HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

The economic assessment of Managed Motorways - All lanes running

Interim Advice Note 164/12 Revision 1

An executive agency of the Department for Transport

INTERIM ADVICE NOTE 164/12 – REVISION 1

The Economic Assessment of Managed Motorways – All Lanes Running

Summary
This document provides requirements and guidance on the economic assessment of schemes designed to the Managed Motorways – All lanes running standards.

Instructions for Use
This IAN should be used on all schemes designed to the Managed Motorway – All lanes running standards and guidance.

Contents

1 Introduction

1.1 Background

This document provides requirements and guidance on the economic assessment of schemes involving Managed Motorways – All lanes running (MM-ALR). It details requirements for the economic assessment whilst highlighting assumptions that can be made.

1.2 Implementation

This IAN shall be implemented except where the procurement of works, at any stage from conception through design to completion of construction, has reached a stage at which, in the opinion of the HA, use of this document would result in significant additional expense or delay progress (in which case the decision must be recorded in accordance with the HA's procedures).

1.3 Documents

1.3.1 The Department for Transport (DfT) and Highways Agency (HA) documents which are relevant to the following guidance in this document are as follows:

Department for Transport Published Documents

1.3.2 The Department for Transport publishes many documents that outline the various aspects of transport assessment. Although none deal directly with the subject of Managed Motorways, these documents are still relevant, providing all the information required on economic assessment.

- Design Manual for Roads and Bridges (DMRB) Volume 12: Traffic Appraisal of Road Schemes;
- COBA – DMRB Volume 13: Economic Assessment of Road Schemes;
- QUADRO – DMRB Volume 14: Economic Assessment of Road Maintenance;
- INCA – Incident Cost Benefit Assessment User Manual;
- TUBA – Transport User Benefit Appraisal Manual;
- WebTAG – Transport Analysis Guidance.

Highways Agency Published Documents

1.3.3 The use of Managed Motorways – All lanes running is a developing process. Additional documents that may assist in the understanding of Managed Motorways – All lanes running include the following documents, which cover topics including first generation Managed Motorways – Hard Shoulder Running (MM-HSR) schemes and their economic assessment, the development of Managed Motorways – all lanes running and its implementation and possible future developments.

- IAN 111/09 – Managed Motorway Implementation Guide: Dynamic Use of the Hard Shoulder;
- IAN 112/08 – Managed Motorway Implementation Guide: Through Junction Hard Shoulder Running;
- IAN 159/12 – Guidance Note for Traffic Consultants on the Economic Assessment of MM-HSR Schemes;
- IAN 160/12 – Appraisal of Technology Schemes;
- IAN 161/12 – Managed Motorways – All lanes running.

1.4 Project Control Framework (PCF)

1.4.1 All Major Projects' road improvement schemes with a value of over £10m are subject to the planning stages presented in the Project Control Framework (PCF). The PCF is defined by a simple matrix consisting of a total of 8 PCF Stages.

Pre-Project	Stage 0	Strategy, Shaping & Prioritisation
Options	Stage 1	Option Identification
	Stage 2	Options Selection
Development	Stage 3	Preliminary Design
	Stage 4	Statutory Procedures & Powers
	Stage 5	Construction Preparation
Construction	Stage 6	Construction, Commissioning & Handover
	Stage 7	Closeout

1.4.2 For Managed Motorways - All lanes running schemes, Stages 1 and 2 may be combined where a single option is to be considered; and it is possible for Stages 3, 4 and 5 to be combined for those Managed Motorways - All lanes running schemes where it is determined that a) an Environmental Statement is not required and b) it is within the highway boundary and therefore does not require Statutory Processes.

1.5 Required Components of Economic Assessment by PCF Stage

1.5.1 As a scheme progresses through the PCF, greater refinement of the economic assessment is required. The initial assessment at Stage 0 is intended to be a guide to the likely impacts of the scheme whilst later stages focus on refining the assessment. As such, not all monetised components of economic assessment are required at each stage. The table below highlights when any given component may be treated as optional.

PCF Stage	Component	Status
0	Cost (to include preliminary assessment of additional maintenance and operational costs)	Required
	Transport Economic Efficiency impacts	Required
	Accident analysis	Required
	Impact of maintenance on users	Optional
	Impact of construction on users	Optional
	Journey time reliability	Optional
	Regeneration impacts	Optional
	Greenhouse gases (carbon)	Optional
	Noise	Optional
	Social and Distributional Impact appraisal	Optional
PCF Stage	**Component**	**Status**
1-5	Cost (including full estimate of maintenance and operational cost)	Required
	Transport Economic Efficiency impacts	Required
	Accident analysis	Required
	Impact of maintenance on users (to include replacement of technology every 15 years)	Required
	Impact of construction on users	Required
	Journey time reliability	Required
	Regeneration impacts	Required*
	Greenhouse gases (carbon)	Required
	Noise	Required
	Social and Distributional Impact appraisal	Required

*This indicates that, in line with standard procedures under WebTAG, an assessment is required to determine the presence of an impact. If an impact is identified then it must be quantified.

1.5.2 During PCF Stages 1-5 there is a WebTAG requirement to undertake sensitivity testing in the forecasting of future year scenarios. This may be treated as optional during PCF Stage 0.

2 Guidance for Assessing Transport Economic Efficiency (TEE) Effects

2.1.1 An initial assessment may be appropriate for PCF Stage 0 and should be carried out using a WebTAG (Web-based Transport Analysis Guidance) compliant process. Any process should be agreed with the Appraisal Certifying Officer (ACO) from the HA Traffic Appraisal, Modelling and Economics (TAME) group as normal practice. For MM-ALR schemes on the Highways Agency (HA) network proceeding beyond Project Control Framework (PCF) Stage 0, a full WebTAG compliant economic assessment should be undertaken. The full assessment should be based on a validated WebTAG compliant traffic model with variable demand functionality, where appropriate.

2.1.2 In order to assess the dynamic nature of earlier MM-HSR schemes, the HA released a spreadsheet-based tool known as IFRIIT (Initial and Full Responsive Intervention Investment Tool), which allowed either a simple link-based initial assessment for use during Stage 0 or the calculation of annualisation factors for the forecast years of the scheme to aid assessments in PCF Stages 1-5.

2.1.3 Managed Motorways – All lanes running schemes are intended to have a less dynamic nature than the first generation of Managed Motorway – Hard Shoulder Running schemes. MM-ALR allows for the reallocation of the hard shoulder as a permanent running lane whilst still adopting Variable Mandatory Speed Limits (VMSL).

2.1.4 In MM-HSR schemes, the hard shoulder was opened when the vehicular flow over a certain period reached a particular threshold and closed when the threshold was no longer being reached. During the time that the hard shoulder was open as a running lane, the maximum speed allowable, controlled by VMSL, was 60mph. The speed of traffic was regulated further as flow built up, with the VMSL being lowered to help reduce the variability of traffic speeds. This technology is more commonly known as Controlled Motorway (CM) and has been in use independently of hard shoulder running on the M25 for many years.

2.1.5 MM-ALR schemes are intended to be run at the national speed limit for motorways with VMSL allowing for control of traffic as flow volumes increase. In this manner, it can be seen that MM-ALR schemes are effectively, in terms of traffic behaviour on a macroscopic level, similar to widening with the introduction of Controlled Motorway. As detailed in IAN 160/12 - Appraisal of Technology Schemes, the effect of Controlled Motorway is to increase the journey time reliability by decreasing the variability of the speeds of traffic. There is no identifiable effect on the average speed of traffic as a whole; therefore the speed/flow relationship of traffic under CM conditions is the same as uncontrolled traffic.

2.1.6 Any traffic model of MM-ALR should, therefore, have the effective number of lanes increased to reflect the re-designation of the hard shoulder as a full time running lane and should use a standard speed/flow curve reflecting the increased number of running lanes.

2.1.7 Due to the dynamic nature of MM-HSR schemes, the economic assessment of hard shoulder running was more complex that that of a non-dynamic scheme, with the basis of the assessment needing to be the annual average of the periods when the hard shoulder would be operational, rather than the standard annual average. Since MM-ALR is less dynamic, the economic assessment can be undertaken on the standard annual average basis.

2.1.8 Since a full assessment needs to include all the elements of economic appraisal for a major scheme, the effects on accidents, maintenance and journey time reliability must all be assessed. The assessment of these is dealt with in the following chapter.

3 Guidance for Assessing Non – Transport Economic Efficiency (TEE) Effects

3.1 Accidents

3.1.1 There are two safety objective requirements for MM-ALR: the first, that there should be no increase in the absolute number of fatal and weighted injuries (FWI) forecast to occur on the links subject to MM-ALR by the scheme compared with the number of FWIs forecast if the scheme were not implemented; and the second, that the FWI rate on the links subject to MM-ALR by the scheme should not increase as a consequence of implementing the scheme. These objectives are minimum requirements and not targets.

3.1.2 The safety objective is expressed in terms of Fatal and Weighted Injuries (FWI) which is defined as:

FWI = (number of fatalities) + 0.1 x (number of serious casualties)
+ 0.01 x (number of slight casualties).

For the purposes of an economic safety assessment, FWI and PIA (Personal Injury Accidents) should be assumed to be equivalent.

3.1.3 Because any increase in capacity is generally associated with an increase in traffic, the consequence of the first requirement is that the PIA rate on the links subject to MM-ALR must be lower with the scheme than in the Do-Minimum. This reduction must be the result of supporting remedial safety measures, rather than the effect of MM-ALR.

3.1.4 Implementation of MM-DHS was preceded by a pilot that showed that a lower accident rate could be anticipated with MM-DHS compared with conventional motorway operation. A pilot of MM-ALR has not been undertaken and, until long term data on the effect of MM-ALR on accident rates are available, it should be assumed that the introduction of MM-ALR itself leads to a neutral impact on PIA rates in comparison to the Do-Minimum, i.e. compatible with the second requirement of the safety objective but without taking account of any scheme specific mitigation measures identified by the Safety Hazard Log Analysis Report.

3.1.5 Demonstration of how the safety objective is to be met is an output of the Hazard Log and Hazard Log Report which is a PCF product and is signed off by the Safe Roads and Casualty Reduction Group. Because it requires a detailed analysis of how the scheme will operate, the Hazard Log and Hazard Log Report can only be completed once the design of the scheme has been largely finalised. Nevertheless, interim versions of the Hazard Log and Hazard Log Report can be produced at earlier stages of a scheme's development. Providing that these have been approved, the report's content can be used to inform the economic safety assessment accident rate. If a signed off version of the Hazard Log and Hazard Log Report is not available, any economic safety assessment should be consistent with the requirements of the safety objective as stated in paragraph 3.1.1 above.

3.1.6 As MM-ALR schemes are likely to attract additional traffic compared with the Do-Minimum, in practice this will require the accident rates on the links subject to MM-ALR to be reduced compared with the Do-Minimum. For example, if the PIA rate before the scheme is to be implemented is 9.6 PIAs per 100 million vehicle kilometres and traffic is forecast to be 20% higher on average in the 3 years after opening with MM-ALR, then the accident rate would need to be at a maximum 9.6/1.2 = 8 PIAs per 100 million vehicle kilometres. The Hazard Log and Hazard Log Report will identify a "reduction of risk" percentage which represents a comparison of the safety baseline with the scheme in place.

3.1.7 Once the Hazard Log and Hazard Log Report has been signed off, then a more sophisticated approach to the economic safety assessment can be adopted enabling the effects of the mitigation measures identified by the Hazard Log and Hazard Log Report to be taken into account. This may justify an accident rate on the links subject to MM-ALR that is lower than that required to meet the safety objective, which may then be utilised in the economic safety assessment.

3.1.8 VMSL, sometimes referred to as Controlled Motorways, are an intrinsic part of MM-ALR. When analyzing the hazards associated with MM-ALR, the potential of VMSL to reduce the risks is taken into account. Therefore, if VMSL on the links subject to MM-ALR has not previously been implemented, no reduction in the accident rate should be included in the economic safety assessment of MM-ALR.

3.1.9 Whilst the baseline used for the safety case is a motorway without MIDAS, the Do-Minimum accident rate will always be the observed rate regardless of whether or not MIDAS is already present. The Do-Something accident rate will be derived from the Hazard Log and Hazard Log Report and should be at a level which results in the safety objective being achieved i.e. no increase in the total number of accidents on the links subject to MM-ALR.

3.1.10 For the purposes of meeting the safety objective, the accident reduction potential of MIDAS (assumed to be 13%) can be taken into account. This is because the baseline for the safety objective is an equivalent motorway without MIDAS which is different from the approach to be taken for economic safety assessment. The presence or otherwise of MIDAS therefore has no bearing on the level of mitigation required to meet the target accident level. When considering the accident rate to be used for economic assessment, considerable care will be required to ensure that the rate used takes account of the effects of MIDAS correctly.

3.1.11 For scheme sections where MIDAS is **already present** in the Do-Minimum, the accident rate used in the economic safety assessment for the links that will be subject to MM-ALR will **only** include a percentage reduction in respect of non MIDAS related mitigation measures identified in the Hazard Log and Hazard Log Report. In the circumstance where MIDAS is already in place, it is therefore possible that the accident rate with MM-ALR will be higher than in the Do-Minimum.

For example: Do-Minimum accident rate =10 PIAs per 100 million vehicle kilometres.

The Hazard Log and Hazard Log Report identifies a reduction of risk of 10%, however, since the latter takes account of the effects of MIDAS, a correction has to be applied.
The accident rate for economic assessment is calculated by factoring the existing accident rate by the reduction in risk identified by the Hazard Log and Hazard Log Report (-10%) and removal of the effect of MIDAS (+13%)

= 10* (1-0.1)*1.13=10.2 PIAs per 100 million vehicle kilometres.

3.1.12 For scheme sections where MIDAS is not already in place, a further reduction of 13% can be applied to the accident rate of the links that will be subject to MM-ALR when undertaking the economic safety assessment.

3.1.13 The derivation and justification of the accident rate used in the economic safety assessment must be included in the Economic Assessment Report, with reference to the Hazard Log and Hazard Log Report for the scheme.

3.2 Journey Time Reliability

3.2.1 An assessment of the effect on journey time reliability, using INCA or an alternate WebTAG compliant process, must be carried out for a full assessment, although it is optional for a scheme at PCF Stage 0. The results should be reported in the Economic Assessment Report and the Appraisal Summary Table (AST) although, in line with current guidance, they should not be included in the Analysis of Monetised Costs and Benefits (AMCB) table.

3.2.2 Details of what assumptions should be made in the assessment of the impact of MM-ALR on journey time reliability are available from the HA TAME group.

3.3 Impacts due to Maintenance and Construction

3.3.1 An assessment of the effects of changes in delay due to the construction and ongoing maintenance of MM-ALR, using the scheme model, QUADRO or alternative similar assessment is mandatory for a full assessment, although it is optional at PCF Stage 0. An outline of the additional maintenance expected to be required for an MM-ALR scheme and the likely traffic management regime is included in Appendix A.

3.3.2 The assessment must be undertaken over the standard 60 year appraisal period and it must be remembered that the technological equipment associated with MM-ALR, e.g. CCTV cameras and variable mandatory speed limit (VMSL) signs, will need to be replaced every 15 years, whilst any supporting gantries will need to be replaced every 30 years.

3.3.3 During periods of maintenance, a hard shoulder gives scope for areas of the normal running carriageway to be removed without loss of capacity. Once MM-ALR has been implemented this flexibility is no longer available, which, in addition to the higher traffic flows under MM-ALR, may lead to an increase in delays during periods of maintenance.

3.4 Costs

3.4.1 Increased operational costs associated with MM-ALR should be included in the scheme costs for any level of assessment, although only a preliminary estimate may be available at Stage 0. These extra costs should include any extra staff costs resulting from additional monitoring by RTCC staff and an increased number of patrols by traffic officers. Details of these costs can be obtained from the HA (current contact is the Delivery Hub Operations Team). Guidance on incorporating these costs in the economic assessment is included in Appendix B.

3.4.2 The works costs associated with maintenance need to include for all aspects of maintenance, including the replacement of all MM-ALR technological equipment (excluding gantries) at 15 year intervals, with gantries projected to be replaced at 30 year intervals.

4 Reporting

4.1.1 The reporting requirements for an assessment of MM-ALR under the PCF remain the same as for a standard highway improvement scheme. Thus a reduced set of reports is required at Stage 0 whilst a full suite of Business Case and Funding products must be produced during PCF Stages 1-5, as laid out in the PCF product descriptions. The Economic Assessment Report (EAR) must include results from all of the aspects of the assessment that have been discussed in this document and are relevant to the Stage and detail the costs and benefits of MM-ALR as per the standard Appraisal Summary Table (AST) supporting worksheets; namely the Transport Economic Efficiency (TEE), Public Accounts (PA) and Analysis of Monetised Costs and Benefits (AMCB) tables.

5 Underlying MM-ALR Assumptions

5.1.1 All appraisals of MM-ALR should be based on the assumption that the reallocation of the hard shoulder as a permanent running lane is equivalent to the provision of a full extra lane under standard widening. This assumption should be retained through any assessment.

6 Contacts

6.1.1 Queries on this document should be made to:

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7 Normative References

- Design Manual for Roads and Bridges (DMRB) Volume 12: Traffic Appraisal of Road Schemes;
- COBA – DMRB Volume 13: Economic Assessment of Road Schemes;
- QUADRO – DMRB Volume 14: Economic Assessment of Road Maintenance;
- INCA – Incident Cost Benefit Assessment User Manual;
- TUBA – Transport User Benefit Appraisal Manual;
- WebTAG – Transport Analysis Guidance;
- IAN 160/12 – Appraisal of Technology Schemes;
- IAN 161/12 – Managed Motorways – All lanes running.

8 Informative References

- IAN 111/09 – Managed Motorway Implementation Guide: Dynamic Use of the Hard Shoulder;
- IAN 112/08 – Managed Motorway Implementation Guide: Through Junction Hard Shoulder Running;
- IAN 159/12 – Guidance Note for Traffic Consultants on the Economic Assessment of MM-HSR Schemes.

Appendix A: Maintenance and the Economic Assessment of MM-ALR

Introduction

1. This appendix describes typical infrastructure maintenance and associated traffic management activities that would be required on Managed Motorways - All lanes running (MM-ALR), insofar as they impact on driver delays.

2. The information can be used as the basis for including driver delays associated with repairs on MM-ALR into an economic assessment.

Item	Description	Location of Item	Density	Traffic Management Required for Access
Gantry	Lightweight, access free (requires cherry picker to access equipment)	Over carriageway	At start of scheme and additional ones every 5km on longer links	Yes
Advanced Message Indicators (AMI)	Lane signal to display speed limit and lane closure / divert messages	On gantry	One per lane on each gantry	Yes
MS4 Variable Message Sign	Variable message sign with graphics capability	On gantry or on pole behind barrier, mounted in the verge	Every 1500m metres	Yes
MIDAS loops	Inductance loop cut as loop pair	Loops in road surface; controller at roadside	One loop pair, per lane every 500m	Yes
HADECS (Highways Agency Digital Enforcement Camera System)	Digital camera used for enforcement of dynamic speed limits	On gantry, over selected lane	One camera every 2nd link (junction to junction stretch of motorway)	Yes
PTZ Camera	Cameras to assist TOS for incident verification and monitoring	In verge, behind barrier	Every 1.5km	Yes (if no off network access is available)
Roadside Cabinets	Cabinets to house electronics	In verge, behind barrier	Various	Yes (if no off network access is available)

Table A1 – MM-ALR Infrastructure Requiring Maintenance and Traffic Management

3. Managed motorway technology equipment will usually be located in roadside cabinets in the verge. Some equipment is mounted on columns in the verge or on overhead gantries. There are also detectors buried in the carriageway.

- Roadside cabinets in the verge will generally be behind a barrier. In some cases, the equipment would be near a designated area for maintenance or accessible off network so no traffic management will be required; however, in other cases traffic management will be required to gain access to the cabinets.
- Maintenance of equipment located on gantries over running lanes and detectors in the carriageway will require traffic management.
- Maintenance of equipment mounted on columns in the verge will require traffic management if not accessible from a designated area for maintenance or accessible off network.

Required Maintenance and Traffic Management Activities

4. Table A2, overleaf, describes the required maintenance and associated traffic management activities for managed motorways equipment. Only equipment that will require traffic management in order to be maintained is included.

Duration of Works

5. All the activities listed are of short duration, i.e. a few hours. It can be assumed that none of these activities will be undertaken during peak periods. Day time activity should be restricted to the interpeak period and night time activity to times when flows are lowest, e.g. 22:00 and 06:00. A simple assumption would be that the traffic management indicated in the table would be in place for the duration of these periods.

6. The only exception to these restricted access times would be Category 1 defects, which may require traffic management from the time at which the defect is identified until the time it has been made safe. At this time there is no evidence that managed motorway sections would be any more prone to Category 1 defects that any comparable section of non-dynamic motorway.

Speed Limit within Roadworks

7. Where running lane 1 is closed it is usual, but not always required, to introduce a 50mph limit. Where two lanes are closed a 50mph limit is always introduced. Table E2 assumes that a 50mph limit is always applied.

Typical Maintenance Schedule

8. Tables A3 and A4 provide sample schedules of cleaning, inspection and equipment maintenance and associated traffic management requirements for one carriageway of a typical 10km section of Managed Motorway – All lanes running.

Item	Required Maintenance	Timing of Work	Required Traffic Management	Length of Roadworks	Speed Limit within Roadworks	Length of Road with Speed Limit
Gantry	Annual inspection	Daytime	Lanes 1 & 2 closure to allow access to three successive gantries	3 km	50mph	4.6km
Gantry	Principal inspection every six years	Daytime	Lane 1&2 closure to allow access to one gantry	200m	50mph	1.8km
AMI (over lanes 1 & 2)	Repairs with frequency based on a 17% failure rate	Night-time	Lane 1&2 closure to allow access to one gantry	200m	50mph	1.8km
AMI (over lane 3&4)	Repairs with frequency based on a 17% failure rate	Night-time	Lane 3&4 closure to allow access to one gantry. Additionally, lane 4 of the opposite carriageway will have a closure when working on an AMI over lane 4.	200m	50mph	1.8km
VMS (MS4)	Repairs, with frequency based on a 10% failure rate	Night-time	Lane 1&2 closure to allow access to gantry	200m	50mph	1.8km
VMS & AMI Annual Cleaning	Annual cleaning	Night-time	Two lanes closed followed by switch to other two lanes to allow access to six successive gantries	4.5km	50mph	6.1km
MIDAS loops	Repairs, with frequency based on a 15% failure rate, spread across loop sets (so every set will have 2-3 loop failures per year) Requirement to replace loops when at least two loops fail	Night-time	Two lanes closed (L3&4) leaving traffic running on lane 1 &2. After having cut and installed the loops in lanes 3 and 4, the TM arrangement will change so that traffic can run in lanes 3&4 and close lanes 1&2	400m	50mph	2km
HADECS	Annual inspection and cleaning	Night-time	Two lanes closed to allow access to one gantry	400m	50mph	2km
PTZ Camera	Electrical and mechanical testing and cleaning	Night-time	Lane 1 closure to allow access to camera (If no off-network access is available)	200m	50mph	1.8km
PTZ Camera	Repairs with frequency based on 10% failure rate	Night-time	Lane 1 closure to allow access to camera (If no off-network access is available)	200m	50mph	1.8km

Table A2 –Required Maintenance and Traffic Management for MM-ALR

Maintenance Item	Qty per 10km Section	Cleaning/ Inspections per Year	Day/ Night	Frequency	Traffic Management Requirement
Gantry	7	1	Day	4 per year	Lanes 1&2 closed with 50mph limit for 3.6km, four times per year
AMI & VMS	7 (Gantries)	1	Night	2 per year	Lane 1&2 closed with 50mph limit for 5.8km, twice per year. Lanes 3 and 4 closed with 50mph limit for 5.8km, twice per year
HADECS cameras	2	1	Night	2 per year	One lane closed with 50mph limit for 2km, twice per year
PTZ Camera	11	2	Night	8 per year	One lane closed with 50mph limit for 2km, twice per year

Table A3 – Sample Cleaning/Inspection Schedule for 10km Section of MM-ALR

Maintenance Item	Qty per 10km Section	Repairs per Year	Traffic Management Frequency	Day/ Night
AMI	16	2	2 per year	Night
VMS (MS4)	7	1	1 per year	Night
MIDAS Loop pairs	25	26	26 per year	Night
HADECS cameras	2	0[1]	1 per year	Night
PTZ cameras	11	1	1 per year	Night

Table A4 – Sample Repair Schedule for 10km Section of MM-ALR

Typical Equipment Renewal Schedule

9. In addition to regular maintenance activities, it will also be necessary for equipment to be renewed at certain intervals. Table A5, overleaf, provides a schedule of equipment renewal periods and associated traffic management requirements for one carriageway of a typical 10km section of MM-ALR.

Maintenance of Existing Equipment and Major Maintenance

10. Any maintenance of existing equipment present on stretches of carriageway converted to MM-ALR will now require temporary traffic management, and this should be reflected as a difference between the Do-Minimum and the Do-Something scenarios.

11. Major maintenance activities of any kind requiring prolonged periods of temporary traffic management will need to be assessed using either QUADRO or the scheme traffic model. The traffic flows should be based upon those forecast by the model for the year in which the maintenance is to take place (or, if necessary, interpolated between available forecast years).

12. Use of the hard shoulder as a permanent running lane is likely to result in predicted traffic volumes higher than in the Do-Minimum. Account must be taken of this in the assessment of delay to traffic during maintenance. If the analysis indicates that this higher demand will lead to excessive user delays during periods of maintenance then discussions should take place with the scheme team about further options for the projected maintenance, such as minimum capacity during peak periods or restricting lane closures to offpeak periods.

[1] Repairs and cleaning carried out at the same time.

Renewal Item	Qty per 10km Section	Renewal Period (years)	Traffic Management Requirement	Length of Roadworks	Speed Limit	Length of Speed Limit	Day/ Night	Traffic Management Duration
Gantry	13	30	Overnight closures (see notes below)	Link	N/A	N/A	Night	2 nights
AMI	16	12.5	Two lanes closed followed by switch to other two lanes	1.8km	50mph	3.4km	Night	4 nights
VMS MS4	7	15	Lane 1 & 2 closure to allow access	200m	50mph	1.8km	Night	7 nights
HADECS cameras	2	7.5	Two lanes closed to allow access to one gantry	400m	50mph	2km	Night	2 nights
PTZ cameras	11	10	Lane 1 closure to allow access to camera	200m	50 mph	1.8km	Night	1 night

Table A5 – Sample Equipment Renewal Schedule for MM-ALR

Notes:

1) MIDAS & ERA Loops do not have specific renewal periods as they are constantly being renewed via general maintenance activities.

2) Gantries are the most complex items to renew and will require a complete overnight closure of both carriageways to remove the old gantry and another closure to install the new gantry. The sequence of events will involve:

(i) Removal of the electronics from the existing structure - overnight with two lanes closed at any one time and a switch in the middle of the night. This will have to be done twice, once for each carriageway, for a double span gantry.
(ii) Removal of the span - overnight complete closure.
(iii) Removal of the existing vertical supports and installation of new supports - hard shoulder closure for 24 hours on each carriageway.
(iv) Installation of the new span - overnight complete closure;
(v) Installation of the new electronics - overnight with 2 lanes closed at any one time and a switch in the middle of the night. This will have to be done twice, once for each carriageway, for a double span gantry. Assuming all gantries are renewed on a link, then the overnight link closures will be used to remove and install all gantries on the link.

Additional traffic management before and after the closures may, however, be required for removal/installation of electronics.

Appendix B: Operating Costs and the Economic Assessment of MM-ALR

1. This appendix provides advice on incorporating operating cost estimates from the Managed Motorways – All lanes running Operational Cost Model into the economic assessments of individual MM-ALR schemes. Any queries concerning the cost model should be directed to the Delivery Hub Operations Team: MMOperations@highways.gsi.gov.uk.

2. The Managed Motorways – All lanes running Operational Cost Model allows operating cost estimates to be calculated for individual schemes. The bottom right hand corner of each individual scheme sheet contains the 60 year expenditure profiles of estimated operating costs that need to be incorporated into the scheme economics.

3. The cost estimates represent the additional maintenance, operating and renewal costs compared to non-Managed Motorway operation. No costs are included that would also be incurred in the Do-Minimum.

4. The model presents annual costs that incorporate assumptions regarding cost reductions over time for specific cost items (e.g. efficiencies in maintenance, reduced need for Managed Motorway infrastructure and therefore renewals). The Delivery Hub Operations Team is of the opinion that such assumptions should be included when estimating the cost profile over 60 years and therefore these should be applied in the version of the costs used in the scheme economic assessment.

5. The costs presented in the model allow for predicted differences between general inflation and inflation in scheme cost items as required by WebTAG Unit 3.5.9. No further adjustment in this regard is necessary when undertaking an economic assessment. The Managed Motorways – All lanes running Operational Cost Model does not include a specific allowance for optimism bias as the estimates already include contingency, and therefore additional optimism bias should not be added.

6. The costs exclude all VAT, whether recoverable or not, therefore there is no need for an adjustment as required by WebTAG. All costs are in 2010 factor costs and the RPI for 2010 is 224.5.

7. The total expenditure and the expenditure profile across the 60 year assessment period should be entered into TUBA or the equivalent WebTAG and HM Treasury Green Book compliant methodology from the table in the bottom right hand corner of the individual scheme sheets; the costs including cost reductions over time. All the costs should be entered into the TUBA assessment as 'Operating' costs regardless of whether they come under the heading of Maintenance, Operations or Renewals. The costs should be entered as costs in the Do-Something only.

8. As noted in WebTAG Unit 3.5.9, The Estimation and Treatment of Scheme Costs, the capital costs of non-traffic related maintenance (e.g. drainage, fencing, grass cutting etc.) should appear in the Public Accounts table as operating costs, as should the extra staffing in traffic control centres, whilst the capital costs of traffic related maintenance (e.g. resurfacing, gantry maintenance etc.) should appear as investment costs.

9. In order to represent these costs in the correct category, the capital costs of non-traffic related maintenance should be entered into TUBA as a 'Maintenance' cost, the additional operating costs should be included as 'Operating' costs and the capital costs of traffic-related maintenance should be entered as 'Construction' costs. This categorisation will ensure that the costs are accounted for in the correct categories whilst also highlighting that the additional operating costs of Managed Motorways – All lanes running have been accounted for.

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