

HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT

GUIDANCE DOCUMENT



MAY 2013

Although this report was commissioned by the Department for Transport (DfT), the findings and recommendations are those of the authors and do not necessarily represent the views of the DfT. The information or guidance in this document (including third party information, products and services), is provided by DfT on an 'as is' basis, without any representation or endorsement made and without warranty of any kind whether express or implied.

Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR

Telephone 0300 330 3000
Website www.dft.gov.uk

©Queen's Printer and Controller of Her Majesty's Stationery Office, 2013, except where otherwise stated

Copyright in the typographical arrangement rests with the Crown.

You may re-use this information (not including logos or third-party material) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or e-mail: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

Comments & Feedback

The HMEP Programme Board would welcome any comments and feedback on this Guidance Document, so that it may be reviewed, improved and refined to give the sector the best support possible. If you wish to make a comment, please send an email to highwayefficiency@dft.gsi.gov.uk with the header, 'Feedback on the Highway Infrastructure Asset Management Guidance'.

CONTENTS

Contents	I
Foreword	V
Executive Summary	VII
Summary of Recommendations	IX
Navigation Guide	XI
1 INTRODUCTION	1
1.1 BACKGROUND	1
1.2 HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT	1
1.3 PURPOSE OF THIS GUIDANCE	3
1.4 SCOPE OF THIS GUIDANCE	4
1.5 RELATIONSHIP WITH OTHER NATIONAL GUIDANCE	4
1.6 RELATIONSHIP WITH ASSET MANAGEMENT STANDARDS	4
1.7 HIGHWAYS MAINTENANCE EFFICIENCY PROGRAMME	5
2 A FRAMEWORK FOR HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT	6
PART A – ASSET MANAGEMENT AND THE ORGANISATIONAL CONTEXT	9
3 NATIONAL AND LOCAL TRANSPORT POLICY	10
3.1 TRANSPORT POLICY	10
3.2 THE IMPORTANCE OF HIGHWAY INFRASTRUCTURE	10
3.3 STAKEHOLDER EXPECTATIONS	11
3.4 COMMUNICATIONS	12
3.5 CRITICAL INFRASTRUCTURE	14
3.6 HIGHWAY INFRASTRUCTURE ASSET PERFORMANCE	15
3.7 FINANCIAL REPORTING REQUIREMENTS	16
4 AN ASSET MANAGEMENT APPROACH FOR HIGHWAY INFRASTRUCTURE	17
4.1 INTERPRETATION OF ASSET MANAGEMENT	17
4.2 IMPORTANCE OF ASSET MANAGEMENT	17
4.3 GOOD PRACTICE IN ASSET MANAGEMENT ACROSS SECTORS	18
5 ORGANISATION AND MANAGEMENT CONTEXT	19
5.1 RESPONSIBILITY FOR THE HIGHWAY NETWORK	19
5.2 CORPORATE VISION	19
5.3 LEGAL CONSTRAINTS	20
5.4 WIDER INFLUENCES	20
5.5 FINANCIAL CONSTRAINTS	20

PART B – ASSET MANAGEMENT PLANNING	23
6 ASSET MANAGEMENT POLICY AND STRATEGY	24
6.1 OBJECTIVES OF AN ASSET MANAGEMENT POLICY AND STRATEGY	24
6.2 ASSET MANAGEMENT POLICY	25
6.3 ASSET MANAGEMENT STRATEGY	25
7 SETTING AND MEASURING PERFORMANCE	28
7.1 OBJECTIVES OF SETTING AND MEASURING PERFORMANCE	28
7.2 INTRODUCTION	28
7.3 FUTURE DEMAND	29
7.4 LEVELS OF SERVICE	31
7.5 PERFORMANCE MEASURES	31
7.6 PERFORMANCE TARGETS	33
7.7 PERFORMANCE MANAGEMENT FRAMEWORK	34
8 ASSET DATA	36
8.1 OBJECTIVES OF ASSET DATA	36
8.2 ASSET DATA	36
8.3 DATA REQUIREMENTS	37
8.4 DATA COLLECTION	39
8.5 MANAGEMENT OF ASSET DATA	40
9 LIFECYCLE PLANNING	42
9.1 OBJECTIVES OF LIFECYCLE PLANNING	42
9.2 LIFECYCLE PLANNING	42
9.3 PERFORMANCE GAP	43
9.4 THE LIFECYCLE PLAN	44
9.5 DETERMINING THE INVESTMENT STRATEGY	50
9.6 SUPPORT FOR LIFECYCLE PLANNING	51
9.7 RESOURCES AVAILABLE	51
10 WORKS PROGRAMMES	53
10.1 OBJECTIVES OF WORKS PROGRAMMES	53
10.2 WORKS PROGRAMMING AND DELIVERY	53
10.3 PROGRAMME DEVELOPMENT	53
10.4 THE FORWARD PROGRAMME	56
10.5 OPTIMISATION	57
10.6 ANNUAL WORKS PROGRAMME	58
11 THE HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN	59
11.1 OBJECTIVES OF HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN	59
11.2 HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN	59
11.3 DEVELOPING THE HIAMP	59

PART C – ENABLERS	63
12 ASSET MANAGEMENT LEADERSHIP AND ORGANISATION	64
12.1 INTRODUCTION	64
12.2 LEADERSHIP AND CULTURE	64
12.3 MAKING THE CASE FOR INVESTMENT	66
12.4 ORGANISATIONAL CONSIDERATIONS	68
12.5 KEY ROLES	71
12.6 COMPETENCY AND SKILLS	71
13 RISK MANAGEMENT	74
13.1 INTRODUCTION	74
13.2 APPROACH TO RISK MANAGEMENT	75
13.3 IDENTIFYING RISKS	76
13.4 IDENTIFYING CRITICAL ASSETS	77
13.5 EVALUATING THE RISKS	78
13.6 MANAGING THE RISKS	80
13.7 MONITORING AND REVIEW	80
14 ASSET MANAGEMENT SYSTEMS	82
14.1 INTRODUCTION	82
14.2 FUNCTIONALITY OF ASSET MANAGEMENT SYSTEMS	82
14.3 CONSIDERATIONS FOR ASSET MANAGEMENT SYSTEMS	84
15 PERFORMANCE MONITORING	89
15.1 INTRODUCTION	89
15.2 PERFORMANCE MONITORING	89
15.3 PERFORMANCE REVIEWS	90
15.4 IMPROVEMENT PLANS	91
15.5 BENCHMARKING PERFORMANCE	92
16 GETTING STARTED AND PROGRESSING	94
16.1 IMPLEMENTATION PLAN	94
16.2 ASSESSING ASSET MANAGEMENT MATURITY	96
17 ACKNOWLEDGEMENTS	97
17.1 HMEP ASSET MANAGEMENT WORKING GROUP	97
17.2 ATKINS PROJECT TEAM	97
18 REFERENCES	98
APPENDIX A – CASE STUDIES	100
APPENDIX B – ABOUT THE HIGHWAYS MAINTENANCE EFFICIENCY PROGRAMME	101
APPENDIX C – DEFINING ASSET MANAGEMENT	103
APPENDIX D – EXAMPLE OF AN ASSET MANAGEMENT POLICY	104
APPENDIX E – CLASSIFICATION OF ASSETS	105
APPENDIX F – DECISION MAKING TECHNIQUES	108
APPENDIX G – WHOLE LIFE COSTING	110
APPENDIX H – DOCUMENTS SUPPORTING ASSET MANAGEMENT	114
APPENDIX I – TYPICAL HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN	116
APPENDIX J – TYPICAL BUSINESS CASE	117
APPENDIX K – ASSET MANAGEMENT ROLES AND RESPONSIBILITIES	118

This Guidance was developed with support from the following organisations:



UK ROADS LIAISON GROUP

FOREWORD



In recent years the investment in highway infrastructure and its performance has been increasingly under the spotlight. The current financial challenges and increased public demands and expectations have meant that we have had to re-think the way we manage our highway infrastructure. Recent severe weather has also provided tangible evidence of the fragility of our highway network, and raised awareness of the financial and other challenges involved in maintaining an ageing infrastructure.

The sector has been working hard to demonstrate that highways are a valuable asset and vital to the economic and social well-being of communities. The implementation of Whole of Government Accounts has proved that the road network is the most valuable asset that many local authorities manage.

Asset management supports business decisions and provides longer term financial benefits. It helps us to understand the asset we have, describe how it performs and determine the funding needed to meet the requirements placed upon it. Much progress has been made in the way asset management is developed and implemented in the UK, it has already been adopted by many highway authorities and is well proven in other sectors, but much more is still to be done.

This Guidance has been developed under the Highways Maintenance Efficiency Programme (HMEP), a sector-led transformation programme designed to maximise returns from highways investment and deliver efficient and effective services. The Guidance will help all those delivering highway services, including senior decision makers, asset managers, service providers and practitioners, to embed asset management principles in their organisations and make the case for funding highway maintenance.

The Guidance consolidates existing documents, builds upon existing good practice and offers a flexible framework that is suitable for all local authorities, wherever they are in terms of implementing asset management. It moves the focus away from developing Transport Asset Management Plans and towards implementing asset management effectively. Its advice should be adopted by all those involved in delivering the highway service to support them in the decisions they make in managing highway infrastructure assets in the UK.

I am therefore pleased to endorse this new Guidance and its recommendations on behalf of the UK Roads Liaison Group.

A handwritten signature in black ink that reads "G. Pendlebury".

GRAHAM PENDLEBURY
Chair – UK Roads Liaison Group

EXECUTIVE SUMMARY

THE CASE FOR ASSET MANAGEMENT

Asset management has been widely accepted by central and local government as a means to deliver a more efficient and effective approach to management of highway infrastructure assets through longer term planning, ensuring that standards are defined and achievable for available budgets. It also supports making the case for funding and better communication with stakeholders, facilitating a greater understanding of the contribution highway infrastructure assets make to economic growth and the needs of local communities.

The demand for a more efficient approach to the management of highway infrastructure assets has come to prominence in the light of the fiscal challenges faced by both by central and local government as well as the devolved administrations. Recent developments include:

- The CIPFA *Code for Transport Infrastructure Assets*, provides advice on how asset management must be implemented for local highway authorities to meet Whole of Government Accounts requirements.
- The Audit Commission report *Going the Distance* recommends that local highway authorities in England should adopt the principles of asset management when making investment decisions in order to optimise the use of available resources.
- The *Potholes Review, Prevention and a Better Cure* found that asset management has not been embraced consistently across all authorities in England although it is clearly understood that a more preventative approach to maintenance and long term planning is likely to reduce the occurrence of potholes.
- The Audit Scotland reports *Maintaining Scotland's Roads* and *Maintaining Scotland's Roads – A Follow-up Report* recommends that councils gather better information on the number and condition of road assets to support the allocation of maintenance budget through an asset management approach.
- Scotland's National Roads Maintenance Review recommends a number of options for improving highway maintenance. These rely on the implementation of robust asset management practices.

These developments provide a greater focus on asset management. Although the principles of asset management have been accepted, highway authorities throughout the UK have adopted a wide ranging approach to its implementation. Many authorities have successfully adopted asset management but others are still at an early stage of implementation. Where asset management has been successfully adopted, demonstration of leadership and commitment from senior decision makers in supporting an asset management approach has been fundamental.

In England the Highways Maintenance Efficiency Programme (HMEP) has recognised that better advice and information is required if local authorities are to benefit consistently from the potential that asset management offers. HMEP has prepared this Guidance for local highway authorities, which is endorsed by UKRLG, to support the adoption of asset management principles and enable implementation of the benefits of long term planning. This will support a more effective and efficient approach to the management of highway infrastructure.

PURPOSE OF THIS GUIDANCE

This Guidance is aimed at all of those involved in managing highway infrastructure, including senior decision makers, asset managers and practitioners. Support from senior decision makers is an important factor in implementing asset management, as are the knowledge and skills of those responsible for managing the asset.

This Guidance is not intended to replace approaches that have been successfully adopted by local highway authorities, but to provide the basis for a consistent approach and understanding of the implementation and delivery of the benefits associated with asset management.

This Guidance makes 14 recommendations which are presented as the minimum requirements to achieve a reasonable level of benefit from asset management. The recommendations should be taken as a suite and considered as a whole. The recommendations can be met through adopting a basic approach to asset management, however, further benefits may be achieved through adopting more advanced practices.

As a basis for providing a consistent approach to implementing this Guidance and its recommendations, a Framework for Highway Infrastructure Asset Management has been introduced. This sets out the activities that support asset management as:

- context of asset management;
- asset management planning process; and
- enablers to support implementation of asset management.

Together they provide the basis to progress the asset management journey and support the benefits of taking a long term view of the management of highway infrastructure. They also support the development of an approach for those authorities making the case for funding.

HOW TO USE THIS GUIDANCE

Authorities should review their current asset management practices against the recommendations in this Guidance. Where additional activities are required to meet the recommendations, authorities should develop an Implementation Plan and may also wish to make the case for additional investment. This will require the support of senior decision makers.

This Guidance sets out an approach to deliver asset management. It is not prescriptive or the only approach. It is evidence based from case studies describing lessons learnt and good practice from the implementation of asset management. The approach that may be adopted to meet the recommendations will vary between authorities based on a number of factors, including their current position, the role their highway network plays in the local community and resources.

This Guidance also provides advice for those authorities that are at an early stage of implementation or have just started on the asset management journey, to ensure that they have the information available to maximise the potential benefits of an asset management approach and make the case for investment, as required.

SUMMARY OF RECOMMENDATIONS

ASSET MANAGEMENT FRAMEWORK

RECOMMENDATION 1

An Asset Management Framework should be developed and endorsed by senior decision makers. All activities outlined in the Framework should be documented.

COMMUNICATIONS

RECOMMENDATION 2

Relevant information associated with asset management should be actively communicated through engagement with relevant stakeholders in setting requirements, making decisions and reporting performance.

ASSET MANAGEMENT POLICY AND STRATEGY

RECOMMENDATION 3

An asset management policy and a strategy should be developed and published. These should align with the corporate vision and demonstrate the contribution asset management makes towards achieving this vision.

PERFORMANCE MANAGEMENT FRAMEWORK

RECOMMENDATION 4

A performance management framework should be developed that is clear and accessible to stakeholders as appropriate and supports the asset management strategy.

ASSET DATA MANAGEMENT

RECOMMENDATION 5

The quality, currency, appropriateness and completeness of all data supporting asset management should be regularly reviewed. An asset register should be maintained that stores, manages and reports all relevant asset data.

LIFECYCLE PLANS

RECOMMENDATION 6

Lifecycle planning principles should be used to review the level of funding, support investment decisions and substantiate the need for appropriate and sustainable long term investment.

WORKS PROGRAMMING

RECOMMENDATION 7

A prioritised forward works programme for a rolling period of three to five years should be developed and updated regularly.

LEADERSHIP AND COMMITMENT

RECOMMENDATION 8

Senior decision makers should demonstrate leadership and commitment to enable the implementation of asset management.

MAKING THE CASE FOR ASSET MANAGEMENT

RECOMMENDATION 9

The case for implementing the Asset Management Framework should be made by clearly explaining the funding required and the wider benefits to be achieved.

COMPETENCIES AND TRAINING

RECOMMENDATION 10

The appropriate competency required for asset management should be identified, and training should be provided where necessary.

RISK MANAGEMENT

RECOMMENDATION 11

The management of current and future risks associated with assets should be embedded within the approach to asset management. Strategic, tactical and operational risks should be included as should appropriate mitigation measures.

ASSET MANAGEMENT SYSTEMS

RECOMMENDATION 12

Asset management systems should be sustainable and able to support the information required to enable asset management. Systems should be accessible to relevant staff and, where appropriate, support the provision of information for stakeholders.

PERFORMANCE MONITORING

RECOMMENDATION 13

The performance of the Asset Management Framework should be monitored and reported. It should be reviewed regularly by senior decision makers and when appropriate, improvement actions should be taken.

BENCHMARKING

RECOMMENDATION 14

Local and national benchmarking should be used to compare performance of the Asset Management Framework and to share information that supports continuous improvement.

NAVIGATION GUIDE

The key activities presented in the Highway Infrastructure Asset Management Framework and this Guidance are summarised below. Each Section provides advice on how to meet the recommendations, together with case study examples of where highway authorities have achieved this successfully.

THE RECOMMENDATIONS

This Guidance makes 14 recommendations which are presented as the minimum requirements to achieve an appropriate level of benefit from asset management. These should be taken as a suite and considered as a whole. The recommendation themes are summarised below.

Highway Infrastructure Asset Management Framework	Leadership and Commitment
Communications	Making the Case for Asset Management
Asset Management Policy and Strategy	Competencies and Training
Performance Management Framework	Risk Management
Asset Data Management	Asset Management Systems
Lifecycle Plans	Performance Monitoring
Works Programming	Benchmarking

THE GUIDANCE

The Guidance is presented as described below:

Section 1 – Introduction

Section 2 – A Framework for Highway Infrastructure Asset Management

Sets out the activities and processes necessary to develop, document, implement and continually improve asset management.

PART A – ASSET MANAGEMENT AND THE ORGANISATIONAL CONTEXT

Section 3 – National and Local Transport Policy

Meeting the requirements of overall transport policy and the diverse needs of stakeholders and local communities are essential to setting the direction for asset management.

Section 4 – An Asset Management Approach for Highway Infrastructure

Asset management has been widely accepted by central and local government as a means to deliver a more efficient and effective approach to management of highway infrastructure assets through longer term planning. A well developed approach to asset management will support local highway authorities responding to budget challenges.

Section 5 – Organisational and Management Context

Local highways are the responsibility of local highway authorities. Major decisions, such as setting the annual budget and agreeing key policies are made by the elected members of the authority. Elected members, officers, contractors and others involved in asset management need to understand the extent and nature of the authority's legal obligations, policies and risks in managing the highway network. They also need to appreciate the distinction between duties and powers, and how they relate to their particular responsibilities.

PART B – ASSET MANAGEMENT PLANNING

Section 6 – Asset Management Policy and Strategy

The asset management policy sets out the commitment by senior decision makers to highway infrastructure asset management. The asset management strategy sets out the long term objectives for the highway asset and how they are met, including statutory obligations, stakeholder needs and the overall performance of highway infrastructure within the context of any constraints such as funding.

Section 7 – Setting and Measuring Performance

Authorities should establish levels of service with their stakeholders, senior decision makers and the public. Performance measures and targets should be set to enable monitoring of delivery of the strategy and of performance and to identify the cost of meeting the strategy in the short, medium and long term.

Section 8 – Asset Data

Asset data describes what highway infrastructure assets an authority has, where they are and how they perform. It is used to support the requirements of the asset management strategy and in determination of the approach to deliver the strategy, including performance management, lifecycle planning, forward programming and risk management.

Section 9 – Lifecycle Planning

Development and use of lifecycle plans will demonstrate how funding and performance requirements are achieved through appropriate intervention and investment strategies, with the objective of minimising expenditure while providing the required performance.

Section 10 – Works Programmes

Delivery of the works programme is the tangible outcome of the asset management planning process. The process to develop a works programme for maintenance and renewal of highway infrastructure assets comprises the identification, prioritisation, optimisation, programming and delivery of individual schemes.

Section 11 – The Highway Infrastructure Asset Management Plan

It is important that authorities document their asset management process to provide clarity and transparency. The Highway Infrastructure Asset Management Plan (HIAMP) is one way to record and communicate the approach to asset management in a single document, informing relevant stakeholders and staff how highway infrastructure assets are managed over a period of time. Authorities may however consider it more efficient and effective to document processes separately.

PART C – ENABLERS

Section 12 – Asset Management Leadership and Organisation

Leadership has a strong influence on the culture and behaviour of all organisations. Clear direction and priorities will ensure that both significant and apparently relatively minor decisions taken across an organisation all support a consistent approach to delivering asset management. Time and effort spent on leadership and organisational development will pay dividends in the long-term as the purpose, objectives and responsibilities for asset management will be clearly established and supported.

Demonstrating the benefits that investment in highway infrastructure assets can achieve is required to support decision making and prioritise investment of capital funds and other valuable resources. Many authorities have been successful in making the case for additional investment in the maintenance of their highway infrastructure by adopting asset management principles.

Section 13 – Risk Management

Highway authorities are required to manage a variety of risks at all levels within their organisations. The likelihood and consequences of these risks can be used to inform and support the approach to asset management and inform key decisions on performance, investment and implementation of works programmes.

Section 14 – Asset Management Systems

Good asset management needs to be supported by robust processes for implementation and management as well as good quality, repeatable and reliable data. An asset management system will support decision making through managing information and data to support asset management as well as to record and monitor its implementation.

Section 15 – Performance Monitoring

A well developed approach to performance monitoring will provide authorities with the ability to continuously improve their asset management knowledge, processes and systems to support effective delivery of asset management and to build on lessons learnt to enable them to continuously improve.

Section 16 – Getting Started and Progressing

Authorities have made varied progress implementing asset management. This Guidance can be used to support starting, improving or further developing their approach to asset management. In assessing desired practice, authorities should consider as a minimum their position against the recommendations in this Guidance. In doing so, they should consider their current practice and what asset management practices they wish to adopt, as well as good practice from other highway authorities.

1. INTRODUCTION

1.1 BACKGROUND

- 1.1.1 The highway infrastructure asset is the most valuable asset owned by the public sector in the UK. Its importance for national and local economic prosperity and the public's quality of life is well documented. The significant levels of funding for the management of this asset are under continuous scrutiny, with increasing pressure from government and the public for transparency, accountability and more efficient use of the limited resources available.
- 1.1.2 Asset management is a well established discipline, implemented in the UK and internationally for the management of physical assets. Many asset owning organisations have adopted the principles of asset management and as a result, can demonstrate benefits in terms of financial efficiencies, improved accountability and stewardship of the asset, better value for money and improved customer service.
- 1.1.3 This Guidance is aimed at local highway authorities. It builds on the progress made with asset management and provides consolidated advice on the implementation and continuous development of highway infrastructure asset management. It provides advice on how asset management principles may be used to support a more efficient approach to maintaining highway infrastructure assets - local highway authorities' most valuable assets.
- 1.1.4 The target audience for the Guidance is local highway authority senior decision makers, asset managers and practitioners involved in managing highway infrastructure. This Guidance may also be useful for providers of highway maintenance services. Advice is given on how the principles of asset management should be applied. A separate companion document *Highways - Maintaining A Vital Asset* (1) provides information for elected members on the value and adoption of asset management.
- 1.1.5 The Guidance includes a suite of recommendations which are presented as minimum requirements for the implementation and continuous development of asset management. Authorities should adopt these recommendations in their entirety. Case studies are used to support the approach described and demonstrate how the advice can be practically implemented. A full list of case studies is included in Appendix A. Reference is also made to other relevant documents throughout this Guidance.
- 1.1.6 Advice on getting started is included in Section 16. Authorities should use this Guidance either as a starting point or as a basis from which to review their current approach, develop their asset management practices and, where necessary, to identify and quantify improvements. Improvement actions may be documented in an Implementation Plan.

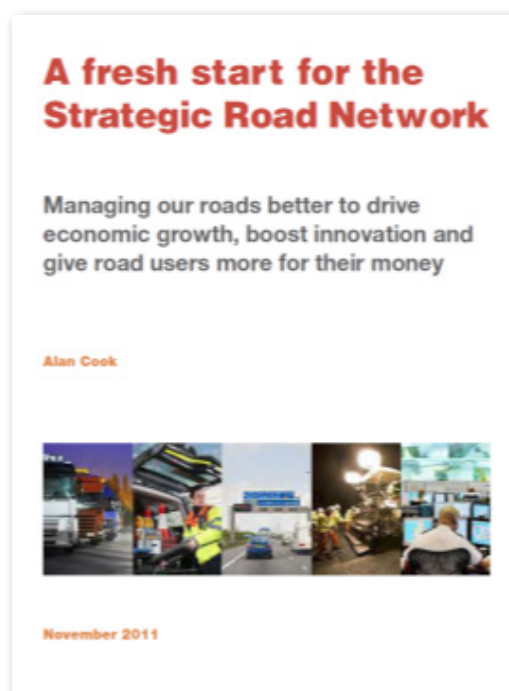
1.2 HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT

- 1.2.1 A review of the implementation of asset management in England was carried out by the Department for Transport (DfT) in 2007 to identify where good progress had been made. The report, *Review of Transport Asset Management Plans* (2), found that the majority of local highway authorities were aware of the potential benefits of asset management. However, it found that a lack of both commitment from senior decision makers and availability of resources were the key blockers to implementation. Since that review, additional advice has been provided, as well as support from the DfT and through various regional and national groups who aim to share good practice. Furthermore, the DfT has provided additional funding to kick start asset management.

- 1.2.2 In England, the DfT works closely with the UK Roads Liaison Group (UKRLG), the Association of Directors for Environment, Economy, Planning and Transport (ADEPT), the Chartered Institute of Public Finance and Accountancy (CIPFA) and others to help spread good practice in asset management, including through the Highways Maintenance Efficiency Programme (HMEP).
- 1.2.3 In Northern Ireland, the Department for Regional Development is the sole authority for roads and roads functions are delivered on their behalf by the Roads Service. Roads Service, which has a considerable and varied asset portfolio and delivers a wide range of services to the public, is working towards the implementation of asset management.
- 1.2.4 In Scotland the SCOTS Asset Management Group has led a project on behalf of all Scottish local authorities to produce a common approach for the implementation of asset management. A similar project has been running concurrently in Wales. It has established a common Asset Management Framework for all Scottish and Welsh local authorities.
- 1.2.5 The Welsh Government's Local Borrowing Initiative, with the aim of improving the local highway asset, has endorsed the work of the CSS Wales Asset Management Group, in particular its Project and Planning Process for highway asset management.
- 1.2.6 Some authorities in the UK have made significant progress implementing asset management. Many lessons have been learnt, experience has been gained and some of the benefits have been recorded. This Guidance incorporates these lessons.

Reviews of Highway Maintenance Practice

- 1.2.7 Since 2010 there have been a number of national reviews of highway maintenance in England and Scotland. These reviews have provided essential information on the status of asset management and some of the context for this Guidance.
- 1.2.8 The Audit Commission published *Going the Distance, Achieving Better Value for Money in Road Maintenance (3)* in 2011. The report recognised that many authorities had traditionally adopted a “worst first” approach to maintenance. It recommends that authorities should adopt the principles of asset management when making investment decisions to optimise the use of available resources. Asset management, however, has not been embraced consistently across all authorities, although it is clearly understood that a more preventative approach to maintenance through long term planning may bring efficiency benefits.
- 1.2.9 *The Potholes Review – Prevention and a Better Cure (4)* published in 2012, provides a suite of recommendations related to highway management. It reported that highway “asset management has not been embraced consistently across all authorities, although it is clearly understood that a more preventative approach to maintenance and long term planning is likely to reduce the occurrence of potholes”.



A fresh start for the Strategic Road Network, image courtesy of the Department for Transport

- 1.2.10 *A fresh start for the strategic road network* (5) published in 2011, recommends that the Highways Agency should seek accreditation to PAS 55 (6) and a specified level of asset management maturity by 2015 in order to facilitate achievement of significant efficiency savings.
- 1.2.11 Audit Scotland published *Maintaining Scotland's Roads* (7) in 2004. The report observed “Many councils had not yet developed up-to-date electronic inventories of the number and condition of road assets to support the allocation of maintenance expenditure.” In 2011 Audit Scotland published *Maintaining Scotland's Roads – A Follow-up Report* (8), which commented “A longer term road maintenance strategy or plan should be an important component of a more broadly based road asset management plan”. In June 2012 the *National Roads Maintenance Review* (9) was published. It involved all stakeholders who use the road network and identified how those responsible for and working in the roads maintenance sector could deliver maintenance requirements more efficiently. Robust asset management planning was a key theme, together with minimum levels of service for roads in Scotland.

1.3 PURPOSE OF THIS GUIDANCE

1.2.12 This Guidance supports local highway authorities in the development and implementation of highway infrastructure asset management, in order to deliver the potential benefits, including efficiencies that can be gained by taking a long term view. It also supports authorities in embedding the recommendations of the national reviews described above. The purpose of the Guidance is to:

- establish a framework to enable development of asset management;
- provide advice for authorities to interpret the requirements of asset management;
- promote good practice through a common framework for highway infrastructure asset management;
- support efficiency in the delivery of highway maintenance;
- embed the learning from practical application of asset management; and
- enable quick and consistent progress to be made.

1.3.1 Separate advice is provided in the UKRLG Codes of Practice (10, 11, 12 13) on the more operational aspects of asset management.

1.3.2 This Guidance and its recommendations should enable authorities to implement asset management and achieve the associated benefits, including longer term efficiency in delivering highway maintenance, prudent stewardship of their assets and better substantiated funding decisions.

1.3.3 This Guidance replaces the 2004 *CSS Framework for Highway Asset Management* (14) and the series of UKRLG *Asset Management Quick Start Guides* (15, 16, 17, 18) and consolidates advice given in other documents.

1.4 SCOPE OF THIS GUIDANCE

1.4.1 This Guidance covers all highway infrastructure assets in the ownership of local highway authorities. There will be assets that some authorities consider appropriate to include as highway infrastructure assets, whilst others may consider them as part of other management arrangements, for example, public rights of way.

- 1.4.2 Asset management comprises the whole lifecycle of an asset from construction, through maintenance, to disposal. This Guidance concentrates on the management and maintenance aspects of highway asset management since these are generally the most relevant aspects for authorities.
- 1.4.3 Some infrastructure assets connected with the highway may be managed by other authorities, depending on the local government arrangements in place in the area. For example, in two tier authorities street furniture could be the responsibility of the District Council, whilst the County Council is responsible for the highway. It is for individual authorities to determine how they manage their assets, but the approach in this Guidance can be applied to a wide range of assets.

1.5 RELATIONSHIP WITH OTHER NATIONAL GUIDANCE

1.5.1 The guidance hierarchy adopted by the UKRLG is shown in Figure 1.

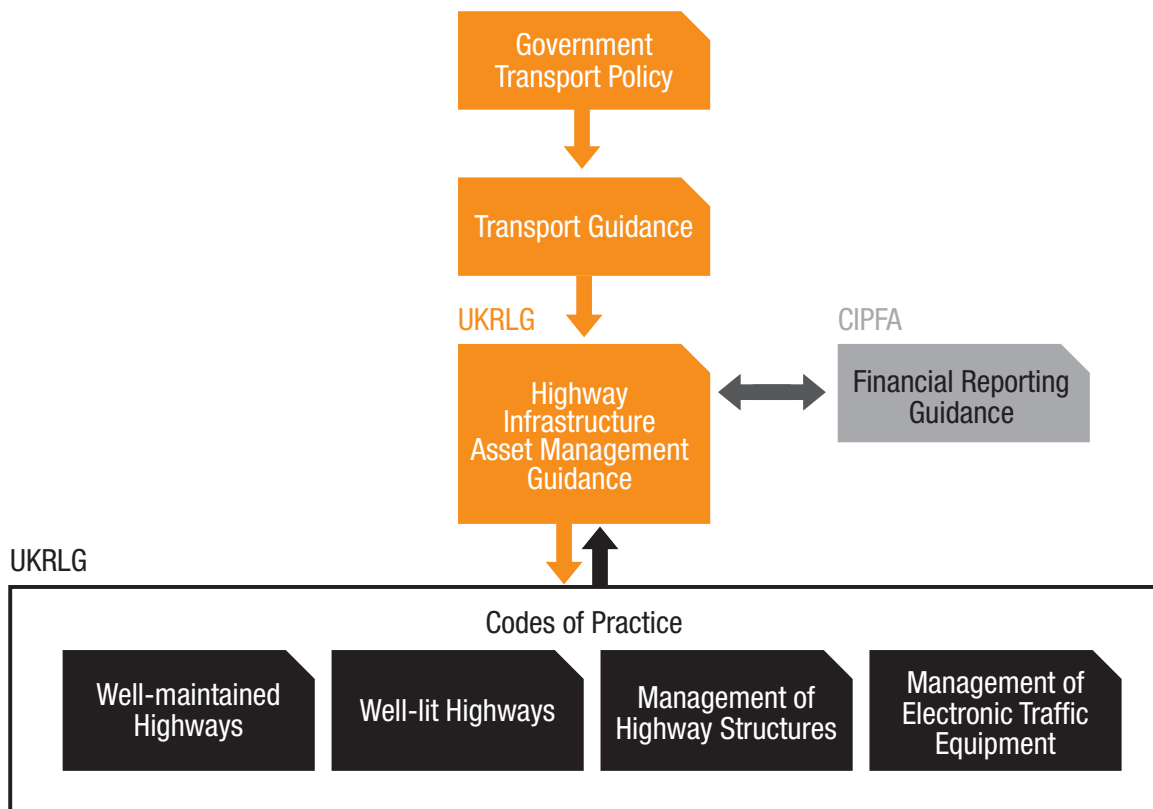


Figure 1 – UKRLG Guidance Hierarchy

1.6 RELATIONSHIP WITH ASSET MANAGEMENT STANDARDS

1.6.1 This Guidance does not replace the British Standards publication ‘*Optimal Management of Physical Assets*’, 2008, known as Publicly Available Specification 55 (PAS 55) (6), which is available for adoption by all asset owners, including local highway authorities, as they see fit. PAS 55 comprises the following documents:

- Part 1 – Specification for the optimised management of physical assets; and
- Part 2 – Guidelines for the application of PAS 55-1.

1.6.2 At the time of publication of this Guidance the International Standards Organisation (ISO) is drafting a Standard for Asset Management (19) which is due to be published in 2014.

This takes a broad view of asset management of physical assets based on experience from around the world. It is intended that the ISO comprises three documents:

- ISO 55000 Asset Management – Overview of Principles and Terminology;
- ISO 55001 Asset Management – Management Systems and Requirements; and
- ISO 55002 Asset Management – Management Systems - Guidelines on the application of ISO 55001.

1.6.3 The intention is that the ISO provides a common platform and reference point for asset management internationally, across all sectors and industries, and is aimed at all assets, including those in public and private ownership. ISO will specify the requirements or “*what to do*” for asset owning organisations but it will not specify the “*how to do*”. The role of this Guidance is to support highway authorities in the UK on the “*how to do*”.

1.6.4 Organisations, including highway authorities, may currently seek accreditation against PAS 55 (6) after considering the benefits of doing so for their organisation. In the future, authorities will be able to seek accreditation against ISO 55000.

1.7 HIGHWAYS MAINTENANCE EFFICIENCY PROGRAMME

1.7.1 This Guidance has been produced under the umbrella of the HMEP, a sector-led transformation programme to maximise returns from investment in highways and deliver efficient and effective highway maintenance services.

1.7.2 The programme is sponsored by the DfT who are providing funding to help the highways sector build on existing good practice and develop further tools and opportunities to realise efficiencies. The key themes promoted by the programme are greater collaboration within the public sector and with the supply chain, smarter procurement, adoption of asset management principles, and benchmarking as a means of improving performance.

1.7.3 At the time of publication of this Guidance other related HMEP products include:

- Lifecycle planning toolkit;
- Support and training for the implementation of lifecycle planning;
- Deterioration model for bituminous carriageways;
- Guidance on drainage asset management;
- Collaboration toolkit; and
- Shared services toolkit.

1.7.4 Further information may be found in Appendix B and at:
<http://www.dft.gov.uk/hmep/index.php>



Screenshot of the HMEP website, image courtesy of the Department for Transport

2. A FRAMEWORK FOR HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT

2.1.1 Authorities in the UK have already embedded some elements of asset management in the way they manage highway infrastructure and some have made significant progress with implementing good practice and realising the benefits. Authorities should build on the work they have already done and use this Guidance and its recommendations to further augment the implementation of asset management.

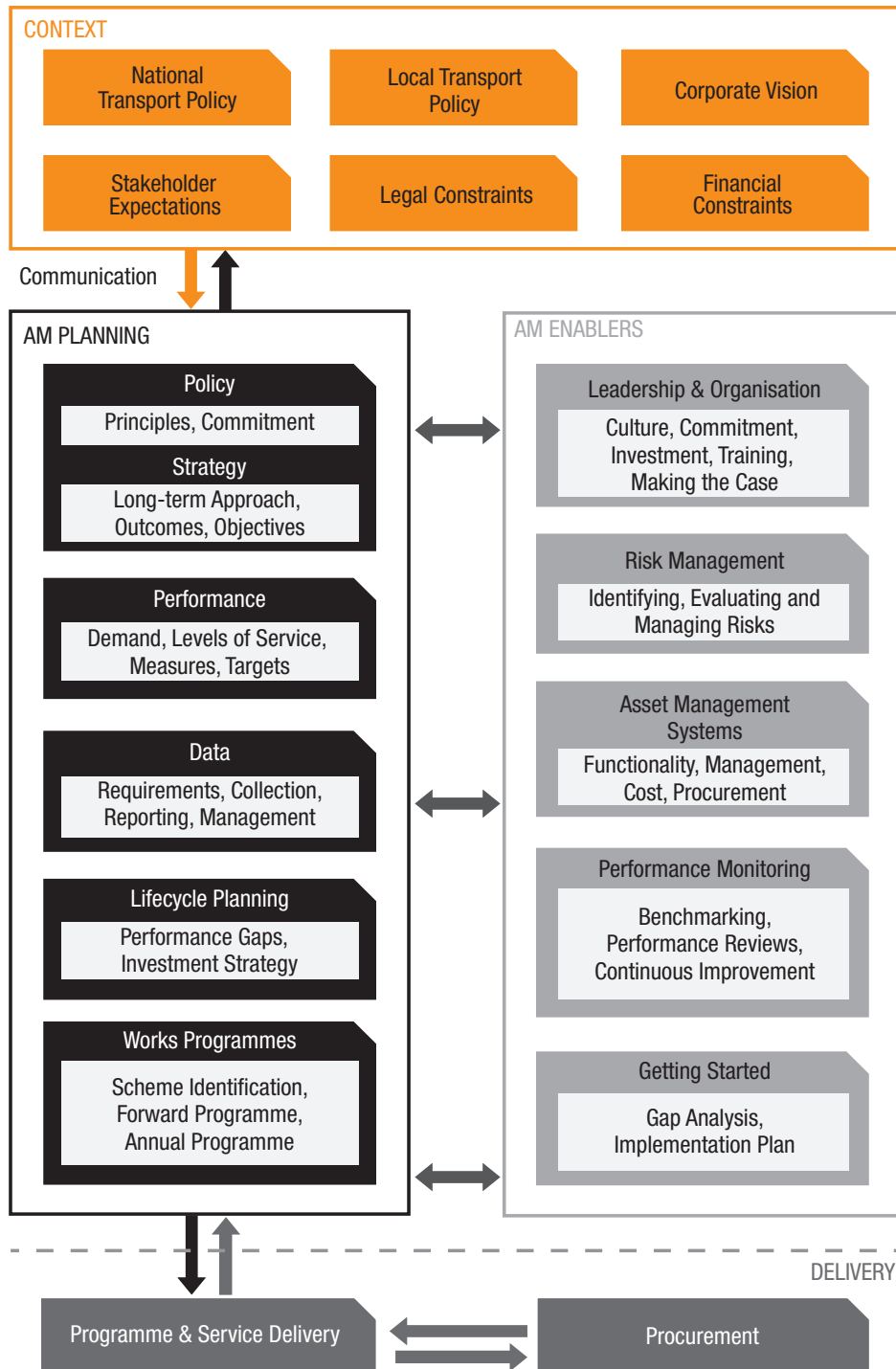


Figure 2 – The Asset Management Framework

2.1.2 The Framework includes all asset management activities normally undertaken by an authority and is flexible to accommodate the requirements of individual authorities. Senior decision makers within authorities should endorse the approach, which should be clearly documented and accessible to relevant stakeholders.

2.1.3 The Asset Management Framework is described in detail in this Guidance and is shown diagrammatically in Figure 2. It comprises the activities and processes that are necessary to develop, document, implement and continually improve asset management. These activities and the approach to their delivery should be clearly documented and accessible to relevant stakeholders.

2.1.4 The Framework is presented in three parts:

- **Context** – Describes the context for highway infrastructure asset management, the organisation and the environment within which the local highway service is delivered, and is covered in Part A;
- **Asset Management Planning** – Describes the key activities and processes for asset management planning and gives advice on how these should be applied to highway infrastructure assets, as covered in Part B; and
- **Asset Management Enablers** – Describes the enablers that support the implementation of the Asset Management Framework and is covered in Part C.

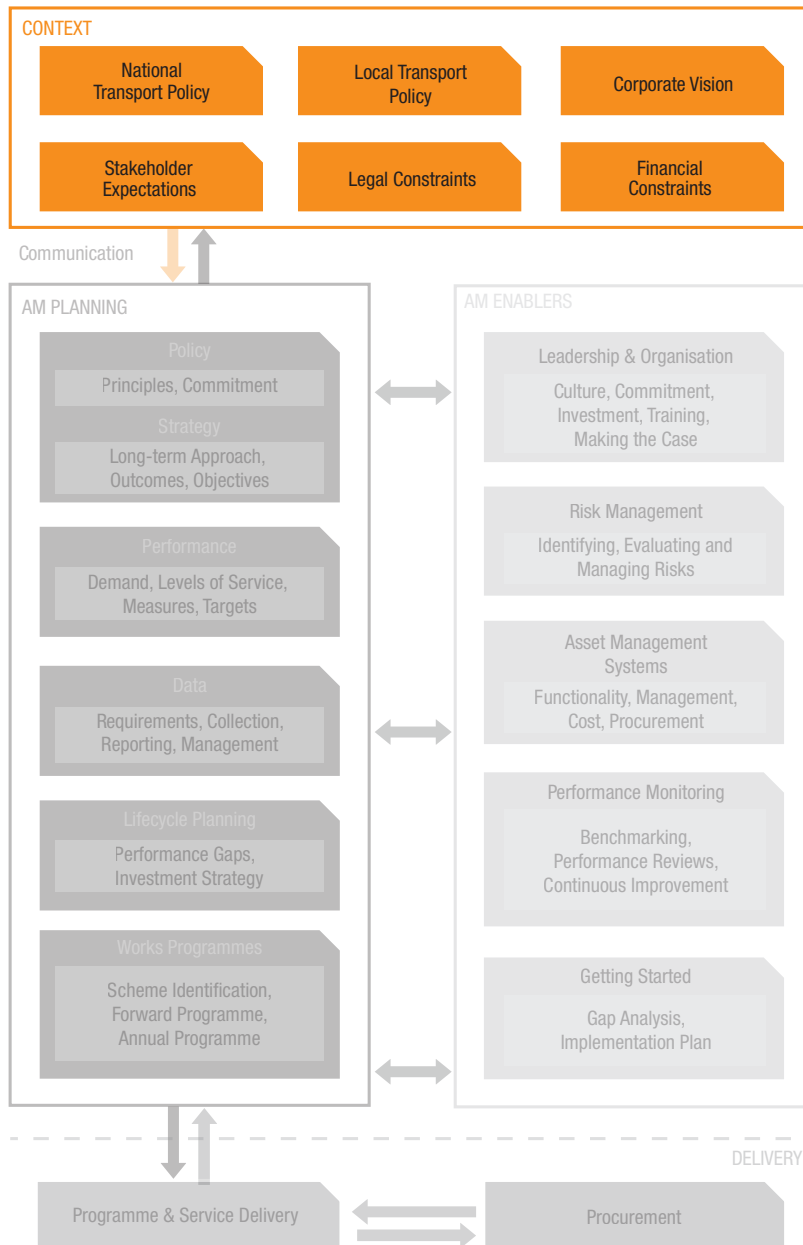
2.1.5 The recommendations in this Guidance all support the Framework and should be considered as the minimum requirements to achieve an appropriate level of benefit from asset management. The recommendations should be taken as a suite and considered as a whole. Many of the recommendations can be achieved through adopting a basic approach to asset management; however, further benefits may be achieved through adopting more advanced practices.

RECOMMENDATION 1

ASSET MANAGEMENT FRAMEWORK

An Asset Management Framework should be developed and endorsed by senior decision makers. All activities outlined in the Framework should be documented.

PART A – ASSET MANAGEMENT AND THE ORGANISATIONAL CONTEXT



Part A of the Guidance sets the context for highway infrastructure asset management by describing the structure and the environment within which the highways service is delivered.

Delivering highway infrastructure asset management is not a stand-alone activity. It is linked with the organisation’s policies and service delivery. It supports the interface with all stakeholders, including elected members, road users, the public and local communities. This Part describes the importance of highway infrastructure, summarises the setting of national and local transport policy, sets requirements for stakeholder communications, and explains the legal and financial constraints.

3. NATIONAL AND LOCAL TRANSPORT POLICY

3.1 TRANSPORT POLICY

3.1.1 Government sets national transport policy and local authorities that have a responsibility for transport develop and set local transport policies which best meet the area's needs. Authorities typically consult stakeholders on key issues and priorities such as public transport, walking, cycling, parking, congestion, rural access, new roads, highway infrastructure condition and spending priorities. Highway asset management policy should be set in the context of overall transport policy.

3.2 THE IMPORTANCE OF HIGHWAY INFRASTRUCTURE

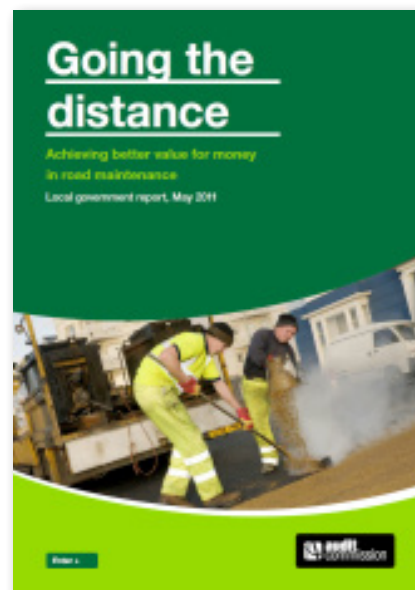
3.2.1 The highway network comprises the strategic network of motorways and trunk roads and both major and minor local roads. It totals some 245,000 miles and includes assets such as carriageways, footways, cycletracks, structures, highway lighting, street furniture, traffic management systems and similar highway infrastructure.

3.2.2 The vast majority of the network is the responsibility of local highway authorities and is the largest, most valuable, and most visible infrastructure asset for which they are responsible. Much of this infrastructure has evolved over a long period of time and was not built to the standards that would be expected of a newly constructed highway. As a consequence, many local highways are less resilient to changing environments and circumstances, such as severe weather events, as described in the *Potholes Review* (4).

3.2.3 Well maintained and accessible highway infrastructure is vital and fundamental to the economic, social and environmental well being of the community. It provides access to business and communities, helps to shape the character and quality of an area, as well as the quality of life of the community and makes an important contribution to wider local authority priorities, including economic activity, regeneration, education, health and community safety. Local highways also provide access to the strategic road network, rail, ports and airports.

3.2.4 It is widely accepted that the performance of the local highway network has a significant impact on the economic development and prosperity of local communities. This is supported by experience from severe winters that have resulted in high economic and social costs from deteriorated and closed highways. Research carried out by the Asphalt Industry Alliance (20) has estimated significant losses to business as a result of poor road condition. Accidents, disruption, increased user costs and vehicle wear and tear are the main contributing factors.

3.2.5 Highway assets, especially carriageways and footways, in poor condition are often the subject of compensation claims against authorities. Direct costs of accidents and vehicle damage to motorists and insurance companies are a real burden on the economy.



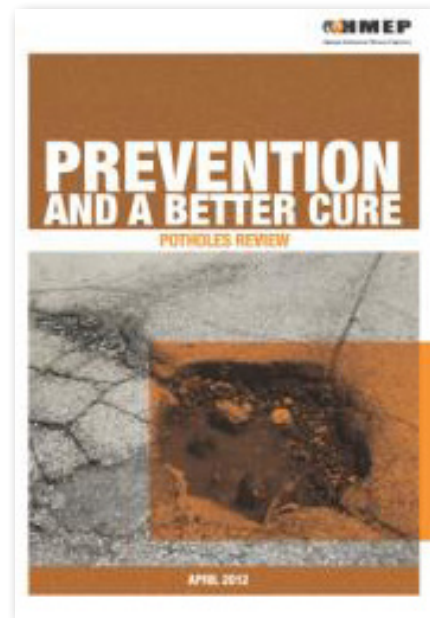
Going the distance, image courtesy of the Audit Commission

- 3.2.6 The economic contribution of highway maintenance is recognised in the Audit Commission report *Going the Distance, 2011* (3). The report highlights that: “Councils must use their road maintenance to support the economic competitiveness of their area. Roads play a critical role in public service delivery and economic growth – both through the increased mobility of citizens, goods and services, and through building and maintaining infrastructure”.
- 3.2.7 As part of the implementation of the recommendations of the *Potholes Review* (4), DfT is undertaking work to enable determination of how investment in improving the condition of the highway network provides economic benefit.
- 3.2.8 In Scotland, the Transport Scotland report *Economic, Environmental and Social Impact of Changes in Maintenance Spend on Roads in Scotland, 2012* (21), concludes that there is an overall disbenefit to society from reducing road maintenance expenditure to the extent that for every £1 reduction there is a cost of £1.50 to the wider economy. It also found that the most significant quantified impact of reduced road maintenance is the increase in vehicle operating costs, and that there are wider community effects of road maintenance beyond those on vehicle journeys.

3.3 STAKEHOLDER EXPECTATIONS

- 3.3.1 People, groups of people, or organisations that can affect or be affected by the policies and actions of the authority are all stakeholders of the highway network. Managing stakeholder expectations and addressing their needs is a key aspect of asset management.
- 3.3.2 In the context of the highway service, stakeholders are many and diverse and may need to be considered in different ways. They are likely to include local road users, local communities, businesses, services such as emergency services, people travelling through the area, highway maintenance service providers, and organisations that have an impact on the network such as utilities. Government, through HM Treasury, DfT and other Departments, also has an interest through legislation, provision of funding, and support in other ways. There are also a number of national and local interest groups that have an important part to play in raising awareness of issues important to their members. Interest groups are likely to include business groups, freight associations, pedestrian groups, cycling and motorcycling groups, disability and mobility groups, and motoring groups.
- 3.3.3 There is a widely held expectation that journeys should be reliable. There is also a perception that highway maintenance and utility companies’ works cause delay and travel disruption. Research carried out for the DfT on *Highway Levels of Service* (22) provides evidence that stakeholder expectations are influenced by where a route fits within personal hierarchies, which were shown to differ from the national road classification system. *Well-maintained Highways* (10) provides advice on developing network hierarchies for carriageway, footways and cycleways based on the importance and use of the routes.
- 3.3.4 The condition of many aspects of the highway network is important to road users. In particular, there are generally high expectations and strong views about the surfaces on which the public moves and an expectation that roads, footways and cycleways can be used without actually noticing the surface they are travelling on.
- 3.3.5 Public perceptions of road and footway surface condition are influenced by the type of user. The vulnerable, including the elderly, whether pedestrians, motorists or passengers, notice surfaces more than any others and they are at a higher risk of being affected by defect hazards and poor quality repairs.

- 3.3.6 A number of different public opinion surveys demonstrate that overall satisfaction with local highways is low. To improve satisfaction, good information is required at a local level about what is important and how it is perceived. This information should be considered by authorities when developing their approach to asset management and can also be used to benchmark performance against other authorities.
- 3.3.7 Effective engagement with stakeholders is a key issue in managing expectations and therefore satisfaction with the highway service. Authorities engage with and involve key stakeholder groups such as local communities, local businesses and services such as emergency services, in a variety of different ways.
- 3.3.8 Stakeholder involvement by means of informed consultation is likely to be beneficial in building understanding and support. Stakeholders need to be engaged at various stages in the asset management process so that they can appreciate the challenges and issues that authorities face. People cannot be expected to understand or accept the level of service provided if they have not been involved in its development or it is not published and transparent.
- 3.3.9 Public opinion surveys are a good way to establish local views. Authorities may commission their own surveys or subscribe to the National Highways and Transportation Survey (NHT) (23).
- 3.3.10 The impact of localism may have an effect on delivery of the highway service in that decisions taken at local community level could easily give different priority to the works programme from that closely aligned to an asset management approach. This may create a tension as a reactive approach to repairs is not efficient asset management. The *Potholes Review* (4) recommends that “local highway authorities should adopt the principle that ‘prevention is better than cure’ in determining the balance between structural, preventative and reactive maintenance activities in order to improve the resilience of the highway network and minimise the occurrence of potholes in the future”.
- 3.3.11 There is a need for local engagement mechanisms to ensure the asset management approach is understood and an appropriate balance between reactive repairs, preventative maintenance and structural repairs can be achieved. *Going the Distance* (3) recommends that “Councillors and senior managers should publish and explain their approach to road maintenance to the public”.



HMEP Potholes Review, image courtesy of the Department for Transport

3.4 COMMUNICATIONS

- 3.4.1 Engaging with stakeholders to understand their needs and expectations provides the information needed to determine and review the service provided by highway infrastructure assets and hence the asset management activities. The highway network is often of significant interest to the public and the media. This interest is likely to continue with robust public expectations of how the network should function. In addition, weather conditions and possible resulting damage to the highway network often provide the focus for significant national and local media coverage.

- 3.4.2 The trend towards transparency in the public sector is resulting in increased availability of a wide range of information in the public domain. Authorities should provide clarity and transparency in how they make decisions in the identification, assessment, programming and delivery of asset management activities, including maintenance works, and how the public are involved in making decisions for the service provided by the network.

CASE STUDY – NATIONAL HIGHWAYS & TRANSPORT PUBLIC OPINION SURVEY

STAKEHOLDER PERCEPTION

The NHT survey is a collaborative venture by a significant number of local highway authorities to give residents the chance to comment on highways and transport services provided by their authority. It is governed by a local highway authority steering group and the same questionnaire is used across all authorities so that comparisons can be made. The survey analysis enables benchmarking, trending, mapping and overlaying of data from national down to local ward level.

Survey results are publicly available on the survey website and provide transparency. Authorities can use the feedback to manage and improve local services. Repeatability of the survey allows authorities to monitor, with some accuracy, the impact of service improvement activity on different aspects, as well as on the service overall. Results are gathered under the themes of: Accessibility, Public Transport, Walking and Cycling, Tackling Congestion, Road Safety, Highways Maintenance & Enforcement.

The opportunity to learn from other authorities is considerable. There are also efficiency savings as bespoke surveys tend to be expensive. A survey similar to the NHT providing the same level of detailed response could easily cost around 100% more if carried out as a 'one-off'.

The NHT is committed to adding value and context to the NHT Survey data and there is a continuous process of research and development. The capacity for this work is provided by a nominal Research & Development element in the survey subscription and through government grants which the NHT has secured separately. This, for example, has successfully resulted in the mapping functionality and more lately in the Cost/Quality/Customer (CQC) comparison work. The latter is assisting the national Highway Maintenance Efficiency Programme (HMEP). Once these additional features have been developed, they are provided to NHT Survey participants at no extra charge. Non participating authorities can also access NHT information, including CQC comparisons, for their own authority, but data on the 'customer' element requires participation in the NHT Survey.

- 3.4.3 Providing good quality information to stakeholders on what can be expected from the asset management approach is an important aspect of service to the public. A clear and effective approach to communications within the Asset Management Framework can be an excellent means of providing information and responding to challenges relating to programmes of maintenance works and value for money. It also assists with the often high volume of public requests, reports from multiple sources, and media interest in highway maintenance. Both the *Potholes Review* (4) and *Scotland's National Road Maintenance Review* (9) recognise the importance of communications and make recommendations in this regard.

- 3.4.4 Highway defects can be a major area of requests for service, complaints or claims to an authority. Processes must therefore be in place to deal with these communications and provide high quality reporting and feedback. It should be made easy for the public to make a report and track progress. Many authorities have sophisticated customer relationship management systems and some provide reports on maps and email alerts on the progress of repairs. Asset management systems, described in Section 14, provide support for these communications.
- 3.4.5 A Communications Strategy is a way of describing how the asset management approach is actively communicated through engagement with relevant stakeholders in setting requirements, making decisions and reporting performance. The *Potholes Review* (4) includes a template for a communication strategy that may be adopted by authorities for this purpose. Further advice on communications is included in *Well-maintained Highways* (10).

RECOMMENDATION 2

COMMUNICATIONS

Relevant information associated with asset management should be actively communicated through engagement with relevant stakeholders in setting requirements, making decisions and reporting performance.

3.5 CRITICAL INFRASTRUCTURE

- 3.5.1 Critical highway infrastructure is considered to be those assets where failure would result in significant impact to the local, and potentially the national, economy. Critical infrastructure assets form a crucial part of the highway network and may include assets such as major bridges and tunnels. There are many potential risks and threats to the function of critical infrastructure, such as climate change, including impacts from flooding, rising temperature, changing sea levels, high winds and drought.
- 3.5.2 Where authorities have identified critical assets, their management should form part of the asset management approach. Adequate management of critical assets, including appropriate investment, is important if the assets are to be sufficiently resilient to cope with potential threats. In managing risk to critical infrastructure, one of the bigger issues is identification of factors that will influence non-performance and of the impact of failure. Further advice on risk management in general is included in Section 13.



Critical infrastructure, image courtesy of Atkins

3.6 HIGHWAY INFRASTRUCTURE ASSET PERFORMANCE

- 3.6.1 The performance of the highway infrastructure is one of the considerations in asset management.
- 3.6.2 Asset condition is a key parameter of performance. Condition data can be collected and used in conjunction with stakeholder information. This helps to determine desired performance and support solutions and programmes of work. The right investment decisions are unlikely to be made without this information. It has been recognised for some time that the condition of local highways has been and continues to be below the desirable level. Asset management provides the means to relate current performance to that required at local level.
- 3.6.3 Historically, condition of carriageways and footways has been reported through various national indicators. In some cases, these have been linked to funding allocations. Condition data collected for national reporting is also used for asset management purposes. Although concentrating on the more important sections of the highway and footway networks, the data provides valuable information that can be used to support planning and decision making. Many authorities have developed mechanisms beyond national requirements to measure and report locally on the condition of various highway assets.

CASE STUDY – CUMBRIA COUNTY COUNCIL

CRITICAL INFRASTRUCTURE

Following the November 2009 floods in Cumbria, several bridges were washed away or deemed unsafe, and large sections of the highway network were damaged. The impact of the floods was felt across the county as it prevented the movement of people, particularly in the town of Workington in which loss of two road crossings and a footbridge over the River Derwent severed the local community. This had an impact on everyday life as well as on business and commerce.

Following the floods, the only remaining link across the River Derwent in Workington was a rail bridge and as a result the Army were called upon to erect a temporary footbridge to reconnect the community, supplemented by additional bus services to connect the two ends of the temporary bridge. In addition, a new train station had to be constructed to enable train services to be provided to link the two halves of the town, thus providing access to employment, facilities and schools. The nearest usable crossing was some 8 miles away, involving a 24 mile diversion route with considerable traffic congestion and delays of up to 3 hours.

These temporary arrangements created very significant additional transport costs through increased travel distances, journey time delays and driver frustration, and consequent safety concerns on this diversion route, particularly in peak hours. The cost of repairing the infrastructure within Cumbria is estimated to have been in excess of £25m and took over three years to complete. In addition to this, further costs to the local economy were incurred as a result of disruption to the movement of goods, access to commercial areas being obstructed, flood damage to business units and the temporary closure of the Port of Workington.

Cumbria has appointed a Resilience Manager who is now working towards identifying critical infrastructure with the aim of improving the resilience of transport infrastructure in the Council.

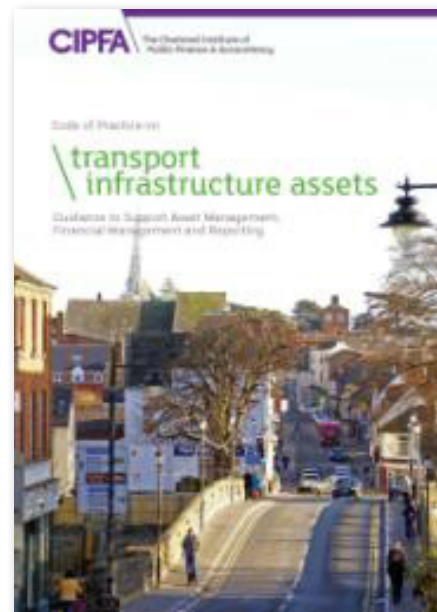
3.7 FINANCIAL REPORTING REQUIREMENTS

3.7.1 As part of Whole of Government Accounts (WGA), authorities are required to report the value of their assets, including transport assets, using standard accounting practices. For WGA purposes, authorities should calculate the value of highway assets using the approach described in the CIPFA *Code of Practice on Transport Infrastructure Assets* (24), which provides advice on financial management and reporting based on asset management principles, in line with WGA requirements. The Code requires calculation of the Gross Replacement Cost and Depreciated Replacement Cost of the highway asset, i.e. the cost of replacement of the highway in its current condition. Trends in Depreciated Replacement Cost can illustrate whether resources are used effectively. For example, if an authority intends to maintain current condition, Depreciated Replacement Cost should not increase or decrease significantly over time.

3.7.2 Depreciated Replacement Cost is calculated based on Gross Replacement Cost, i.e. the cost of replacing the asset with its modern equivalent, less deductions for deterioration and impairment. Early implementation of the Code indicates that the combined value of the local authority highway assets in England, Scotland and Wales could be in excess of £400bn, excluding the value of highway land, which makes it the most valuable asset owned by local government. Availability of all asset values at corporate level in authorities may well influence investment strategies across services.

3.7.3 The strategic road authorities in the UK have slightly different approaches to calculating the value of their assets. Although the financial reporting standards are similar, the detailed approach to the calculation of Depreciated Replacement Cost varies slightly. The infrastructure valuation model and methodology is common to Highways Agency, Transport Scotland, the Welsh Assembly and to the Roads Service and has been subject to external audit by their national auditors.

3.7.4 While the Depreciated Replacement Cost approach based on the Code is required for WGA purposes, local authorities are currently, at time of publication, still required to report highway asset values in their own accounts on an 'historic cost' basis. The historic cost approach produces a significantly lower value than the Depreciated Replacement Cost -based approach. In late 2012, CIPFA-LASAAC (Local Authority (Scotland) Accounts Advisory Committee), the board responsible for setting and maintaining the Code of Practice for Local Authority Accounting in the UK (25), consulted on a proposed change to bring local authority accounts into line with WGA by using the same methodology. A decision on whether or not this is to proceed and, if so, on what timetable, is expected during 2013.



Code of Practice on Transport Infrastructure Assets, image courtesy of CIPFA

4. AN ASSET MANAGEMENT APPROACH FOR HIGHWAY INFRASTRUCTURE

4.1 INTERPRETATION OF ASSET MANAGEMENT

4.1.1 Asset management can be defined in a number of ways either in general or applicable to specific infrastructure. Definitions are included in Appendix C of this Guidance. An interpretation of asset management for highway infrastructure may be based on consideration of the following:

- A strategic approach over the long term;
- Meeting stakeholders' needs;
- A systematic approach;
- Optimal allocation of resources;
- Managing expenditure over the asset lifecycle;
- Meeting performance requirements in the most efficient way;
- Managing risk; and
- Operational delivery.

4.1.2 Adopting an interpretation of asset management may be useful for authorities to aid understanding and help articulate its importance to senior decision makers. This Guidance offers an interpretation of asset management for highway infrastructure as:

“A systematic approach to meeting the strategic need for the management and maintenance of highway infrastructure assets through long term planning and optimal allocation of resources in order to manage risk and meet the performance requirements of the authority in the most efficient and sustainable manner”.

4.2 IMPORTANCE OF ASSET MANAGEMENT

4.2.1 Asset management has been widely accepted by central and local government as a means to deliver a more efficient and effective approach to management of the highway infrastructure assets through longer term planning. Such an approach enables more efficient and effective use of resources, while fulfilling legal obligations, delivering stakeholder needs and safeguarding the engineering integrity of the network.

4.2.2 When considering the performance requirements of the asset, stakeholder needs should be taken into account, together with asset condition and business needs, including budgets.

4.2.3 There is a continuous drive to deliver services more efficiently. This can mean delivering services in the same way at lower cost, but increasingly, delivering services in a different way to achieve the same or better outcomes. CIPFA has estimated that full implementation of asset management for highways may achieve a 5 % saving over the long term (26). *Asset management - Whole life management of physical assets* (27) reports that sectors have reported savings of 5 to 15%.

4.2.4 Significant challenges facing authorities have reinforced the view that a systematic process is needed to manage the highway asset. These include:

- Increasing public expectations for accessibility and availability of the highway network and for reliability of journey times;
- Increasing scrutiny, transparency, accountability and media exposure in delivering legal requirements, meeting stakeholder expectations and maintaining the engineering integrity of the network;
- Managing the impact of traffic growth;
- Severe financial constraints and clear messages of “more for less”, “sweating the asset” and “make the most of what you have” that create a culture for making best use of existing assets;
- A move away from new highway infrastructure, and making better use of an ageing network that may require significant investment to extend its useful life;
- Removal of ring fencing of government funding leading to competition between local authority services; and
- Skill shortages.

4.2.5 Adopting asset management provides a means to face these and similar challenges through the development of a systematic approach that aims to deliver the most efficient and effective approach over the long term. Adoption is more than the ability to respond to budget and other challenges, it is the whole systematic approach to meeting the strategic need for the management and maintenance of highway infrastructure that is of value. The approach needs to be developed through knowledge and understanding of the network gained from information and data and is enabled through the use of appropriate tools including asset management systems.

4.3 GOOD PRACTICE IN ASSET MANAGEMENT ACROSS SECTORS

4.3.1 Asset management is a well established approach in many sectors. Both our society and economy are underpinned by infrastructure assets, including water supply, waste disposal, energy, telecommunications as well as transport. This infrastructure is vital in modern society and requires significant investment for development and maintenance. Infrastructure asset management is playing an increased role in all these sectors, as it has been proven to support accountability, lead to sustainable decisions, enhance customer service, manage risk and provide financial savings.

4.3.2 It is established good practice in business for organisations to develop, deliver and monitor strategies and plans for all services they deliver. This applies equally to those who own and manage highway infrastructure assets.

4.3.3 Good practice outside the highways sector demonstrates that the development of an asset management approach within asset owning organisations may be documented in a variety of ways. PAS 55 (6) sets out an approach to documenting asset management which describes asset management as a management system for business, embedded alongside the quality, management and environmental that systems may be already adopted. All these management systems require a policy endorsed by a senior decision maker and are visible to the organisation, setting out the principles that will be adopted for the organisation to meet its requirements.



Thames Barrier, image courtesy of Atkins

4.3.4 The draft ISO 55000 (19) sets out the requirements related to asset management, including a requirement to establish levels of service and document through asset management plans.

5. ORGANISATION AND MANAGEMENT CONTEXT

5.1 RESPONSIBILITY FOR THE HIGHWAY NETWORK

- 5.1.1 In England the strategic network outside London is the responsibility of the Highways Agency, an executive agency of the DfT, accountable to the Secretary of State for Transport. Within London, Transport for London, a functional body of the Greater London Authority, is accountable to the Mayor of London. In Scotland the strategic network is the responsibility of Transport Scotland, an agency of the Scottish Government, and in Wales the Transport Directorate of the Welsh Government. In Northern Ireland, both strategic and local roads are the responsibility of the Roads Service, a business unit of the Department for Regional Development of the Northern Ireland Executive.
- 5.1.2 Local highways, the vast majority of the network, are the responsibility of local highway authorities, which are usually part of County Councils, City Councils, Metropolitan Borough Councils, Unitary Councils and London Boroughs. Authorities manage the highway asset through their Corporate Plans, Local Transport Plans and equivalents.
- 5.1.3 Local authorities have wide ranging duties, powers and responsibilities, which can include significant services such as strategic and local planning, economic development, adult social services, children's services, education, transport, highways, housing, cleansing, libraries, trading standards, leisure, waste collection and waste disposal. Authorities are also responsible for a range of infrastructure assets, including buildings, highways, parks and some transport facilities.
- 5.1.4 Councillors are democratically elected to become Members of the Council of a local authority. Their role is to represent the electorate in making decisions about how the area is governed within the responsibilities of the authority. Major decisions, such as setting the annual budget and some key policy plans are made by the full Council. Other decisions are often made by the Executive Committee of the Council, which comprises the Leader and a number of other senior councillors, or by individual Executive members in some circumstances. In addition, Councils usually have a number of committees that make decisions about matters such as planning.
- 5.1.5 Councils are likely to have one or more Overview and Scrutiny Committees whose role is to hold decision makers to account and to undertake policy and performance reviews. Some Councils also have arrangements such as Area Panels to facilitate discussions on local issues. Some Councils have directly elected Mayors who have similar powers to the Leader and Executive Committee. The Mayor of London has a strategic regional role, which is quite different to other directly elected Mayors.
- 5.1.6 Advice to elected members on policy formulation, implementing policy and delivering the day-to-day business of the authority is carried out by the officers of the Council. Officers are non political officials responsible to the head of paid service.

5.2 CORPORATE VISION

- 5.2.1 Authorities usually develop a corporate vision, which is used to guide their actions over the long term. The vision is often expressed as a short, high level statement outlining in simple terms how the authority would like to see the locality and its people develop and the type of organisation it wishes to be. Vision statements are usually long term. The vision is used to develop corporate policies and objectives, some of which may be directly or indirectly relevant to asset management.

5.3 LEGAL CONSTRAINTS

- 5.3.1 There are a number of legal requirements on authorities around maintaining a safe network as described in *Well-maintained Highways* (10). Authorities also have a range of powers which they may choose to exercise in various circumstances.
- 5.3.2 Elected members, officers, service providers and others involved in asset management need to understand the extent, nature and policies relating to the authority's legal obligations and risks in managing the highway network. They also need to appreciate the distinction between duties and powers, and how they relate to their particular responsibilities.
- 5.3.3 In England and Wales, *the Highways Act 1980* (28) sets out the main statutory duties of highway authorities. This includes a duty to maintain highways maintainable at public expense in a safe condition. There is also a duty under the *Traffic Management Act 2004* (29) to secure the expeditious movement of traffic on the authority's road network. In Northern Ireland the main duties are set out in the Roads (Northern Ireland) Order 1993 (30), and in Scotland in the *Roads Act (Scotland) 1984* (31).
- 5.3.4 There is also a range of wider applicable legislation, such as Health and Safety, Roads and Streetworks, Environmental Protection, Disability Discrimination, Wildlife and Countryside, Freedom of Information, Human Rights, Civil Contingencies and general local government legislation.

5.4 WIDER INFLUENCES

- 5.4.1 There are some inherent issues that influence the way local authorities implement asset management that may differ from some other asset owning organisations, such as utilities which operate in a regulated sector. Examples include:
- The political system, where policies may change as elected national or local administrations change, may affect the ability to take a long term view;
 - Statutory obligations which must be met alongside stakeholder needs and other requirements of the highway network;
 - Funding, where a substantial proportion is provided by central government through revenue and capital allocations, and where there is generally no requirement for the funding to be spent on any particular service; and
 - Users, where the highway service is for the whole community and mostly paid for through taxation. Expectations for the quality of the service are often high.
- 5.4.2 Adoption of the principles of asset management supports authorities in managing their highway infrastructure assets, taking into account the context and delivering in the most effective and efficient way.

5.5 FINANCIAL CONSTRAINTS

- 5.5.1 The highway service is managed and delivered within financial constraints. Local government funding is complex and it is not the purpose of this Guidance to review it in detail, but an outline is given below.
- 5.5.2 Asset creation is the starting point for asset management. Funding new build can be complex, but it is again not the purpose of this Guidance to detail funding of this nature. Regardless of how new build is developed, operational costs and the future cost of maintenance should be considered through adopting asset management principles. Designing for future maintenance should be a key part of this process.

CASE STUDY – BLACKPOOL COUNCIL

SECURING CAPITAL FUNDING

Blackpool's total maintenance funding before 2010 (capital and revenue) was insufficient to arrest deterioration of the network. Much of this funding was spent on routine maintenance, including pothole repairs, whilst insufficient investment was available for preventative maintenance treatments. To improve the condition of the network to meet the standards required by stakeholders, a more effective approach was required.

Development of a recovery programme provided the data required to support a business case for Prudential Borrowing. The business case was based on asset management principles supported by specifically developed asset management tools. Key aspects of the business case that Blackpool was able to substantiate included:

- Demonstration that at the current rate of network deterioration and investment it would take 25 years to recover the network to an acceptable standard of condition; and
- An upfront capital investment of £30m over the next five years that would bring the network to the required standard and subsequently reduce the amount of revenue required for routine maintenance of the network, creating a long term saving of £100 million.

The approach was successful in obtaining an additional £30 million through Prudential Borrowing. The additional funding enabled Blackpool to develop levels of service that met the needs of stakeholders, including elected members and the public. A deterioration model is used at both network and section levels to inform a preventative maintenance approach that will sustain network condition over the remaining life of the borrowing term. This ensures that the highway maintenance budgets used for this purpose are ring-fenced for the next 25 years.

5.5.3 Highway maintenance is funded from several sources. Day to day and routine maintenance is supported by revenue funding, which comprises funds provided by Government, from council tax, and additional funds raised locally. Preventative and structural maintenance, which enhance the value of the asset, are often funded based on capital allocations from Government and local sources of capital. Government allocations are not 'ring fenced' for the purpose and the amount of funding spent on highways is determined locally. Other capital funding mechanisms include use of local capital receipts, Prudential Borrowing and Private Finance Initiative (PFI) grants. Further information is provided in the ADEPT report (32).

5.5.4 Authorities generally determine revenue and capital budgets annually. Some are beginning to look at longer periods to generate budget stability, but guaranteed spend is usually only available year on year. Some set capital budgets for two years or more, with indicative budgets for two to three years thereafter, but retain an annual review.

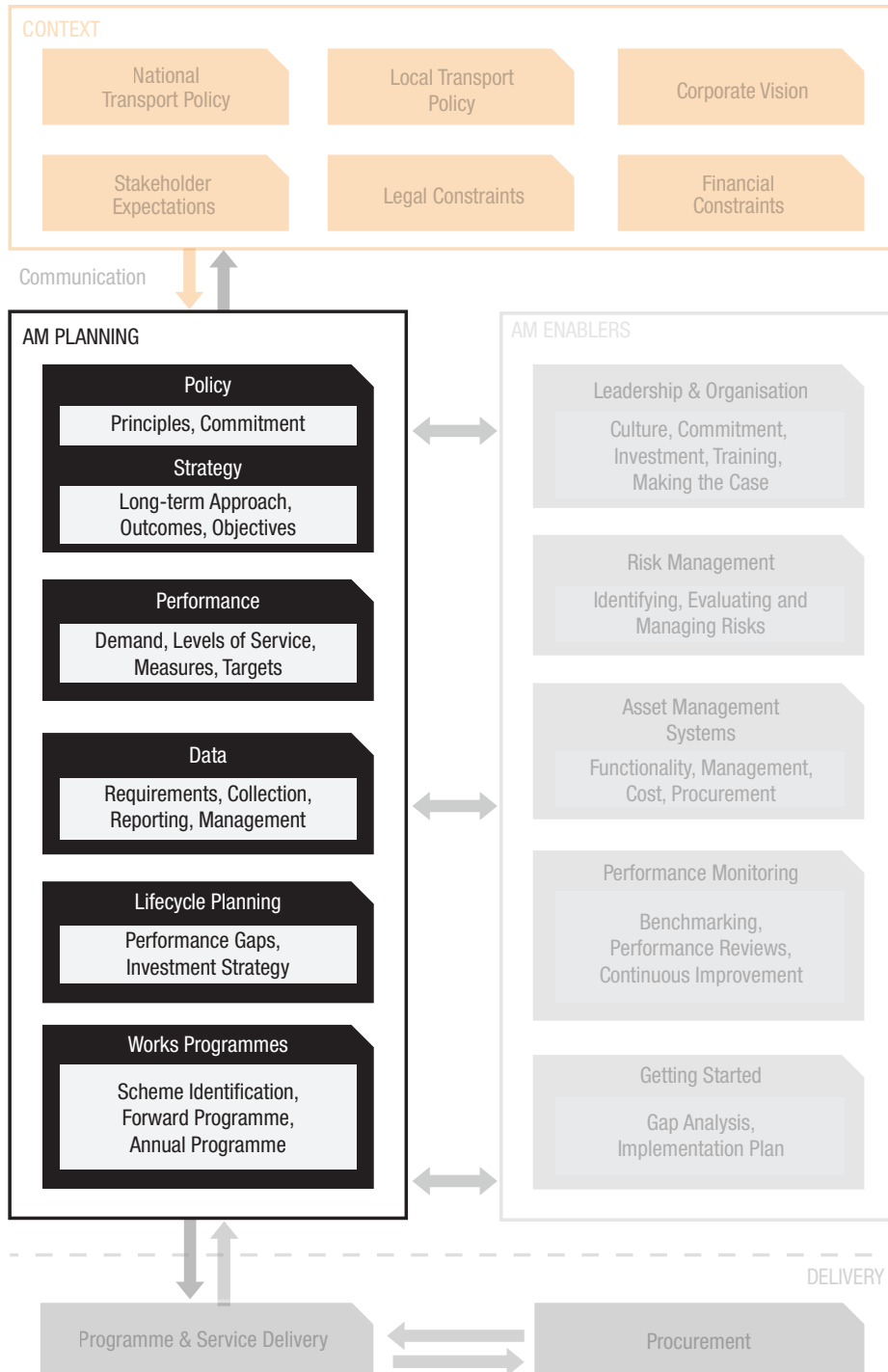
5.5.5 Maintenance activities funded from capital budgets are most effectively planned where there is reasonable certainty regarding the availability of longer term investment. This enables investment strategies to be developed to maximise longer term savings, while enabling the same level of performance, leading to greater long term efficiencies. It will also provide confidence to local communities on works planned for future years. Authorities may use this information to support their financial plans, as discussed in Section 11.



Potholes, image courtesy of David Mazurke

- 5.5.6 Adopting an asset management approach supports longer term commitment of budgets. It allows authorities to estimate the funding required to deliver the required level of service and provides the tools and processes to ensure efficient and effective use of available resources.
- 5.5.7 If additional funds are required to deliver asset management, a robust case should be made based on asset management principles. This can include demonstration of the long term benefits of providing an injection of funds to improve the condition of the highway network. Depending on the form of borrowing, costs need to be repaid over time.

PART B – ASSET MANAGEMENT PLANNING



Part B describes the key activities for asset management planning and gives advice on how these may be applied for highway infrastructure asset management. It describes the development and contents of asset management policy and strategy, explains the concept of a performance management framework, summarises issues related to asset data, provides information on lifecycle planning and work programming and covers the need for documenting asset management activities.

PART B

6. ASSET MANAGEMENT POLICY AND STRATEGY

6.1 OBJECTIVES OF AN ASSET MANAGEMENT POLICY AND STRATEGY

- Demonstrate the commitment to adopting the principles of highway infrastructure asset management by senior decision makers.
- Document the principles, concepts and approach adopted in delivering highway infrastructure asset management at a high level.
- Link with the local authority's policies and strategic objectives and demonstrate the contribution of the highway service in meeting these.
- Set out the desired levels of service from implementing asset management.
- Facilitate communication with stakeholders of the approach adopted to managing highway infrastructure assets.

6.2 ASSET MANAGEMENT POLICY

The asset management policy is a short and concise document that describes the principles adopted in applying asset management to achieve the authority's strategic objectives.

- 6.2.1 The asset management policy describes the authority's commitment to highway infrastructure asset management. It should be endorsed by senior decision makers, including elected members and be visible to all staff involved in related activities.
- 6.2.2 The asset management policy aims to demonstrate to the public and all stakeholders, including senior decision makers, elected members, practitioners and service providers, how it supports the authority's corporate policies. It provides a visible commitment to achieving the benefits that can be delivered through asset management and should be established at the highest level within the authority. Ideally, it is a one or two page, stand-alone document that is readily accessible.
- 6.2.3 In practice an authority may have a number of detailed statements, sometimes called policies that are related to the management of its assets; for example, highway inspection policy. The asset management policy should be a broad statement of intent that provides direction to other policies and practices related to asset management.
- 6.2.4 The asset management policy should be developed through reviewing and assessing corporate and all other relevant policies, and reflecting how these apply to the highway infrastructure. The asset management policy should be consistent with, and not contradict, the authority's vision, strategic objectives/plans and other relevant policies. It can be developed to cover all highway infrastructure assets, should be written in clear and concise language and may include:

- Adherence to relevant statutory requirements;
- Commitment to satisfy relevant strategic policies, objectives and plans;
- The context within which levels of service are set;
- Commitment to continuous improvement of the approach to asset management; and
- The asset management principles adopted, for example: risk based, whole life value, sustainable, customer focused, socially inclusive and integrated.

6.2.5 The use of facilitated workshops may be one way in which the policy may be developed. It should be realistic and achievable – it can be undermined if it is too far reaching and overly optimistic. The policy should be communicated and made available to the public and all staff. Appendix D includes an example of an asset management policy.

6.3 ASSET MANAGEMENT STRATEGY

The asset management strategy should be a clear and concise high level document setting out how highway infrastructure asset management is delivered for the authority to meet its long term corporate goals and objectives.

6.3.1 The asset management strategy sets out how the long term objectives for managing the highway infrastructure asset are met, including statutory obligations, stakeholder needs and the overall performance of highway infrastructure, within the context of any constraints, such as funding. The implementation of the asset management policy and how it is achieved should be described in the asset management strategy, along with an explanation on how the principles of asset management are to be adopted to achieve the authority's long term goals and objectives.

6.3.2 The strategy sets a clear direction for implementation of asset management and provides a link with other relevant documents, such as corporate objectives, business planning, risk management and transport objectives. It provides the basis for the authority to adopt asset management principles to achieve greater efficiency and value for money and describes the benefits that this brings to economic prosperity and the wider community. It sets out the benefits of investing in the highway infrastructure on a comparable basis to other infrastructure services the authority funds. The strategy also sets out how asset management activities are implemented, measured and continuously improved.



Highway infrastructure in the community, image courtesy of Atkins

- 6.3.3 In preparing its strategy, the authority should undertake a thorough review of its key documents and plans and identify key statements and objectives such as transport and risk management. As a consequence of any reviews, including the Management Review, as described in Section 15, it may include actions supporting continuous improvement in asset management practices.
- 6.3.4 The strategy should cover a number of aspects regarding the planning, delivery and management of highway infrastructure assets and how these are delivered over the short, medium and long term. Typically, these may include:
- Relevant strategic plans and transport objectives;
 - The high level outcomes required;
 - Performance management, including levels of service;
 - Stakeholder needs and how these are managed;
 - Future demands in the management of the asset and how these contribute to meeting stakeholder expectations and needs;
 - Meeting statutory obligations, including maintaining a safe network;
 - Long term financial needs including its investment requirements and meeting WGA requirements;
 - Implementation of the Asset Management Framework and how it is delivered;
 - The process for making investment decisions and the priorities for funding;
 - Identification of any critical assets and management of risk associated with those, as well as all other assets;
 - The benefits and consequences to the local community through asset management and investment. For example, it may include contributions to maintaining or developing economic prosperity and how it meets local needs;
 - Findings from any Management Reviews (Section 15) and the approach to continuous improvement, capturing lessons learnt and how practices will be improved; and
 - Initiatives undertaken to improve any asset management activities.
- 6.3.5 The strategy should provide a clear public-facing message about the highway service. It may be helpful to test and review this with elected members, together, perhaps, with a small focus group of stakeholders.
- 6.3.6 The strategy should be prepared by the staff responsible for asset management and be endorsed by senior decision makers. Ideally, it should be a short (up to 10 to 20 pages) stand-alone document that is concise and available on the authority's website. The asset management strategy is a high level document that takes a long term view and will only need to be updated when there is a change in policy or approach, or to reflect improvement actions undertaken following the Management Review, as described in Section 15.

CASE STUDY – HAMPSHIRE COUNTY COUNCIL

ASSET MANAGEMENT STRATEGY

In order to facilitate engagement with senior decision makers in the Council, Hampshire's Asset Management Group has developed an Asset Management Policy that confirms the Council's commitment to highway asset management and links the maintenance functions to the Council's strategic priorities. The Policy is a one page document that has been approved by the relevant committee and is published on the Council's internal and external websites.

The Policy is supported by the Asset Management Strategy which sits within the wider Asset Management Framework and is one of the key strategic documents related to the delivery of the Council's highway service.

Hampshire's Asset Management Strategy sets out how its Asset Management Policy is to be achieved. In particular, it describes how Hampshire is working towards implementing an asset management approach to the management of the Council's highway infrastructure. It provides the framework for delivering its corporate priorities through effective, informed and defensible decision making.

In addition to the development of strategic documents and in order to embed and promote asset management practices, Hampshire has set up an organisational structure that reflects the importance asset management plays in the delivery of its highway services. A key function of the asset management process is to understand the spending needs of each asset group, component and activity against performance, aims and objectives. This means understanding funding needs to meet:

- LTP objectives;
- Delivery planning; and
- Performance targets.

Inherent to this process is a need to understand the influence of budget decisions on stakeholder satisfaction and delivery of the corporate priorities. Furthermore, the impact that investing in one asset component may have on the overall performance of other asset components, as well as the whole asset, is examined. To this end, a Needs Based Budgeting (NBB) approach has been developed and is being used.

The benefits to Hampshire of implementing the asset management strategy are:

- Encouraging engagement with the majority of stakeholders resulting in a better understanding of their aspirations;
- Being able to respond to unexpected changes to the network from resilience and finance challenges;
- Alignment with Corporate aims and objectives; with greater influence and better use of resources; and
- Improved delivery within budget constraints and better ways of doing things.

RECOMMENDATION 3

ASSET MANAGEMENT POLICY AND STRATEGY

An asset management policy and a strategy should be developed and published. These should align with the corporate vision and demonstrate the contribution asset management makes towards achieving this vision.

7. SETTING AND MEASURING PERFORMANCE

7.1 OBJECTIVES OF SETTING AND MEASURING PERFORMANCE

- Provide a systematic approach to measure progress in the implementation of asset management.
- Set levels of service and performance targets to enable auditing and monitoring of the delivery of the asset management strategy.
- Demonstrate how funding is being used effectively to meet the levels of service and performance targets.
- Provide the link between corporate vision, asset management strategy, levels of service and maintenance operations.
- Facilitate effective communications with stakeholders by demonstrating performance against their requirements.
- Demonstrate any shortfalls in funding.

7.2 INTRODUCTION

- 7.2.1 The asset management strategy sets out what the authority intends to do in order to manage its highway infrastructure assets. In developing the strategy, authorities should establish levels of service with their stakeholders. Performance measures and targets should also be set in order to determine whether these are being delivered. The process for establishing these is set out in this Section.
- 7.2.2 Current and future demand for the service and funding for its delivery are identified as part of the asset management planning process. It needs to be recognised, however, that the levels of funding required may not always be available. Where funding is limited, authorities should review their levels of service to confirm that they are affordable. In these cases, maintaining statutory requirements should be a priority. A link needs to be established from corporate objectives to levels of service, performance measures and targets, and the cost of delivering these needs to be determined.

7.3 FUTURE DEMAND

- 7.3.1 The future demand for highway infrastructure should relate to the future requirements of the authority across its corporate vision. The performance demands placed on highway infrastructure may change over time. This may arise through changing social and commercial patterns, additional network related to development, or as parts of the network are redeveloped through economic regeneration. As local communities grow there are also greater demands for housing, schools and other services which place pressure and demand on highway infrastructure assets. Environmental demands, such as those arising from climate change, may also put additional demands on highway infrastructure such as drainage.
- 7.3.2 Changes in the authority's aspirations may be reflected in changes to its transport policy and strategy (e.g. change of function, alternative transport, congestion charging, energy efficiencies or construction of a new bypass), which is also affected by changes in stakeholder expectations, or from external factors. Therefore, the future demand which is likely to be placed on the highway network should be incorporated in defining the levels of service. Alternative options for managing and regulating the demand, as opposed to improving the network, may also need to be explored. Examples may include introducing weight restrictions for bridges or switching off street lighting.

- 7.3.3 It is probable that some demand predictions may not materialise due to socio-economic and political changes. Potential changes should be monitored and when appropriate, included in future revisions of the asset performance targets. This is discussed in Section 15.

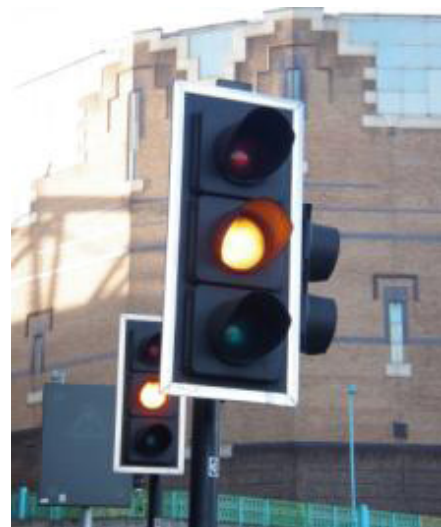
7.4 LEVELS OF SERVICE

Levels of service are broad statements that describe the performance of highway infrastructure assets in terms that stakeholders can understand. They should relate to outcomes and cover key aspects of asset performance such as safety, serviceability and sustainability. They should consider the performance of the whole network rather than that of individual assets.

- 7.4.1 It should be noted that the term “asset management objectives” is used in some asset management guidance documents to describe the same broad statements. In this Guidance, the terms “levels of service” is adopted.
- 7.4.2 The *International Infrastructure Management Manual (33)* describes levels of service as the key business driver that influences all asset management decisions. All stakeholders need to be made aware of the performance of the highway infrastructure asset. Senior decision makers need to be informed that the authority’s corporate vision and objectives are being delivered, the quality to which they are being delivered and the contribution of the highway service in delivering them. Measures of engineering performance, such as condition indicators and the quantum of assets that comprise the network can be used to support the levels of service.
- 7.4.3 Levels of service should be developed as part of the asset management strategy.

Developing Levels of Service

- 7.4.4 In developing levels of service, understanding the context of corporate vision, objectives and transport priorities is the starting point. Levels of service should be developed using broad statements or themes that demonstrate the relationship between higher level corporate objectives and any stakeholder requirements for delivery of the service.
- 7.4.5 Each level of service should be supported by a framework of performance measures. This will enable both individual aspects of performance to be measured as well as the overall level of service. Typically, performance measures may include both engineering and non-engineering considerations.
- 7.4.6 Examples of broad statements describing levels of service might be:
- “To ensure that our road users feel safe and are confident about their personal safety when using the highway.”
 - “To provide our road users with a reasonable level of confidence that their journeys on the highway will be predictable and timely.”
 - “To ensure that the highway network is available and accessible, as far as possible.”
 - “To progressively reduce the environmental impact of the highway asset for the benefit of all our road users.”



Traffic signals, image courtesy of Atkins

7.4.7 Information from stakeholder experience can be used to develop the levels of service. Many authorities conduct regular opinion surveys to identify the experience of the public and what is most important to them, and to determine those areas where further improvements can be made. Public opinion surveys may be developed locally or as part of a wider national initiative such as the NHT survey (23) (Section 3). These surveys provide important information to help identify what levels of service can be developed to support delivery of stakeholders' expectations.

7.4.8 Each authority needs to determine its own levels of service. There are many common aspects which can be considered and may include:

- **Safety** – Providing a safe highway network is a statutory requirement for highway authorities. It is essential, therefore, that the approach to asset management makes a positive contribution towards a safe network;
- **Serviceability** – The performance of each asset in the highway contributes to meeting stakeholder expectations;
- **Sustainability** – The environmental contribution of the highway infrastructure and associated maintenance activity. This may include activities that reduce carbon usage and noise pollution, such as reuse of materials, recycling and low noise surfacing;
- **Accessibility** – Aspects that contribute towards reducing congestion and improving journey time reliability, as well as provide access to isolated communities and the vulnerable; and
- **Financial performance** – Aspects associated with service delivery, choice of materials, third party funding and delivering value for money.

7.4.9 Levels of service can be developed through:

- **Workshops** – This is an effective way of understanding stakeholder expectations and communicating the meaning of operational measures to stakeholders. Typically, elected members and senior decision makers should attend such events;
- **Focus Groups** – Groups of interested individuals can be useful in understanding the views of certain groups of highway users;
- **Public Opinion Surveys** – Surveys using photographs of different assets with descriptions such as good/fair/poor, can be used to understand the public's interpretation of the condition of assets. Such surveys could include questioning on desirable standards of maintenance and associated costs. This will provide information on the levels of service the public are willing to pay for and accept. Surveys should be carried out at least every 5 years, ideally aligning to budget cycles; and
- **Collaborative Working** – Working with other similar or neighbouring authorities, sharing understanding and lessons learnt.



Public consultation, image courtesy of Atkins

7.4.10 *Going the Distance* (3) supports this approach and recommends that the Executive and senior managers should set the service standards for elements of the highway infrastructure asset, such as the road condition and response times to fix defects, at levels the authority can afford. Authorities may use levels of service to demonstrate the quality of the highway infrastructure service it proposes to deliver for the budgets available.

- 7.4.11 Where budgets are not sufficient to deliver the desired level of service, the approach described may be used to demonstrate the implications on the performance of the highway infrastructure asset.

7.5 PERFORMANCE MEASURES

- 7.5.1 Levels of service are expressed in a qualitative way which stakeholders, including the public, can understand and do not comprise the performance measures themselves.

Performance measures are used to monitor whether authorities are meeting the levels of service and to report the actual performance. They may be technical and non-technical and are usually numbers or scores that have meaning to relevant staff.

- 7.5.2 Authorities need performance measures to monitor, record and report delivery of the highway service, the asset management strategy, levels of service and their overall approach to asset management. Performance measures need to be monitored, audited and communicated on a periodic basis. An authority may choose to adopt a range of performance measures, including nationally recognised indicators and their own performance indicators. Each performance measure should link to a level of service, and through this, to the asset management strategy, corporate vision and objectives.

- 7.5.3 Performance measures may be used at the following levels:

- **Strategic** – To report on annual performance through a publicly available document. This provides a snapshot of overall performance, generally for stakeholder consumption;
- **Tactical** – To provide regular management information to senior decision makers and asset managers to inform decision making, particularly in terms of investment; and
- **Operational** – To provide information on operational aspects of the service, such as the speed of repairs. This may include the performance of service providers undertaking maintenance activities.

Development of Performance Measures

- 7.5.4 Performance measures should be selected or developed by those responsible for asset management with the support of senior decisions makers, who should formally approve them, if appropriate.

- 7.5.5 There are four types of performance measures that may be considered;

- **Input** – Demonstrates the amount of resources needed to complete activities and includes staff, labour and material costs and other relevant financial information. This type of measure does not necessarily demonstrate the performance of the service or whether the overall strategy is met;
- **Output** – Typically measures completed activities, such as the area of surface dressing per year. This type of measure provides information on the activities completed against a programme of works, but does not provide information on whether the level of activity met the overall strategy, whether it met any of the performance requirements, or if it delivered value for money;
- **Outcome** – Describes the results of activities provided and may include measures such as public satisfaction and the condition of various assets. These measures can be used to demonstrate the link between the asset management strategy and service delivery most effectively; and

- **Efficiency** – Reflects the input cost per activity or for the total service. It could be used to support investment decisions.
- 7.5.6 Authorities may choose a combination of these types of performance measures. They may also choose performance measures that are non engineering, for example based on results from public opinion surveys combined with others based on engineering measurements.
- 7.5.7 In developing each performance measure, a number of aspects should be considered:
- Is it meaningful?
 - Does it demonstrate that the strategy is being delivered?
 - Is reliable data available?
 - Is it simple to understand?
 - Can the data be compared over time?
 - Is it comparable with other authorities?
 - Is the measure useful to others?
 - Is it already being measured?
 - Is it, or something similar, already being measured by others?
 - Can the cost of data collection for the measure be justified?
- 7.5.8 In selecting the performance measures it is important that their future management is considered, including collection of the data and reporting. They should be focused on demonstrating key aspects of performance and not be excessive in number.
- 7.5.9 The performance measures selected should be those that are most effective in supporting the asset management strategy. When the relevance of performance measure has been determined in principle, a SMART approach may be used to develop the actual performance measures themselves. The approach is summarised below:
- **Specific** – the measure should be specific, clear and unambiguous, explaining clearly what is expected;
 - **Measurable** – there must be a simple method for measuring it;
 - **Attainable** – the measure must be realistic and there needs to be a clear action plan of how it can be achieved;
 - **Relevant** – must be important in achieving the asset management objective; and
 - **Time-bound** – must be measured in a timeframe.
- 7.5.10 For each level of service, a number of performance measures may be chosen which can be combined to give an overall performance. In doing so, performance measures may be weighted to emphasise their importance and contribution to the level of service.

Data and Other Information to Support Performance Measures

- 7.5.11 Typical sources of data and other information to support performance measures may include:
- Public opinion surveys, letters, emails and calls;
 - Business reporting;
 - Operational reporting;
 - Existing inventory data;

- Performance data (including condition); and
 - Financial reporting.
- 7.5.12 One of the considerations in developing performance measures is to maximise the use of existing data and minimise the need for collection of additional data. Most authorities have relevant performance measures in place to a varying extent. Typically, these include national reporting requirements, internal management information and key performance indicators to measure performance of their service provider. Typical performance measures often include condition of carriageways and footways, response times, energy consumption and customer complaints.
- 7.5.13 Authorities should consider reviewing their existing performance measures and, if appropriate, adopt these measures rather than develop new ones. Where possible, recognised performance measures with documented approaches to their measurement or procedures should be used since they are auditable and repeatable.
- 7.5.14 New data and information may be required to support the development of performance measures. Collecting new types of data should be identified as part of the authority's overall approach to data management, as described in Section 8.

7.6 PERFORMANCE TARGETS

Performance targets describe the performance that needs to be achieved. They should be set by staff responsible for asset management, agreed with senior decision makers and be affordable.

- 7.6.1 Each performance measure should have a performance target associated with it over a period of time, typically up to five years. The targets should be easily recognisable and understood by senior decision makers and/or the asset manager depending on whether they are strategic, tactical or operational.
- 7.6.2 In developing performance targets, consideration should be given to past and current performance, what is achievable and at what cost in the short, medium and long term. When the performance targets have been developed, they can be used to illustrate current against the desired performance. Any gap between the two informs the programme of actions and works necessary to meet the asset management strategy. As an example, whether the network condition remains in a steady state, improves or declines in a specific way will probably be a consideration in developing performance targets.
- 7.6.3 The process needs to be iterative in determining the best combination of targets against what is affordable. It is important to capture the lessons learnt from any performance below the desired level and include these in any revision of performance measures and targets. This should be part of the approach to performance monitoring described in Section 15.
- 7.6.4 Performance targets should be agreed with senior decision makers in the authority and if appropriate, be formally endorsed, approved, published and reviewed. Targets with implications for cost, other resources and statutory obligations will be of particular importance.

CASE STUDY – NORTHUMBERLAND COUNTY COUNCIL

PERFORMANCE MEASUREMENT

The Policy and Strategy document of the Northumberland Transport Asset Management Plan sets out the approach to performance measurement in ways that are meaningful to the public. Instead of simply measuring what is done, the Council has transformed its systems and now gathers data and reports in a new way.

A suite of performance measures based on the themes of Network Safety, Serviceability, Sustainability and Customer Service are used to communicate the state of the asset and the Council's performance. Each theme is measured at high level as: poor – does not meet minimum standards, fair – meets minimum standards, good – exceeds minimum standards, excellent – exceeds minimum standards and refines service delivery to suit the need of the customer. Long term performance aims have been set for each theme.

Below each theme, and for each asset group, are detailed levels of service, defined as what the asset will do. There are also a series of service standards, defined as what the Council will do to ensure the asset can do what it is supposed to do. These were agreed by groups of elected members and are consistent across the network hierarchy, but may vary across the hierarchy in future.

Performance gaps are addressed by specific actions, including improving communications and public visibility of data, setting investment priorities for specific assets or parts of the network, focusing on preventative rather than reactive maintenance, focusing on long term demands over short term, and improving data.

Main benefits of the system are the ability to engage in informed dialogue with elected members and to have a non technical way of explaining issues to the public.

7.6.5 Authorities may also choose to vary performance targets according to asset hierarchy.

7.7 PERFORMANCE MANAGEMENT FRAMEWORK

The levels of service, performance measures and targets form the performance management framework.

- 7.7.1 Once performance measures are developed and linked with levels of service, the levels of service and individual measures can be banded and described in qualitative terms such as excellent / good / fair / poor. Alternative bandings can be adopted to align with the overall approach to performance management in the authority. This allows performance to be described in a way that is easily understood by all stakeholders.
- 7.7.2 It may be appropriate to use different weighting factors for each of the performance measures that contribute to a level of service. For example, condition of footways may have a greater weighting than condition of white lines. Weighting factors need to be developed and agreed in the same way as the performance targets.
- 7.7.3 The principles of a performance management framework are shown in Figure 3.

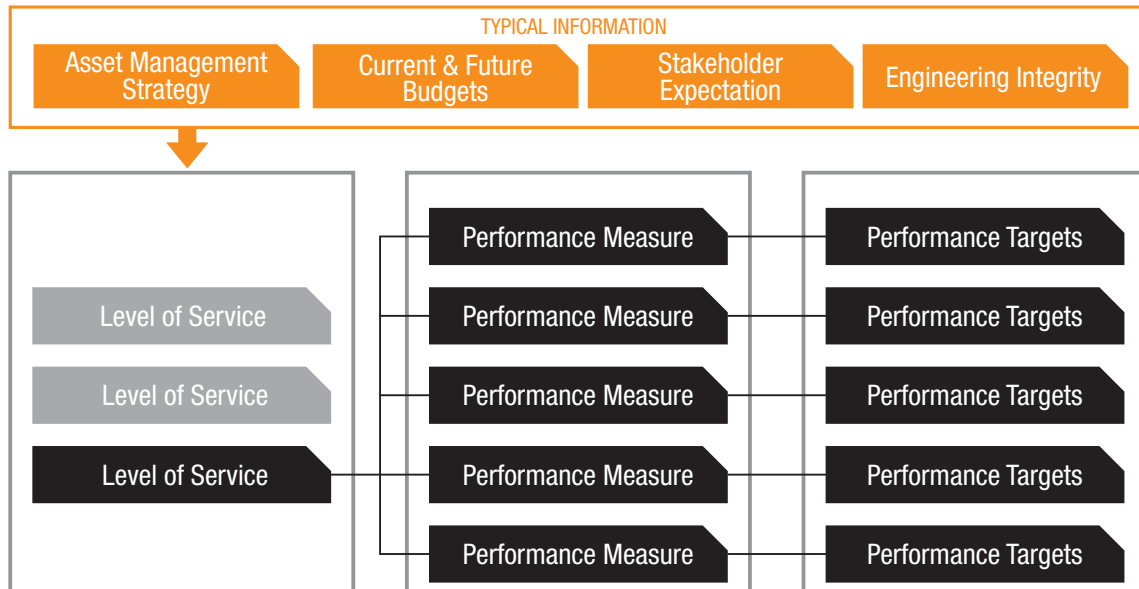


Figure 3 – Performance Management Framework

RECOMMENDATION 4

PERFORMANCE MANAGEMENT FRAMEWORK

A performance management framework should be developed that is clear and accessible to stakeholders as appropriate and supports the asset management strategy.

Communications

7.7.4 Authorities may develop an approach to communicating the levels of service to external and internal stakeholders. The overall approach to communication is discussed in Section 3. Relevant stakeholders include:

- **Public** – publication of levels of service sets a public commitment to deliver the levels of service;
- **Staff** – levels of service should be disseminated to all staff involved in the highway service; and
- **Service Providers** – service providers may be part of the delivery and performance regime and information on what they need to achieve and why they need to do it will be useful.

Recording the Approach to Measurement

7.7.5 The methodology used to collect data, calculate the performance measures and define the associated level of service should be fully documented for future reference.

Monitoring Regime

7.7.6 Authorities should monitor the performance of the asset against their performance targets to determine whether the authority is meeting its approach to asset management and if not, why not. The approach to developing an Improvement Plan is discussed in Section 15. Authorities may benefit from developing a collaborative approach with neighbouring or similar authorities so that lessons may be learnt and shared.

8. ASSET DATA

8.1 OBJECTIVES OF ASSET DATA

- Provide the data required to support the approach to asset management.
- Describe the asset and its performance.
- Provide the basis for informed decision making.
- Facilitate communications with stakeholders.
- Inform the assessment and management of risk.
- Support the management of statutory requirements.
- Support continuous improvement.

8.2 ASSET DATA

Asset data comprises information on what physical highway infrastructure assets an authority has responsibility for and includes number, location, performance, financial value and public opinion. Effective asset management planning and decision-making relies on this data being available, appropriate, reliable and accurate.

8.2.1 Asset data describes what highway infrastructure assets an authority has, where they are and how they perform. Data is used to support the overall requirements for asset management including:

- Defining network inventory and asset performance;
- Supporting statutory requirements;
- Making effective and informed decisions;
- Understanding the impact of decisions on the asset and the subsequent level of service and performance;
- Assessing and managing risk;
- Determining investment requirements;
- Assessing and reporting financial value; and
- Reporting performance.

8.2.2 Identifying data requirements, data collection, processing and reporting forms part of data management. Adopting a strategic and planned approach to the collection and management of asset data may provide cost savings and other benefits such as maximising the use of data.

8.2.3 Authorities typically hold the following types of asset data:

- **Inventory** – describes the full extent of an asset and can include location, type, size and construction. This will also support the calculation of Gross Replacement Cost;

- **Performance** –
 - o condition information related to aspects of performance, lifecycle planning, identifying programmes of work, and to financial requirements, such as calculation of the Depreciated Replacement Cost;
 - o public satisfaction, public enquiries, third party claims, traffic flows, accident records, maintenance history, energy consumption and environmental impact; and
- **Financial** – Supports budgets, financial planning, determining value for money in delivering overall performance and prioritising maintenance activities. It includes unit rates for asset management activities and data to support WGA requirements, including calculation of the Depreciated Replacement Cost and Gross Replacement Cost.

8.3 DATA REQUIREMENTS

8.3.1 It is a matter for each authority to determine their data requirements to support asset management. Much of the data required may already be collected as part of established practices, such as public opinion surveys, national data requirements, traffic surveys, road condition surveys, bridge inspections, street lighting maintenance work and WGA. It is a statutory requirement to hold a highway register known as the National Street Gazetteer and minimum data requirements for street lighting have been defined (34).



Data collection vehicle, image courtesy of Atkins

8.3.2 Asset data should at least provide information on the extent of the asset and its potential maintenance liabilities, as well as supporting any critical decisions that need to be made relating its management. Maintenance history may also be required when assessing performance and planning for future maintenance activities. Data requirements for lifecycle planning are discussed in Section 9.

8.3.3 The required accuracy, reliability and repeatability of data should be considered when determining the purpose of the data and how it is used as these factors are likely to affect the cost of collection. Sometimes coarse data from driven inspections may be sufficient, whilst for other purposes sophisticated techniques such as mobile mapping may be appropriate. For data to be effective, the level of accuracy and quantum required must be appropriate for the investment and risk associated with that asset.

8.3.4 An assessment of data requirements should consider:

- How the data supports the approach to asset management;
- Data quality, age, coverage and currency requirements;
- Potential opportunities to share or re-use existing data to reduce duplication in data collection;
- Historic data and its appropriateness for future use;
- Removal of redundant or out of date data;

- Statutory requirements;
- Cost of data collection and ongoing management, including any software and licences and IT infrastructure requirements;
- Lifecycle planning data; and
- Value of data and/or the risk of not collecting it.

8.3.5 A gap analysis may be used to identify what data currently exists and what additional data is required to support asset management. If this demonstrates that additional data is required, a case may need to be made to senior decision makers for additional funding.

8.3.6 In making the case for funding for additional data collection, the requirements for data should be documented. This should include the approach to reviewing current data, identifying the need and frequency to update data, any new data needs, analysing the gaps, and prioritising the collection of additional and updated data. Costs for data collection, day to day management and regular updating should be included. Risks associated with not having data or any part of it should also be identified.

8.3.7 A Data Management Strategy is one way of documenting information and demonstrating the benefits of data. Typically, a Data Management Strategy may comprise:

- **Identify business need** – This should be based on an assessment of the data requirements, demonstrating how they meet the asset management strategy and include the risk associated with the data;
- **Identify data owner** – An “owner” for the data is required to be responsible for managing the collected information;
- **Accessibility and date stamping** – Access rights to the data should be considered, and all data should be date stamped;
- **Data collection** – When determining the method of collection, the most cost effective method should be used. Requirements for the accuracy, reliability and repeatability of data should also be considered. Collaboration (e.g. in procurement) between authorities should also be considered as appropriate with the objective of delivering cost savings;
- **Frequency of collection and updating** – A risk based approach may be suitable, particularly where assets pose low risk to the performance of the network and are unlikely to require capital investment. Decisions about the life expectancy of all data types will need to be made;
- **Data management** – Data storage and management processes should be considered to ensure that these are fit for purpose, especially as the quantity and quality of data is likely to increase. IT specialists may need to contribute to this to ensure that the proposed approach complies with the authority’s IT requirements; and
- **Disposing of data** – The Data Management Strategy should consider how archiving or disposing of out-of-date data may be dealt with. This should consider whether the data will be required at a later date or whether it may be disposed of completely. In determining the performance of individual assets, historical information and trends may be invaluable to support decisions regarding future performance.

8.3.8 Regular reviews of data requirements and strategy, as appropriate, should be undertaken to ensure that data continues to support asset management. Practical advice on data management has been published by the Western European Roads Directors (WERD) (35).

8.3.9 Where authorities have not developed a Data Management Strategy then due consideration should be given to the individual aspects described above in developing their data requirements.

Training Requirements

8.3.10 Those involved in data management need to have the knowledge and capability to specify and/or undertake data collection and assess the quality of the information collected. Training on issues related to data collection and management are available through various sources. Further information is available from: <http://www.pcis.org.uk>

8.4 DATA COLLECTION

Programme for Data Collection

8.4.1 Data collection programmes may be developed based on the above advice. A programme of comprehensive data collection is likely to require significant investment. However, if planned and managed effectively and the data is fully used to support asset management, then it is likely to offer good value for money and support the longer term benefits of asset management.

8.4.2 Advice on specific requirements to support national reporting on pavement and footway condition is available from: <http://www.pcis.org.uk>

Risk Based Approach to Data Collection

8.4.3 Where the cost of data collection outweighs the business benefit and/or may not be affordable, a risk based approach may be considered. In doing so, each asset group should be considered separately and consideration given to:

- Any historic concerns over existing performance;
- How it supports statutory requirements;
- The reputational consequence of network disruption, reduction in serviceability, etc, which may have been avoided if data existed;
- Critical parts of the network;
- Safety of the network;
- The likely increased long term cost of maintenance with inadequate asset data to make long term investment decisions; and
- The critical nature of the asset in supporting the function of the network.

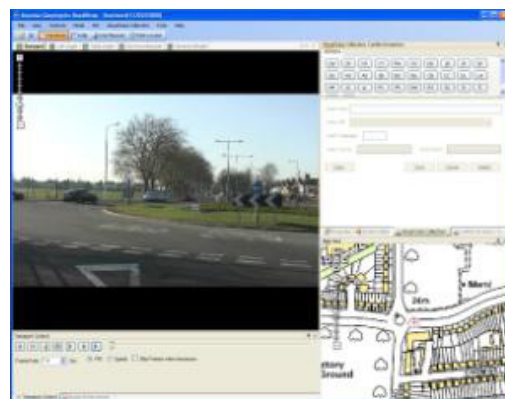
8.4.4 A risk based approach has been successfully implemented for inspection of highway structures (36).

Inspection Frequencies

8.4.5 The UKRLG Codes of Practice (10, 11, 12) provide advice on some aspects of data collection, including inspection frequencies. Advice on specific requirements to support national reporting on pavement and footway condition is available from: <http://www.pcis.org.uk>.

Innovations in Data Collection

8.4.6 As a result of innovation the quality of surveys has improved over time. It should be recognised that technology is continuously evolving and every opportunity should be considered to incorporate the innovations that this provides. For instance, many authorities make use of spatially referenced videos for collecting asset inventory data.



Data processing system, image courtesy of Atkins

This links the video stream directly to most management systems, making the video instantly available for other purposes. Other techniques are being developed, including mobile mapping and LiDAR (37) surveys. In innovating in data collection, authorities should consider the risks involved and identify how these can be mitigated. Consideration may be given to sharing risks between authorities.

Accuracy, Reliability and Repeatability of Data

- 8.4.7 Specifying the quality of the data and having an audit process in place to ensure the specified quality is met is part of the data collection process. The authority may have data quality standards which could provide the starting point for accuracy, reliability and repeatability requirements. Further information is provided in *Road Maintenance Management, Concepts and Systems* (38)

8.5 MANAGEMENT OF ASSET DATA

Asset Registers

- 8.5.1 Asset registers should be the repositories for all data associated with the asset, including inventory, location and performance. In their basic form, asset registers are databases for each individual asset type. They are used to support maintenance management and the management of defects as part of the asset management system (Section 14). In their advanced form, they are integrated databases with single network referencing. Authorities should store asset data in the format that is most appropriate for their organisational need. Each asset register has to be the “single source of truth” for highway authorities for each of its different asset types.
- 8.5.2 All asset data collected should be stored in an appropriate asset management system in a format that is cost effective, reliable and that enables it to be readily captured, transferred, accessed and used. In most instances, authorities have management systems that act as asset registers and facilitate the management of all asset data. The type and utilisation of these management systems is likely to vary between asset types and from one authority to another. Asset management systems are discussed in Section 14.

Network Referencing

- 8.5.3 It is essential that consideration is given to how the location of any data is referenced and authorities should consider using a single set of rules for network referencing in all their asset registers. Most authorities may well be running more than one system of network referencing e.g. link and section for UK Pavement Management System (UKPMS), geo-spatial co-ordinates for GIS or the National Street Gazetteer (NSG) (39) for Streetworks Register. Authorities should at least have data referenced to National Grid Co-ordinates and the NSG.

CASE STUDY – SURREY COUNTY COUNCIL

DATA MANAGEMENT

Surrey County Council's vision for data management is to have one single asset register for storing and managing all asset data. The register will be accessible by all management and decision support systems used by the Council.

GIS was the biggest driver for developing the single asset register. A new central geo-database was developed and the Council has been running a project for 18 months to shape the register, migrate the data from existing systems and provide links with the required systems. It is anticipated that it will take a further 12 months to complete the project, but once complete, all highway infrastructure asset data will be stored in one place.

By developing a data catalogue for all its infrastructure assets, the Council was able to understand what asset inventory and condition data is available, its currency, accuracy and coverage. Furthermore, the single asset register will enable accurate, consistent, repeatable and schedulable reports and analysis, as well as publication of data used by a variety of systems in a single format and to any group of stakeholders.

Asset inventory, condition and defect data is already available in the database and further developments will see data such as customer service and accident data also updated to the geo-database where it can be analysed and any resulting priority list for all the inventory asset types displayed in one map.

Processes will be put in place to keep data current for every activity undertaken on the highway by referencing all works to asset ID's while also maintaining a historical record of works carried out.

The biggest advantage of the single asset register is that it provides “a single source of truth” and hence eliminates the risk for duplicate or conflicting information. The approach also allows visual display of information on GIS maps and facilitates better use of data for decision making, empowering staff that communicate with the public thereby improving customer satisfaction and enabling district and other partners to view and interact with data.

Surrey is currently working on validating the data that has been transferred into the asset register and further integrating it with existing tools.

RECOMMENDATION 5

ASSET DATA MANAGEMENT

The quality, currency, appropriateness and completeness of all data supporting asset management should be regularly reviewed. An asset register should be maintained that stores, manages and reports all relevant asset data.

9. LIFECYCLE PLANNING

9.1 OBJECTIVES OF LIFECYCLE PLANNING

- Identify long term investment for highway infrastructure assets and develop an appropriate maintenance strategy.
- Predict future performance of highway infrastructure assets for different levels of investment and different maintenance strategies.
- Determine the level of investment required to achieve the required performance.
- Determine the performance that will be achieved for available funding and/or future investment.
- Support decision making, the case for investing in maintenance activities and demonstrate the impact of different funding scenarios.
- Minimising costs over the lifecycle while maintaining the required performance.

9.2 LIFECYCLE PLANNING

Lifecycle planning comprises the approach to the maintenance of an asset from construction to disposal. It is the prediction of future performance of an asset, or a group of assets, based on investment scenarios and maintenance strategies. The lifecycle plan is the documented output from this process.

9.2.1 Lifecycle plans may be used to demonstrate how funding and/or performance requirements are achieved through appropriate maintenance strategies with the objective of minimising expenditure, while providing the required performance over a specified period of time.

9.2.2 Lifecycle planning can be applied to all highway infrastructure assets. However, its application may be more beneficial to those assets that have the greatest value, require considerable funding, are high risk and/or seen as critical assets. In some cases, complex approaches may be applied and in these circumstances higher quality data and predictive modelling techniques will often be needed. Where minimal data is available, a risk based approach may be adopted, as discussed in Section 8.



Carriageways, image courtesy of Atkins

9.2.3 The lifecycle of an asset covers the following stages:

- **Creation of a new asset** – this may include a single asset such as a new bridge, new lamp column or sign post, or a series of new assets in the construction of a new road;

- **Routine maintenance** – This is the reactive and cyclic activity to maintain the asset over time. Examples include pothole repairs, tensioning of safety fencing and cleaning of drainage and signs. It should be noted that strategies for routine maintenance may affect the long term performance of the relevant asset. The approach to routine maintenance needs to be considered as part of the lifecycle planning process. Effective routine maintenance has the potential to extend asset life;
- **Renewal or replacement** – This is the process required to bring the asset back to the required performance after it has deteriorated. This generally requires capital expenditure, unless it is a smaller item of highway inventory, in which case it could be replaced as part of routine maintenance; and
- **Decommissioning of the asset** – Most highway infrastructure assets are rarely decommissioned. However, there are instances where some assets are removed from service. This is likely to include the legal process of “stopping up” areas of the highway, closing bridges or removing street lighting, signs and barriers.

9.2.4 Maintenance strategies may be developed that consider different treatment options and balance renewal with routine maintenance. These should take into consideration the service life for each treatment option and balance the costs over a planned period of time. The objective of this process is to provide a lifecycle plan for an asset that supports the asset management strategy. When applying a lifecycle approach, the following questions may be answered for a short, medium and long term period of planning for each asset:

- What funding is needed to meet the performance targets?
- If there is insufficient funding to meet the performance targets, what is the resulting asset performance expected to be?
- What funding is required to maintain the asset in a steady state or any other condition?
- What is the lifecycle plan that delivers the minimum whole life cost?

9.2.5 Adopting a lifecycle planning approach supports authorities in applying the principles of asset management and in setting the performance standards they can afford and/or are desirable.

9.3 PERFORMANCE GAP

A performance gap is the difference between the current performance and the desired performance of an asset.

9.3.1 The desired performance is determined by setting the performance targets described in Section 7. Current asset performance is assessed through collecting information and data, based on the approach described in Sections 8 and monitoring performance as described in Section 15. The performance gap may be reported through the performance management framework.

9.3.2 Typically, performance targets will have been selected for each asset type or group. It should be recognised that different performance requirements may be adopted across different network hierarchies.

9.3.3 Where assets are to be maintained in a steady state, the lifecycle plan should be developed to meet existing performance requirements.

9.4 THE LIFECYCLE PLAN

- 9.4.1 The approach adopted for lifecycle planning should be documented. It should include the assumptions made, performance requirements, maintenance needs, the decision making process and set out the proposed maintenance strategy, including the timing of interventions.
- 9.4.2 A lifecycle planning approach will enable the maintenance strategy for all assets to be determined. However, the principal assets, where greatest investment and/or risk will be incurred, should be considered as priorities when resources are scarce. Lifecycle planning is therefore likely to provide the greatest benefits for assets where large investments are made including carriageways, footways, structures and lighting.
- 9.4.3 The lifecycle planning process is shown in Figure 4.
- 9.4.4 The degree and sophistication to which each aspect is considered depends on the approach to asset management and the information and data available on the asset.

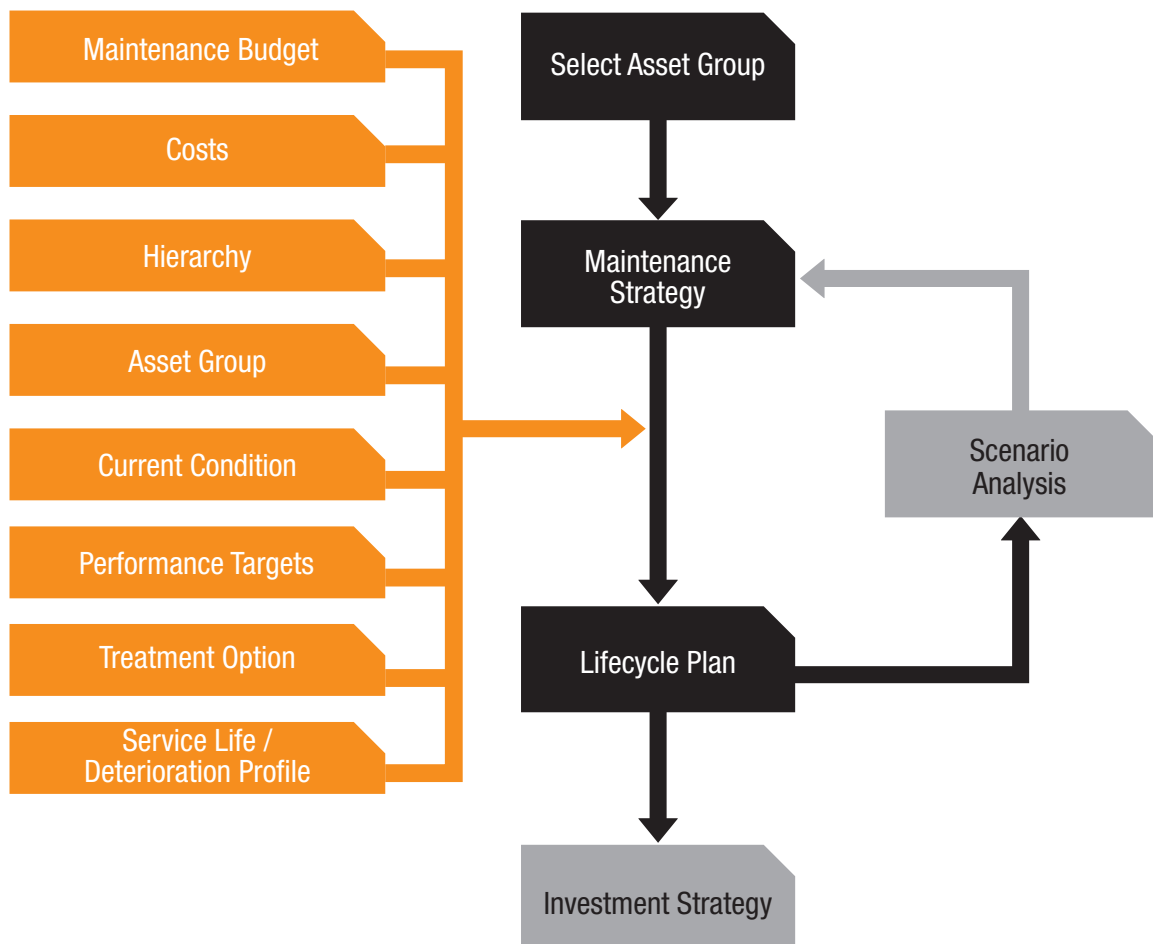


Figure 4 – Lifecycle Planning Process

- 9.4.5 Lifecycle plans should be updated regularly as new asset data becomes available. They should also be reviewed against any changes in the approach to asset management.

CASE STUDY – STAFFORDSHIRE COUNTY COUNCIL**LIFECYCLE PLANNING**

Staffordshire published their first Transport Asset Management Plan (TAMP) 2006 -11. Although they had always had a prioritised list of structural and preventative maintenance schemes, these were based on 8 district areas each with their own local engineering manager and teams. The creation of the asset management unit enabled the development of lifecycle and financial investment models.

In 2009, the management and delivery of highway asset management, including operations delivery, was centralised in a virtual joint venture with the highways contractor. This enabled highway asset management to be prioritised and delivered on a countywide basis, using value management prioritisation criteria and whole life costing principles, and embracing the efficiencies this provided. Based on the lifecycle plans developed, it was possible to demonstrate the need for additional capital structural and preventative maintenance funds, and the Council allocated an additional £30 million of investment over three years (2009/10 – 2011/12) for structural and preventative maintenance.

The second Staffordshire TAMP 2011-16 built on the knowledge and success of the implementation of asset management, and with further refining of lifecycle and investment requirements the Council allocated an additional £20 million of investment over the following two years (2012/13 and 2013/14).

Staffordshire intend to continue with ongoing refinement of these lifecycle and investment models, with a view to at least maintaining a steady state through the austerity years and potentially continuing to improve the highway network through further additional investment post 2013/14. This is in line with the Council's priority of making Staffordshire a better place to live, work, visit and invest in.

The benefits of adopting the above asset management approach include:

- Member buy-in;
- Efficiencies in the prioritisation and delivery of the highway maintenance capital programme;
- Reducing occurrences of potholes;
- Securing a long term visible capital programme;
- Improved co-ordination of activities with the integrated transport programme and those of statutory undertakers;
- Improvement in public perception of the network through the NHT survey; and
- Major investment and job creation in the county by large multi-national organisations who have or are in the process of expanding into the area.

Classification of Asset Data

- 9.4.6 In developing a lifecycle plan the asset group and/or its components should be identified at the network level, grouping and aggregating similar assets together. The *Code of Practice on Transport Infrastructure Assets* (24) adopts a three layer approach for selecting and grouping assets and may be adopted as good practice. This is described in detail in Appendix E and is summarised below:

- **Level 1** – Asset type e.g. highway lighting;
- **Level 2** – Asset group e.g. lighting column; and
- **Level 3** – Components that Level 2 implicitly covers e.g. luminaires.

Asset Data

9.4.7 Asset data for lifecycle planning should be available from an authority's asset management system, asset register or maintenance management system (Section 14). Typically, the following is required to develop lifecycle plans:

- Inventory (road lengths, widths, structure components and dimensions, lighting column types and sizes as a minimum);
- Performance (including asset condition);
- Routine maintenance (including reactive and cyclical maintenance activities); and
- Treatment options (including their historic performance and cost).

9.4.8 The data requirements for lifecycle planning should be identified as part of the overall approach, as described in Section 8. This may require specific data to be collected for relevant asset groups and their components.

9.4.9 The reliability, quality and quantity of the data available, including inventory and historical performance of treatments should be assessed before developing lifecycle plans. In general, the greater the confidence in the data available, the greater the confidence in the lifecycle plan.

9.4.10 Authorities may adopt a basic or more complex approach to lifecycle planning, depending on their asset management maturity (Section 16) and on information and data availability. More complex approaches are likely to require higher quality data for deterioration modelling. Subsequently, additional investment in data collection and asset management systems may be required and the case should be made based on the benefits and efficiencies that can be obtained as described in Sections 8 and 13.

9.4.11 A more basic approach to lifecycle planning may be sufficient to meet requirements and may also be adopted where insufficient data is available. However, even basic approaches require data on asset hierarchy, inventory and service life (estimated life of the treatment option). This may require assumptions to be made based on the experience and local / technical knowledge of staff involved in the process. This may include quantum as well as current and predicted future performance of the asset. Any assumptions need to be documented and any significant risks set out.

9.4.12 More complex lifecycle planning practices may require historical data such as: construction, maintenance and performance of the asset. This enables deterioration models to be developed over time for each asset. In addition, more frequent collection of data may be required to provide greater confidence in these models and knowledge of associated assets, such as drainage. Ideally, this data can be held in an asset management system and will also provide data for a more robust assessment of risk.



Local highway network, image courtesy of Atkins

CASE STUDY – HERTFORDSHIRE COUNTY COUNCIL

DETERIORATION MODELLING

Hertfordshire has been using asset management techniques to help drive value for money in its highway service since 1999. One of the key tools used in this process is deterioration modelling. Modelling is used to help predict the future condition of the carriageway asset and a range of scenarios can be run to consider the impact of different budgets and maintenance strategies.

Hertfordshire's deterioration model assesses outcomes 15 years into the future and reports them for 10 years. It identifies the most appropriate time to intervene with a maintenance treatment within the constraints specified. Optimisation is then used to find the most appropriate type of treatment and timing. Treatments are not triggered at a defined point, but allowed to occur within a range. This provides the most appropriate treatment at the best time and, because the model is run annually, timings and treatments are reassessed each year which also allows response to changing conditions. The model then selects the best strategy, or combination of treatments, that maximise network condition for the available funding across the entire analysis timeframe.

In effect, the model generates a mini lifecycle plan for each road section, selecting treatments to suit its needs. It then rolls this up to a network-wide programme by selecting those treatments that offer the best value if all work cannot be afforded. The model does not just select preventative treatments, but has at its disposal a full range of options from surface dressing through to reconstruction and suggests the one that gives the greatest benefits.

Hertfordshire gains several benefits from this approach:

- At the strategic level, it allows decision makers to make informed choices about budgets and levels of service in the context of future performance;
- At the tactical level, it helps to illustrate the benefits of the asset management approach in striking the right balance between preventative and corrective work; and
- At the operational level, it helps to suggest the programme of works that will give the greatest benefit for the available funds and give a long-term view to help planning and coordination.

The modelling has political support and has given authority to the asset management plan and to works programming decisions. A fuller description of the model can be found at:

<http://www.dft.gov.uk/hmep/docs/element2/120504-Hertfordshire.pdf>.

Maintenance Strategy

9.4.13 Ideally, a number of maintenance strategies should be considered for the treatment of the asset. These are likely to include combinations of renewal and/or routine maintenance over a specified period. The decision making approach to select the preferred maintenance strategy is described below. Typical options that may be considered include:

- Do-minimum maintenance (routine maintenance only – e.g. localised defect repair to maintain safety);
- Reducing the level of serviceability (below current);

- Sustaining the current level of serviceability (steady state – e.g. patching and surface dressing of carriageways and footways);
- Prioritised performance to improve targeted parts of the assets (funding being targeted on a prioritised basis – e.g. principal roads); and
- Enhanced level of performance to meet performance targets (this maintenance strategy is important particularly where additional capital funding may be sought – e.g. inlay/overlay or reconstruction of carriageways and footways).

9.4.14 The maintenance strategy should take into account the likely modes of deterioration and/or failure of the proposed treatment, and when the next intervention (the time for the asset to reach the end of its serviceable life) will occur. Therefore, the following needs to be considered:

- **Service Life** – Life expectancy from construction to the next intervention based on industry best practice and local knowledge. This may vary according to traffic or environmental conditions. A number of sources exist for such information, including the ADEPT/RSTA Report *Service Life of Surface Treatments* (40) and the Institution of Lighting Professionals (ILP) Technical Report 22: *Managing a Vital Asset, Lighting Supports* (41). Consultation with maintenance contractors may also be helpful. An authority’s own records of material performance should be a good reference.
- **Deterioration Profile** – Deterioration profiles for an asset can be determined from a variety of sources including historical performance, local knowledge and best practice. Some authorities have developed bespoke deterioration profiles. These can be used for lifecycle planning with more sophisticated approaches to decision support. These models may be part of the decision support component of the asset management system described in Section 14. HMEP has developed a deterioration model for bituminous carriageways as described in this Section.

9.4.15 Consideration should be given to the selection of the planning period for the lifecycle plan. Depending on the planning period, different maintenance strategies may provide the lowest whole life costs, as shown in Figure 5 below.

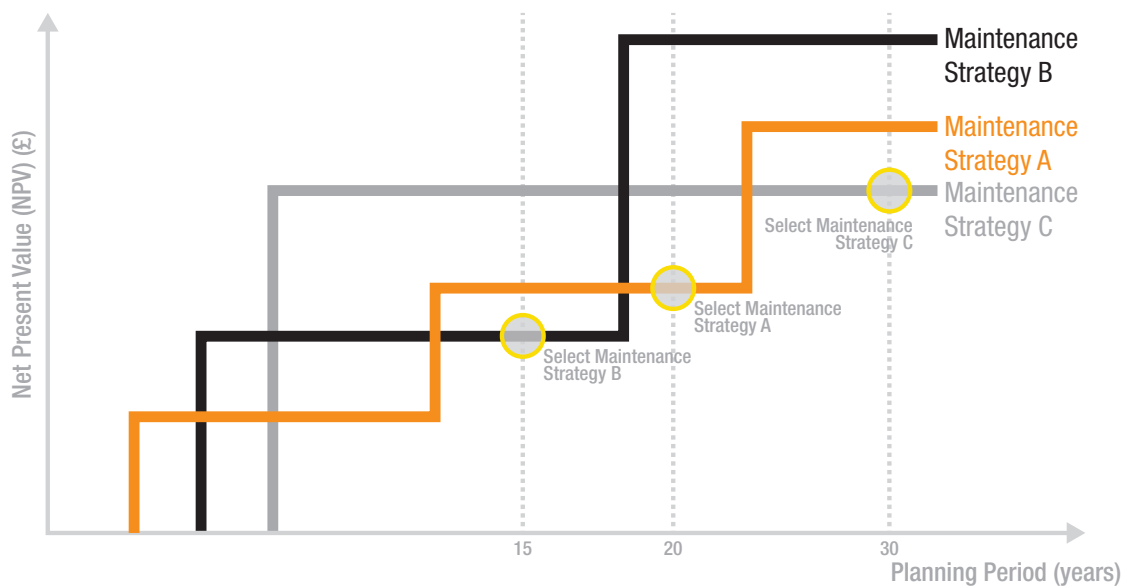


Figure 5 – Comparison of Maintenance Strategies

Selecting a Maintenance Strategy

- 9.4.16 The process adopted to select the maintenance strategy should align with the approach to asset management and in particular provide the most efficient and affordable way of achieving the performance requirements. Typically, the selection of maintenance strategies considers:
- Minimising whole life costs;
 - Meeting statutory requirements;
 - Meeting performance targets; and
 - Managing risk.
- 9.4.17 A number of techniques may be used to select the most appropriate maintenance strategy, some of which are listed below. Further information on each technique can be found in most good financial planning books. The *International Infrastructure Maintenance Manual* (33) also gives advice on these decision making techniques. Further details are provided in Appendix F.

Risk Based Evaluation

- 9.4.18 Risk based evaluation focuses on minimising the risk associated with the asset through an appropriate maintenance strategy, while ensuring that any risks are managed at the minimum cost. The approach to risk management is described in Section 13. Risk evaluation can be used as a decision making technique on its own or considered with the other decision support techniques described below.

Whole Life Cost

- 9.4.19 Whole Life Cost is a cost benefit analysis that quantifies the investment costs, including the cost of the treatment and subsequent maintenance interventions, against economic benefits, including safety, traffic delays and pollution. These should be assessed for each maintenance strategy. The maintenance strategy with the lowest Net Present Value (NPV) over the period of analysis provides the lowest whole life cost (Figure 5).
- 9.4.20 Costs may be determined as described above. Benefits should be determined by each authority and considered in the context of their overall approach to asset management. An example of calculating Whole Life Costs is include in Appendix G.

Multi Criteria Analysis

- 9.4.21 Multi Criteria Analysis may be used to prioritise competing treatment options from which the maintenance strategy may be selected. A number of criteria may be selected that align with the levels of service and/or goals and objectives of the authority. Typically, these may include: safety, serviceability, sustainability and accessibility. A weighting to demonstrate the relative importance of these factors may be selected from which an overall score is determined. The necessity to meet statutory requirements needs to be reflected in the scoring.
- 9.4.22 This technique can be used where benefits and costs are less tangible to define. However, it supports a qualitative assessment as well as a quantitative one.

Maintenance Costs

- 9.4.23 The costs selected for any routine maintenance and asset renewal should be as reliable as possible. The selection of the maintenance strategy may be sensitive to the accuracy of this information.
- 9.4.24 A rigorous process should be developed for the collection and recording of cost data for the purposes of lifecycle planning. This cost data may be different from current contract rates as it takes other factors into account such as overheads. Rates that are used should take into account inflation and be reviewed and updated as more cost information becomes available. The source of all cost data should be referenced.
- 9.4.25 The build up of cost data is likely to include a number of assumptions, such as the inclusion of traffic management, contractor's overheads, scheme design and supervision costs. Such information may not be directly available from unit rates which may be obtained from sources such as term maintenance contracts or framework contracts. Care therefore needs to be taken in building up the rates in order to understand the item coverage.

9.5 DETERMINING THE INVESTMENT STRATEGY

- 9.5.1 The outcome of the lifecycle planning process is an investment strategy for the highway infrastructure asset that comprises an asset group and its components, that is affordable and delivers the required performance at the minimum cost. In meeting this outcome, it should also support the asset management strategy. A number of iterations, with different maintenance strategies, may be necessary to optimise the investment strategy.
- 9.5.2 In developing an investment strategy, the following issues should be considered:
- **What is the level of performance required to maintain steady state condition and what is the budget required?** – Lifecycle plans may be used to demonstrate the investment required to maintain the asset at its current level of performance. This is useful where authorities are satisfied with the performance of their network and also to compare the impact of different funding scenarios;
 - **What is the level of performance that can be achieved with a fixed budget?** – Where an authority has fixed funding, lifecycle planning may be used to determine the performance of the asset for the funding allocated. It may also be used to target or prioritise funding in those areas that are most in need. It can also demonstrate the effect of reduced funding on the performance of assets over the short, medium and long term;
 - **What is the budget requirement to deliver the performance required?** – Authorities can use lifecycle planning to determine future budget requirements. Performance targets may be selected for hierarchy, asset groups and their components. In doing so, authorities may wish to consider work needed to sustain the agreed performance requirements and any performance gaps;
 - **Cross asset considerations** – No authority will have unlimited funds to invest in the asset. Cross asset prioritisation, or “trade-off” techniques, may be used to determine where budgets are spent most effectively or at the lowest cost. Consideration of risk, cost and performance associated with each asset is a key consideration; and
 - **Timescale** – Lifecycle plans should be prepared for a period of at least 10 years.
- 9.5.3 Lifecycle plans are essential to assist senior decision makers in developing their financial plans and to substantiate any additional funding needed to achieve the required performance. Equally, they provide evidence on the effect on the asset if funding is not made available and what the future performance of the asset may be as a consequence.

RECOMMENDATION 6

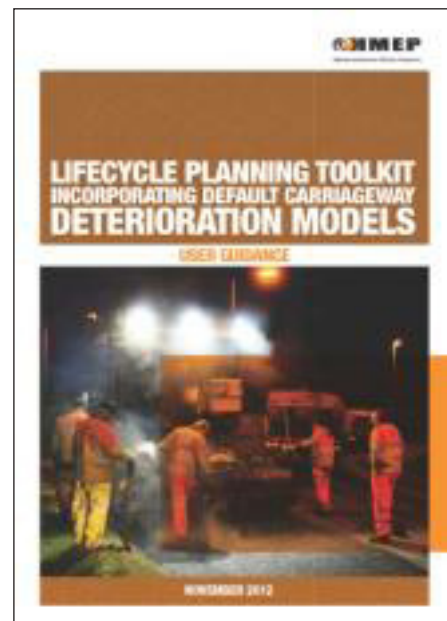
LIFECYCLE PLANS

Lifecycle planning principles should be used to review the level of funding, support investment decisions and substantiate the need for appropriate and sustainable long term investment.

9.6 SUPPORT FOR LIFECYCLE PLANNING

Lifecycle Tools and Deterioration Models

- 9.6.1 HMEP has developed a lifecycle tool that is available to all local highway authorities. The tool is available from www.dft.gov.uk/hmep/efficiency/asset-management.php. The user manual associated with the lifecycle tool gives further assistance on the application of lifecycle planning in general. It should also be noted that the tool has models that allow deterioration modelling for all highways assets except structures, where deterioration is the principal measure of performance.
- 9.6.2 Further information on lifecycle planning is available in the Red Book (42). Advice on whole life costing is given in *Whole Life Costing for Option Appraisal of Highway Maintenance Schemes for Local Highway Authorities* (43).



HMEP Lifecycle Planning Toolkit User Guidance, image courtesy of Department for Transport

9.7 RESOURCES AVAILABLE

- 9.7.1 When developing lifecycle plans, authorities should ensure that staff are appropriately trained and have the time, resources and suitable tools to develop robust and realistic lifecycle plans. Authorities should select a method of lifecycle planning appropriate to their needs and resources.

CASE STUDY – HIGHWAYS MAINTENANCE EFFICIENCY PROGRAMME

LIFECYCLE PLANNING TOOLKIT

As part of HMEP, a Lifecycle Planning Toolkit was developed by Atkins following a review of existing tools. The specification for the Toolkit was based on the findings from user consultation. Three versions of the Toolkit are available, covering carriageways, footways and other ancillary highway assets such as road signs, bollards, vehicle restraint systems, street lighting, traffic signals and linear assets (eg, road markings and kerbs).

The Toolkit, which works based on data readily available in local authorities, is intended for use by local highway asset managers to support strategic level planning decisions including:

- Assessing the impact of different levels of funding on asset performance and asset maintenance needs;
- Investigating current and future levels of funding required to achieve a given performance target for the asset; and
- Identifying the levels of funding required to minimise whole life costs.

Long-term estimates of expenditure and associated asset performance are produced by the Toolkit, which is freely available to download from the internet. These estimates can be used to determine the likely performance of the asset under budget constraints or, alternatively, to determine the budget required to support a target asset performance. The outputs from the Toolkit can be used to:

- Facilitate communication with stakeholders, including senior decision makers;
- Make the case for funding; and
- Benchmark lifecycle plans against those produced by other tools.

Generic default carriageway deterioration models were also developed for local highway road networks, using SCANNER and Coarse Visual Inspection (CVI) data. The principal uses of deterioration models are to predict how asset condition changes over time and, in conjunction with treatment options, to allow practitioners to determine the most cost-effective timing of treatments.

These are intended as a starting point for local highway authorities who may not have deterioration models that would allow them to develop sensible lifecycle plans immediately, or do not have data appropriate for developing such models. Local highway authorities may adjust (calibrate) these default models so that predictions from the Lifecycle Planning Toolkit closely match recent locally observed trends. The default models may also be used to benchmark existing models.

10. WORKS PROGRAMMES

10.1 OBJECTIVES OF WORKS PROGRAMMES

- Develop effective and efficient works programmes to meet the approach to asset management and deliver the service.
- Identify potential maintenance works – candidate schemes.
- Develop works programme of candidate schemes.
- Prioritise and optimise schemes in the works programme to meet the available budgets.
- Monitoring of works to ensure it meets the approach to asset management.

10.2 WORKS PROGRAMMING AND DELIVERY

The delivery of the works programme is the tangible outcome of the asset management planning process. The programming and delivery of works should align with the asset management strategy and meet the performance targets.

- 10.2.1 The process to develop a works programme for asset maintenance comprises the identification, prioritisation, optimisation, programming and delivery of individual schemes. It should meet the annual budgets that have been developed by the authority, ideally with the support of lifecycle planning process described in Section 9.
- 10.2.2 Key aspects of progress in delivering the asset management strategy and performance requirements may be monitored through the long term performance of the schemes delivered each year from the works programme.

10.3 PROGRAMME DEVELOPMENT

- 10.3.1 The process for identifying candidate schemes and developing a programme of works is described in the following paragraphs and summarised in Figure 6 below.



Figure 6 – Developing a Programme of Works

Identify Candidate Schemes and Prepare Initial Programme of Works

10.3.2 Candidate schemes, may be identified from the following sources of data and information:

- Asset data including results from inspections and condition surveys including SCANNER, Principal Inspections to structures, Footway Network Surveys, structural and electrical testing of street lighting and illuminated traffic signs, and general service inspections. Depending on the output of the asset management system, this data may be available visually via GIS, which may assist in the assessment process;
- Surveys where the primary objective is not to assess asset condition, such as safety inspections. These may provide useful information on the performance of assets as well as identifying risks. Ideally, this information should also be available from the asset management system;
- Local knowledge from operational staff involved in managing the network, including inspectors and contractors. Typically, this may include information on drainage, signs and lines and those areas of the network that are inspected or surveyed less frequently. Gaps are likely to exist in the quantity and quality of some aspects of this information and site visits may be required to verify and supplement the information;
- Stakeholder needs, particularly those aspects of the service that are important to the local community;
- Complaints and areas where there are a large number of personal injury accident claims. This information should be available from the asset management system; and
- The requirements of meeting wider transport and corporate objectives.

10.3.3 Candidate schemes may be collated into an initial works programme for each asset.

Prioritise Works Programme for Each Asset

10.3.4 Candidate schemes in the initial the works programme should be prioritised to identify those maintenance works requiring the most immediate action, as well as to identify a list of future schemes sufficiently in advance to ensure effective planning and preparation.

10.3.5 Those assets most in need of maintenance are likely to be:

- Safety critical;
- Carry a high level of risk, such as highly trafficked principal roads;
- Those with condition at or below the specified intervention level;
- Have keen stakeholder interest; and
- Support the corporate vision.

10.3.6 It is likely that there will be insufficient budget to deal with all these needs. Where this is the case it is likely that those that are safety critical or have a high level of risk will carry the highest priority. It is also essential that candidate schemes are prioritised to ensure that those that provide greatest contribution to the asset management strategy at the minimum cost are undertaken, especially where funds are limited. Adopting such an approach will ensure value for money is achieved.

10.3.7 Before candidate schemes can be prioritised, priced options for maintenance should be developed for each. Ideally, selected treatment options should align with those developed for lifecycle plans.

10.3.8 A process for prioritising competing maintenance demands will then be required. Some of the techniques that support decision making to enable prioritisation to be undertaken are discussed in Section 9. However, different decision making techniques may be appropriate for different assets. Further information is included in Appendix F. The lowest whole life cost may be useful for prioritising candidate schemes for carriageways, structures or lighting (including consideration of energy consumption).

10.3.9 A risk-based approach may be more appropriate for assets such as drainage, earthworks, safety fencing and those assets on remote parts of the network. This would identify the impact on local communities in terms of safety and serviceability of not undertaking the work by calculating a risk rating. Those with the highest risk rating would carry the highest priorities. Risk management is described further in Section 13.



Damage to ironworks, image courtesy of Atkins

10.3.10 Prioritisation on single criteria may not contribute fully to meeting the asset management strategy and therefore may be less effective in meeting the performance requirements.

10.3.11 Value Management is an example of a multi-criteria decision making process that can be used to prioritise candidate schemes. Ideally, the criteria adopted should align with the approach to asset management particularly the levels of service and may also include some of the single criteria described above. An example of a multi-criteria approach is described below:

- **Safety** – Schemes that are aimed at maintaining a safe network and meeting statutory requirements, such as restoring skidding resistance or replacing safety fencing;
- **Socio-economic and environmental** – Wider policy issues, including providing for the vulnerable, impact on local communities and businesses, environmental impact, sustainability, carbon reduction, noise reducing surfacing and recycling of bituminous materials;
- **Value for money** – Cost benefit determined from the whole life cost approach i.e. invest now to deliver savings later; and
- **Risk** – The individual risk associated with each of the schemes. This could include a number of factors including the impact of climate change, engineering risk and reputational risk.

10.3.12 The prioritisation process requires each criterion to be assigned a weighting which represents its importance in the delivery of the asset management approach. While it is recognised that safety will be of primary importance, other issues should also be addressed, including serviceability, sustainability, stakeholder requirements and value for money.

Select and Optimise Schemes for the Forward Programme

10.3.13 Adopting the above techniques will enable a prioritised programme of works to be developed from the candidate schemes. The lifecycle plan and investment strategy approach described earlier will have determined the appropriate finance and schemes are selected from the prioritised programme of works by totalling the indicative costs up to the point where the budget is utilised. This is referred to as the “cut-off” point. In adopting such an approach, a contingency can be considered to manage any risk associated with delivering the schemes.

- 10.3.14 The period the forward programme covers will vary according to individual requirements. Realistically however, a works programme of three to five years provides greater flexibility in programming than an annual programme and may allow consideration to be given to grouping works to provide cost savings in delivery.
- 10.3.15 Flexibility also has to be allowed in the programme for unforeseen schemes that may arise from issues such as the effects of severe winters and flooding. Such works may require immediate action with other schemes having to be deferred.

10.4 THE FORWARD PROGRAMME

- 10.4.1 The forward programme comprises schemes for each asset programmed to be carried out within the next three to five years. In some cases where the information is available, indicative forward works programmes can be developed for longer periods of time, for example, up to ten years or even longer.
- 10.4.2 The forward programme supports financial planning. Ideally it should be communicated through a communication strategy to elected members, other stakeholders and the public as described in Section 3. It can clearly demonstrate what, where and when schemes are to be undertaken. It should be subject to annual review and updated using the latest sources of data and other information described in Section 8.
- 10.4.3 For schemes in the forward programme, and particularly those around the budget 'cut off' as well as those that require significant investment, additional data may be required to verify any assumptions made. Where this will incur significant cost, the risks and benefits of undertaking additional investigation to obtain this data should be carefully considered.
- 10.4.4 A robust forward programme provides short to medium-term evidence of the level of funding required for the authority to maintain its assets. It is likely to be challenged by senior decision makers and can form part of the case for justifying additional funding. As such, it will need to be robust and therefore based on reliable information and data. It should clearly demonstrate how it will meet the requirements of the asset management strategy.

CASE STUDY – CORNWALL COUNCIL

WORKS PROGRAMMING

Cornwall Council applies asset management principles to managing its highway drainage infrastructure. Routine inspection and maintenance frequencies, as well as capital investment schemes, are prioritised using a structured risk based approach to ensure that resources are targeted to deliver the optimum return.

The establishment of a network hierarchy, based on road usage and risk, rather than purely road category, has been fundamental to the development of Cornwall's asset management strategy (See Case Study on page 7 and Appendix B of HMEP Drainage Guidance (44)). Flooding events and flood maps are also considered when developing the works programmes.

Each December Cornwall's highway service provider nominates sites for drainage schemes based on their operational knowledge and customer complaints, they provide mapped details of the problem, a provisional cost estimate and a completed copy of the scheme prioritisation matrix (Appendix B and Case Study on page 23, HMEP Drainage Guidance); each site is scored using the matrix.

Cornwall interrogates routine inspections for outstanding maintenance issues and any wet weather visits and if CCTV surveys have been carried out by the service provider. The scored sites are then ranked by Cornwall with reference to its legal obligations, strategic objectives and agreed policies. Each site is then visited by the Council's Asset Team and from all the data, an agreed prioritised countywide programme is established.

Prior to the finalisation of the annual budget allocation, should budget allocation be insufficient to treat all sites, a cut off score falling below that score being carried forward and subject to re-nomination/ evaluation for the following year. For those approved sites Cornwall issues scheme briefs to the service provider who is required to complete the schemes within that financial year with final claim payment being confirmed upon receipt of the 'as built drawings' and supporting information. The highway drainage asset inventory is updated to show changes to the infrastructure and routine inspection and maintenance schedules amended accordingly.



10.5 OPTIMISATION

10.5.1 Schemes may be optimised within the forward programme around selected criteria. This may include the following considerations:

- **Minimise occupation of the network** – Value of these schemes will be maximised by co-ordination with other works programmes and integrated transport projects on related parts of the network, thus minimising disruption to users and maximising benefits to the community; and
- **Deliver efficiencies by combining activities** – A number of schemes may be combined and delivered together, for example this may include schemes identified as being in close proximity from the forward works programme, but shown in different years.

Consideration should also be given to those operational activities in the Highway Maintenance Plan and how they can be combined to create greater efficiency. Equally, involvement of statutory undertakers and coordination with their work may also be beneficial.

- 10.5.2 At a programming level, the objective of optimisation is to provide greater efficiency. Before commencing an exercise on optimising schemes, authorities need to ensure that the identified efficiencies can be delivered. At this stage, early involvement of the maintenance contractor undertaking works can be beneficial.

10.6 ANNUAL WORKS PROGRAMME

- 10.6.1 The annual works programme should be developed from the forward programme and is effectively the highest priority projects that can be delivered from the available annual budget.
- 10.6.2 Ideally, projects in the annual programme should have been already designed and be ready to be delivered. This enables the maintenance contractor to plan the works properly and minimise any potential risks associated with delivery. In designing these projects, consideration should be given to collecting additional detailed data on the performance of the respective assets to ensure that the intervention proposed delivers the desired outcomes. It is important for financial control purposes to ensure that a more detailed cost estimate of each project is produced and a suitable contingency is allowed for risk.

RECOMMENDATION 7

WORKS PROGRAMMING

A prioritised forward works programme for a rolling period of three to five years should be developed and updated regularly.

11. THE HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

11.1 OBJECTIVES OF HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

- Document the activities and processes of the Asset Management Framework.
- Provide detailed information to senior decision makers to support investment decisions and enable longer term planning.
- Allocate resources for asset management.
- Inform all staff involved in asset management about how the highway infrastructure is to be managed and their responsibilities.
- Provide information to support the procurement of maintenance activities.
- Facilitate communication with stakeholders.

11.2 HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

The Highway Infrastructure Asset Management Plan (HIAMP) may be the documented outcome of the asset management process adopted by an authority. It is one way to record and communicate the approach to asset management in a single document, informing relevant staff and stakeholders how highway infrastructure assets are managed over a period of time.

- 11.2.1 The HIAMP is one way of providing information and evidence on how the asset management process is applied in order to meet the wider objectives of the authority over the short, medium and long term. Typically, it sets out the agreed levels of service, performance targets, how these are met through lifecycle planning, and a forward and annual programme of work. It sets out how overall performance is monitored and any lessons learnt that have been captured. The HIAMP should incorporate or reference the asset management policy and strategy; however, these should also be available as a stand-alone document(s).
- 11.2.2 The HIAMP is potentially subject to regular change as aspects of the asset management planning process become updated. Updating the HIAMP can be a resource intensive activity. It is therefore not essential that a HIAMP is in place as long as the asset management approaches are documented and updated regularly to reflect the approach to asset management. It therefore does not need to be a single document and can comprise a series of documents describing the asset management planning processes that link together. The HIAMP may be available in either electronic or hard copy format.
- 11.2.3 Each authority should decide its own approach to developing their HIAMP. Many authorities have successfully worked in collaboration in developing their asset management approach using generic templates and contents. However, it should document what the authority's approach to asset management is, set out what they are doing, why they are doing it, and who is the owner.
- 11.2.4 Some authorities may wish to produce a HIAMP, such as those in Scotland and Wales who have adopted standard approach to asset management document in a plan. The HIAMP often provides the opportunity to encourage internal buy-in and allocate resources for the

implementation of asset management.

- 11.2.5 Where a HIAMP is not produced, authorities should ensure that all asset management activities are documented, clearly indicating ownership of each. Regardless, authorities should consider how they document the asset management approach in the most efficient and effective manner. Authorities should avoid producing documents that are lengthy or difficult to use and opt for an approach that supports the implementation of asset management. A summary of documents including strategies and plans that may be used to support asset management are provided in Appendix H.
- 11.2.6 The HIAMP will provide evidence of how the authority manages its highway infrastructure. It explains the basis for the allocation of budgets and the development of financial plans. It provides evidence to justify the levels of budgets that are necessary and the likely impact different funding scenarios may have on the performance of the asset. Through the HIAMP, asset management may be set in the wider business context and provide support for making the case for asset management as described in Section 12. It will also provide information on how asset management, including works programmes, will be delivered and funding requirements met. Consideration should also be given to how the HIAMP links with or incorporates the Highway Maintenance Plan.

Target Audience

- 11.2.7 The target audience for the HIAMP is potentially wide ranging with different elements of the plan of interest to different stakeholders, as described below.
- **Senior Decision Makers** –Senior decision makers, including elected members, need to support the HIAMP and make the necessary financial commitment to support the plan;
 - **Highway Maintenance Staff** – Asset managers and/or practitioners will be responsible for developing and then delivering the HIAMP. The plan can be used as a benchmark to monitor progress against the Asset Management Framework. The plan can be a valuable tool in managing highway infrastructure maintenance within the authority; and
 - **Other stakeholders** – These are potentially wide ranging such as road users, local communities and special interest groups.

Communication

- 11.2.8 A targeted approach to communications may be used if appropriate to ensure that all stakeholders have the opportunity to contribute to the HIAMP and any reviews. An approach to communications is discussed in Section 3. Stakeholders views that have been included through other parts of the asset management process should also be considered.

Timescales

- 11.2.9 The HIAMP should cover at least a three to five year period on a rolling basis. However, the forward programme and lifecycle plans and may cover the medium and longer term horizon respectively.

Level of Detail

- 11.2.10 The level of detail within HIAMP should be proportionate to the size and complexity of the highway network being managed and the maturity level of asset management being practiced. It may be of benefit to some authorities to work collaboratively to develop similar levels of detail.

Procurement of Programme and Service Delivery

- 11.2.11 The HIAMP should provide information on how the network is managed, its performance requirements and the programme of works. This will provide essential information to enable effective and efficient procurement of the service in the future. It can provide a comprehensive reference document through which service providers tendering for such work can fully understand the work to be delivered and the risk involved. This can, if used appropriately, reduce the risks around procurement of the service.
- 11.2.12 *The Infrastructure Procurement Routemap* (45) highlights the importance of asset management in procurement.

Review

- 11.2.13 The HIAMP should be reviewed regularly and updated as appropriate as new information becomes available. Such an approach ensures that it remains a live document that may be used in the delivery of the service.

11.3 DEVELOPING THE HIAMP

- 11.3.1 The contents of the HIAMP should be proportionate. A large amount of content may fail to articulate key messages. Appendices should therefore be used as appropriate. It should be flexible and simple to update in order that it can remain a live document that is applicable to all staff undertaking asset management activities.
- 11.3.2 Appendix I sets out an example of the typical contents of a HIAMP if it were to be presented in a single document.

CASE STUDY – NORTH TYNESIDE COUNCIL

HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

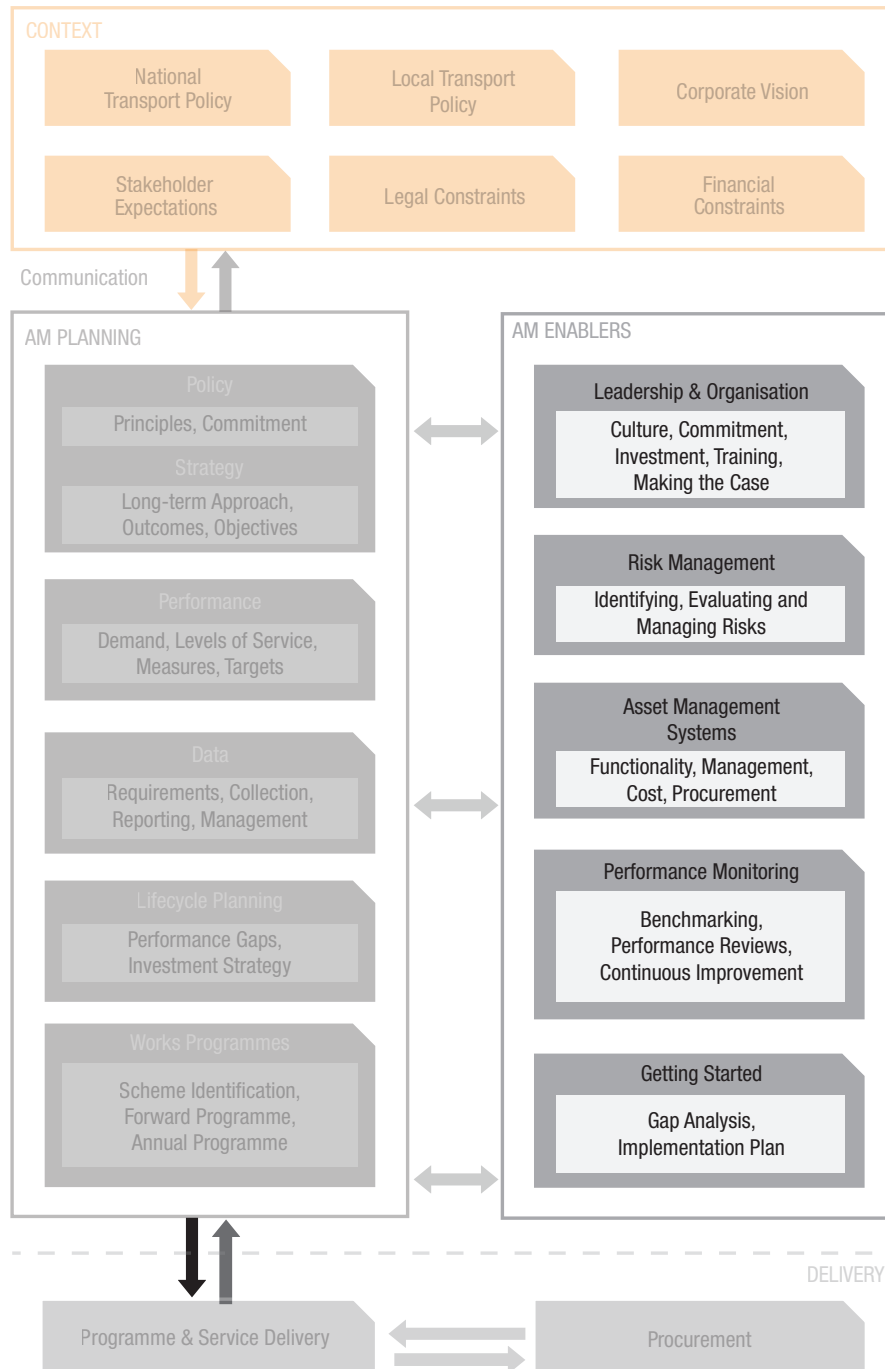
By producing a Highway Asset Management Plan, North Tyneside Council identified the optimal allocation of resources for the management, operation, preservation and enhancement of the highway infrastructure to meet its strategic needs and the needs of current and future stakeholders.

The HAMP document is split into three separate parts:

- **Part 1 – Policy Statement.** The overarching aims and objectives of the HAMP and sets out the Council's general policy in respect to highway asset management.
- **Part 2 – HAMP Working Document.** The operational document that is used to manage and further develop the HAMP. A working framework document used for future reporting and works planning and will be reviewed and updated annually. It is used to plan future service development and improvement actions.
- **Part 3 – Appendices** which contains the technical and supporting data (e.g. inventory data, condition data, legislation etc) supporting the HAMP.

The HAMP allows highway and infrastructure assets to be managed in the most cost-effective and strategic way in line with corporate governance and stakeholder expectations.

PART C – ENABLERS



Part C provides advice on the enablers that support the implementation of the Asset Management Framework. It highlights the need for engagement with senior stakeholders and the demonstration of leadership, describes how authorities should make the case for asset management, sets the context for risk management, and summarises the role of asset management systems. Advice is also given on how authorities should progress their implementation of asset management based on the work they have already done.

12. ASSET MANAGEMENT LEADERSHIP AND ORGANISATION

12.1 INTRODUCTION

- 12.1.1 Leadership has a strong influence on the culture and behaviour of all organisations. Clear direction and priorities will ensure that both significant and apparently relatively minor decisions taken across the organisation support a consistent approach to delivery of the business objectives. Such decisions will include appropriate investment decisions to meet the asset management strategy.
- 12.1.2 Time and effort spent on leadership and organisational development will pay dividends in the long-term as the purpose, objectives and responsibilities for the implementation and delivery of asset management will be clearly established and supported.

12.2 LEADERSHIP AND CULTURE

- 12.2.1 Leadership is reflected in the behaviours and culture developed within an organisation. Senior management can demonstrate leadership by creating the culture and environment that will support an authority-wide commitment to asset management. This may be demonstrated through adopting asset management principles when making investment decisions. Other important aspects include endorsing the development and implementation of the Asset Management Framework, including the policy and strategy, and by supporting continual improvement through the Management Review (Section 15).
- 12.2.2 Strong leadership and an asset management culture should run throughout the authority since it takes many functions to manage highway infrastructure. Functions that may have operated separately become linked and all relevant functions need to understand and be part of the wider asset management approach.
- 12.2.3 An asset management culture, with appropriate behaviours, will usually be characterised by a consistent approach across the authority to the long term management of the highway network. Behaviour of teams and individuals will be aligned to common objectives rather than to individual priorities that may encourage short term actions that will not meet the longer term vision and strategy.
- 12.2.4 An asset management culture should avoid conflicting priorities and messages, lack of understanding, or lack of a collaborative approach, all of which can lead to inefficient and ineffective working.
- 12.2.5 Adoption of a preventative approach to maintenance is an example of where a common culture in delivering asset management is important. There may be a less immediate gain in terms of responding to stakeholder pressure and satisfaction compared to repair of some obvious defects, but timely intervention is known to preserve the asset, to be good value for money, and is supported. If a common approach to asset management is not shared, preventative work may be delayed or omitted in favour of more apparently pressing activities, deterioration occurs, and higher long term costs result.
- 12.2.6 It may be helpful for the senior decision makers to demonstrate commitment to asset management by giving one of their number responsibilities for sponsoring asset management across the authority. This will help to ensure that asset management issues are given appropriate priority that resources are available, that asset management approach is being

effectively developed and implemented, and the benefits of asset management achieved. It will be helpful for the sponsor to meet with asset management teams on a regular basis to ensure good communication and understanding.

- 12.2.7 Achieving good leadership requires a certain amount of knowledge on the part of leaders and senior decision makers. There is a role and a responsibility for asset management staff to articulate the key issues and benefits of asset management in ways that are non-technical and meaningful, as described in Section 7.

CASE STUDY – HERTFORDSHIRE COUNTY COUNCIL

LEADERSHIP

Hertfordshire is a leading authority in the development of highway asset management. Its main driver is the desire to achieve value for money through developing and continuously improving asset management.

The asset management approach is presented to elected members in works programmes and has enjoyed significant local political support for many years. Consequently, Hertfordshire provides national leadership in asset management, in particular through its development and experience of deterioration modelling and using this to develop works programmes.

Introduction of an asset management culture to Hertfordshire required building credibility and respect for a predictive model, which needed involvement of members and staff over a considerable period of time. The principles of asset management also need continual reinforcement, even after 10 years of implementation, to remind existing stakeholders of the benefits, avoid pressure to revert to inefficient methods and to introduce the concepts to new stakeholders, such as new elected members.

There are still challenges to the asset management approach through tensions between planned maintenance programmes and local pressures to deliver 'worst-first' schemes. Resolution is through engaging and empowering elected members and local communities in an efficient manner while retaining a focus on long-term objectives and value for money. Discretionary budgets for elected members allow them to commission some local priority works alongside the planned works programme to help meet local aspirations without compromising the overall asset strategy.

External validation of Hertfordshire's asset management approach has proved valuable in reinforcing political support, giving pride to elected members and staff, and in briefing new elected members.

Member scrutiny in 2011 considered Hertfordshire's asset management based strategy in some detail and endorsed it, concluding that it was right to focus on getting the maximum benefit from the available resources.

RECOMMENDATION 8

LEADERSHIP AND COMMITMENT

Senior decision makers should demonstrate leadership and commitment to enable the implementation of asset management.

12.3 MAKING THE CASE FOR INVESTMENT

- 12.3.1 Senior decision makers, including elected members, are often required to approve and support the case for investment in the management and maintenance of highway infrastructure. This is often against competing demands. Asset management principles should be applied to enable the case for this investment to be made, demonstrating how levels of service will be met and cost minimised over the longer term.
- 12.3.2 There may also be a number of supporting activities required to make the case for investment. This may include additional investment to collect information and data managed through asset management systems, as well as investment in staff time and other resources. This Section provides advice on how the case for investment for highway maintenance may be made.



Maintenance work, image courtesy of Asphalt Industry Alliance

Adopting the Principles of Asset Management

Demonstrating the benefits

- 12.3.3 Many authorities have been successful in making the case for additional investment in the maintenance of their highway infrastructure by adopting the principles of asset management. Demonstrating the benefits that investment can bring is required to support decision making and prioritise investment of capital funds and other valuable resources. Cost benefits of an investment over a specific period of time should be considered. The objective of investment may be to improve long term value for money, and provide economic and community benefits from highway maintenance.
- 12.3.4 Ascertaining the wider economic benefits should form part of making the case. It is generally accepted that there is a link between highway maintenance and economic growth, but the economic benefits of well maintained highways have not been systematically determined. Furthermore, there is not a widely recognised and accepted approach to calculating these benefits, although some methods do exist.
- 12.3.5 The decision making techniques that support lifecycle planning, described in Section 9 and Appendix F, may be used to inform decisions on the appropriate long term investment strategy. At present there are limited models and information available in the UK on assessing the wider economic benefits of highway maintenance.
- 12.3.6 Outside of the UK, predictive models for planning maintenance which determine the economic benefits of investment strategies have been developed and are widely used. These models, largely based on vehicle operating costs, have been used by institutions such as the World Bank to evaluate investment in road maintenance, particularly in the developing world.

- 12.3.7 Achieving good leadership requires a certain amount of knowledge on the part of leaders and senior decision makers. There is a role and a responsibility for asset management staff to articulate the key issues and benefits of asset management in ways that are non-technical and meaningful, as described in Section 7.

CASE STUDY – TRANSPORT SCOTLAND

ECONOMIC BENEFITS OF HIGHWAY MAINTENANCE

The consequences of poorly maintained roads can be significant to the local and national economy. Poorly maintained roads have a direct impact on users in terms of vehicle operating costs and safety and may have a much broader impact on a country's economy in terms of inward investment, tourism and development.

Transport Scotland recognised the importance of the economic case for investment in maintenance and commissioned the report Economic, Environmental and Social Impact of Changes in Maintenance Spend on Roads in Scotland (21) to provide evidence for the National Road Maintenance Review for Scotland. The study took a broad perspective, including footways, lighting, street cleaning etc. It concluded that there is an overall loss to society of reducing road maintenance expenditure to the extent that for every £1 reduction in maintenance budgets, there is a cost of £1.50 to the wider economy, largely through higher vehicle operating costs, with a larger impact for local roads. Aside from vehicle journeys, significant impacts were found on wider society, including pedestrians, especially older people and the disabled, cyclists, and people in remote communities for whom single roads can represent lifeline links.

Further information may be obtained below:

Summary report:

<http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j235740-00.htm>

Trunk roads analysis:

<http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j235739-00.htm>

Local roads analysis and literature review:

<http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j235737-00.htm>

Issues to consider

- 12.3.8 In making the case for investing in maintenance of highway infrastructure, the following issues may be considered:
- The wider benefits, including social, environmental, economic and financial, although often the financial parameter forms the most significant element;
 - Clarity in use of resources and demonstration of good practice;
 - Lifecycle plans to demonstrate the effects of different investment strategies;
 - Any benefits from 'quick wins', but recognising that investment should be considered over the long term; and
 - Case studies, examples of benefits achieved, and any good practice that has been adopted.

Developing the Business Case

- 12.3.9 Authorities may need to support their argument for investment. In particular, this may be appropriate where the authority is seeking additional funding or financing for the maintenance of their highway infrastructure. Such decisions should be underpinned by a robust business case.
- 12.3.10 A business case presents evidence to assess whether an investment is, or continues to be, desirable, viable and achievable. It does not need to be complex, but should set out the reasons for investment together with the costs, risks and benefits over the period of the proposal. Essentially, the business case should answer the question of why investment in maintenance of highway infrastructure is worthwhile.
- 12.3.11 There are a number of typical stages in developing a business case and a considerable amount of advice exists from both government and commercial sources. In particular, HM Treasury provides advice at: http://www.hm-treasury.gov.uk/data_greenbook_business.htm.
- 12.3.12 Authorities may have a corporate approach to developing and presenting business cases. A summary of what may be included is included in Appendix J.
- 12.3.13 Responsibility for developing the business case for investment in maintenance of highway infrastructure should remain with those staff leading on asset management, with support from senior decision makers who should undertake an informed challenge and approval, as necessary.
- 12.3.14 Where authorities require additional investment that cannot be provided by existing funding within an authority it may come from sources such as Prudential Borrowing. The ADEPT Report *Funding & Financing Infrastructure: an Approach* (32) provides useful advice on sources of funding and financing to support investment decisions in highway infrastructure.

Making the Case for Asset Management

- 12.3.15 Asset management principles will support the case for investment in the implementation and delivery of asset management. The benefits of adopting the Asset Management Framework and investing in an asset management approach will demonstrate the benefits of funding and wider benefits, such as reducing costs over the longer term through greater efficiency, improved performance of the asset, accident reduction and reduced public liability claims. Other indirect benefits can be achieved through improved stakeholder satisfaction.

RECOMMENDATION 9

MAKING THE CASE FOR ASSET MANAGEMENT

The case for implementing the Asset Management Framework should be made by clearly explaining the funding required and the wider benefits to be achieved.

12.4 ORGANISATIONAL CONSIDERATIONS

- 12.4.1 Local authorities own and manage a portfolio of infrastructure assets, including highways and property. Asset management may be developed in different ways and to various degrees for different assets, so it is important that a coordinated view of asset management policy and strategy is taken at leadership level. It is essential to have an organisational structure that facilitates implementation and delivery of asset management by appropriately empowered and competent staff.

- 12.4.2 Asset management can be organised on a centralised or de-centralised basis within an authority. A mainly centralised approach facilitates consistency across assets, but with the risk that it may become remote from implementation and that issues regarding delivery of the service and funding requirements may not be fully understood. Conversely, a mainly decentralised approach, possibly based around service or area teams, may be aligned with and close to the critical issues and risks, but provide a fragmented overall approach and culture.
- 12.4.3 Whatever organisational structure is adopted, consideration must be given to the roles and relationships involved in asset management. If a centralised approach is adopted, it is important that asset management is an integral part. If a decentralised approach is adopted, it is important that asset management is linked to corporate activity at a strategic level, perhaps through a cross-organisation steering group that coordinates overall asset management strategy.
- 12.4.4 Regardless of how roles are structured and defined, asset managers need to work closely with others, including finance and strategic planners to ensure that asset management is strongly aligned with wider activities.
- 12.4.5 Decision making on key matters such as lifecycle planning, financial planning, works programmes and investment in asset management systems should be made for the long term and be sustainable. Depending on the way risk is allocated, this will normally imply that such decisions are the responsibility of the authority, rather than service providers. If consultancy support is engaged to help support asset management, it is important that decision making resides with the authority.
- 12.4.6 An exception may be where asset management risk has been transferred to another organisation for many years, such as through a Private Finance Initiative (PFI) arrangement over 25 years. Where asset risk is transferred the performance of the assets in the period after their return should be considered. Some PFI contracts provide an obligation to consider the performance of the assets up to 15 years after handback.
- 12.4.7 Asset management may be considered at three levels within an organisation, namely strategic, tactical and operational (Figure 7):

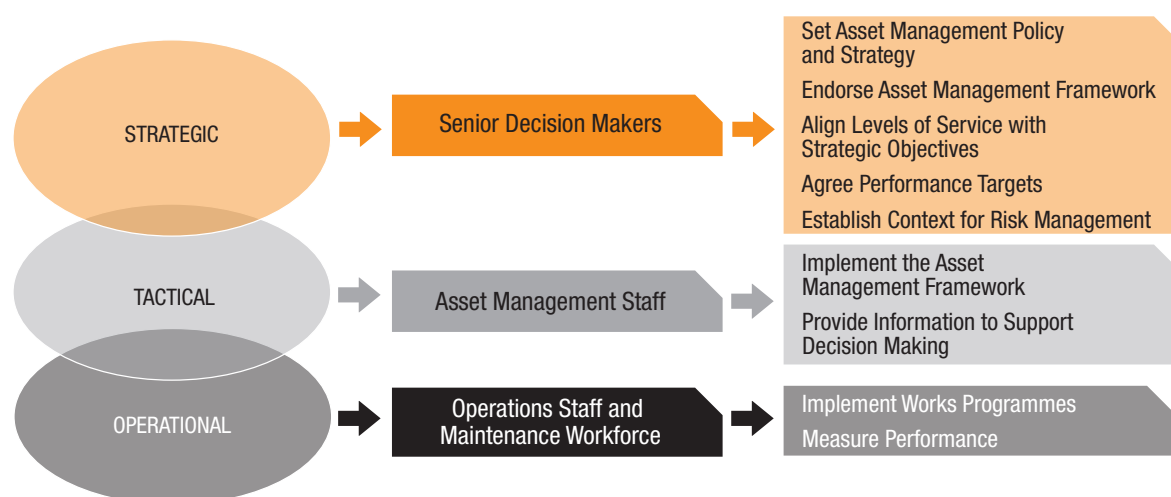


Figure 7 – Organisational Hierarchy

12.4.8 Typical strategic aspects of asset management include:

- Development and endorsement of an Asset Management Framework;
- Developing and agreeing asset management policy, strategy and levels of service and performance targets; and
- Reviewing achievement of outcomes and benefits.

12.4.9 In developing the strategic aspects of asset management senior decision makers should have clear sight of the outcomes they wish to achieve.

12.4.10 At a tactical level decisions are made on how to meet the performance requirements arising from the asset management strategy. These decisions require knowledge, information and data in the form of asset inventory, condition data and predicted performance of the network. Decisions for lifecycle planning and works programmes can be made using the techniques described in Section 9 and Appendix F. Typical tactical aspects of asset management include:

- Development of an Implementation Plan, as described Section 16;
- Preparation of the Highway Infrastructure Asset Management Plan (HIAMP) and/or other supporting documents, as described in Section 11;
- Development of a functional network hierarchy;
- Preparation of lifecycle plans and financial plans to meet either budgets or performance targets;
- Developing the approach for prioritising schemes;
- Developing works programmes; and
- Developing annual programmes.

12.4.11 The operational level is about delivery of maintenance activities that align with the approach to asset management. Typical operational aspects include:

- Collection of data, including inspections, safety and serviceability defects and asset condition;
- Management of asset data;
- Reactive work, including rectification of defects and winter service;
- Cyclic maintenance;
- Confirmation that works programmes can be implemented to budget and timescale;
- Implementation of a works programme;
- Co-ordination of works, including utilities, roadspace booking or permitting requirements; and
- Reporting on the performance of the asset.



Maintenance work, image courtesy of Asphalt Industry Alliance

CASE STUDY – GLOUCESTERSHIRE COUNTY COUNCIL

COMMISSIONING SERVICES

Gloucestershire's values are: 'Living within our means', 'providing the basics' and 'helping communities to help themselves'. To be clear about what the Council will do, work is now thought about in terms of outcomes for individuals or communities, rather than outputs. The Council has moved away from a traditional directorate based structure to a structure based on Commissioning and Delivery.

Commissioning: longer-term or strategic decision-making for allocating resources, prioritising outcomes and managing internal service level agreements and external contracts. Commissioners' roles are to secure delivery through internal providers, contracts with external providers and partnerships with other agencies and communities to achieve the Council's strategic outcomes.

Delivery: operational delivery to manage operations and ensure front-line services deliver for customers.

A highways commissioner sits within the Commissioning structure with a small team responsible for asset management, procurement and contract management. Staff managing day to day operations sit within Delivery in either internal support or external front line delivery teams.

The benefits of the structure are:

- Commissioners have a more detailed understanding of the needs and expectations of local people and the resources available to meet those needs; and
- Delivery gives front-line staff the flexibility to put customers first.

12.5 KEY ROLES

12.5.1 There are a number of key roles in developing and delivering asset management:

- **Senior Decision Makers** – Asset management policy, strategy and performance requirements need support and endorsement from senior decision makers. Successful asset management requires leadership, an organisational culture and structure to implement asset management and financial commitment from senior decision makers, senior decision makers should undertake a formal review of the approach adopted for asset management from time to time; and
- **Asset Managers and Practitioners** – Asset managers and practitioners should be responsible for developing and delivering the approach to asset management that has been agreed with senior decision makers and documented in the strategy and performance requirements. Collection and management of appropriate data, development of lifecycle plans, forward programmes and of works programmes will be required to support the approach and to meet the asset management requirements.

12.5.2 Appendix K includes advice on roles and responsibilities for staff who are involved in asset management activities.

12.6 COMPETENCY AND SKILLS

12.6.1 Over the last few years, valuable experience has been gained by the sector on the implementation of asset management and the skills required, such as technical expertise, financial planning and communication.

- 12.6.2 Authorities should identify the competencies necessary to meet their requirements for asset management. Where these competencies are not available in the organisation training of staff may be required. Recruitment, mentoring or collaboration with other authorities may also be considered.
- 12.6.3 If all the competences or resources are not available, external support can be an effective way of addressing gaps, particularly if part of the role is to build capability in the organisation. It is important that ownership is retained within the authority and that asset management staff have enough knowledge to be smart purchasers.
- 12.6.4 The Institute of Asset Management Competencies Framework (46) provides useful advice in identifying and assessing competencies for asset management roles within an organisation. Asset management capability for procurement is described in the *Infrastructure Procurement Route Map* (45).
- 12.6.5 Competencies may fall under several broad headings namely:
- Leadership and governance;
 - Communications and relationship management;
 - Strategic thinking and decision making;
 - Risk management;
 - Business management, finance, resources, tools, information management;
 - Planning development and review;
 - Asset understanding;
 - Lifecycle management;
 - Technical skills, including choice of treatments and materials;
 - Procurement and contract management; and
 - Delivery.
- 12.6.6 In assessing competency, consideration should also be given to the maturity of the organisation, as described in Section 16.

Training and Development

- 12.6.7 To maintain competency regular training should be considered for staff undertaking roles in asset management, such as the Highway Asset Manager. This will ensure the authority has the continuing ability to efficiently and effectively prepare, implement and review their approach to asset management.
- 12.6.8 Investment in development of staff will support the overall improvement in the implementation and delivery of asset management supporting the subsequent business benefits.

Succession Planning

- 12.6.9 Long term asset management involves many different people over time. As people change and as the approach evolves it will be necessary to ensure an orderly transfer of knowledge. This can best be achieved where those involved in asset management have clear roles and where due consideration is given to succession planning and the smooth hand-over of responsibilities.

CASE STUDY – SOUTH EAST 7 COUNCILS**BRIGHTON UNIVERSITY MSc IN HIGHWAY ENGINEERING**

The University of Brighton has teamed up with seven local highway authorities and their main service providers to launch an MSc in Highway Engineering, billed as the first course designed specifically to develop a blend of highway engineering and management skills.

Local authorities in the South-East, including Brighton & Hove, West and East Sussex, Surrey, Hampshire, Kent and Medway Councils and their service providers, have funded 19 places on the new Masters Course, which has been developed with the University. The first two intakes of students were in February and October 2012 and contain students from both local authorities and service providers.

Surrey County Council leader David Hodge said the aim for the councils was to combine forces and create the excellent Heads of Highway Services of the future. “People delivering highway services need to be equipped with skills that are hard to acquire on traditional engineering courses. Only by having the best staff can we provide the best services.”

The University believes that the Masters Course, which is designed to take Engineering graduates who have successfully completed BEng or HND courses, will fill a gap in the market, by advancing engineers’ skills. The course includes six core modules in Highway Engineering Context, Theory, Contracts, Design & Implementation, Asset Management & Engineering and Management, as well as a dissertation project. Knowledge in contract management and commissioning, as well as on the technical aspects of highway engineering, are essential for effective highway engineers, and the course aims to develop these through work placed learning, supported by intensive study weeks.

This course demonstrates how collaboration between the University and employers can ensure that programmes of study are aligned with the needs of specific sectors.

Some Councils, having to rationalise staff in the past, have lost technical expertise and knowledge base. The authorities are collaborating and bringing resources together to ensure that this mistake is not repeated, and council staff with responsibility for delivering the highway service, including asset management, have the right skills.

The aim is for highway engineers to gain good management and technical skills and the SE7 consortium have championed the need for a qualification that reflects the changes in the local authority role.

Managing Change

- 12.6.10 Step changes to service delivery may require significant change to the established asset management processes. Failure to recognise this may lead to slow progress in implementing asset management and realising the benefits it offers. Authorities need to ensure good change management practices are applied to delivering the management of its highway infrastructure assets. Authorities should identify resources required to support change management and ensure that input in this area is considered appropriately.

RECOMMENDATION 10**COMPETENCIES AND TRAINING**

The appropriate competency required for asset management should be identified, and training should be provided where necessary.

13. RISK MANAGEMENT

13.1 INTRODUCTION

13.1.1 Risk management supports the approach adopted for making decisions through the asset management planning process. Risk management is a discipline in itself and covered by ISO 31000 Risk Management (47). This Guidance does not aim to provide detail on how risk management should be implemented but provides advice on how it can support the approach to asset management.

13.1.2 A risk can be defined as an uncertain event, which, should it occur, will have an effect on the desired performance of on an asset or series of assets. It consists of a combination of the likelihood of a perceived threat or opportunity occurring, and the magnitude of its impact on the objectives, where:

- **Threat** is used to describe an uncertain event that could have a negative impact on the levels of service; and
- **Opportunity** is used to describe an uncertain event that could have a favourable impact on the levels of service.

13.1.3 Highway authorities are required to manage a variety of risks at strategic, tactical and operational levels. The likelihood and consequences of these risks can be used to inform and support their approach to asset management and inform key decisions regarding performance, investment and implementation of works programmes.



Flood damage, image courtesy of
Cumbria County Council

13.1.4 Successful implementation of the Asset Management Framework requires a comprehensive understanding and assessment of the risks and consequences involved. Understanding of risk enables the asset management process to address the issues identified.

13.1.5 The most commonly understood risks affecting the highway service relate to safety. However, there are a wide range of other risks and their identification and evaluation is a crucial part of the asset management process. Risks may include:

- Safety;
- Reputation;
- Asset loss or damage;
- Service reduction or failure;
- Operational;
- Environmental;
- Financial; and
- Contractual.

13.1.6 Understanding and management of risk is fundamental to effective asset management and should figure strongly in the training and development programmes for asset managers, as described in Section 12. An approach that may be adopted for the management of risk is shown as in Figure 8 below.

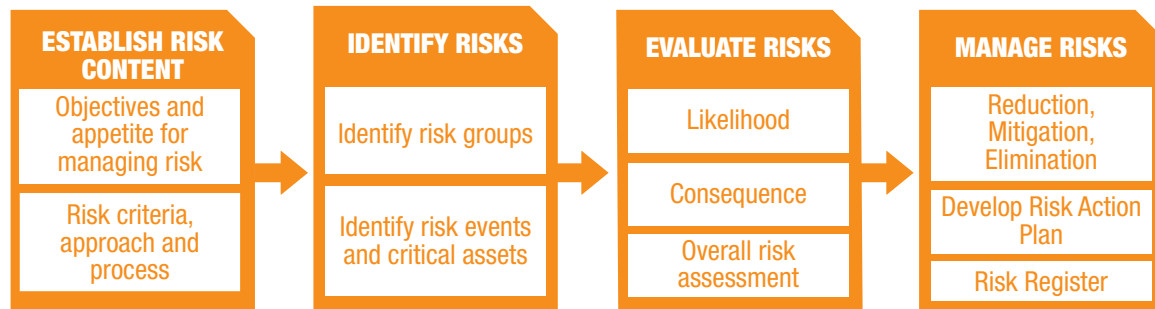


Figure 8 – Risk Management Process

13.2 APPROACH TO RISK MANAGEMENT

13.2.1 Risk can be managed at several levels using a consistent risk framework that enables the comparison of risks across all services. This may include risks seen as:

- **Corporate** – High level risks that effect the whole authority. Such risks include corporate reputation, civil defence, emergencies; business continuity, health and safety, political and legal and financial risk. Risk policy and management of these risks is usually undertaken by the senior decision makers and is beyond the scope of this Guidance;
- **Strategic & Tactical** – Risks affecting the management of the highways infrastructure should be considered throughout at both strategic and tactical levels. This Section focuses on these risks; and
- **Operational** – Risk should also be managed when undertaking operational activities. Advice is provided in the UKRLG Codes of Practice (10, 11, 12, 13).

13.2.2 The risk management approach to support asset management should build on the authority's corporate approach to managing risk. The following aspects will need to be considered:

- **The nature of the service** – Does the risk effect how the approach to asset management will be achieved?
- **Legislation** – Are risk management processes mandated, such as public health and safety or the environment?
- **Cost** – Is the effort put into assessing and managing the risk in proportion to the risk exposure?

13.2.3 To support asset management, authorities should have an understanding of:

- Which assets are critical to the functioning of the network;
- What could affect the delivery of the required performance, including meeting stakeholder expectations;
- The level of funding;
- The level of risk that is acceptable; and
- Options to mitigate all those risks deemed unacceptable.

13.3 IDENTIFYING RISKS

13.3.1 At the strategic and tactical level, risk types may be grouped together. These groups together with examples are shown in Table 1.

<p>Planning Risks</p>	<p>Strategic planning Asset management strategy Performance and level of service and performance Asset management planning Funding and investment Climate change / natural events and environmental</p>
<p>Management Risks</p>	<p>Leadership and organisation Stakeholder and communication Information and data People, including competency Financial IT including asset management system</p>
<p>Delivery Risks</p>	<p>Procurement Cost Works programming Scheme identification and design Contract and project management</p>
<p>Asset Risks</p>	<p>Risks common to all assets including investment, performance and loss of service Risks associated with specific asset types such as severe consequence of failure, accessibility and construction</p>

Table 1 – Risk Groups

13.3.2 Issues to be considered as part of the risk identification process may include:

- What are the risks to achieving the asset management strategy and levels of service?
- What is the source of each risk?
- What might happen?
- What would the effect be?
- When, where, why and how are these risks likely to occur?
- Who might be involved or impacted?
- What controls presently exist?
- What could cause the control to not have the desired effect on the risk?

- 13.3.3 Risks can be identified at different levels of detail. For example, an asset risk defined as “failure of a bridge due to scour” may be an acceptable level of detail in some cases, whilst in others it may be desirable to describe the risk in more detail for each component of a bridge. It may, for example, be decided to undertake a specialist assessment of each failure mode for each component of each bridge. This is the basis of a risk based approach to inspection, described in more detail in Section 8.
- 13.3.4 A common approach is to commence the risk identification at a high level to obtain an assessment for the level of overall risk exposure. This may then be followed by a detailed assessment of more specific risks where critical assets, critical failure modes and high risk areas can be defined and analysed in greater detail.
- 13.3.5 A risk register can be established to record all relevant risks together with the agreed mitigation. A regular review of the risk register should be undertaken by asset management staff. Where another party is involved for example the Highways Agency or Network Rail, the register will need to identify the assignment of risks between the respective parties. An example of a risk register is given in Figure 9.

Record type	ID	Title	Owned by	Status	Review date	Current Risk level	Residual Risk Level
Risk	431	Delivery of Surface Dressing Programme 13/14	Davies, Rebecca	Open	30-Jul-13	VH (24)	H (18)
Risk	432	Reputational risk of non delivery of Highways Local	Harries, Kris	Open	30-Jul-13	VH (22)	H (18)
Risk	437	May 2013 Elections	Marsh, Simon	Open	30-Jul-13	M (13)	L (8)
Risk	445	Serious accident claim at Risford surface dressing site	Davies, Rebecca	Open	30-Jul-13	VH (23)	H (19)
Risk	491	Burnshall PI claim	Davies, Rebecca	Open	30-Jul-13	H (18)	M (13)
Risk	1233	Delivery of Beechbridge Major Project	Davies, Rebecca	Open	30-Jul-13	H (20)	L (8)
Risk	1461	Loss of hearing claim - J Riley	Harries, Kris	Open	30-Jul-13	VL (3)	VL (2)
Risk	1587	Surface dressing programme - remedial works - accidents	Marsh, Simon	Open	30-Jul-13	H (18)	M (12)
Risk	1752	Fatal on B4565 16 Feb 2013 on road that had recently been surface dressed - Privileged and Confidential	Marsh, Simon	Open	30-Jul-13	H (18)	M (12)
Risk	2414	Mike Davies - Claims	Harries, Kris	Open	30-Jul-13	VL (4)	VL (2)
Risk	2636	Lower Lingsford Safety Scheme	Davies, Rebecca	Open	30-Jul-13	VL (3)	VL (3)
Risk	3410	Change in key stakeholders associated with the Highways Contract	Marsh, Simon	Open	30-Jul-13	M (13)	L (7)
Risk	3617	A797 between Burrow's Lodge and Green Carr (pedestrian fatality)	Marsh, Simon	Open	30-Jul-13	H (19)	M (13)
Risk	4010	Potential claim from Authority for Fatal Accident at A790 Crallinge - Privileged and Confidential	Marsh, Simon	Open	30-Jul-13	H (19)	M (13)
Risk	4126	Claim from Accident at work - Muhammad Tahir	Denby, John	Open	30-Jul-13	M (14)	M (14)
Risk	4598	Potential Claim from Accident at Work - Robert Lovelace	Harries, Kris	Open	30-Jul-13	M (14)	M (14)
Risk	4621	Potential criminal investigation into Fatality at B4292 Redbath - Privileged and Confidential	Marsh, Simon	Open	30-Jul-13	VH (22)	H (18)
Risk	4739	Uninsured Plant	Denby, John	Open	30-Jul-13	VL (3)	VL (3)
Risk	4745	Revised policy does not match available resources and budget	Marsh, Simon	Open	30-Jul-13	M (13)	M (11)
Risk	4821	Lack of support for Highways Dept (HD) from LA staff in HD	Marsh, Simon	Open	30-Jul-13	M (13)	M (11)
Risk	4837	Claims arising from Healthcare checks	Harries, Kris	Open	30-Jul-13	M (14)	M (14)
Risk	4891	Pension deficit in ex-authority City DLO	Marsh, Simon	Open	30-Jul-13	M (13)	L (7)

Figure 9 – Risk Register Example

13.4 IDENTIFYING CRITICAL ASSETS

- 13.4.1 Critical assets are those that are essential for supporting the social and business needs of both the local and national economy. They will have a high consequence of failure, but not necessarily a high likelihood of failure. These assets should be identified separately and assessed in greater detail as part of the asset management planning process.
- 13.4.2 By identifying critical assets, authorities can target and refine investigative activities, maintenance plans and financial plans at the most crucial areas. Such assets may include special and major structures such as estuarial crossings. They may also include access to assets owned by third parties such as substations, where access is via a single track road but with accessibility being critical. Critical assets are also discussed in Section 3.

13.4.3 Criticality can be assessed by applying broad assumptions about the implications of failure. For example, whether the non-availability of a major structure or tunnel would have a significant impact on the local or possibly the national economy, or assuming that higher trafficked roads have a larger consequence of failure than lower trafficked. Using this approach, simple criteria can be defined to assess the loss of service. For example, loss of use of a road will:

- Affect or disconnect specific parts of a community;
- Affect businesses of different sizes and significance; and
- Affect specific numbers of road users/hour.

13.4.4 Depending on the criticality of the asset, the risk management approach may be at a network level by ensuring diversions are available and have minimal impact, individual asset level, or at a detailed component level with extensive consideration of failure modes

13.5 EVALUATING THE RISKS

Risk assessment

13.5.1 Risk assessment involves determination of the likelihood and consequence of an event. Risk assessment allows the identified risks to be analysed in a systematic manner to highlight which risks are the most severe and which are unacceptably high. An authority can then determine its level of exposure to the risk and the actions necessary to minimise that risk. An example of assessment of the likelihood and consequence through a qualitative matrix approach is illustrated in Figure 10.

13.5.2 Overall risk is normally described as:

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

Likelihood

13.5.3 Likelihood is the chance of an event happening, for example, a failure (asset as well as organisational) or service reduction. It can be measured objectively, subjectively, qualitatively or quantitatively. It can be described using general or mathematical terms such as frequency or probability. Issues to be considered include:

- Changes in policy and funding;
- Current and historic performance (severity and extent) of the asset;
- Severity of the environment, rate of deterioration and/or current age of the asset;
- Asset type, material type, mode of failure, extent of failure, etc;
- Exposure to incidents of all types;
- Human behaviour and workmanship;
- Vulnerability to climate change; and
- Quality of asset management approach and systems.

13.5.4 The likelihood of physical failure of an asset is related to the current condition of the asset, hence the importance of realistic and accurate condition assessment. The likelihood of natural and external events is determined less easily but scientific studies are usually available. The likelihood of other events, such as poor work practices or planning issues can be difficult to ascertain.

13.5.5 Examples of physical failures include loss of bridges such as in Cumbria in 2009 as described in the case study in Section 3, and landslides as experienced in Scotland on the A9, A83 and A86. These highlight the vulnerability of the rural road network and the communities it serves. Other more minor failures may include streetlight lighting columns, but failure may have a significant impact on safety.

Consequence

13.5.6 Consequence is the outcome of an event, such as increased journey times, isolation of local communities or a drop in public perception of the service provided. It can have positive or negative effects and can be expressed qualitatively or quantitatively. The consequences associated with an event leading to failure or service reduction may include:

- **Safety** – including fatalities and personal injuries;
- **Functionality** – impact of a loss or reduction in service at route, asset or component level, such as weight restrictions on a bridge;
- **Cost** – increased costs due to bringing forward or delaying work, repair costs, fines or litigation costs and loss of income or income potential;
- **Sustainability** – any impact on future use of highway infrastructure assets.
- **Environment** – environmental impacts, such as pollution caused through traffic delay or contamination from spillages, the sensitivity of the route/area, etc;
- **Reputation** – public confidence in organisational integrity; and
- **Community costs** – damage to property or other third party losses, which may include business impacts, traffic delays, etc.

LIKELIHOOD OF EVENT OCCURRING	CONSEQUENCE OF EVENT OCCURRING				
	NEGLIGIBLE	LOW	MEDIUM	HIGH	SEVERE
NEGLIGIBLE	1	2	3	4	5
VERY LOW	2	4	6	8	10
LOW	3	6	9	12	15
MEDIUM	4	8	12	16	20
HIGH	5	10	15	20	25
KEY TO RISKS					
LOW		MEDIUM		HIGH	

Figure 10 – Qualitative Matrix Approach

PART C

13.6 MANAGING THE RISKS

- 13.6.1 The “risk appetite”, or the amount of risk the authority is willing to accept in pursuit of its objectives should be understood. In doing so, the risks requiring further consideration for action or mitigation should be defined. This may be done through a risk policy where the statement of the overall intentions and direction of the authority may be stated.
- 13.6.2 Mitigation options should be identified for all risks assessed to be unacceptable. Unacceptable risks may include:
- High risks, where the product of likelihood and consequence exceeds a threshold, e.g. all risks assessed as “high” or “extreme”;
 - High consequence events, even where the likelihood may be very small;
 - Risks with legal or particular compliance requirements; and
 - Risks which may be readily reduced for little cost.
- 13.6.3 There will usually be many options to reduce the likelihood and/or consequence of different risks. If agreed and implemented, these may result in anything from minor reductions to almost total risk elimination. Some risks can be addressed more easily and effectively than others and costs may range significantly. Analysis of the costs of risk reduction against different options will assist in identification of the optimum solution.
- 13.6.4 Risks and their management should be addressed as part of the asset management planning process. In particular, they can form part of the decision making process described in Section 9. Where physical works are part of the measures to mitigate the risks they should be considered as part of the works programme described in Section 10.

13.7 MONITORING AND REVIEW

- 13.7.1 A Risk Action Plan may be prepared which consolidates the risk register, evaluation, mitigation to be undertaken, resources, timeframes and responsibilities. Alternatively this information may be summarised within the Highway Infrastructure Asset Management Plan or other documentation and should support the lifecycle planning process and works programming described in Sections 9 and 10 respectively.
- 13.7.2 The Risk Action Plan should be reviewed by asset management staff and senior decision makers on a regular basis and updated as appropriate. The scope, responsibilities, timeframes, method and frequency of reviews should be documented.

CASE STUDY – CITY OF WESTMINSTER

IMPLEMENTING A RISK MANAGEMENT APPROACH

London Boroughs have in place long established procedures and practices for dealing with highway maintenance. However, many of these were not documented. The City of Westminster was the first Borough to fully document their standards and practices in respect of highway maintenance, in accordance with *Well-maintained Highways*.

In order to promote consistency across London, the London Technical Advisors Group (LoTAG) built upon the work of the City of Westminster and produced a generic document titled, “Framework for Highway Maintenance Management Plan” as the London-wide standard. This provides a starting point for Boroughs to develop their own unique Plan in a standard format with common methodology. This framework document was endorsed by Zurich Municipal insurers and although it was produced primarily for London Boroughs, it is applicable to all local highway authorities in the UK.

Westminster City Council's approved Highways Maintenance Management Plan sets out how Highways Inspectors shall undertake the risk assessments of highway defects that have reached or exceeded agreed investigatory levels, to determine whether a repair is necessary and, if so, the appropriate repair period to be applied. The risks to be considered are all those with a defect severity at or in excess of the agreed investigatory level.

The key to the risk assessment are the basic ‘principles’ that are applied for quantifying the likelihood and impact of risks (each being quantified on a scale of 1 to 5) as the response Category, and thereby the timescale for rectifying the defect, is determined from the Risk Factor calculated as the product of the Probability Score and the Impact Score (a maximum score of 25 can be achieved).

The City Council's ‘Risk Register for Highway Safety Defects’, that includes a wide range of defect types likely to be encountered on Westminster Streets, has been incorporated into hand held devices and is used on-street by the Highway Inspectors to easily assess each defect type in terms of its extent, location, network hierarchy and type of usage. Automatic ‘orders’ are then created and issued electronically to the City Council's Service Provider for them to action within the timeframes set for defect rectification.

RECOMMENDATION 11

RISK MANAGEMENT

The management of current and future risks associated with assets should be embedded within the approach to asset management. Strategic, tactical and operational risks should be included, as should appropriate mitigation measures.

14. ASSET MANAGEMENT SYSTEMS

14.1 INTRODUCTION

- 14.1.1 Asset management systems provide information on location and performance of highway infrastructure assets and ultimately support decision making and reporting. This Section provides advice on how these systems can enable asset management through appropriate management, reporting and communication of information and data. Advice is also provided on how investment in these systems can be made in a sustainable manner.
- 14.1.2 Good asset management must be supported by robust processes, as well as good quality, repeatable and reliable data. The data and information required for asset management is described in Section 8. Knowledge of the asset and its condition and performance is vital for making the right investment decisions, as well as for demonstrating to senior decision makers and stakeholders the overall investment requirements. It is also enables effective communication.
- 14.1.3 Staff undertaking asset management activities should have access to the information and data they require to fulfil their role. Effective management of this is required so that benefits in implementing asset management can be maximised over the short, medium and long term.
- 14.1.4 It is recognised asset management systems are essential for managing highway infrastructure assets and in particular required to deal with the increasing amount of information and data available. Most authorities already operate asset management systems, some of which are based on standalone systems and data bases. More recently there have been moves toward fully integrating these databases through single data repositories by some authorities.

14.2 FUNCTIONALITY OF ASSET MANAGEMENT SYSTEMS

- 14.2.1 A number of commercial, off the shelf systems (COTS), are available that provide a range of functionality to support the asset management process. Some highway authorities have developed bespoke systems. All these systems are conceptually similar and generally consist of a central database with a map-based user interface and a decision support element. They are able to hold inventory, construction, and condition data, spatially referenced to a common network. Collectively this should provide the Asset Register as described in Section 8.
- 14.2.2 Many have Geographical Information System (GIS) capabilities to enable spatial analysis of data and/or modelling capabilities and can be used to produce various outputs and reports. Others include operational functionality, such as routine maintenance management.

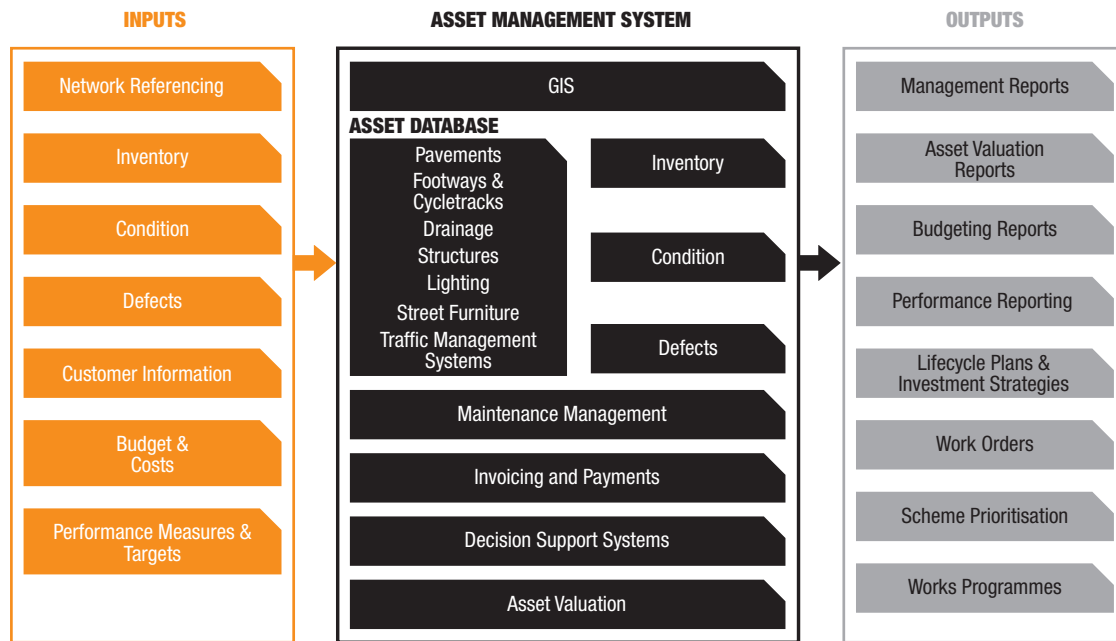


Figure 11 – Asset Management System

14.2.3 The functionality of a generic asset management system is illustrated in Figure 11. The generic components of an asset management system may be summarised as follows:

- **GIS** – This is a system that will hold and present all types of spatial data related to highway infrastructure assets. It may enable visualisation of the asset and analysis of data and presentation in a format usually with background mapping;
- **Asset database** – The asset database is a register of assets. At its most advanced level it may be a single integrated database. Equally, it may comprise separate asset registers for each asset group, e.g. pavements and structures will have separate databases. It may hold inventory and condition data for each asset type. For example, a pavement management system such as UKPMS will hold inventory, condition and defects for pavements. A lighting management system would hold inventory data, maintenance history, condition and inspection data;
- **Maintenance management** – A maintenance management system will record routine maintenance defects from safety inspections or reported by the public, and support raising works orders for their repair;
- **Invoicing and payments** – Linking to the maintenance management system will ensure invoices and payments are made and are auditable;
- **Decision support systems** – These will link to the asset database and support predictive modelling to determine future condition of an asset. They are likely to be integrated into more advanced asset management systems. They will be used to develop lifecycle planning and develop works programmes. They should also be able to support prioritisation of candidate schemes; and
- **Asset valuation** – An asset valuation system will calculate Gross Replacement Costs and Depreciated Replacement Costs as part of Whole of Government Accounts, based on information provided in the asset database including inventory and condition.

- 14.2.4 The inputs to the system are discussed in more detail in Section 8. The outputs should provide the information and data required to support the asset management process.
- 14.2.5 Many authorities now have systems to support all their asset types, including pavements, footways, cycleways, street lighting, traffic signals, structures and rights of way. In some cases these are databases and have limited functionality to allow processing of condition to determine long term performance. Some systems have been developed for specific asset types. There are also a few integrated products offering additional packages such as streetworks and customer communications.

14.3 CONSIDERATIONS FOR ASSET MANAGEMENT SYSTEMS

- 14.3.1 The key aspects that authorities should consider when reviewing, investing and upgrading asset management systems are described below.

Identifying Requirements

- 14.3.2 Whether purchasing a new asset management system or upgrading an existing one, it is important that authorities define their system requirements as a starting point. As systems become more complex, poorly informed decisions on their selection may be costly to rectify.
- 14.3.3 Before setting system requirements asset management requirements should be developed, including data, decision making and communications. Authorities should review any systems in use and seek the views of users at all levels in the organisation. Authorities should include their IT staff to ensure the proposed solution is compatible with other systems. The following should be considered:
- How the system will be used to support the overarching asset management strategy and levels of service, including reporting requirements;
 - The information needs identified in their asset management strategy and how the system will support those needs in terms of uploading, management and reporting of data;
 - The asset management planning processes that the system will support, including maintenance decisions;
 - Type and quality of data in existing systems;
 - Associated requirements for hardware, software, licences, data and processes, which may require input from the IT function within the authority whether the system is hosted or in-house;
 - Information security policies and standards of the authority;
 - The long-term sustainability of the solution;
 - The number of potential users and data owners;
 - User support requirements;
 - Access and use the system; and
 - Staff competency and training.

Making the Case for Asset Management Systems

- 14.3.4 It is recognised that varying requirements for existing systems, as well as developing and implementing new systems can be a costly process. The associated licensing and training can also be expensive.

- 14.3.5 Where authorities need to invest in existing or implementing new asset management systems, the business benefits of any large investments should be clearly understood. Where this is the case, authorities should consider developing a business case as discussed in Section 12. The case should recognise that using asset management systems is key to managing data, reporting and supporting decisions to deliver effective and efficient asset management.
- 14.3.6 When selecting an asset management system, future costs should be considered, including costs of long term support. If the cost is not sustainable then the authority should review their data collection and reporting requirements. It is important that a sustainable approach is developed.

Managing the Asset Management System

- 14.3.7 Asset management systems are becoming complex in terms of software, hardware and the volume of data and number of users they support. For some authorities it is likely to be the largest IT systems they have. It is therefore important that IT staff are involved in setting requirements, selecting and setting up systems.



Screenshot of asset management system, image courtesy of Transport Scotland

- 14.3.8 Others matters to consider include day-to-day support of the system, product updates and system development. These are key management considerations that must not be ignored if the asset management system is to remain fit for purpose. There are benefits in having local support as well as corporate support and each will have their own costs which must be considered.
- 14.3.9 Where an externally managed arrangement is used such as a hosted service, accessibility and development are still key matters that need to be considered as part of any arrangement with a service provider.
- 14.3.10 Where GIS requirements are separate from the asset management system, it is important to include any specific user licence requirements within the management of the asset management system.
- 14.3.11 Where highways maintenance service providers are required to access the asset management system, due consideration to their access and any authorisations necessary for external access need to be resolved at an early stage.

Access, Training and Competency

- 14.3.12 The asset management system should be accessible to all relevant staff involved in asset management to ensure they have the information and data required to undertake their role effectively. This may include staff from service providers and staff in remote locations, such as depots. Access arrangements need to be made based on the authority's IT management approach and function. In providing access to staff, all corporate information assurance and security requirements need to be complied with.
- 14.3.13 Staff using asset management systems should be competent in their use. This may include training in certain aspects that are appropriate to their requirements. Training may be provided from a number of sources, including the system provider, through collaboration with other authorities using similar systems, or through user groups.

Benefits of Asset Management Systems

14.3.14 Asset management systems should be designed and upgraded to enable value from asset information and data to be maximised. With continual advancements in systems and technology, a number of potential benefits may be achieved that will support asset management including:

- A single source of asset data, reducing the risk of multiple databases with similar but inconsistent data;
- Visual representation of the network, enabling senior decision makers to better understand the performance of the network and the consequence of investment decisions;
- Support for objective investment decisions using lifecycle planning approaches, enabling the consequences of funding scenarios to be identified and presented quickly and efficiently;
- Providing evidence to justify service outcomes or maintenance budgets;
- Reporting against performance targets developed as part of the asset management planning process using visual displays such as dashboards;
- Reporting and presenting long-term prioritised works programmes in a way that can be communicated effectively to stakeholders, including the public, staff, and service providers;
- More effective management, through scheduling and optimisation of maintenance activities, including combining of works, potentially in single road closures; and
- Improving consistency, transparency and accountability through process efficiencies, reducing duplication and supporting better data management.

Review and Upgrade

14.3.15 Asset management systems, like all computer systems, require upgrading from time to time. In particular, as the maturity of an authority in asset management improves, systems that support more advanced analysis of data may be required. As with other aspects of asset management, systems need to be reviewed regularly to ensure that they adapt to changes within the authority, including information and data requirements.

Total Cost of Ownership

14.3.16 Asset management systems can be expensive both in terms of initial capital cost and also in terms of licences, upgrades, and training. It is therefore important that the asset management system is sustainable in the long term. Authorities should therefore consider the Total Cost of Ownership when making investment decisions. This will typically include:

- Cost of the procurement process;
- Annual software licence costs, including associated database and other software licences and user licences;
- Hardware and communications infrastructure;
- Third-party software licences;
- Implementation and product configuration costs;
- Initial and continuing user training;

- Data cleansing and migration from existing systems;
- Establishment of any interfaces with existing systems;
- Continuing support and maintenance, including upgrades;
- Potential changes to business processes;
- Internal project management costs;
- Costs of externally managed systems;
- Cost of IT support; and
- Data security.

RECOMMENDATION 12

ASSET MANAGEMENT SYSTEMS

Asset management systems should be sustainable and able to support the information required to enable asset management. Systems should be accessible to relevant staff and, where appropriate, support the provision of information for stakeholders.

CASE STUDY – TRANSPORT SCOTLAND AND WELSH GOVERNMENT

PROCUREMENT OF ASSET MANAGEMENT SYSTEMS

Transport Scotland and the Welsh Government have for many years, in common with UK good practice, been developing and using a number of asset management systems to support decision making.

Discussion between Transport Scotland and Welsh Government identified that procuring future contracts in collaboration could provide better value for money to both organisations, as requirements for asset management systems are very similar.

A business case identified that procurement of a single contract for the supply of an Integrated Road Information System (IRIS), including all road condition surveys, was the optimum solution. The objective of the IRIS contract was to bring IT asset management services under one supplier, replacing various existing contracts as they expired, providing greater integration and delivering significant cost savings. A system was procured in 2012 for a seven year period.

A Collaboration Agreement identifying the roles and responsibilities of both Scottish and Welsh Ministers in the management of the IRIS Commission was developed.

IRIS is a fully integrated system with over 20 core functions, including pavement, structures, lighting, environmental, geotechnical and drainage management systems. IRIS is a flexible system that will be adapted over the life of the commission to support future business needs and has the potential to set new industry standards.

The benefits of developing the system are that all data will be centrally accessible and reportable, with a staged delivery ensuring a seamless migration.

Procurement of Asset Management System

14.3.17 The procurement of an asset management system, as well as any large scale upgrades, required by and authority will have to be in accordance with their procurement rules. It is therefore advisable to seek advice from appropriate procurement staff at the start of the process. When considering the approach to procurement, COTS products will need to be considered against bespoke system development. In general any decision on this will be a compromise between:

- Standard products with each having variable adaptability to existing business processes and in costs of adapting;
- Initial development cost and future product development costs; and
- Internally hosted product versus an externally hosted management service.

14.3.18 Software vendors are increasingly offering web based managed service solutions hosted externally. Externally managed solutions can be cheaper and remove the need for internal hardware and infrastructure however, they may reduce the level of knowledge and control that users have over the systems and processes.

14.3.19 Authorities should also consider collaborative procurement with other authorities. This may require compromise where requirements or priorities differ.

Supporting Communications

14.3.20 Communications with stakeholders should be considered as part of setting requirements for the asset management system. Asset management systems should provide essential information to support the communication strategy described in Section 3. This information can be provided to the public via websites and to staff via the intranet. Any information communicated to the public needs to be concise and updated regularly.

15. PERFORMANCE MONITORING

15.1 INTRODUCTION

15.1.1 Performance monitoring is the process of monitoring and reviewing the Asset Management Framework. A well developed approach to performance monitoring will support authorities in reviewing progress in the delivery of their asset management strategy, performance requirements and works programmes.

15.2 PERFORMANCE MONITORING

15.2.1 Information and data arising from implementation and delivery of asset management may be used in identifying actions for continual improvement of the approach, including delivery of the overall service. Such an approach will enable relevant processes and practices to be assessed and improved where required and lessons learnt. This will form the basis for continuous improvement. It will also enable critical issues regarding performance to be identified and improvement plans developed. This approach is not intended to replace audit processes that may already be in place. Setting of and measuring of performance is discussed in Section 7.

Types of Performance Monitoring

15.2.2 Authorities should establish, implement and maintain processes to monitor the performance of their approach to asset management. This will assist in demonstrating the benefits of their approach and equally any performance improvements they choose to make. These processes should cover:

- **Strategic monitoring** – To seek assurance that asset management is being operated as intended. This shall include monitoring to ascertain whether the asset management strategy outcomes are being met, including stakeholder requirements, that the approach to asset management has been documented and implemented, and that the supporting processes are effective;
- **Performance measures and targets** – To assess the effectiveness and efficiency of asset management it should be monitored using a series of metrics at the strategic, tactical and operational levels, as described in Section 7. This will include monitoring against levels of service and supporting performance targets and determining whether they have been met;
- **System audits** – Monitoring the data in the asset management system in order to determine whether it is fit for purpose, as well as reviewing the output and how it is being used; and
- **Compliance monitoring** – Depending on contractual relationships, the performance of maintenance contractors against their contractual obligations may need to be assessed.

Frequency

15.2.3 When setting the frequency for performance monitoring consideration should be given to the balance between the cost of collecting the monitoring data and information and the risks of not having the information available. This is particularly important when considering compliance with statutory obligations and demonstrating value for money.

Benefits Realisation

15.2.4 It is important that the benefits from implementing asset management are captured and measured against those identified in the case for investment, or to support value for money initiatives or greater efficiency in delivery of the service. Recording and demonstration of the benefits may provide essential evidence for further investment. It is therefore a key success factor in the implementation of asset management and should form part of the monitoring process.

Techniques to Report Performance

15.2.5 There are a number of techniques available to report the results from performance monitoring. The techniques are described below:

- **Balanced scorecard** – presents performance metrics against a range of criteria that include key aspects of the asset management Framework. Targets and actions can then be set against each of the criteria. Subsequent performance reviews can be monitored against these; and
- **Dashboard** – a multi-layered performance management tool that enables the measurement, monitoring and management of asset management activity against the performance management regime. This may include, for example, financial measures.



Example of balanced scorecard, image courtesy of Highways Agency

15.2.6 Tools to support performance monitoring can be part of an asset management system as described in Section 14. Integrating performance monitoring in this way will ensure the same data sets are being using for performance monitoring and reporting purposes as well as for making maintenance and other investment decisions.

15.3 PERFORMANCE REVIEWS

15.3.1 Authorities should consider regular reviews to support continuous improvement. It is anticipated that the performance monitoring and reporting regime will be complemented with activities to review progress in achieving the overall requirements from asset management that have been set in the strategy.

Performance Reviews

15.3.2 Performance reviews consider results, factors contributing to performance, and options for when performance requirements have not been met. Reviews can be carried out at regular intervals, but it would be usual for them to be carried out on an annual basis.

15.3.3 Reviews should focus on the performance requirements that have been developed to support the asset management strategy and measure the progress in delivering the Asset Management Framework. They can also consider more operational requirements. Lessons learnt and improvement actions should be captured for all aspects of the process, especially where performance is below that expected.

Management Review

- 15.3.4 Senior decision makers should ensure that their asset management approach continues to be effective by conducting Management Reviews at regular intervals. These will consider performance reviews, other reviews, and any supporting improvement programme. The approach to a Management Review is described in PAS 55 (6).
- 15.3.5 The Reviews should include:
- Results of internal audits and evaluations of compliance with applicable legal and other requirements;
 - The results of stakeholder engagement and relevant communications, including complaints;
 - Records or reports on performance of the highway infrastructure;
 - The extent to which the performance requirements have been met;
 - Follow-up actions from previous Management Reviews;
 - Changing circumstances, including changes in legislation, funding or other requirements related to the highway infrastructure;
 - Changes in technology; and
 - Comparisons of performance with similar organisations.
- 15.3.6 The outputs from Management Reviews may include improvement actions and possible changes to:
- Asset management policy and strategy;
 - Asset management performance requirements;
 - Resources for highway infrastructure maintenance and support; and
 - Other elements of the Asset Management Framework.

15.4 IMPROVEMENT PLANS

- 15.4.1 As a result of any of the reviews, it is likely that a number of improvements may be identified. These improvements may be formally documented in an improvement plan. It should detail the expected outcomes of the improvement plan, the specific actions to be taken, the owner, the resources needed to deliver them and timescales. This will ensure that focus is maintained on the outcome of the improvement and the ultimate benefit it may provide to the authority and stakeholders.

Developing an Improvement Plan

- 15.4.2 The difference between current and desired practice can be identified through a gap analysis. The output will be a series of agreed improvement actions. Improvement actions can be classified as corrective or preventative as described below:
- **Corrective actions** – These are required to eliminate the reasons for poor performance as a result of using the asset management approach; and
 - **Preventative actions** – These are required to eliminate potential reasons for poor performance.

15.4.3 Improvement actions may include:

- Reviewing the asset management strategy;
- Creating or improving a process or advice to ensure processes are applied consistently;
- Developing improved maturity levels or competence levels through training of staff;
- Revising and implementing the asset management planning processes to improve efficiency;
- Reviewing service provision arrangements; and
- Implementing data quality improvements.

15.4.4 Improvement actions should be prioritised and placed into timeframes that are realistic and affordable. In prioritising the actions, a balance between risks, costs, strategic priorities, levels of service and expected benefits should be achieved. The roles and responsibilities for implementing and improving asset management should be determined as described in Section 12. Further information is provided in Section 16 for authorities wish to improve their maturity to adopt more advanced asset management practices.

15.4.5 An improvement plan should have the support of senior decision makers and can be established using the following steps:

- Confirm the programme of improvement actions;
- Identify resource requirements (internal and external);
- Monitor and control the plan in terms of time, cost and quality;
- Report on progress; and
- Review project outcomes to ensure they are as desired, and take action if they are not.

RECOMMENDATION 13

PERFORMANCE MONITORING

The performance of the Asset Management Framework should be monitored and reported. It should be reviewed regularly by senior decision makers and when appropriate, improvement actions should be taken.

15.5 BENCHMARKING PERFORMANCE

15.5.1 Benchmarking is a systematic process of collecting information and data to enable comparisons with the aim of improving performance, both absolutely and relatively to others. It provides a structure to search for better practice in similar authorities that can then be integrated into an asset management approach.

15.5.2 There are four approaches to benchmarking that may be considered, each of which provides a different perspective:

- **Strategic benchmarking** – Compares outcome performance in the implementation of strategic or policy objectives across organisations;
- **Functional benchmarking** – Compares the performance and structure of an entire service area or function within an organisation;

- **Process benchmarking** – Compares and measures processes, sequences or activities with those of other organisations to identify how existing methods can be improved; and
 - **Data benchmarking** – Involves the use of objective data for comparing performance, very often cost or measurement related.
- 15.5.3 Selection of the benchmarking network is important in providing useful information. Its significance will be improved if partners have similar characteristics.
- 15.5.4 There are a number of local authority benchmarking groups or networks dealing with highway maintenance. These enable authorities to share best practice and performance, including cost.
- 15.5.5 ADEPT and regional groups have supporting benchmarking groups in England. Local authorities in Scotland and Wales have been grouped into “family groups” for the purposes of benchmarking. The family groups are cities, urban, semi- urban, rural and islands. APSE has a performance network for benchmarking the local authorities delivering front line services including highways.
- 15.5.6 The NHT Survey (23) is a national public opinion survey in England that many highway authorities subscribe to and as a result, an authority’s performance can be compared with others. It measures performance across a number of functions and is a powerful way for an authority to identify other authorities where performance is better than their own.

RECOMMENDATION 14

BENCHMARKING

Local and national benchmarking should be used to compare performance of the Asset Management Framework and to share information that supports continuous improvement.

16. GETTING STARTED AND PROGRESSING

16.1 IMPLEMENTATION PLAN

16.1.1 Authorities have generally made varied progress in the implementation of asset management. This Guidance should be used to support them to either start or improve their approach to asset management. In assessing desired practice they should consider, as a minimum, their position against the recommendations in this Guidance. In doing so, they should compare their current practice against the desired one, taking into consideration recognised good practice from other authorities.

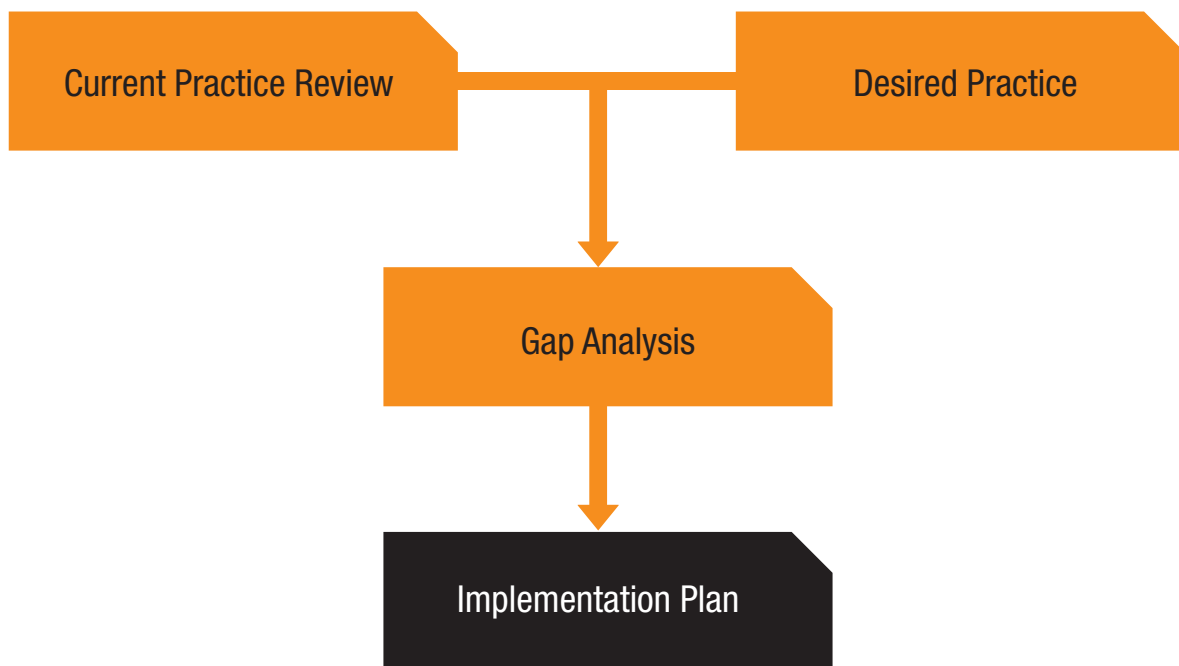


Figure 12 – Asset Management Gap Analysis

16.1.2 This comparison may be carried out in the form of a gap analysis, as shown in Figure 12. The analysis should consider:

- **Gap** – What are the differences between current and desired practice?
- **Cost** – What are the costs of closing the gaps?
- **Timescales** – How much time is needed to make progress in closing the identified gaps?
- **Benefit** – How will the proposed changes benefit the overall approach to asset management and the desired outcomes? This should also consider the financial benefits.
- **Priorities** – Which items are most crucial to meet the requirements and will achieve the maximum benefit for the minimum cost?
- **Resources** – Can resources be made available to action the desired changes?

16.1.3 The outcome from the gap analysis can be set out in the form of an Implementation Plan. Some authorities with a desire to practice more advanced asset management may wish to consider, as part of this Implementation Plan, how they could achieve accreditation against PAS 55 (6), and later, ISO 55000 (19). Equally the Implementation Plan may support meeting the recommendations of this Guidance, or the performance improvements that have been identified from monitoring the approach to delivering asset management as described in Section 15.

- 16.1.4 The Implementation Plan should summarise the findings from the gap analysis and describe:
- The required actions and those responsible for their completion;
 - A communication strategy to inform affected staff;
 - A programme, possibly including a staged delivery;
 - The funding required; and
 - The review process.
- 16.1.5 Authorities should monitor progress against the Implementation Plan, and where appropriate, take corrective action. An approach for monitoring performance is described in Section 15.
- 16.1.6 Authorities may find it useful to consider the following steps as a starting point for implementing or improving their approach to asset management.

Step 1: Carry out Gap Analysis Against this Guidance.

- 16.1.7 This Guidance and its recommendations cover all aspects of developing and implementing asset management. Reviewing current practice against these recommendations will assist authorities in making progress with the implementation of asset management.

Step 2: Carry out Gap Analysis of Current Against Desired Practice.

- 16.1.8 In setting desired practice, authorities should consider the recommendations in this advice and recognised good practice. For the gap analysis to be effective, a number of other issues need to be addressed in parallel.
- **Informing senior decision makers** – This should be done in order to get their support to undertake the gap analysis and implementation of asset management, including costs and potential future investment;
 - **Personal skills and knowledge** – Skilled individuals who are competent in asset management should undertake the gap analysis. Where the necessary skills or resources are not available, authorities should work in collaboration with other authorities undertaking similar reviews or get support from appropriate third parties;
 - **Requirements and competencies associated with each recommendation** – The detailed requirements behind each recommendation in this Guidance should be understood by staff undertaking the assessment. Consideration should be given to working in collaboration with other authorities who have undergone training or which have made good progress with asset management, or obtaining support from elsewhere;
 - **Document findings of gap analysis** – This should summarise progress against each recommendation and identified best practice and identify any gaps in the approach and staff competency to implement them;
 - **Develop detailed Implementation Plan** – The Implementation Plan should include the actions that are required to be undertaken over a time period. Ideally, a maximum of 1 year should be considered for implementation to reach the minimum requirements of the recommendations in this Guidance. Actions should be prioritised and owners and anticipated benefits should be recorded against each action; and
 - **Approval from senior decision makers** – The Implementation Plan requires approval and funding from senior decision makers.

Step 3: Making the Case for Asset Management

16.1.9 It is essential that the Implementation Plan sets out the case for asset management. Section 12 describes the case for making investment. The following issues need to be considered in making the case.

- **Demonstrate the benefits** – Consider the advice and good practice in this Guidance in demonstrating the benefits of asset management;
- **Collaboration** – Authorities should collaborate with other authorities or departments where possible to provide evidence of the benefits of asset management, develop good practice and share lessons learnt;
- **Engage with senior decision makers**– In making the case, senior decision makers should be engaged. This will be helpful in achieving their buy-in early on. This Guidance provides evidence of good practice and potential benefits. The Audit Commission Report Going the Distance (3) provides a number of recommendations for councillors and senior managers that support the case for asset management; and
- **Document** – The evidence needs to be documented with the benefits and cost clearly set out to assist in the decision making process. Where additional funding or financing is required, this may be sought through a business case.

Step 4: Implement Actions in the Implementation Plan

Step 5: Monitor Performance and Review Progress

- **Monitor performance** – Progress should be reviewed in accordance with this advice and the approach described in Section 15.

16.2 ASSESSING ASSET MANAGEMENT MATURITY

16.2.1 As described above those authorities getting started they should consider their position against the recommendations in this Guidance. It is however recognised that asset management practices have evolved over a number of years and some authorities may adopt a more advanced approach to asset management. Where this is the case they may wish to undertake a maturity assessment against various aspects of their asset management practice in adopting such an approach authorities will be able to determine how good they are at asset management compared to where they may wish to be.

16.2.2 Typically, a maturity assessment will include an assessment of competence across a number of asset management activities. It may go from basic at one end of a scale to advanced at the other end. Authorities practicing advanced asset management are those where asset management activities are fully integrated and are being continually improved to deliver maximum value at a minimum cost. The level of maturity should be appropriate to the authority and the portfolio of assets. PAS 55 (6) provides a framework against which a maturity assessment may be carried out. Considering maturity against the asset management planning process and enablers in Asset Management Framework may also be considered for those authorities not wishing to follow such an approach.

17. ACKNOWLEDGEMENTS

This Highway Infrastructure Asset Management Guidance has been developed under the Highways Maintenance Efficiency Programme. The help and support of the Asset Management Working Group, Project Team and contributors is acknowledged.

17.1 HMEP ASSET MANAGEMENT WORKING GROUP

Chair – Matthew Lugg OBE

(Director of Environment and Transport for Leicestershire CC and Former President of ADEPT)

Department for Transport - Haydn Davies

UK Lighting Board / Leicestershire -
Peter Hosking

Department for Transport - Steve Berry

UKRLG AM Group / Cornwall - Andy Stevenson

HAMFIG / Hertfordshire - Chris Allen-Smith

UKRLG AM Group / Transport for London -
Garry Sterritt

Highways Agency - Clare Griffin

UKRLG AM Group / Staffordshire - Paul Boss

Highways Agency - Richard Arrowsmith

UKRLG AM Group / Devon - Lester Wilmington

HTMA / Ringway - Dennis Parkinson

UKRLG Northern Ireland - Francis Miskelly

TAG / Medway - Phil Moore

UKRLG Scotland / Transport Scotland -
Donald Morrison

UK Bridges Board / LoTAG / Westminster -
David Yeowell

UKRLG Wales / Welsh Government - Alison Jones

17.2 ATKINS PROJECT TEAM

Alan Taggart

Lila Tachtsi

Mike Bordiss

Chris Capps

Andy McLoughlin

John Paterson

Andy Woolley

18. REFERENCES

- 1 Highways - Maintaining A Vital Asset, HMEP, 2013
- 2 Review of Transport Asset management Plans, DfT / Atkins, 2008
- 3 Going the distance - Achieving better value for money in road maintenance, Audit Commission, 2011
- 4 The Potholes Review – Prevention and a Better Cure, HMEP / UKRLG, 2012
- 5 A fresh start for the strategic road network, DfT, August 2011
- 6 PAS 55, Institute of Asset Management, 2004
- 7 Maintaining Scotland's Roads, Audit Scotland, 2004
- 8 Maintaining Scotland's Roads – A Follow-up Report, Audit Scotland, 2011
- 9 National Road Maintenance Review, Transport Scotland, 2011
- 10 Well-maintained Highways, Code of Practice for Highway Maintenance Management, TSO, 2005
- 11 Management of Highway Structures, A Code of Practice, TSO, 2005
- 12 Well-lit Highways, Code of Practice for Highway Lighting Management, TSO, 2004
- 13 Management of Electronic Traffic Equipment, A Code of Practice, TSO, 2011
- 14 Framework for Highway Asset Management, CSS / TAG, 2004
- 15 UKRLG Asset Management Quick Start Guidance Note – getting started, August 2009
- 16 UKRLG Asset Management Quick Start Guidance Note – levels of service, August 2009
- 17 UKRLG Asset Management Quick Start Guidance Note – lifecycle planning, August 2009
- 18 UKRLG Asset Management Quick Start Guidance Note – risk assessment, August 2009
- 19 ISO 55000 - Standard for Asset Management, expected 2014
- 20 The economic impact of local road condition, YouGov for the Asphalt Industry Alliance (AIA), 2010
- 21 Economic, Environmental and Social Impact of Changes in Maintenance Spend on Roads in Scotland, Transport Scotland, July 2012
- 22 Highway Service Levels (PPR251), Vijay Ramdas, Craig Thomas (TRL), Carol Lehman, Dan Young (Ipos MORI), 2007
- 23 National Highways and Transportation Survey - benchmarking public satisfaction with highways & transport services, NHT, 2012
- 24 Code of Practice on Transport Infrastructure Assets, CIPFA, 2010
- 25 Code of Practice on Local Authority Accounting in the United Kingdom: Guidance Notes for Practitioners – 2012/13 Accounts, CIPFA, 2012
- 26 Local Authority Transport Infrastructure Assets – Review of accounting, management and finance mechanisms, CIPFA, 2008 Report
- 27 Asset management – Whole-life management of physical assets, Chris Lloyd, Thomas Telford, 2010
- 28 Highways Act 1980
- 29 Traffic Management Act 2004

- 30 Roads (Northern Ireland) Order 1993
- 31 Roads Act (Scotland) 1984
- 32 Funding & Financing Infrastructure: an Approach, ADEPT, 2012
- 33 International Infrastructure Management Manual, IPWEA, 2011
- 34 Street Lighting Inventories, DTLR, 2002
- 35 Data Management for Road Administrations – A Best Practice Guide, Western European Roads Directors, WERD, 2003
- 36 Interim Advice Note 171/12, Risk Based Principal Inspection Intervals, Highways Agency, 2012
- 37 RouteMapper www.routemapper.net, IBI Group, 2008
- 38 Road maintenance management: concepts and systems, Richard Robinson, Uno Danielson, Martin Snaith. Palgrave, 1998
- 39 The National Street Gazetteer, NSG, 2005
- 40 Service Life of Surface Treatments, ADEPT / RSTA, 2011
- 41 Technical Report 22 - Managing a Vital Asset: Lighting Supports, ILP, 2007
- 42 Red Book – RICS Valuation Standards, Royal Institute of Chartered Surveyors, 2009
- 43 Whole Life Costing for Option Appraisal of Highway Maintenance Schemes for Local Highway Authorities, UKRLG, 2011
- 44 Guidance on the Management of Highway Drainage Assets, HMEP, 2012
- 45 The Infrastructure Procurement Routemap, HMT and IUK, 2013
- 46 The Institute of Asset Management Competencies Framework, IAM, 2012
- 47 ISO 31000 - Risk Management, 2009
- 48 Asset Management for the Roads Sector, OECD, 2001
- 49 AASHTO Transportation Asset Management Guide, American Association of State Highway Transportation Officials, 2011
- 50 Building on Strong Foundations - A Framework for Local Authority Asset Management, Department for Communities and Local Government, 2008
- 51 Local Highway Authorities Collaborative Alliances Toolkit, HMEP, 2012

APPENDIX A – CASE STUDIES

Title	Organisation	Contact
Stakeholder Perception	National Highways & Transport Public Opinion Survey	Peter Radford paradford@somerset.gov.uk
Critical Infrastructure	Cumbria County Council	Liz Hillier elizabeth.hillier@cumbria.gov.uk
Securing Capital Funding	Blackpool Council	Will Britain will.britain@blackpool.gov.uk
Asset Management Strategy	Hampshire County Council	Clive Griffiths clive.griffiths@hants.gov.uk
Performance Measurement	Northumberland County Council	Ruth Bendell ruth.bendell@northumberland.gcsx.gov.uk
Data Management	Surrey County Council	Amanda Richards amanda.richards@surreycc.gov.uk
Lifecycle Planning	Staffordshire County Council	Paul Boss paul.boss@staffordshire.gov.uk
Deterioration Modelling	Hertfordshire County Council	Chris Allen-Smith chris.allen-smith@hertfordshire.gov.uk
Lifecycle Planning Toolkit	Highways Maintenance Efficiency Programme	Michael Anyala michael.anyala@atkinsglobal.com
Works Programming	Cornwall Council	Andy Stevenson astevenson@cornwall.gov.uk
HIAMP	North Tyneside Council	Mark Newlands mark.newlands@northtyneside.gov.uk
Leadership	Hertfordshire County Council	Chris Allen-Smith chris.allen-smith@hertfordshire.gov.uk
Economic Benefits of Highway Maintenance	Transport Scotland	Karl Johnston karl.johnston@transportscotland.gsi.gov.uk
Commissioning Services	Gloucestershire County Council	Scott Tompkins scott.tompkins@gloucestershire.gov.uk
Brighton University MSc in Highway Engineering	South East 7 Councils	Kassim Gidado K.I.Gidado@brighton.ac.uk
Implementing a Risk Management Approach	City of Westminster	David Yeoell dyeoell@westminster.gov.uk
Procurement of Asset Management Systems	Transport Scotland and Welsh Government	Angela Owen angela.owen@transportscotland.gsi.gov.uk

APPENDIX B – ABOUT THE HIGHWAYS MAINTENANCE EFFICIENCY PROGRAMME

The Highways Maintenance Efficiency Programme (HMEP) is a sector-led transformation initiative that will maximise returns from investment and deliver efficiencies in highway maintenance services. The Programme started in April 2011 with sponsorship from the Department for Transport and is intended to run until 2018.

The Programme is offering local highway practitioners benefits from different ways of working. The vision is that, over time, local highway authorities as clients and their service providers (be they from the private or public sector) will adopt an ambitious and longer-term approach to delivering highway maintenance. This will enable them to:

- continuously find new and improved ways of delivering services to highway users and managing highways assets;
- make use of collaborative partnerships to improve processes and outcomes; and
- deliver a sustainable balance between meeting the needs of highway users, improving quality and minimising costs.

The overall programme has been developed by key personnel from the sector who are supporting HMEP's development. This ensures that:

- HMEP is truly being driven by what the whole sector needs and wants ('by the sector, for the sector').
- the solutions identified by the sector are relevant, realistic, repeatable, scalable and sustainable; and
- HMEP is benefits-led, driving true transformation of the sector with tangible efficiency gains and a lasting legacy.

As a transformation initiative, HMEP is targeting the way local highway authorities conduct their business. It invites the sector to adopt new ways of working to deliver efficiency savings within the following themes:

- Collaboration and Change
 - o Guidance on how alliances between authorities, and clients and their providers, can be formed to deliver efficiencies in the delivery of highway maintenance services.
 - o Processes for changing business; for instance, by applying LEAN thinking to the processes behind service delivery and how services or processes can be streamlined to realise efficiencies.
 - o Guidance on how authorities can become better clients by establishing a framework of skills and training.
- Procurement, Contracting and Standardisation
 - o Advice on routes to procurement, enabling authorities to determine how their current service aligns with current thinking and which is the best procurement option to realise future service ambitions.
 - o A standardised form of contract and highway maintenance specification which are better aligned to the activities that local highway authorities undertake.

- Asset Management
 - o Advice to the sector in the form of updated asset management guidance for highway infrastructure.
 - o A lifecycle planning tool incorporating deterioration models, to determine whole life asset costs, thus moving away from a reactive to a longer-term approach for maintaining highways assets.
 - o Guidance on the management of highway drainage assets.
 - o Training specifically targeted at practitioners to help them move towards an asset management approach and to adopt the new HMEP guidance and tools.
 - o To improve the coordination between local highway authorities and utilities over streetworks to reduce disruption to the public and the impact they have on businesses.
- Benchmarking and Performance
 - o Collecting, sharing and comparing performance data on Cost /Quality/Customer to help drive targeted efficiencies and understand how effective local highway authorities are in delivering Value for Money services.

Products and tools are being developed within each of these themes and are being designed to be both interdependent and complementary so that authorities can maximise returns from their investments.

An example is the Local Highway Authorities Collaborative Alliances Toolkit (51).

APPENDIX C – DEFINING ASSET MANAGEMENT

There are a number of published definitions that describe the key elements of asset management. These definitions are useful to describe what asset management is. Those wishing to adopt a definition of asset management should consider the definitions below in the context of what they are aiming to achieve from adopting and implementing an asset management approach.

PAS 55 - Optimal management of physical assets (6)

Systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its physical assets, asset systems and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organisational strategic plan.

CSS Guidance for Highways Asset Management (14)

Asset management is a strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the highway infrastructure to meet the needs of current and future customers.

OECD – Asset Management for the Roads Sector (48)

A systematic process of maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organised and flexible approach to making the decisions necessary to achieve the public's expectations.

International Infrastructure Asset Management Manual (IIMM) (33)

To meet a required level of service, in the most cost effective manner, through the management of assets for present and future customers.

American Association of State Highway and Transportation Officials (AASHTO) (49)

Transportation Asset Management is a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well-defined objectives.

Royal Institution of Chartered Surveyors - Public Sector Asset Management Guidelines (50)

Strategic asset management is the activity that seeks to align the asset base with the organisation's corporate goals and objectives. It ensures that the land and buildings asset base of an organisation is optimally structured in the best corporate interest of the organisation concerned.

ISO 55000 (19)

The set of coordinated activities that an organization uses to realize value from assets in the delivery of its outcomes or objectives. Realization of value requires the achievement of a balance of costs, risks and benefits, often over different timescales.

APPENDIX D – EXAMPLE OF AN ASSET MANAGEMENT POLICY

Hampshire Country Council Policy for Highway Asset Management

Hampshire County Council considers effective asset management to be one of the key factors to enable the delivery of the corporate priorities namely:

- Hampshire safe and secure for all
- Maximising well-being
- Enhancing our quality of place

It is recognised that a good transport network is essential for a successful economy and society for Hampshire. Our roads provide access to jobs, services, schools, get goods to the shops and allow us to make the most of our free time. Our local roads are at the heart of the transport network and have a key role to play in ensuring that transport in Hampshire delivers the services our residents both want or need. In order that the transport network meets this need Hampshire's policy on Asset Management will meet the Environment Department's Aims and Objectives for 'Moving and Shaping a Prospering Hampshire'.

Aim1. Keeping Hampshire Moving. Our first priority will be to provide a safe, well managed, maintained and more resilient highway network for all who use it. We will make every effort to understand current and future requirements for the highway infrastructure. In order to deliver this we will continue to understand our stakeholders needs, promote levels of service and maintenance priorities for our highways.

Our adoption of an asset management approach will take a long term view in making informed maintenance and investment decisions.

Aim 2. Shaping Hampshire's Future. We strongly believe that we must make best use of our natural mineral resources, making sure we plan for Hampshire's long term mineral needs whilst minimising waste going to landfill. We work towards enabling the delivery of high-quality strategic approach to development and regeneration that will reduce Hampshire's carbon footprint and allow us to adapt to climate change. *Our adoption of asset management will place sustainable solutions that minimise waste and landfill at the centre of our approach to highway maintenance.*

Aim 3. A Prospering Hampshire. We fully recognise the vital role transport has to play in Hampshire's economic vitality and will endeavour to maintain access to education, employment and rural services, as well as widen travel choice through public and community transport, supported by reliable and safe journeys on our transport network.

Our adoption of an asset management approach will enable greater value for money to be delivered by taking a long term view on investment decisions. This approach will maximise the benefits for future prosperity and quality of place by ensuring the right investments decisions are made in the transport network.

APPENDIX E – CLASSIFICATION OF ASSETS

There may be advantages in classifying assets in consistent groups. The table below has been reproduced from the *Code of Practice on Transport Infrastructure Assets (24)* adopts a three layer approach for selecting and grouping assets. This approach is the one currently recommended for authorities undertaking their returns for Whole of Government Accounts.

Level 1	Level 2	Level 3
Asset type	Asset group	Components that level 2 implicitly covers
Carriageway	<ul style="list-style-type: none"> • Area (square metre) based elements • Flexible pavements • Flexible composite pavements • Rigid concrete pavements • Rigid composite pavements 	<ul style="list-style-type: none"> • Pavement layers • Other surface types, e.g. paved • Central reservation, roundabout, lay-by, traffic island, etc • Earthworks (embankments and cuttings, retaining walls height <1.35m) • Traffic calming • Fords and causeways
	Linear elements	<ul style="list-style-type: none"> • Kerbs • Line markings • Road studs • Road drainage elements (gullies, drains, etc, but not large structures) • Boundary fences and hedges • Hard strip/shoulder verges/vegetation
Footways and cycletracks (attached to the road or segregated)	<ul style="list-style-type: none"> • Footways • Pedestrian areas • Footpaths • Cycletracks 	<ul style="list-style-type: none"> • Pavement layers • Other surface types, e.g. block paving, unbound materials

Level 1	Level 2	Level 3
Asset type	Asset group	Components that level 2 implicitly covers
Structures	<ul style="list-style-type: none"> • Bridges (span >1.5m) • Cantilever road sign • Chamber/cellar/vault • Culverts (span >0.9m) • High mast lighting columns (height >20m) • Retaining walls (height >1.35m) • Sign/signal gantries and cantilever road signs • Structural earthworks, eg strengthened/reinforced soils (all structures with an effective retained height of 1.5m or more) • Subway: pipe • Tunnel (enclosed length of 150m or more) • Underpass/subway: pedestrian (span of 1.5m or more) • Underpass: vehicular • Special structure 	<ul style="list-style-type: none"> • All elements identified on the CSS inspection pro forma • Smaller water-carrying structures are considered as road drainage
Highway lighting	<ul style="list-style-type: none"> • Lighting columns • Lighting unit attached to wall/ wooden pole • Heritage columns • Illuminated bollards • Illuminated traffic signs 	<ul style="list-style-type: none"> • Column and foundations • Bracket • Luminaires • Control equipment, cables • Control gear, switching, internal wiring cabling (within ownership)

Level 1	Level 2	Level 3
Asset type	Asset group	Components that level 2 implicitly covers
Street furniture	<ul style="list-style-type: none"> • Transport • Highway • Streetscene/amenity 	<ul style="list-style-type: none"> • Traffic signs (non-illuminated) • Safety fences • Pedestrian barriers • Street name plates • Bins • Bollards • Bus shelters • Grit bins • Cattle grids • Gates • Trees/tree protection, etc • Seating • Verge marker posts • Weather stations
Traffic management systems	<ul style="list-style-type: none"> • Traffic signals • Pedestrian signals • Zebra crossings 	<ul style="list-style-type: none"> • Different types
	<ul style="list-style-type: none"> • In-station 	<ul style="list-style-type: none"> • Complete installation
	<ul style="list-style-type: none"> • Information systems • Safety cameras 	<ul style="list-style-type: none"> • Variable message signs • Vehicle activated signs • Real time passenger information
Land	<ul style="list-style-type: none"> • Freehold land • Rights land 	<ul style="list-style-type: none"> • Features on the land are not taken into account in the valuation

APPENDIX F – DECISION MAKING TECHNIQUES

Different decision making techniques are available that will support authorities in developing processes that ensure that decisions are made that align with their asset management strategy and available funding. Examples of these techniques are described below.

Whole Life Cost

Whole life cost is a cost benefit analysis that can be used to compare maintenance strategies with the objective of selecting the one with the lowest. It quantifies the investment costs and financial benefits for each strategy. In calculating cost benefits of maintenance strategies, authorities should determine the investment costs of the treatment options such as structural maintenance costs together with the benefits (measured in financial terms) of implementing the strategy including elements like reduced claims from personal injury accidents, reduced noise, improved safety, less traffic congestion.

Where authorities are comparing the costs and benefits of different maintenance strategies, these costs should be calculated in terms of Net Present Value (NPV), discounted over the lifecycle or period of analysis. The Treasury's Green Book currently adopts a discount rate of 3.5%.

While determining the costs of maintenance treatments are relatively straightforward to quantify (Section 9), the financial benefits of maintenance are less quantifiable and may require a detailed assessment. Alternatively, authorities may consider the benefits of all maintenance strategies to be comparable and then undertake an assessment based solely on the NPV of the combined treatments costs of renewal and routine maintenance. A worked example is included in Appendix G.

Multi Criteria Analysis

Multi Criteria Analysis (MCA) is an approach that may be used to prioritise competing treatment strategies. It should be used where benefits and costs are less tangible to define. However, it supports a qualitative assessment as well as a quantitative one.

Using the MCA approach, a number of different criteria, including performance, may be selected in order to compare and then prioritise each maintenance strategy. As way of example, the following may be considered:

- **Safety** – Criteria in this category should cover projects with poor skidding resistance, high claims, and may include the overall safety of the network;
- **Socio-economic and environmental** – Criteria in this category should cover the wider policy issues, that cannot be readily quantified by automated prioritisation procedures e.g. local importance, impact on local businesses and communities, environmental impact, sustainability, and considerations such as noise reducing surfacing and recycling of bituminous materials;
- **Value for money** – Criteria in this category could include the value of the project in overall terms of financial benefit including NPV or any other approach to cost benefit; and
- **Risk** – The individual risk associated with the maintenance strategy could include a number of factors including traffic congestion, design risk and contractual aspects.

Each category is assigned a weighting to represent the category's importance. While it is recognised that safety is a statutory duty and will be of primary importance, other issues should also be addressed assuming the funding is available; otherwise the process may focus solely on safety and fail to address serviceability, sustainability and stakeholders' needs.

Weightings should be allocated, ideally, with the support of senior decision makers in a workshop environment. The outcome of this work determines the assessment of the performance of each of the maintenance strategies under the various criteria. The outcome of the MCA is the agreed scoring process for each maintenance strategy for each relevant asset.

Risk based

Risk based techniques focus on minimising the risk associated with the maintenance strategy, while at the same time ensuring that the risk is managed at the minimum cost. Risk can be used as a decision making technique on its own or as part of the other decision support techniques described above.

A number of alternative analysis methods are available for carrying out risk analyses. These include:

- **Qualitative analysis** – Using descriptive scales; and
- **Quantitative analysis** – Using numerical scales to rank the relative risks.

Whichever method is used, it will provide some documented basis to make a decision about the level of risk it wishes to take in adopting a maintenance strategy. It can also identify the actions required to minimise existing risks to an acceptable level as part of delivering that strategy.

A quantitative method of assessing risk is to place a monetary value on the risks by pricing the “consequence of failure”. By doing this it then becomes possible to evaluate the cost benefit ratios of differing risk reduction actions.

An example of a qualitative analysis is MoSCoW. The acronym is based on four words assessing the priority: Must-Should-Could-Won't. Using this technique a MoSCoW priority is given to each of the risks associated with the maintenance strategy.

- **Must** – This functionality is of utmost importance, for example the strategy fulfils a statutory requirement;
- **Should** – This is work that needs to be carried out in the next 5 years in order to meet the agreed levels of service;
- **Could** – This is work that is not a priority and does not support all aspects of the asset management approach. It is likely that this work could be deferred; and
- **Won't** – This is work that does not necessarily support the asset management approach.

Application of decision making techniques

Depending on the asset under consideration, different decision techniques may be adopted. For example, a risk based approach may be more applicable to drainage or earthworks where failure to undertake maintenance activity may have a significant impact on other parts of the network. For pavement renewals, a whole life cost approach may be more appropriate where there is potential to provide benefits to local businesses and the wider community by undertaking a maintenance scheme. However, authorities should maintain a consistent approach to decision making for each separate asset. This process should be documented and have the agreement of senior decision makers.

APPENDIX G – WHOLE LIFE COSTING

<p>(STEP 0) Identify maintenance requirement</p>	<p>This Appendix describes an approach to the calculation of whole life costs. It is based on the UKRLG document <i>Whole Life Costing for Option Appraisal of Highway Maintenance Schemes for Local Highway Authorities</i>, and starts from the premise that a site has already been identified as potentially being in need of maintenance.</p> <p>Methods of identification could include safety or service inspections, defect histories, customer complaints or local network knowledge. Guidance is provided in <i>Well-maintained Highways</i> (10).</p> <p>In the case of pavements, a site could also be identified from a highway authority's UKPMS system as being either 'Red' or 'Amber' in terms of condition.</p>
<p>STEP 1 Formulate alternative maintenance strategies</p>	<p>Typically the following range of maintenance strategies should be considered:</p> <ul style="list-style-type: none"> • 'Do Nothing'. This, commonly used, strategy title is a misnomer. Highway authorities have a duty of maintenance and so a literal interpretation is inappropriate. Under a 'Do Nothing' strategy the highway authority would undertake reactive repairs to safety defects only. These are likely to be superficial repairs and would possibly be temporary in nature. The repairs would not arrest the decline of the asset and frequent re-visits are likely to be required. In the short term, routine maintenance costs are likely to be high due to the ongoing liability to repair Category 1 defects (as defined in <i>Well-maintained Highways</i>). There is also an increased risk of personal injury accidents (resulting from road users' interface with the defective asset) and the resulting legal consequences. • 'Do Minimum'. This approach seeks to do the minimal amount of routine maintenance work to keep the asset safe and serviceable. Works will normally be restricted to the repair of Category 1 defects. However, the works effort will be slightly enhanced in comparison to the 'Do Nothing' as repairs will normally be permanent in nature – although they will add no value to the asset. In the context of a pavement scheme a 'Do Minimum' approach might be limited to the permanent repair of potholes only. These would be undertaken on an isolated basis or may extend to small patches. • 'Do Something' – this is likely to involve capital expenditure by an authority rather than routine expenditure. It may include wholesale replacement or major repair of an asset to a level that will enhance its long term durability and minimise future routine maintenance. A pro-active approach may also be adopted which means that repair takes place before the condition intervention level is reached. In the context of a pavement scheme this could see the treatment of a section of pavement classified as being in the 'Amber' condition category (as defined by UKPMS). <p>It is recommended that more than one 'Do Something' strategy is evaluated in order to explore the range of available treatment types.</p> <p>For the 'Do Something' strategies the required timing of the initial maintenance intervention requires consideration. Options may include:</p> <ul style="list-style-type: none"> • Undertaking capital maintenance at the soonest opportunity. • Deferring the capital maintenance for a few years whilst holding the condition in a safe and serviceable state by undertaking routine maintenance only. <p>If the latter (deferred) option is selected then the additional routine maintenance costs need to be included in the whole life costing. The recent defect history for the site will provide an evidence-base for estimating these costs.</p> <p>In the context of a pavement scheme, the above factors could be realised in the following way:</p> <ul style="list-style-type: none"> • A pavement nearing the end of its serviceable life may exhibit surface defects such as potholes. These could be Category 1 defects. • If the initial treatment is deferred then there will be an ongoing (possibly increasing) requirement to re-visit the site during the period of deferment to carry out repairs to these defects. The costs of these repairs need to be included in the whole life cost analysis. • If the initial treatment is deferred then more deterioration may occur to the pavement structure. This may result in a more extensive treatment eventually being required - compared to the treatment that would otherwise have been implemented if the site was addressed earlier. <p><i>By considering a range of treatment strategies and permutations on the type and timing of the initial intervention an optimum whole life cost can be determined from the following steps.</i></p>

<p>STEP 2 Predict future performance and the required timing of maintenance interventions</p>	<p>For each maintenance strategy formulated in STEP 1, appropriate treatments and lifecycles should be determined.</p>
<p>STEP 3 Determine costs over the analysis period</p>	<p>Annual costs should be determined for each intervention of each maintenance strategy. These should be based on:</p> <ul style="list-style-type: none"> • Direct (Works) Costs; • Indirect Costs; and • Residual Value. <p>The Worked Example below illustrates how these costs should be presented.</p>
<p>STEP 4 Calculate Whole Life Costs on the basis of NPV</p>	<p>The costs determined in STEP 3 are converted to their present-day values using Equations 1 to 3 (respectively).</p> <p>Discounted Works Cost = Works Cost / (1+r)ⁿ Equation 1</p> <p>Discounted Indirect Cost = Indirect Cost / (1+r)ⁿ Equation 2</p> <p>Discounted Residual Value = Residual Value / (1+r)ⁿ Equation 3</p> <p>Where:</p> <p>r = Discount Rate expressed in decimal form (i.e. 3.5% ≡ 0.035)</p> <p>n = Year in which the cost or benefit occurs (current year = Year 0).</p> <p>The Net Present Value (NPV) of a particular option is then determined by considering all of the costs (and benefits) for a particular maintenance strategy throughout the analysis period – as shown in Equation 4.</p> <p>NPV = ∑ Discounted Works Costs + ∑ Discounted Indirect Costs - Discounted Residual Value Equation 4</p>
<p>STEP 5 Initial assessment of results</p>	<p>The maintenance strategy with the lowest NPV is generally regarded as the most economically beneficial option.</p> <p>However, whole life costing is only one factor when selecting a preferred maintenance option. Other factors such as engineering judgement, network operations, buildability, affordability and risk management also require consideration.</p>

<p>STEP 6 Undertake sensitivity analysis</p>	<p>On significant or complex maintenance schemes it may be appropriate to undertake a sensitivity analysis in order to test the effects of certain assumptions used in the previous steps. Such schemes could include:</p> <ul style="list-style-type: none"> • Those with a value that represents a substantial (or unusually high) proportion of the highway authority’s capital maintenance budget. • Works to a part of the network that is likely to undergo development which could affect future usage. For example, a pavement rehabilitation scheme near to where a planned shopping centre is to be built or a new bypass is to be tied-in – both of which could potentially affect future traffic loading (which would have an influence on the long-term performance of the asset). • Those involving innovative treatment types that have not previously been applied on the local network and are therefore considered to involve a degree of risk. <p>The following input parameters can be subject to particular uncertainty:</p> <ul style="list-style-type: none"> • Unit rates; and • The required timings of individual maintenance interventions. <p>By varying these input parameters across the full range of values that could perceivably be experienced and then repeating the above steps it is possible to assess the potential economic uncertainty. When undertaking this process only one input parameter should be varied at a time. The outcomes will reveal:</p> <ul style="list-style-type: none"> • Whether the selection of a preferred option (based on lowest NPV) is affected. • The likely variability in the resulting whole life cost of the preferred option. This variability represents a risk and should be managed accordingly. <p>On small to medium scale sites with commonplace maintenance requirements it is unlikely that sensitivity analyses will provide significant benefits – once the highway authority has developed a set of reliable, proven input parameters.</p> <p>All assumptions made and input parameters selected should be documented.</p>
<p>STEP 7 Arrive at a preferred option</p>	<p>The initial assessment of results (undertaken in STEP 5) should be revisited when the outcome of (any) sensitivity analysis are available.</p> <p>A final preferred option will then emerge.</p>

WORKED EXAMPLE

A worked example is provided on the following page to demonstrate the whole life costing process.

The worked example considers a generic asset type in need of maintenance. A 25 year analysis period and a discount rate of 3.5% have been assumed. Only the (direct) works costs have been considered.

The worked example shows a typical format for presenting a whole life costing analysis. A tabulated (spreadsheet) approach serves to illustrate the maintenance and cost profiles for competing options. It also facilitates subsequent amendments as part of any sensitivity analysis.

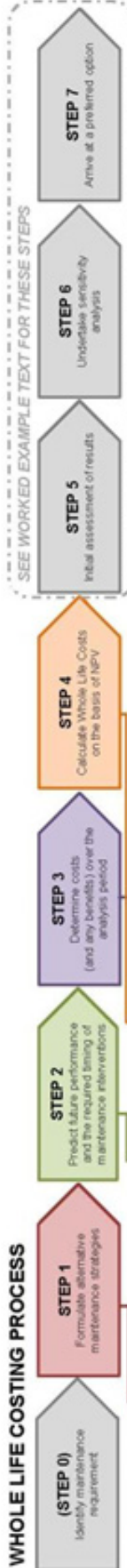
The “Do Something (1)” option is seen to have the lowest NPV over the analysis period and therefore emerges as the preferred option.

NOTES:

1) This worked example considers an asset on the Secondary network – where its usage is predicted to be light.

2) Routine maintenance activities are not considered beyond the first major intervention. However, local highway authorities may decide to include the cost of routine maintenance, in accordance with their policies.

WHOLE LIFE COSTING PROCESS



Maintenance Strategy	Performance Prediction	Works Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
'Do Nothing' Asset condition deteriorates rapidly and the eventual scope of the capital maintenance intervention is increased.	Asset becomes life-expired in 5 years time. Over the initial 4 years there is an increasing requirement to undertake Category 1 (temporary) repairs. In the 5th year the asset is replaced/reconstructed to deliver a 40 year design life.	Intervention type: Works Cost	£1,000	£2,000	£4,000	£8,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000
'Do Minimum' Maintenance limited to essential, permanent repairs to keep the asset safe and serviceable. Asset condition deteriorates and the eventual scope of the capital maintenance intervention is increased.	Asset becomes life-expired in 10 years time. Over the initial 9 years there is an increasing requirement to undertake Category 1 (permanent) repairs. In the 10th year the asset is replaced/reconstructed to deliver a 40 year design life.	Intervention type: Works Cost	£500	£500	£934	£1,307	£1,699	£36,665	£2,000	£2,500	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000	£50,000
'Do Something (1)' Capital maintenance. Permanent treatment Type 'X' (Medium-term solution).	The asset receives a major maintenance treatment (Type 'X') in Year 0 (i.e. the current works year). The treatment is designed to deliver a 25 year design life.	Intervention type: Major Maint	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000	£20,000
'Do Something (2)' Capital maintenance. Permanent treatment Type 'Y' (Long-term solution).	The asset receives a major maintenance treatment (Type 'Y') in Year 0 (i.e. the current works year). The treatment is designed to deliver a 40 year design life.	Intervention type: Major Maint	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000	£30,000
Net Present Value		Net Present Value	£25,073																									
Net Present Value		Net Present Value	£20,000																									
Net Present Value		Net Present Value	£29,264																									
Net Present Value		Net Present Value	£46,502																									

SAMPLE CALCULATION:
Works Cost = Unit Rate * Works Quantity
SAMPLE CALCULATION:
Discounted Works Cost = $\frac{\text{Works Cost}}{(1+r)^t}$ = $\frac{£50,000}{(1+0.035)^t}$ = 1.147579

SAMPLE CALCULATION:
Residual Value - the asset was renewed 15 years ago at a cost of £50k. At the end of the Analysis Period it still has 25 years of its 40 year design life remaining. If the value of the asset decreases linearly over time then the Residual Value is 25/40 * £50,000.
NOTE: Residual value calculation methodologies vary according to asset type

SAMPLE CALCULATION:
Discounted Residual Value = $\frac{\text{Residual Value}}{(1+r)^t}$ = $\frac{£31,250}{(1+0.035)^{15}}$ = 2.28333

SAMPLE CALCULATION:
Net Present Value = $\sum \text{Discounted Works Cost}(t) - \sum \text{Discounted Residual Value}(t)$ = £30,000 - (£4,928)

APPENDIX H – DOCUMENTS SUPPORTING ASSET MANAGEMENT

This Guidance describes a number of documents that support the development, implementation and management of the asset management process. The purpose of each of these documents is described below.

Improvement Plan

An Improvement Plan is the outcome of a performance review. It should set out the actions, resources and timescales required to meet the requirements of the approach adopted to asset management. It should also include reference to the expected outcomes of the improvement plan and the ultimate benefit it may provide to the authority and stakeholders.

Implementation Plan

The Implementation Plan is the starting point for implementation the recommendations of this Guidance, the Framework and the other contents of this guidance. It may include: The required actions and those responsible for their completion, a communication strategy to inform affected staff, a programme, possibly including a staged delivery, the funding required. It may also be used to describe support the performance improvements that have been identified from performance monitoring.

Lifecycle Plan

The Lifecycle Plan is the documented outcome of the lifecycle planning process. It may include; the assumptions made, performance requirements, maintenance needs, the decision making process and set out the proposed maintenance strategy, including the timing of interventions.

Highway Infrastructure Asset Management Plan

The Highway Infrastructure Asset Management Plan (HIAMP) is be the documented outcome of the asset management process. It is one way to record and communicate the approach to asset management in a single document, informing relevant staff and stakeholders how highway infrastructure assets are managed over a period of time.

Financial Plan

The Financial Plan should cover investment requirements for the short, medium and longer term. It should provide a basis for supporting future budgetary requirements and ensure funding is appropriately targeted and resource effectively spent.

Highway Maintenance Plan

The Highway Maintenance Plan sets out the operational requirements to maintain the network and identifies the resource requirements to deliver the maintenance service. It is described in detail in Well-maintained Highways.

Risk Action Plan

The Risk Action Plan consolidates the risk register, evaluation, mitigation to be undertaken, timeframes and responsibilities for managing risk associated with Highway Infrastructure Assets. This information can be summarised within the HIAMP or other documentation and should be one of the key inputs into the lifecycle planning process and works programming.

Risk Management Policy

A statement of the overall intentions and direction of an organisation related to risk management.

Asset Management Policy

The asset management policy is a short and concise document that describes the principles adopted in applying asset management to achieve the authority's strategic objectives.

Asset Management Strategy

The asset management strategy should be a clear and concise high-level document setting out how highway infrastructure asset management is delivered in order for the authority to meet its long term corporate goals and objectives.

Data Management Strategy

The Data Management Strategy is a means of the requirements for data and how the requirements may be met over the short term, medium term and long term. The requirements for data should be documented as part of the asset management planning process.

Maintenance Strategy

The Maintenance Strategy an approach to maintain the asset over the short, medium and long term. It is likely to consider a combination of renewal and/or routine maintenance over a specified period. The maintenance strategy will support the development of the Lifecycle Plan.

Investment Strategy

The Investment Strategy is the outcome of the lifecycle planning process. A number of iterations with different maintenance strategies for each asset group may be necessary to optimise the strategy.

Communication Strategy

The communication strategy should set out how asset management will be communicated to stakeholders primarily the public including the wider community and road users. It should consider how this is done including websites, community meetings and leaflets.

APPENDIX I – TYPICAL CONTENTS OF HIGHWAY INFRASTRUCTURE ASSET MANAGEMENT PLAN

Highway authorities may wish to document their approach to asset management in a Highway Infrastructure Asset Management Plan (HIAMP). Guidance on the contents of a HIAMP is provided below:

Executive Summary – Summary of the key results of the HIAMP in terms of the investment required with the various assets broken down by each year of the HIAMP period. It should also illustrate the financial profile for predicted asset performance and the funding required. It should be written and presented in a manner that is appropriate for senior decision makers and non-technical readers.

Introduction – Provide the background to the HIAMP including purpose, historical context including budgets, funding/financing arrangements, relationship with other organisational documents, a summary of key roles and responsibilities and definitions of the asset types covered. A brief description of each section of the HIAMP and their contents should also be included.

Asset Management Policy, Strategy and Levels of Service – This may be part of the HIAMP or a separate document for all staff and senior decision makers respectively. It should summarise the strategic goals and levels of service that are relevant to the HIAMP.

Performance Management – A description of the performance measures in order to monitor performance against its levels of service. This section should also provide details of current and any expected changes in future network demand and any adaptation to environmental changes through the impact of climate change that are likely to impact on the performance required.

Asset Information and Data – A summary of the assets included and excluded, providing explanations for any exclusion. The summary should include a breakdown of assets by type, group, sub-group and components. Ideally visualisation should be provided for each asset type/group to describe construction or renewal dates, material types and other important asset characteristics. This section should also document the approach for collecting data and monitoring the condition of the assets, including any data strategy.

Lifecycle Planning – The approach adopted for lifecycle planning should be documented. It should include; the assumptions made including cost/unit rates used, performance requirements, maintenance needs, the decision making process e.g. minimising whole life costs, the proposed maintenance strategy, including the treatment strategy and the timing of interventions. Visual displays of work quantities and costs per year for each asset group and sub-group should also be provided.

Investment Strategies – Details of the funding required to deliver the lifecycle plan, the forward and annual works programme, including the amounts needed to sustain the current and enhanced levels of performance if appropriate. The breakdown of the financial plan should align with the work types and volumes. The plan should also include the impact of different levels of funding on network performance, whole life costs, etc. It should provide information to support the budgets required for managing the asset.

Work Programming – Work required to manage and operate the network at the required performance levels. The section should summarise how the works programme was developed and prioritised and describe the work volumes (by asset type, group and subgroup), work type and phasing (by year of the HIAMP period). Refer to Section 10 of this document for further information.

Overall risk implications of the plan – Details of the risks in managing highway infrastructure assets. This should include risk to individual assets, including critical assets and how these risks are being mitigated. It should also link to the corporate approach to risk management. In addition it can also include risks to overall delivery of the plan.

Performance Monitoring – Details of how the HIAMP performance will be monitored and the results fed back into the asset management planning process. It can also identify potential improvements and how they will be managed.

Appendices - More detailed information to support the HIAMP as relevant.

APPENDIX J – TYPICAL CONTENTS OF BUSINESS CASE

Authorities may have a corporate approach to developing and presenting business cases. A summary of what may be included is given below.

Executive Summary – Brief summary of key issues.

Context – Local economy, access to services, use of the highway network, value of the highway network, existing service arrangements, the problem being addressed, current approach to asset management and gaps from recognised good practice.

Reasons for considering asset management – The economic benefits provided by highway maintenance and improving highway performance, value for money through longer term investment, meeting stakeholder expectations and public satisfaction.

Strategic fit – Consistency with and contribution to the corporate vision, contribution to the authority's wider asset management policy.

Options – Cost benefit analysis, including 'do nothing', reasoned recommended option, if change is recommended, impact of not changing.

Benefits – Quantitative and qualitative benefits, evaluating benefits, including establishing the base line.

Dis-benefits – Outcomes likely to be perceived as negative by stakeholders.

Risks – Reputational, financial, delivery, how risks will be managed.

Assumptions – Any significant assumptions.

Resources – Financial, time, competences, skills, collaboration.

Timescales – Described over the short term, medium term, long term.

Organisational Issues – Centralised or service based, links to corporate or other asset management groups, staff, procurement and change management.

Milestones – Key activity completion dates.

Business Case Review – Annual review, achieving the benefits, meeting the levels of service.

APPENDIX K – ASSET MANAGEMENT ROLES AND RESPONSIBILITIES

There can be no one correct way of defining roles for asset management. They will vary from authority to authority depending on a number of factors and constraints set out in Part A and C of this Guidance. However where roles are defined it is important that they are clearly defined including scope of role and decision making responsibility. Roles and responsibility for asset management within a typical highway authority are set out below.

Elected Members and Senior Decision Makers	
<ul style="list-style-type: none"> Leadership, culture and direction for asset management across the authority 	
Senior Management Team Sponsor	
<ul style="list-style-type: none"> Demonstration of senior management commitment 	
Director with Responsibility for Highways	
<ul style="list-style-type: none"> Leadership, culture and direction 	<ul style="list-style-type: none"> Delivery of asset management benefits
<ul style="list-style-type: none"> Embedment of behaviours related to a whole life view 	<ul style="list-style-type: none"> Asset Management Champion (optional)
Highways Asset Manager	
<ul style="list-style-type: none"> Develop highways asset management strategy 	<ul style="list-style-type: none"> Review asset management activities and develop improvements where necessary
<ul style="list-style-type: none"> Develop documentation to support asset management 	<ul style="list-style-type: none"> Ensure work programmes are consistent with levels of service
<ul style="list-style-type: none"> Develop the Highways Infrastructure Asset Management Plan and resource requirements 	<ul style="list-style-type: none"> Work with business and information systems to ensure they meet asset management needs
<ul style="list-style-type: none"> Liaise with stakeholders 	
Roads and Footways Management	
<ul style="list-style-type: none"> Paved areas 	<ul style="list-style-type: none"> Road markings and road studs
<ul style="list-style-type: none"> Drainage 	<ul style="list-style-type: none"> Road traffic signs
<ul style="list-style-type: none"> Geotechnical assets 	<ul style="list-style-type: none"> Landscaped areas
<ul style="list-style-type: none"> Fences, walls, screens and environmental barriers 	<ul style="list-style-type: none"> Signs and bollards
<ul style="list-style-type: none"> Road restraint systems 	
Structures Management	
<ul style="list-style-type: none"> Bridges 	<ul style="list-style-type: none"> Retaining walls
<ul style="list-style-type: none"> Large culverts 	<ul style="list-style-type: none"> Tunnels
<ul style="list-style-type: none"> Small span structures 	<ul style="list-style-type: none"> Sign gantries

Lighting Management	
• Lighting	• Energy
• Illuminated signs and bollards	
Information Technology Management	
• Traffic signals	• Information systems
• Variable message signs	
Data Collection and Management	
• Inventory	• Traffic
• Condition	• Construction and maintenance records
Programme Management	
• Portfolio of projects in the works programme	• Impact on the network
• Integrate and optimise projects to minimise	• Procurement associated with projects
Maintenance Management	
• Maintenance works	• Procurement associated with maintenance
• Integrate and optimise planned works	• Minimise impact on the network
Inspection and Condition Measurement	
• Safety and serviceability inspections	• Condition surveys

