FTP Final signal/VMS - 300 to 450m from the fixed taper point
- FTP Secondary signal/VMS - 500 to 1500m from the final signal/VMS
- FTP Primary signal/VMS - 500 to 1500m from the secondary signal/VMS

7.24 An Intra-Junction VMS with combined signal must be provided if the distance between the Continuation VMS/Conditioning VMS and the Gateway Signal/VMS following the junction merge, is greater than 1500m. The Intra-Junction VMS should be located as near to the midpoint as possible subject to sight line and buildability constraints. The spacing requirements described in paragraph 7.23 c) of this document are also applicable intra-junction, however non-compliances will not require a departure from standard but should be recorded in the DSR and endorsed by the PSCRG. This amends IAN 149 paragraph 5.6.4.

Strategic variable message signing

7.25 Additional strategic VMS will not be required as part of the scheme, however where existing strategic VMS are present they must be retained or be repositioned. The sequence of sign and signalling installations on the approach to a junction should be strategic VMS, VMS, and then the 1 mile ADS. This sequence is then repeated for the ½ mile ADS. The spacing between this roadside equipment is to be nominally equalised and must be no less than 180m. Where lane signalling is present the layout and sequence must follow the requirements of IAN 149. If it is not possible to relocate strategic VMS at the above defined positions, alternative positions must be agreed with the RCC, NTIS and the Senior User, endorsed by the PSCRG and recorded in the DSR.

7.26 Where other existing VMS are used to provide a strategic signing capability by the National Traffic Operations Centre for strategic traffic management or driver information messages, the scheme must agree with the scheme Senior User and Traffic Management Directorate, the level of strategic signing capability which must be retained for each link, and how this should be provided.

7.27 Where there are currently no VMS used to provide a strategic signing capability on a link, the scheme is not required to provide this capability.

7.28 Any VMS used for this purpose must be prioritised for strategic use within the message hierarchy, and must have remote access capability.

Entry slip signals

7.29 Entry slip signal(s) (ESS) must be provided at all junctions.

7.30 ESS must be located at the last decision point before accessing the motorway, normally the start of the slip road, such that drivers still have the option not to join the motorway (during a motorway closure) when viewing the signal(s). Multiple directions of entry to a slip road may require additional signals to provide adequate forward visibility.

7.31 If there is a pair of existing ESS, capable of displaying advisory aspects and suitably located to provide adequate forward visibility, they can be retained provided the first signal downstream of the merge is visible from the entry datum point.

7.32 Existing ESS must be upgraded to ESS capable of displaying the aspects detailed in paragraph 7.18 if the first signal downstream of the merge is not visible from the entry datum point. Where existing ESS are being upgraded the existing infrastructure should be re-used where possible.

7.33 If existing ESS are not suitably located at the start of the slip or there are no existing ESS then a single mandatory ESS must be installed at the start of the slip road, located to provide adequate visibility for approaching traffic. If adequate visibility cannot be achieved with one signal, additional signals must be provided as necessary.

Paragraphs 7.29 to 7.33 supersede IAN 149 paragraph 5.6.6.

7.34 At motorway service areas (MSAs), existing ESS can be retained if the first signal downstream of the merge is visible from the entry datum point; otherwise they should be replaced with a single ESS capable of displaying the aspects detailed in paragraph 7.18.

Where ESS are not currently installed (at MSAs) they must only be provided if:

a) the first signal downstream of the merge is not visible from the entry datum point; or
b) the ESS can be located such that drivers still have the option not to join the motorway (during a motorway closure) when viewing the signal.

8 Traffic modelling

8.1 As MM-ALR schemes involve the conversion of the hard shoulder to a permanent controlled running lane, unlike previous managed motorway schemes which made dynamic use of the hard shoulder, the traffic modelling needs to be undertaken using conventional techniques. Refer to IAN 164 for the requirements and guidance on the economic assessment of schemes designed to IAN 161 Managed Motorways – All lane running.

8.2 As a result, the guidance included in the relevant parts of WebTAG, DMRB and appropriate IAN documents will apply, as in the case of conventional schemes for the Highways Agency.

9 Structures

9.1 Highway structures i.e. overbridges, underbridges, retaining walls etc along the length of the MM-ALR scheme should be reviewed and any features that would not meet the requirements of the managed motorway scheme should be identified. This should be based on a review of existing data, including completed structural assessment and inspection reports, and should consider the condition of the structures and any safety related defects. Any additional assessment work which is considered necessary shall be agreed with the Highways Agency Project Manager. This should be undertaken at the earliest opportunity.

9.2 In the initial review particular focus must be placed on those structures which could restrict the operation of the MM-ALR scheme i.e. geometric and headroom constraints over hard shoulders and verges at overbridges and any current loading restriction on structures (underbridges or retaining walls) supporting the motorway. Headrooms must be checked on site, and compared to TD27/05 'Cross-Sections and Headrooms' requirements.

9.3 Where structural assessments are required, these must be in accordance with the principles set out in BD 95 'Treatment of Existing Structures on Highway Widening Schemes', although it should be noted that a MM-ALR scheme is not a widening scheme. They will be subject to technical approval procedures.

Retention of existing gantries

9.4 Any existing gantries modified, repositioned or reused as part of an MM-ALR scheme will be subject to a detailed special inspection (with testing where appropriate) and structural assessment. Attention is drawn to the need to consider wind and vehicle buffeting loading and fatigue effects in the assessment. A geotechnical assessment will also be required where the loadings on existing foundations increase significantly. This needs to be carried out early in the design process, so as to establish the need for gantry strengthening works. Inspections and assessments must address welds between critical structural members. Where agreed with the Highways Agency Project Manager, critical welds should be tested.

New gantries

9.5 In accordance with IAN 86/07 gantries must not be provided with a fixed means of access for inspection and maintenance i.e. walkways. A gantry support in the central reserve must not be provided as this would increase maintenance activities in the central reserve. Where the carriageways split creating a wide central reserve then a gantry support may be provided in the central reserve where it becomes impractical to span both carriageways and the central reserve. The decision to locate a gantry in such a location and the assessment of the required span must be included in the DSR.

9.6 Not used.

9.7 Gantries sited or re-sited on bridges or viaducts require detailed consideration of the structural effects and interactions.

9.8 The design life of gantries must be in accordance with IAN 86/07.

Piers, parapets and gantries

9.9 IAN 91/07 and IAN 97/07 deal respectively with the identification and assessment of piers and parapets that are not compliant with current standards. They enable such sites to be classified as high, medium, low, or negligible risk advocating the following principles for mitigation:

High-Risk: high-priority upgrade/strengthening required in managed motorway scheme
Medium-Risk: upgrade at next suitable major maintenance scheme
Low-Risk: upgrade at next suitable major maintenance scheme
Negligible-Risk: upgrading not required (monitor only)

9.10 Not used.

9.11 Not used.

9.12 For existing bridge piers the risk of vehicle impact shall be assessed using IAN 91/07.

9.13 Existing gantry legs should be reviewed in accordance with Clause 1.4 of BD 48/93 for the risks associated with potential vehicular impact protection. For existing gantries: BD 48/93 clause 1.4 provides the following advice:

"Sign and signal gantries and pipe bridges need not be assessed for impact loading using analytical methods. However, each structure should be individually assessed to ensure that it is adequately protected by a vehicle restraint system which has a containment level equal to or greater than an open sided box beam."

9.14 Consequently, in accordance with current guidance, gantry legs protected by vehicle restraint systems of N2 containment class (or equivalent) are acceptable for assessment purposes. Where gantry legs are not provided with this minimum level of protection, the level of risk is never higher than low (based on comparison with IAN 91 risk ranking levels for low-use footbridges), and upgrading would not normally be required.

9.15 For bridge parapet sites the risk of vehicle impact shall be assessed using IAN 97.

9.16 Where sites are assessed as high-risk (e.g., Group 1A piers, parapets requiring upgrading to H4A level of containment, parapets with containment level less than minimum requirement for pedestrians), the risk should be mitigated by upgrading work carried out as a matter of priority before or during the MM-ALR scheme. The upgrading work must be discussed and agreed with the Highways Agency Project Manager. The upgrading work will be subject to Technical Approval.

9.17 Where sites are assessed as medium-risk or low-risk (e.g., Group 1B and Group 2 piers, substandard gantry leg protection, parapets requiring N1/N2 or H2 level of containment), the risk should be mitigated by upgrading work carried out as part of a planned maintenance scheme undertaken either before or after the MM-ALR scheme. The upgrading work must be discussed and agreed with the Highways Agency Project Manager. The upgrading work will be subject to Technical Approval.

Railway/third party infrastructure considerations

9.18 Bridges and structures belonging to Railway Infrastructure Owning Authorities or third party owners may be affected by MM-ALR proposals. Any potential changes to such bridges and structures (e.g. structural modifications, replacement of protective barriers, reduced setbacks etc.), should be discussed and agreed with the Railway Infrastructure Owning Authority or with the third party and should be reported to the Highways Agency Project Manager, and may be subject to their approval procedures.

10 Environment

Environmental design

10.1 The principles to be applied in environmental design and on the application of potential mitigation strategies must follow those set out in the DMRB Vol 10 guidance and supporting IANs, particularly HA 85/01. Particular attention is drawn to section 11 on drainage and section 12 on earthworks of this IAN and the fact that any mitigation must be maintainable by the maintenance service provider.

The environmental condition of the soft estate should be reviewed to establish the baseline conditions that exist. This should take the form of collecting desk top information available for example from ENVIS & Biological Record Centres together with any necessary walk over surveys.

10.2 To aid consistency of data collection requirements across projects, particularly as they progress through the project control framework (PCF) process, projects are advised to use the checklists attached (see section 16):

- Checklist 1 - Existing data review
- Checklist 2 - Cable runs and infrastructure field appraisal
- Checklist 3 - Major equipment site field appraisal

Landscape

10.3 Localised visual impact to adjacent receptors must be considered for MM-ALR schemes. However with reduced levels of gantries and signs and their associated design tolerances it should be possible to adjust the design and/or location of the infrastructure so as to reduce these occurrences. Section 12 sets out a design hierarchy for taking into account tree loss.

With reduced verge width it may not always be possible to mitigate localised impacts by landscape planting as it may not be maintainable. In such instances consideration must be given to others forms of screening. If visual screens are to be proposed then designers should consider combining these with noise barriers, where both are required. It should however be noted that each scheme may be different and a scheme specific scoping exercise will require to be concluded and agreed with the Highways Agency Project Manager.

Ecology and nature conservation

10.4 The impact on protected species has been an issue for all types of MM schemes and MM-ALR schemes are no different. Where species need to be relocated, designers should consider appropriate receptor sites which may need careful management. Refer to DMRB Vol 10 for specific advice.

Noise

10.5 MM-ALR schemes may result in adverse noise and vibration impacts, as a result of traffic permanently moving closer to receptors. These impacts should be assessed using the methods set out in HD 213/11. Where noise mitigation in the form of environmental barriers are proposed, reference should be made to the design guidance contained in

advice notes HA 65/94 and HA 66/95.

When considering noise mitigation, designers should be aware of noise mitigation proposals that the Highways Agency has developed at a number of 'Important Areas' and 'First Priority Locations' on the strategic road network in response to the legal obligations set out in the Environmental Noise Regulations 2006. Advice should be sought from the Highways Agency Project Manager as to whether any of these noise mitigation proposals lie within the scheme boundary and how they should be considered in the assessment process.

It is important to note that unless there is a recognised commitment to take forward any of the noise mitigation measures indicated at 'Important Areas' and 'First Priority Locations' with the Highways Agency, measures should not be included in the assessment of noise impacts undertaken as part of the environmental assessment process. This will ensure that the assessment process reflects the worst case in terms of noise impact.

Drainage and water quality

10.6 Refer to section 11.

Air quality

10.7 MM-ALR schemes may result in changes to air quality along the corridor or along defined links within the traffic reliability area of the traffic model, as identified in accordance with standard DMRB screening exercises.

Assessments should be carried out in accordance with standard DMRB methodologies with particular attention paid to the requirements of interim advice notes on Air Quality Significance, IAN 174/13 - Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07) and Compliance IAN 175/13 - Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

When considering any requirements for mitigation, advice must be sought from the Highways Agency Project Manager as to whether any mitigation actions can be adopted and what this may require with reference to the governance, design or operation of the scheme.

Environmental management plans

10.8 Projects must detail any mitigation and how this is to be subsequently managed in the Outline Environmental Management Plan (which forms part of the environment assessment) and ensure this information is carried though the Construction Environmental Management Plan (CEMP) and Handover Environmental Management Plan (HEMP). This would include any environmental requirements relating to IAN 84/10.

11 Drainage and water quality

11.1 In line with guidance on environmental scoping above, it is suggested that no assessment of discharge rates, water quality and flood risk would normally be required for managed motorways schemes. The following summarises key issues set out in the scheme design assumptions:

- existing outfalls continue to discharge at existing established rates.
- where pavement area increases are required, e.g. ERAs or central reserve paving to accommodate the inclusion of a concrete barrier, the flood risk to the receiving watercourses must not be made worse than existing up to the 1:100 year rainfall event, in accordance with the National planning policy framework (NPPF). This must be done by ensuring the flow rates at the outfalls do not exceed current rates up to the 1:100 year return period. Carriageway flooding shall not be increased or created up to a 1:5yr return period; attenuation may be required to prevent this. Attenuation may be required at ERAs to allow for storage. Appropriate spillage control measures should also be included in the ERA design. An allowance for climate change should only be applied to additional hardened areas and should follow guidance set out in HD33.
- the design of flow restrictions and attenuation to meet the existing flow rates up to the 1:100yr return period can be done by one of two methods: 1. hydraulic modelling of the existing and proposed drainage network; or 2. application of an appropriate hydraulic design method, using the characteristics of the network.
- flow width: managed motorways schemes are a managed environment where operational regimes can provide mitigation for different types of event. Where it is seen as a potential risk that the flow width will ingress onto lane 1 (including the road markings at the back edge of lane 1) an assessment should be made of how often this may occur and whether these events could reasonably be managed. The flow of water parallel to the carriageway edge should not exceed an allowable width. When checked for a 1 in 5 year storm the maximum verge side flow width, inclusive of hardstrips where present, must not encroach more than 200mm (at 2.5% crossfall) into Lane 1. Where the crossfall is greater than 2.5% then the depth of water lying on the carriageway must not exceed 5mm. This supersedes HD 33 para 6.3, Bullet 3.
- keep surface and sub-surface waters separate in design process, but encourage permeable solutions.
- be mindful of safety issues associated with loose materials.
- manholes in what will be Lane 1 should be avoided if possible, relocated or upgraded to ensure they meet the necessary wheel loading and skid resistance requirements.

11.2 Adoption of the above procedures and standards, which have been agreed with the Environment Agency, should both satisfy design and statutory requirements with reference to attenuation requirements and a pragmatic system for pollution incident control and management. The latter is anticipated to provide a 'betterment' to the existing pollution control management procedures, specifically when linked to the greater degree of control and monitoring provided under managed motorways schemes.

12 Earthwork and retaining structures

12.1 MM-ALR utilises the full carriageway by converting the hard shoulder to a running lane, it is not a widening scheme. The design process shall be set out in the normal way using the Standard HD 22/08 'Managing geotechnical risk' mandatory geotechnical certification process. Early liaison with the Highways Agency will permit agreement on the appropriate reporting strategy.

12.2 The condition of the existing earthwork asset along the length of scheme, not just at the proposed new structures, should be assessed in accordance with HD41/03 'Maintenance of Highway Geotechnical Assets'. Those earthworks identified with defects should be reviewed and the current mitigation strategy assessed in light of the proposed operational regime.

- **Class 1A, 1B & 1C** high priority earthwork defects whose current remediation is to close the existing hard shoulder should be re-assessed in consultation with NDD, prior to any agreement to include them within the scope of the scheme. Remaining defects should be addressed at the next appropriate maintenance period.

- **Class 1D, 2A & 2B** areas of risk should have an agreed monitoring regime in place during the MM works and mitigation plans approved for implementation.

- **Class 3A, 3B & 3C** low risk areas where previous defects have been repaired or which are unlikely to develop into a defect should be subject only to routine inspections.

12.3 This and the following clause give the key design and environmental issues that need to be addressed when finalising the selection and development of a detailed design solution for a site specific earth retaining requirement, considering selection criteria and treatment options. These requirements are in addition to the requirements given in HA43/91. It provides a hierarchy of potential options, taking into consideration sometimes conflicting engineering and environmental objectives.

12.4 The key design hierarchy selection should consider, at all stages, the impact of the loss of significant amounts of tree and shrub cover in the short and medium term, particularly where this may be located adjacent to sensitive receptors. Further, in consultation with the Highways Agency, consideration should be given to the value of vegetation cover against the context of environmental assumptions and commitments given in the environmental assessment report (EAR) and specifically in terms of its function and practicality of replacement.

- **Is sufficient space available to create a slope re-grading or granular earthwork modification system?**

If yes then consider the following: would the construction of a slope realignment solution require the loss of significant amounts of vegetation as stated above? If 'yes' then consider another system, see below; if 'no' then proceed with the design solution, accommodating opportunities for reinstatement including tree and shrub planting.

If no then consider next stage in the design solution selection system.

- **Is sufficient space available for some form of green faced geotechnical**

retention system?

If yes then consider the following: would the construction of the green faced retention system (also taking into consideration temporary construction land take requirements) require the loss of significant amounts of vegetation as stated above? If 'yes' then consider another system, see below; if 'no' then proceed with the design solution.

If no then consider next stage in the design solution selection system.

- **Are there space and/or geotechnical restrictions where some form of near vertical treatment may be required?**

If the retention of significant amounts of vegetation cover governs and geotechnical considerations permit, then utilise stable exposed rock cutting faces or retaining wall and geotechnical solutions to achieve earthwork stability, but accommodate a facility for a standardised, aesthetically appropriate surface treatment.

The process set out in HA43 includes a variety of geotechnical solutions, including soil nailing, reinforced soil, crib wall, gabion, blockwork, gravity in-situ concrete and piling solutions to meet the specific design constraints. From an environmental perspective, piled solutions generally require a smaller overall footprint than other solutions, hence minimising impacts on the adjacent soft estate.

13 Contact

Max Brown
Technology Solutions & Standards team
Network Services (Operational & Technical Solutions Division)

14 Glossary of acronyms and terms

Acronym/Term	Description
ADS	Advance Direction Sign
ALM	Ambient Light Monitor
CCTV	Closed Circuit Television
DfS	Departure from Standard
D3M	Dual 3 Lane Motorway
DMRB	Design Manual for Roads and Bridges
DLS	Driver Location Sign
DSR	Design Strategy Record
EAR	Environmental Assessment Report
EMI	Enhanced Motorway Indicator
ERA	Emergency Refuge Area
ERT	Emergency Roadside Telephone
ESS	Entry Slip Signal
FWI	Fatal and Weighted Injury
HGV	Heavy Goods Vehicle
HSR	Hard Shoulder Running
IAN	Interim Advice Note
IP	Internet Protocol
Kph	Kilometres per hour
MAC	Managing Agent Contractor
MIDAS	Motorway Incident Detection and Automatic Signalling
MM	Managed Motorways
MM-ALR	Managed Motorways - All lane running
MP	Major Projects directorate
MSA	Motorway Service Area
NetServ	Network Services directorate
NDD	Network Delivery and Development directorate
NRTS	National Roads Telecommunications Services
NVC	National Vegetation Classification
OAL	Outstation Auxiliary Link
PAR	Project Appraisal Report
PIA	Personal Injury Accident
PCF	Project Control Framework
PSCRG	Project Safety Control Review Group
PTZ	Pan-Tilt-Zoom
REA	Regional Environmental Advisors
RCC	Regional Control Centre
RPSG	Roads Programme Steering Group
SFAIRP	So Far As Is Reasonably Practicable
SMS	Safety Management System
SSD	Stopping Sight Distance
TMD	Traffic Management Directorate
VMS	Variable Message Sign
VMSL	Variable Mandatory Speed Limits
VE	Value Engineering
VRS	Vehicle Restraint System

15 Normative and Informative References

Normative References

The following documents contained within the Design Manual for Roads and Bridges (DMRB), available from The Stationary Office:

GD 01/08 - Introduction to the Design Manual for Roads and Bridges (DMRB 0.1.2)

GD 04/12 - Standard for Safety Risk Assessment on the Strategic Road Network

Environmental Design and Management, DMRB, Volume 10

Environmental Assessment, DMRB, Volume 11

TD/TA

TD 9/93 - Highway Link Design (DMRB 6.1).

TD 17/85 - Criteria for the Provision of Closed Circuit Television on Motorways (DMRB 9.3.1)

TD 19/06 - Requirements for Road Restraint Systems (DMRB 2.2.8)

TD 22/06 - Layout of Grade Separated Junctions (DMRB 6.2.1)

TD 27/05 - Cross-Sections and Headrooms (DMRB 6.1.2)

TD 42/95 - Geometric Design of Major/Minor Priority Junctions (DMRB 6.2.6)

TD 45/05 - Motorway Incident Detection and Automatic Signalling (MIDAS) (DMRB 9.1.2)

TD 46/05 - Motorway Signalling (DMRB 9.1.1)

TA 49/07 - Appraisal of New & Replacement Lighting on the Strategic Motorway & All Purpose Trunk Road Network (DMRB 8.3.1)

TD 69/07 - The Location and Layout of Lay-bys and Rest Areas (DMRB 6.3.3)

TA 73/97 - Motorway Emergency Telephones (DMRB 9.4.2)

TA 74/05 - Motorway Signalling (DMRB 9.4.3)

Interim Advice Notes (IAN)

IAN 69/05 - Design for Maintenance

IAN 84/10 - Highways Agency Environmental Information System – EnvIS (Parts 1 and 2)

IAN 86/07 - Amendments to Design Requirements for Portal and Cantilever Sign/Signal Gantries

IAN 91/07 - Interim Advice on the Identification of 'Particularly At Risk' Supports

IAN 97/07 - Assessment and Upgrading of Existing Vehicle Parapets

IAN 103/08 - Advice Regarding the Assessment of Sites for Ramp Metering

IAN 139/11 - Managed Motorways Project Safety Risk Work Instructions

IAN 143/11 - Supplementary Advice and requirements for the Provision for Non-Motorised Users and Accessibility during planning, design, construction and handover of Improvement Schemes

IAN 149/11 - Existing Motorway Minimum Requirements

IAN 164/12 Rev 1 Managed Motorways - All Lane Running – Economic Assessment

IAN 165/12 Managed Motorways Commissioning and Handover Guidance

IAN 167/12 Guidance for the Removal of Road Lighting

IAN 174/13 - Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)

IAN 175/13 - Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

HD/HA

HD 20/05 - Detector Loops for Motorways (DMRB 9.3.1)

HD 22/08 - Managing Geotechnical Risk (DMRB 4.1.2)

HD 29/08 - Data for pavement assessment (DMRB 7.3.2)

HD 33/06 - Surface and Sub-surface Drainage Systems for Highways (DMRB 4.2.1).

HD 36/06 - Surfacing Materials for New and Maintenance Construction (DMRB 7.5.1)

HD 41/03 - Maintenance of Highway Geotechnical Assets (DMRB 4.1.3)

HD 47/08 - Screening of Projects for Environmental Impact Assessment (DMRB 11.2.3)

HA 43/91 - Geotechnical Considerations and Techniques for Widening Highway Earthworks (DMRB 4.1.1)

HD 48/08 - Reporting of Environmental Impact Assessments (DMRB 11.2.6)

HA 65/94 – Design for Environmental Barriers (DMRB 10.5.1)

HA 66/95 - Environmental Barriers: Technical Requirements (DMRB 10.5.2)

HA 85/01 - Road Improvement within Limited Land Take (DMRB 10.2.1)

HD 213/11 – Noise and Vibration (DMRB 11.3.7)

MCH

MCH 1596 - HATMS Site Data Change Procedure

MCH 2470 - Ramp Metering Technical Design Guidelines

BD

BD 2/12 - Technical Approval of Highway Structures (DMRB 1.1.1)

BD 48/93 - The Assessment and Strengthening of Highway Bridge Supports (DMRB 3.4.7)

BD 95/07 - Treatment of Existing Structures on Highway Widening Schemes (DMRB 1.2.3)

Other

Generic MM-ALR Safety Report

Transport Analysis Guidance (WebTAG)

Highways Act 1980

Traffic Signs Regulations and General Directions

Traffic Signs Manual - Chapter 5

BS 5489-1 Code of Practice for the Design of Road Lighting, Lighting of Roads and Public Amenity Areas

Planning Policy Statement 25 (PPS25), Development and Flood Risk

Assessment of Environmental Effects Regulations 1999

Informative References

Managed Motorways - All lane running - Concept of Operations

Asset Maintenance and Operational Requirements (AMOR)

Technology Management and Maintenance Manual (TMMM)

Traffic Officer Manual

TD 23/99 - Trunk Roads and Trunk Road Motorways Inspection and Maintenance of Road Lighting (DMRB 8.3.1)

TD 34/07 - Design of Road Lighting for the Strategic Motorway and All Purpose Trunk Road Network (DMRB 8.3.1)

IAN 126/09 - Environmental Impact Assessment: Reporting of Determination and Publication of Notices

HA 104/09 - Chamber Tops and Gully Tops for Road Drainage and Services Installation and Maintenance

PD CEN/TR 13201-1: 2004 - Road Lighting, Selection of Lighting Classes

MCH 2530 - Technical Requirements for the HA CCTV System

Highways Agency Major Projects MMP Project Control Framework

“M42 MM Monitoring and Evaluation Three Year Safety Review”, HCG, January 2011

http://www.highways.gov.uk/knowledge_compendium/assets/documents/Portfolio/Existing_Motorway_Minimum_Requirements_-_Worked_Example.pdf

www.nrtsco.com - A guide to working with the NRTS Contractor (GYS/RGD/USG/0038)

Generic Safe Method for placing TTM on MM-ALR:
http://www.dft.gov.uk/ha/standards/tech_info/index.htm

16 Checklists

CHECKLIST 1	EXISTING DATA REVIEW		
PROPOSAL NAME			
SCHEME DESCRIPTION			
DESIGNATIONS	Description / Sensitivity	Marker Post / Reference	Strategic Impact and Mitigation Outline
AIR QUALITY			
CULTURAL HERITAGE			
LANDSCAPE			
NATURE CONSERVATION			
NOISE & VIBRATION			
MATERIALS			
KEY CONSTRAINTS / OUTLINE MITIGATION STRATEGY			
CONSULTATION REFERENCES	Address Details	Contact Name	Comments / Responses

CHECKLIST 2		CABLE RUNS AND INFRASTRUCTURE FIELD APPRAISAL		
PROPOSAL NAME		*(e.g. M6 J5-8)*		
LOCATION REFERENCE		HA Environmental Database / Site Description / Impact Assessment	Mitigation	Residual Impact (If Applicable)
Cable Runs/Local Connections				
A Carriageway				
From:	To:			
B Carriageway				
From:	To:			

CHECKLIST 3		MAJOR EQUIPMENT SITE FIELD APPRAISAL							
Location	**Type**	**Landscape Character**	**Site Description**	**Visual Impact Assessment**			**Biodiversity**	**Mitigation**	**Residual Effect** (after 15 years)
				Visual Receptors	**Sensitivity**	**Magnitude of Impact**			
(Motorway eg M6 J5-8)									
Detail Location eg M5 Eastern Slip									

If you need help using this or any other Highways Agency information, please call **0300 123 5000** and we will assist you.

This document is also available on our website at **www.highways.gov.uk**

If you have any enquiries about this publication email **ha_info@highways.gsi.gov.uk** or call **0300 123 5000**.
Please quote the Highways Agency publications code **PR64/13**.

Highways Agency Media Services Bristol. Job number M130202.

Printed on paper from well-managed forests and other controlled sources.

GOV.UK