APPENDIX A

Highways Asset Management Strategy

Issued 2016

Contents

Registry of Amendments

Amendment Number	Page / Drawing Number	Signature and Date of Incorporation

Foreword

Lincolnshire County Council has a duty to maintain a sizeable highway asset, valued at over £9bn, which is used by all members of the community on a daily basis. The management of this asset has a significant impact on the County's residents, businesses and visitors. It is important to recognise how much we all depend upon our highway network to sustain our economic and transportation needs and develop a strategy that uses the resources available in an efficient, responsible and sustainable way.

This Asset Management Strategy aligns with the Council's vision for Lincolnshire and describes how the highway assets contribute to the achieving of our objectives. In the current economic climate, managing the work to get the best value outcomes with what we have has never been more important. This strategy will cover a 5 year period from 2017 to 2022 and provides scenarios for different budget levels showing the effects on service levels of assets, which in the end are the primary concern of each user of the highway network.

The information provided in this document will allow us to make more informed decisions to ensure that the standard of highway assets meets our desires both now and into the future.

1. Introduction

1.1. Overview

The Association of Directors of Environment, Planning and Transport (ADEPT) define asset management as:

"A strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the highways infrastructure to meet the needs of current and future customers."

Lincolnshire County Council has been at the forefront of the development of an Asset Management led approach to the maintenance of highways infrastructure assets. This approach is encouraged by Central Government, who in December 2014 announced that the capital settlement for local highway authorities would include an incentivised funding element for authorities who were able to demonstrate that they had adopted an asset management based approach to the management of their infrastructure assets.

This Asset Management Strategy (AMS) replaces the previous Transport Asset Management Plan 2012-2016 and has been updated to reflect:

- Current financial constraints
- Recent national and regional developments in asset management
- Changes in local practice since the previous Transport Asset Management Plan was published

It will be amended as a live document and comprehensively reviewed when necessary.

1.2. Purpose

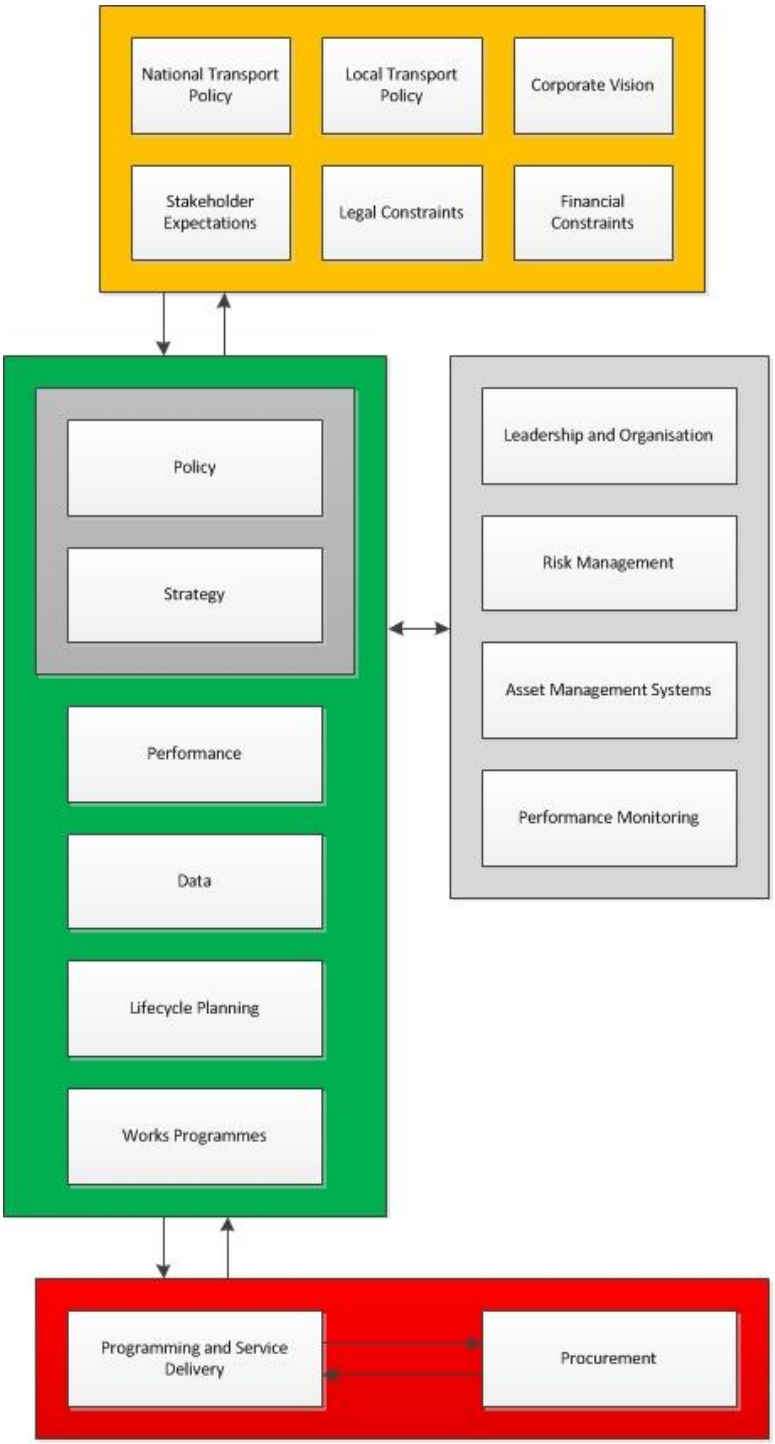
The purpose of this Asset Management Strategy (AMS) is to:

- Formalise strategies for investment in key highway asset groups
- Define affordable service standards
- Improve how the highway assets are managed
- Enable a more effective and efficient highways service to be delivered

The plan also identifies the funding requirements and pressures for the key asset groups.

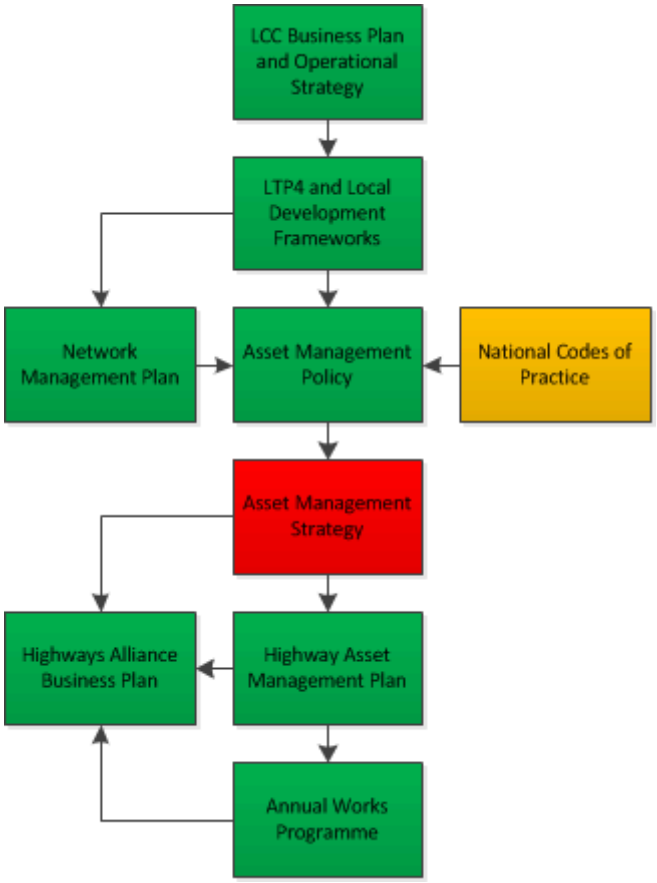
1.3. Asset Management Framework

The following diagram illustrates the asset management framework and how processes and components relate to national and local factors:



1.4. Links to Other Plans

The following document framework shows how this Asset Management Strategy relates to other Lincolnshire County Council plans and policy documents:



2. Asset Description

2.1. Asset Table

The following table outlines the major highways assets managed by the County Council:

Asset Group	Element	Quantity	Data Confidence
Carriageway	A Roads	1,073 km	High
	B Roads	788 km	High
	C Roads	2,912 km	High
	Unclassified Roads	3,996 km	High
	Unmetalled "Green" Lanes	322km	Medium
	White and Yellow Lines	No Data	Low
Footways and Cycle tracks	Footways (including combined Cycleways)	4,134 km	High
	Dedicated Cycleways	3 km	High
Verges	Highway Verge	70,456Ha	High
Public Rights of Way (PRoW)	Remote from the carriageway – total length of PRoW	4,005 km	High
Structures	Bridges	1,516 No.	High
	Footbridges	126 No.	High
	Culverts >0.6m diameter	2,163 No.	High
	Retaining walls	144 No.	High
	Subways (including submersible pumps)	12 No.	High
	Gantries	11 No.	High
Street Lighting	Lighting columns	64,543 No.	High
	Illuminated signs and posts	9,694 No.	High
	Illuminated bollards	2,525 No.	High
	Feeder pillars	798 No.	High
	Vehicle activated signs	271 No.	High
	Zebra crossings	270 No.	High
Traffic Management Systems	Signals at junctions	147 No.	High
	Signals at pedestrian crossings	125 No.	High
	Signals at pedestrian and cycle crossings	33 No	High
	Signals at pedestrian and cycle/ horse crossings	1 No.	High
	CCTV cameras (traffic control)	35 No.	High
	Traffic Signal UTMC in-station system equipment (SCOOT/UTC, remote monitoring & strategy manager)	1 No.	High
	Tidal flow system (Canwick Road Lincoln)	1 No.	High
	Traffic signal CCTV matrix	1 No.	High
Drainage	Gullies	140,814 No	High
	Offlets	29,167 No	High
	Drainage Systems	No Data	Low
	Sustainable Urban Drainage System (SUDS)	*[1]	Low
Street Furniture	Vehicle safety fences	202,743 m	High
	Pedestrian Guard rails	No Data	Low
	Non-illuminated signs (warning, regulatory and local direction / info signs)	86,563 No.	Medium

	Grit bins	1893 No.	High
	Trees, Tree Groups and Woods (Principal Roads only)	5,982 No	Medium
	Automatic Traffic Counters (carriageway and cycleway)	57 No.	High
	Weather stations (ice prediction equipment managed by Vaisala Ltd.)	12 No.	High
	Bus Stops	2,131 No.	High
	Safety Cameras	49 No.	High
	Average Speed Safety Cameras	2 No.	High

*[1] Data under review

2.2. Data Collection

A programme of inventory surveys is developed each year based on priorities and available budgets. Inventory data is only collected and maintained where there are demonstrable benefits when compared to the cost of collecting and maintaining this data.

Further details of how the asset data will be collected and maintained is included in the Highway Asset Management Plan.

2.3. Assets Not Covered by this Plan

Some highway related assets are not the responsibility of the County Council and Highways Department. The assets not covered in this plan include:

- Car parks (multi-storey and street level managed by either private or District Councils)
- Street name plates (owned and managed by the District Councils)
- Picnic Sites

2.4. Asset Growth

The quantity of highways infrastructure assets, managed by the County Council continues to grow each year due to new adoptions and improvements to the highway network. On average approximately 15km to 20km of new highway is added to the network each year together with associated footways, street lighting, traffic signals, signs and street furniture.

3. Community Requirements

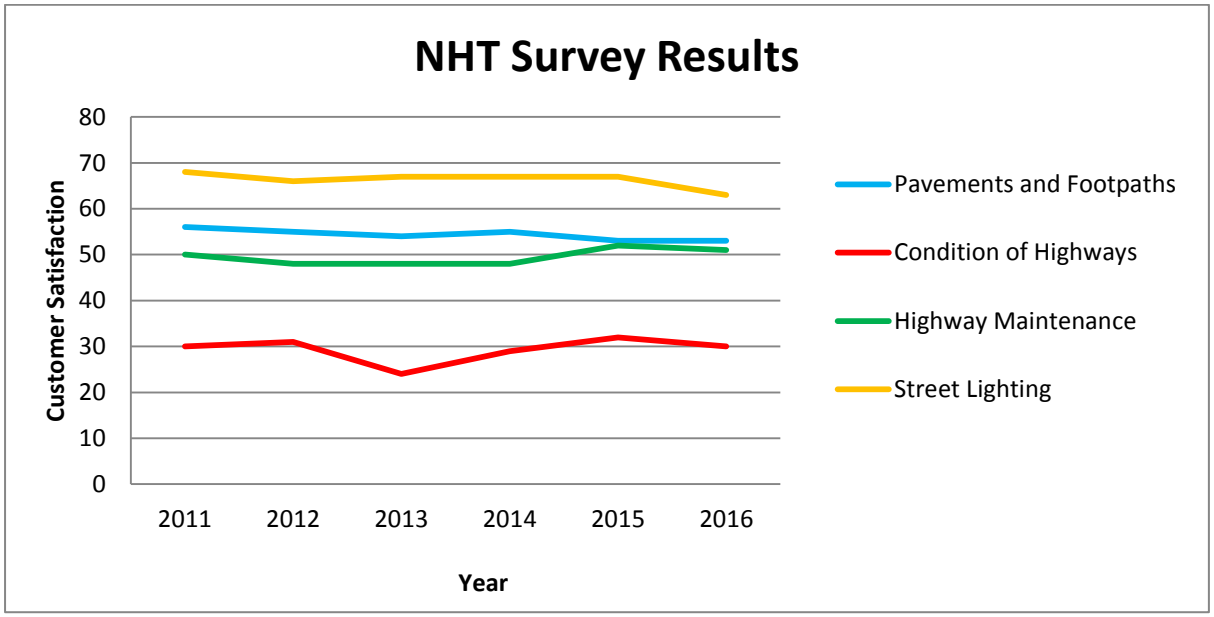
This section describes information about the community's requirements for the transport/highways asset. It outlines how this information is obtained and what it says in relation to community preferences.

3.1. Customer Consultation

In order to obtain information on the customer view of the Highways Service the Council participates in the National Highway and Transport (NHT) Public Satisfaction Survey which covers all aspects of Highways and Transport service delivery. Details of the results of the surveys are available at www.nhtsurvey.org.

The Council has participated in the NHT survey since 2008 and this enables us to understand the views and preferences of a sample of resident and to compare these against other similar councils. The survey, undertaken by Ipsos MORI, is based on a sample of residents and is designed to represent a spread of customers' views of the service across the county, geographically by gender and by age.

The following graph provides details of the results for Lincolnshire County Council. The score is given out of 100, representing the level of satisfaction of those surveyed:



The results from the 2016 survey indicate that in general there has been no significant change in customer satisfaction levels with the condition of highways and highway maintenance over the past 5 years although a reduction was recorded in the 2013 survey.

The street lighting service continues to score highly for Public Satisfaction, although there has been a small decline in 2016. This was anticipated as a potential consequence of the "Street Lighting Transformation Project" which includes a programme of part night time lighting and switch-offs. The project and its rationale and benefits are being actively communicated to the public through a variety of channels and it is expected that these results will level off and improve as this becomes accepted as normal operational practice.

The figure for customer satisfaction in pavements and footpaths has shown a decline over the previous plan period 2011 – 2016. This reduction in satisfaction reflects the previous strategy which was to transfer some of the funding for footway maintenance into carriageway maintenance.

3.2. Customer Care

Customer contacts with the Council regarding highways are managed using a Customer Relationship Management (CRM) system. The system is used to record and categorise contacts made by customers and the actions taken in response to the queries and issues are monitored and reported.

A new system (LAGAN) has been introduced to provide an improved interface between the customer and LCC's asset management teams. The County Council website has also been updated to allow for the public to log defects and complaints directly, which feeds into the Confirm asset management software.

Lincolnshire County Council will continue to explore the options afforded by modern asset management practices and developments in IT to provide a more efficient service and improved customer care.

4. Future Demands

This section outlines the anticipated demands that will be placed on the asset over the duration of the plan. These have been considered when formulating the plan and presenting the risks associated with it.

4.1. Asset Growth

New assets are continuing to be added to the network thereby creating an additional need for maintenance and management. This growth in the asset is due to the adoption of additional roads into the network and through improvement activities such as traffic safety schemes and construction of new road links. Over the last 10 years (2006 to 2016) the key highways assets have grown as follows:

	10 Year Growth	Average Growth per Annum
Carriageway	165.2 km	16.5 km
Footway	164.5 km	16.4 km
Street Lighting Columns	7380 No	738 No
Structures	76 No	7.6 No
Signal Installations	30 No	3.0 No

There has also been a corresponding growth in associated assets such as street furniture, signs and drainage systems which will all require inspection and maintenance.

4.2. Traffic Growth

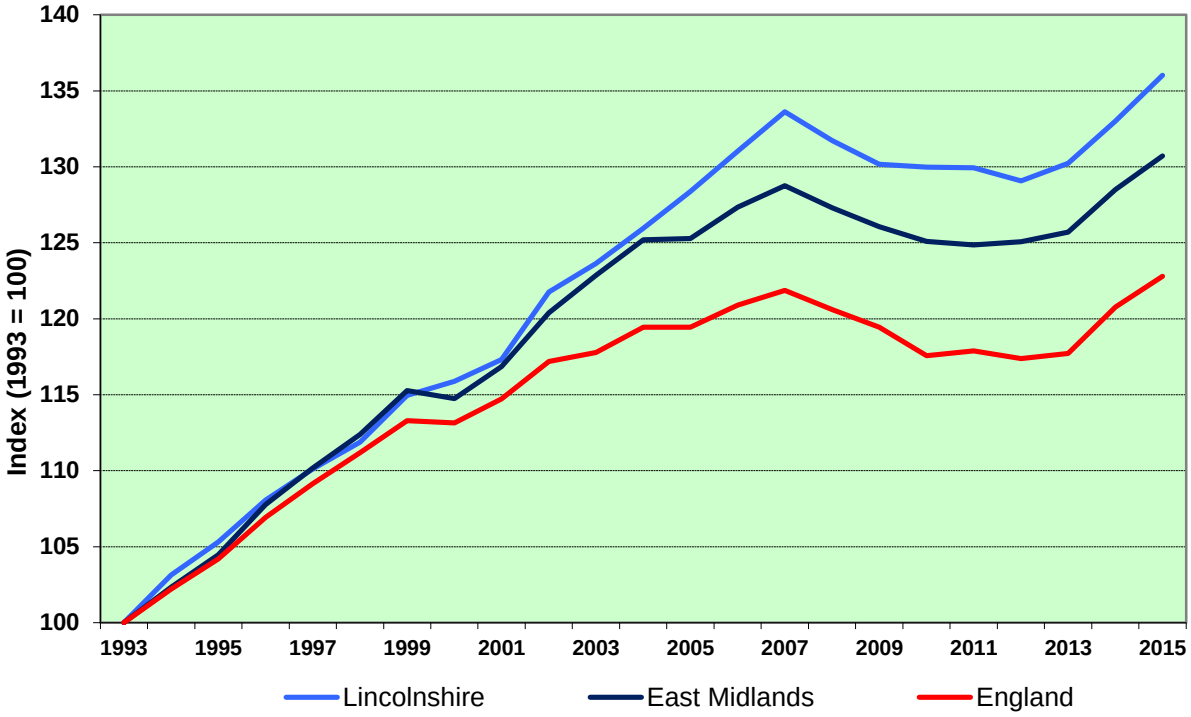
Traffic growth is monitored regularly and details are published in an annual Transport Monitoring Report. The Key elements identified in this report are:

- Between 1993 and 2007, the number of vehicle kilometres travelled in Lincolnshire rose by 33.6%. This was greater than that for the East Midlands (28.8%) and for England (21.9%) as a whole over that same period.

- Following a peak in 2007, the number of vehicle kilometres travelled in the county fell noticeably between 2007 and 2009 (by some 2.5%) before levelling off in recent years. However, in 2013 flows rose slightly for the first time in six years.

- Further increases in 2014 and 2015 resulted in the number of vehicle kilometres now exceeding the previous peak in 2007.

The following graph illustrates the growth in traffic in Lincolnshire in comparison with the East Midlands and National trends:



4.3. Traffic Composition

Traffic composition is a major factor affecting the rate of deterioration of our highway infrastructure. In particular, concentrations of heavy good vehicles on roads that were never designed to cope with such loadings can cause accelerated deterioration of carriageway pavements. This has a significant impact in certain areas of the county where there are a number of distribution warehouses with very significant levels of heavy goods vehicle traffic.

4.4. Environmental Conditions, Climate Change and Network Resilience

Environmental conditions have a significant influence on the condition of the road network. During winter periods, freeze/thaw action can accelerate the deterioration of carriageways and footways, and winter maintenance operations have a direct effect on the resources needed for other maintenance activities. The UK experienced particularly harsh winters in 2009/10 and 2010/11 with periods of severe weather, but the winters since have been relatively mild. There is a high chance of at least one severe winter occurrence within the scope of this plan and the contingencies are outlined in the Risk Register (Appendix F).

Changes in the climate also have significant implications for the management of highways infrastructure assets.

Within Lincolnshire, roads constructed in the fenland areas are susceptible to severe damage during long periods of very dry conditions. This is due to the uneven settlement of roads constructed on moisture susceptible soils which, on drying, shrink significantly and

unevenly. This reduces the carrying capacity of the road construction and creates surface alignments that are not consistent with high or medium speed traffic requirements. Work has been undertaken to identify the areas of the county which are susceptible to damage during drought conditions and identify specific treatments to remediate the roads affected in these areas.

Increased rainfall and flooding events impact on the capacity of drainage systems and also create additional maintenance requirements for carriageways and footways.

In 2012 the Floods and Water Management Act introduced new duties for local authorities which will need to be considered when managing the various asset groups. Investment in Sustainable Urban Drainage Systems (SUDS) and design considerations in new schemes has an increased focus on preventing surface water flooding. In 2016 the County Council published an updated Development Road Specification which details the requirements which have to be met for developments with SUDS (e.g. permeable pavements) to be adopted.

However, the introduction and maintenance of SUDS is a further pressure on maintenance budgets as these are more expensive to maintain than traditional drainage systems.

5. Financial Summary

5.1. Asset Valuation

The following table outlines the value of our highways assets at 31 March 2016 as submitted for the WGA (Whole of Government Accounts) return:

Asset Type	Gross Replacement Cost (GRC)	Depreciated Replacement Cost (DRC)	Annualised Depreciation
Carriageways	£7,908m	£7,553m	£35.2m
Structures	£732m	£455m	£15.3m
Footways	£527m	£472m	£9.2m
Street Lighting	£88m	£38	£2.3m
Traffic Management	£16m	£9m	£0.7m
Street Furniture	£106m	£54m	£4.8m
Total	**£9,377m**	**£8,581m**	**£67.4m**

The Gross Replacement Cost (GRC) represents the cost of replacing the existing asset with a new modern equivalent asset. The Depreciated Replacement Cost (DRC) represents the GRC less the value of the deductions for physical deterioration and obsolescence.

The annualised depreciation figure is the cost of all the treatment required to restore the service life of the asset spread over the lifecycle. This is the theoretical annual cost of maintaining the Asset in a "Steady State" condition although in practice the budgets and costs are significantly less than this.

5.2. Historical Expenditure

The following table shows details of the historic budgets allocated for maintaining the highways infrastructure:

Asset	Works	Historic Budget Allocations £000					
		2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Carriageways	Reactive	4,128	3,912	3,759	3,795	3,692	3,089
	Planned	18,909	22,424	30,249	21,527	26,103	25,027
Footways	Reactive	Included in Carriageways					
	Planned	4,898	4,304	3,636	3,096	3,494	3,293
Structures and Safety Barriers	Routine and Reactive	1,173	1,232	1,272	1,311	1,306	1,120
	Planned	2,175	2,075	2,075	2,015	2,015	2,118
Street Lighting	Energy Costs	2,510	2,600	3,002	3,349	3,026	2,648
	Routine and reactive	2,134	2,236	1,995	2,013	1,876	2,003
	Planned	750	750	750	750	750	750
Drainage	Routine and reactive	1,571	1,837	1,998	1,736	1,762	1,378
	Planned	Included in Carriageways					
Traffic Signals	Routine and Reactive	795	827	833	845	844	844
	Planned	600	600	600	600	600	600
Street Furniture / Signs and Markings	Routine and Reactive	1,601	1,665	1,658	1,673	1,558	1,084
	Planned	50	50	50	50	50	50
Winter Maintenance	Winter Maintenance	4,437	4,568	4,649	4,800	4,870	4,858
Environmental	Routine and Reactive	3,134	3,304	3,424	3,439	3,599	2,831
Other	Surveys, Inspections, Fees and Contributions	2,727	2,463	2,679	2,575	2,510	2,403
Totals		**55,628**	**51,333**	**54,804**	**62,294**	**58,055**	**54,231**

5.3. Funding

Funding for maintaining the asset is made available from a combination of Revenue and Capital allocations. In general Revenue funding is provided by the County Council and Capital funding is provided by central government. In addition, specific grants (Revenue and Capital) may be made available by both the County Council and Central Government for certain items e.g. excessive deterioration and damage caused by severe winters, drought and flooding.

Transport assets generally deteriorate slowly and the effect of a change in the level of funding is not always immediately evident. The strategies in this plan have been compiled using long term predictions of condition for all the key highways assets. The periods chosen (typically 20 years plus) are designed to cover a reasonable number of replacement cycles and enable strategies to be developed which consider the whole life cost of maintaining the asset. Using long term predictions means that decisions about funding levels can also be taken with due consideration of the future maintenance funding liabilities that are being created.

The table below shows the capital funding which has been made available between 2016 and 2021 to deliver the strategies and future condition of the assets outlined in Sections 6 and 7. These figures exclude funding for "Routine" and "Reactive" maintenance which are funded by revenue and also exclude the repair and maintenance of specific major structures (see Appendix C).

	Projected Capital Maintenance Budgets			
	2017/18	**2018/19**	**2019/20**	**2020/21**
Carriageways (Including Drainage)	£25.9m	£25.3m	£25.3m	£25.3m
Footways	£2.9m	£2.9m	£2.9m	£2.9m
Structures	£2.0m	£2.0m	£2.0m	£2.0m
Street Lighting	£0.8m	£0.8m	£0.8m	£0.8m
Signals	£0.60m	£0.60m	£0.60m	£0.60m
Signs & Lines	£0.40m	£0.40m	£0.40m	£0.40m
Total	**£32.6m**	**£32.0m**	**£32.0m**	**£32.0m**

The above funding levels assume that the Department for Transport capital grant for highways maintenance remains constant over the period and that Lincolnshire County Council continues to receive the full allocation of the incentive element of the grant.

The actual funding levels allocated to the key assets will be reviewed on an annual basis taking into account any specific funding pressures identified.

The level of funding that will be made available from 2021 onwards has still to be determined. It should be noted that there is a significant gap between the estimated annual depreciation value (£67.4m) and the level of funding allocated for capital maintenance (£32.0m). Whilst the annual depreciation value is a theoretical figure and tends to overstate the level of funding required, it is likely that an increase in the level of funding will be required from 2021 onwards in order to maintain the condition of our key assets in their current state.

6. Asset Investment Strategies

Lifecycle Planning and Long Term Cost Prediction (LTCP) modelling enables the Council to understand the relationship between future funding needs and the resulting condition and performance levels. The level of complexity of each asset model is dependent on the asset data available and the deterioration mechanism used.

The following summarises the asset investment strategies being developed for each of the main asset groups.

6.1. Carriageways

It is estimated that to maintain the carriageway asset in good condition over the long term will require investment of up to £35m per annum in planned maintenance works (reconstruction, resurfacing and surface treatment).

The budgets available for carriageway maintenance are currently significantly below this level (£25.9m). This plan is based on taking the opportunities for making the available funding deliver the best possible value and to obtain the best possible condition for the available budget using a "prevention is cheaper than cure" approach. This will entail the following:

- Maintenance schemes will be identified and prioritised based upon information from Engineering condition surveys
- Aiming to maintain the condition of the network in the bands outlined in Section 7
- A focus on continued investment in preventative maintenance, predominantly surface dressing and targeted structural patching
- A continuing reviewing of reactive maintenance works to determine if greater efficiency can be achieved
- A reduction in service levels relating to the condition of some lightly trafficked roads where maintenance will primarily comprise works to make safe category 1 defects.
- The standards applied to the repair of priority defects (category 1) both in terms of what constitute a category 1 defect and the response times will be determined using a risk-based approach, details of which can be found in the Highway Asset Management Plan. These response times will continue to be reviewed throughout the life of this document

Further detail and analysis on the above is contained in Appendix A.

6.2. Footways (including Shared Cycleways)

Footway Network condition Surveys (FNS) have now been undertaken on the whole of the footway (and shared cycleway) network. The current performance indicators show that the footways are generally relatively good condition overall. A revised maintenance programme with a greater emphasis on preventative treatments (slurry sealing and selective structural repairs) will be implemented which will allow further budget to be transferred to carriageway maintenance whilst maintaining the overall condition of the footway network.

The asset management strategy for the footway network will involve the following:

- Continued monitoring of the condition of the footway network based on FNS surveys
- Maintenance schemes will be identified using information from engineering condition surveys.
- Aiming to maintain the condition of the network in a steady state up to 2021 through a focus on preventative maintenance treatments and selective structural repairs

Further detail and analysis on the above is contained in Appendix B.

6.3. Structures

Continued investment in planned maintenance has ensured that the Lincolnshire bridge stock is generally in good condition and performance indicators show that the stock is being maintained in a steady state overall.

There are a number of larger structures with critical elements which are a cause of concern. Repairs to these structures will be expensive and will require significant additional funding over the base budget in the year repaired.

The asset management strategy for structures will involve the following:

- Aiming to maintain the condition of the structures stock (as measured by the BSCI) at a steady state through a programme of routine planned maintenance and a targeted programme of works.
- Monitoring the condition of those structures giving cause for concern and highlighting the associated budget pressures at the point when repair is required

Further detail and analysis on the above is contained in Appendix C.

6.4. Street Lighting

Analysis of the age and condition of the street lighting stock shows that this is in good condition and also indicates that a budget for renewals and replacements of £750k per year (at 2016 prices) should be sufficient to maintain a steady state in the short to medium term.

In 2016 the County Council invested a further £6.4m of capital financing as part of an "invest to save" initiative to significantly reduce Street Lighting energy costs.

In the longer term (from 2030 onwards) additional funding will be required (up to £3m per year) to maintain the condition of the street lighting stock as it reaches the end of its anticipated service life.

The asset management strategy for Street Lighting will involve the following;

- Aiming to maintain the condition of the lighting stock in a steady state
- A focus on investments which further reduce energy consumption and routine maintenance costs

Further detail and analysis on the above is contained in Appendix D.

6.5. Traffic Signals

Analysis of the age and condition of the traffic signals assets show them to be generally in good condition and that at current funding levels the asset can be maintained in a steady state condition based upon an assumed replacement life of 25years. However, from 2021 onwards additional capital funding will be required periodically for replacement of the CCTV systems and Urban Traffic Control (UTC) system.

Specifically the strategy for the management of the traffic signals assets will involve the following;

- Aiming to maintain the condition of the traffic signals stock at a steady state based upon a 25 year lifecycle and replacement programme
- Replacing the supporting infrastructure (CCTV and UTC systems etc.) as the need arises
- Reducing future maintenance costs wherever practicable through investment in appropriate new technologies and systems

Further detail and analysis on the above is contained in Appendix E.

6.6. Street Furniture

This covers a wide range of assets including non-illuminated signs, safety fencing, vehicle-activated signs, bus shelters etc. The age of many of these assets is unknown. There is limited inventory and detailed condition information available and this is relatively expensive to collect and maintain.

These assets are generally replaced as the need occurs and as identified in routine network Safety and Service inspections and budgets will be reviewed annually to reflect this.

Where non regulatory traffic signs fail or require replacement a review of the requirement for the asset will be undertaken and signs will not be replaced where this is appropriate.

7. Service Standards

This section defines standards that users can expect from the County's transport assets. It records how these are measured and outlines the targets that have been set for the duration of the plan.

7.1. Purpose

This strategy is based upon delivery of the service standards set out below. The standards described are based upon the funding levels and strategies outlined in sections 5 and 6 and are challenging in the current economic climate and with the projected levels of funding available.

Publishing these standards enables users (customers) to understand what they can expect from our transport assets.

Details of how the specific measures shown in the tables on the following pages have been established are included in the Highway Asset Management Plan.

Carriageways				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Response to incidents	Percentage of emergency incidents answered within response times	100%	100%	100%
Repair of high priority defects	Percentage of Category 1 defects repaired within response times (risk matrix defining Category 1 defects is contained within the Highway Asset Management Plan).	85%	85% - 90%	>90%
Repair of other defects	Percentage of Category 2 defects repaired within response times (risk matrix defining Category 2 defects is contained within the Highway Asset Management Plan).	80%	80% - 85%	>85%
Maintain road surface condition	Percentage by network length of Principal roads where maintenance should be considered (A roads)	1.9%	2% - 3%	2% - 3%
	Percentage by network length of Non-principal roads where maintenance should be considered (B roads)	3.5%	3% - 5%	3% - 5%
	Percentage by network length of Non-principal roads where maintenance should be considered (classified C)	6.5%	6% - 8%	6% - 8%
	B & C Roads combined	5.9%	5% - 7%	5% - 7%
	Percentage by network length of Unclassified roads where maintenance should be considered	29.8%	28% - 32%	28% - 32%

Footways				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Maintain skid resistance of road surfaces	Percentage of the Principal Road Network at or below the Skidding Investigatory level (3 year average value)	9.7%	≤10%	≤10%
Maintain the structural condition of the carriageways	Percentage of the Principal Road network with a "zero residual life"	4.5%	4% - 5%	4% - 5%
Response to incidents	Percentage of emergency incidents answered within response times	100%	100%	100%
Repair of high priority defects	Percentage of Category 1 defects repaired within response times (risk matrix defining Category 1 defects is contained within the Highway Asset Management Plan).	85%	85% - 90%	>90%
Repair of other defects	Percentage of Category 2 defects repaired within response times (risk matrix defining Category 1 defects is contained within the Highway Asset Management Plan).	80%	80% - 85%	>85%
Maintain footway surface condition	Percentage of Hierarchy 1 and 2 footways in FNS Condition Category 4 (Structurally Impaired)	3.2%	3% - 4%	3% - 4%
	Percentage of Hierarchy 3 and 4 footways in FNS Condition Category 4 (Structurally Impaired)	10.0%	9% - 11%	9% - 11%

Street Lighting				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Repair street lights that go out	Percentage of street lights not working as planned on any one evening	<0.8%*	<0.8%	<0.8%
	Percentage of repairs completed within 5 working days	>75%*	>75%	>75%
Maintain street lighting column condition	Percentage of columns exceeding their average expected service life	6%*	6%	7%
Maintain street lighting lanterns condition	Percentage of lanterns that have exceeded their expected service life	28%*	28%	32%
Maintain illuminated sign post condition	Percentage of sign posts exceeding their average expected service life	22%*	22%	27%
Maintain illuminated sign unit condition	Percentage of sign units that have exceeded their average expected service life	33%*	33%	38%
Maintain illuminated bollard condition	Percentage of illuminated bollards exceeding their average expected service life	33%*	33%	38%

*Figures based on most current statistics. The ongoing Street Lighting Transformation Project is impacting performance but this will be reviewed following completion.

Structures				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Repair of damage to structures	% of reactive repairs made safe repaired within specified response times	100%	80%	80%
Maintain structure/bridge condition	Bridge stock condition indicator (BClav)	92.6%	90%	90%
	Percentage of bridges in very poor condition (BClcrit <39)	0.8%	0%	0%
	Percentage of bridges in poor condition (BClcrit <60)	10.2%	10%	10%
	Percentage of retaining walls in very poor condition (BClcrit < 39)	4.8%	5%	5%
Maintain the load carrying capacity of the bridge stock	Number of structures requiring strengthening	2 No.	2 No.	2 No.

Traffic Signals				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Repair of 2 hour emergency faults	Percentage of 2 hour emergency faults made safe within response times	99.5%	100%	100%
Faults resolved at first visit	Percentage compliance with fault repair response times	99.5%	100%	100%
Maintain condition of traffic signals	Percentage of traffic signal installation exceeding average expected service life (25 years)	3%	5%	5%

Winter Service				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Keep roads open during snow and ice	Maximum percentage of the network treated by salt during periods of snow and ice. (Route Based forecasting allows for only a portion of this percentage to be treated on marginal nights.)	33%	33%	33%
	Percentage of precautionary road salting completed on time	>85%	85% - 90%	>90%

Verge Maintenance				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Keep verges cut to provide safe visibility	No. cuts of grass verges and visibility splays (at junctions etc.) per annum	2	2	2

Drainage				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Keep highway drainage working	Full cycle of gully cleansing per year on the full network (rural and urban)	1	Under review	Under review

Safety Fences				
Service	**Measured By**	**Current Performance**	**Target Standard**	
			2017	**2021**
Maintain integrity of safety fencing	Percentage of safety fencing 7 day repair orders closed within time	80%	80%	100%

8. Risk Management

Managing risks is a critical part of the management of the highway asset. This section describes how these risks are managed. It identifies the risks that could prevent this plan being delivered with how these risks are to be controlled.

8.1. Risk Context

This Asset Management Strategy will align with the Lincolnshire County Council Risk Management Strategy which sets out how the Council manages risk corporately. This risk strategy has been applied to managing the Council's transport assets and the highest rated risks that were considered when compiling this plan were:

- Reduction in funding for capital maintenance works
- The condition of unclassified roads is relatively poor and whilst recently this has seen a slight improvement any severe winter or weather event could reverse this trend
- There is no long term trend data available to estimate deterioration in the condition of footways
- Failure of a critical element of a large structure or embankment
- Adverse weather events
- Reductions in revenue funding impact on the long term condition of key assets

8.2. Risk Identification

Risks are identified from historical experience from both contractor and Lincolnshire County Council staff. They are informed by the internal Legal Services, Risk Management and Insurance teams.

8.3. Risk Assessment/Evaluation

The following process is used to evaluate and assess risks, to give a consistent approach:

Impact		**Likelihood**	
Risk Rating Score	**Impact**	**Risk Rating Score**	**Likelihood**
1	Insignificant	1	Remote
2	Minor	2	Unlikely
3	Moderate	3	Possible
4	Significant	4	Likely
5	Catastrophic	5	Very Likely
Overall Risk (Likelihood X Impact)			
Net Risk Score	**Risk Rating**	**Action**	
16-25	Red	Action Required	
11-15	Amber	Consider Action	
1-10	Green	May Consider Action	

8.4. Risk Treatment/Control

"Control is a response to risk – to contain the risk to an acceptable level and to reduce the likelihood of an unwanted outcome."

Each risk identified in this plan should have an associated control measure. If the existing control measure is considered to be inadequate or a control measure does not exist, a Mitigating Action should be identified to enhance the existing control measure or put a suitable control measure in place. These Mitigating Actions should be specific tasks allocated to a specified Lead Officer with a deadline for completion.

8.5. Risk Reporting

Risks should be monitored and any progress made should be recorded in accordance with the reporting regime in the Corporate Risk Management Strategy. The Management Team and Elected Members will be kept informed of the risks and progress in their control and management via regular reports.

8.6. Risks Relevant to this Plan

A detailed Risk Registered is included at Appendix E.

9. Asset Management Planning Practice

This section defines the asset management planning practices that the Council uses. The application of these practices is essential to the achievement of this plan.

9.1. Highways Asset Management Policy

Sets out the policy and principles that will be adopted for the management of the highways assets and how these align to the long term vision and purpose of the county council.

9.2. Highways Asset Management Strategy

Contains descriptions of the assets, future demands on the assets, investment strategies, service standards, finance and budget detail and an improvement action plan. It has been developed by Senior Management and managers with specific responsibilities for key assets and reviewed by Council members at Highways, Transportation and Technology Scrutiny Committee meetings.

9.3. Highway Asset Management Plan

The systems used to manage the County's transport assets are set out in the Highway Asset Management Plan. The plan defines how and when we:

- Inspect
- Categorise and prioritise reactive repairs
- Assess condition
- Identify and prioritise sites for resurfacing (or strengthening/replacement)
- Choose the materials used
- Prepare works programmes
- Procure and manage works
- Record and report costs
- Records and respond to customer contacts

9.4. Asset Investment Strategies

Specific investment strategies for the major asset groups of carriageways, footways, structures, street lighting and traffic signals will be reviewed each year as part of the budget setting process. Each strategy will define how the target service standards are to be delivered and any specific requirements for additional funding or opportunities for improvements. This review will also address the types of works to be planned and outline where a "prevention is better than cure" approach will be adopted.

9.5. Performance Reporting

A performance report will be compiled annually summarising the condition of each asset group. The report will describe the result of the previous year's investment in terms of meeting the target service standards and key outcomes.

The report will also include long term predictions of levels of defects and condition and will be used to enable the Council to best allocate the following years budgets and to decide whether any of the service standards contained in this plan or funding levels need to be revised.

10. Improvement Plan

This asset management strategy has been designed to deliver improvements to the management of the county's assets. This section describes the changes that are planned to ensure that these benefits are achieved.

10.1. Improvement Actions

A review of the Council's current transport asset management capability undertaken as part of the development of this plan has identified the following desirable improvements:

Theme	Status	Actions	Completion Date
Data	Future customer contact data and NHT survey results to be reviewed and analysed.	1. Customer contact data to be collected and analysed as appropriate. 2. NHT survey results to be reviewed and analysed as appropriate.	Ongoing
Safety and Condition Inspections	New Code of Practice "Well Managed Highway Infrastructure" published October 2016 introducing opportunity for review of strategy and hierarchy.	Review of hierarchy and safety inspection frequencies in coordination with Legal Services. Review of operations in line with Future Operating Model.	October 2018
Value for Money	Current value for money of service delivery is undefined in terms of management of highways assets.	Value for money assessments will be carried out for specific service areas, with results clearly communicated to the Elected Members. Programme leads will be accountable for performance and improvements if value for money is not demonstrated as being delivered.	2020
Programming and Job Management	Programming and job management is split across divisional teams with generic working practices. Engineers are unable to focus on management of the asset and programming of works.	A disciplined and consistent approach to programming and job management will be implemented. This will enable effective resources management, reducing costs. All work types will be overseen by the Programming & Job	2020

		Management function, including; planned, reactive and cyclical jobs.	

11. Management of the Plan

11.1. Responsibility for Delivery

The following people are charged with the delivery of this AMS:

Item	Main Council Position
AMS Document	• Infrastructure Commissioner • Highways and Transportation Scrutiny Committee • Executive Councillor for Highways and Transportation
AMS Implementation and practice improvements	• Infrastructure Commissioner • Highways Assessment and Laboratory Manager • Highways Asset Manager
AMS document updating and reporting	• Highways Assessment and Laboratory Manager • Asset Management Commissioner
Finance and valuation	• Highways Assessment and Laboratory Manager • Head of Finance – Economy and Environment
AM Data	• Highways Assessment and Laboratory Manager • Asset Management Commissioner
AMS Risk	• Infrastructure Commissioner • Highways Assessment and Laboratory Manager
Carriageway lifecycle plan and annual options report	• Programme Manager – Highways Assets • Principal Engineer (Pavements)
Footway lifecycle plan and annual options report	• Programme Manager – Highways Assets • Principal Engineer (Pavements)
Street lighting lifecycle plan and annual options report	• Principal Engineer (Lighting, Signs and CAD)
Structures lifecycle plan and annual options report	• Principal Engineer (Structures)
Traffic signals lifecycle plan and annual options report	• Principal Engineer (Traffic Signals)

11.2. Associated Documents and References

The following documents are essential components of the Council's approach to the management of its Highways Assets and complement and support this strategy.

- **Highways Asset Management Policy**
  The policy outlines the general principles that will be applied to the management of the County Councils assets and has been approved by members.

- **Highway Asset Management Plan (HAMP)**
  The HAMP documents how the highway asset is managed. It records the policies and procedures used. It is the owner's manual and formalises the practices used to operate the highway network.

- **4th Local Transport Plan**
  The 4th Lincolnshire Local Transport Plan was published in April 2013 and sets out the Transport Strategy for the County for a 10 year period. The Transport Act 2000 set out the need for Statutory Local Transport Plans to be produced.

- **Winter Maintenance Plan (WMP)**
  The Winter Maintenance Plan documents how the winter service operates. It records the policies and procedures used and the sections of the network that will be treated.

- **Lincolnshire County Council Risk Management Strategy**
  The Risk Management Strategy aims to provide an effective framework for the council to manage the key risks facing its services and the successful delivery of its Business Plan.

Appendix A – Carriageways

The Asset

	Km
A Roads	1,073
B Roads	789
C Roads	2,912
U/C Roads	3,996
Green Lanes	322

Asset Valuation

The asset has been valued as follows:

	2016
Gross Replacement Cost (GRC)	£7,908m
Depreciated Replacement Cost (DRC)	£7,553m
Annualised Depreciation (AD)	£35.2m

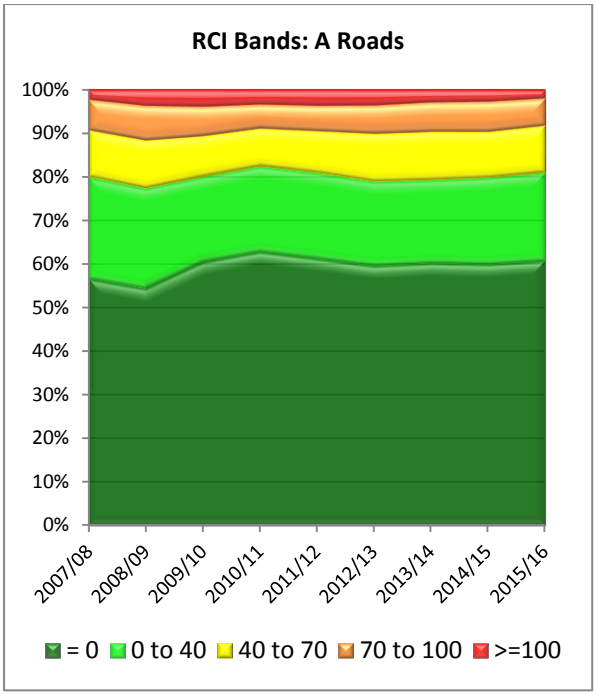
In theory the annualised depreciation represents the average amount of annual investment required in asset renewals in order to keep the asset in its current state. In practice this is significantly higher than the budget available to maintain the carriageway network.

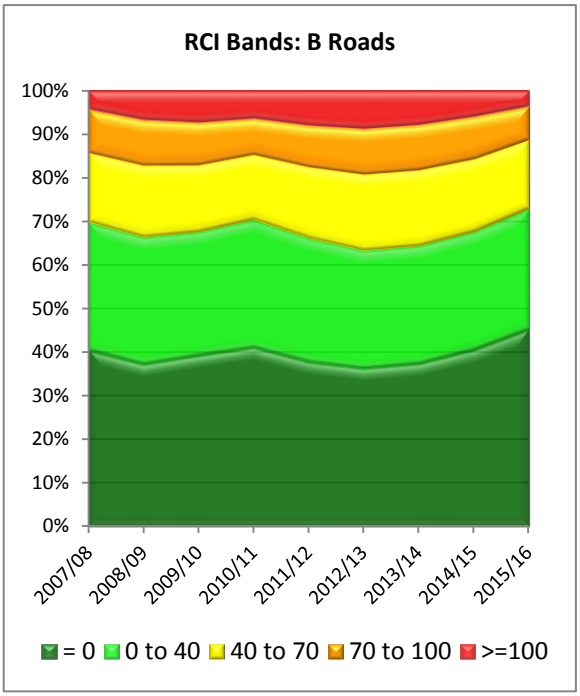
Condition

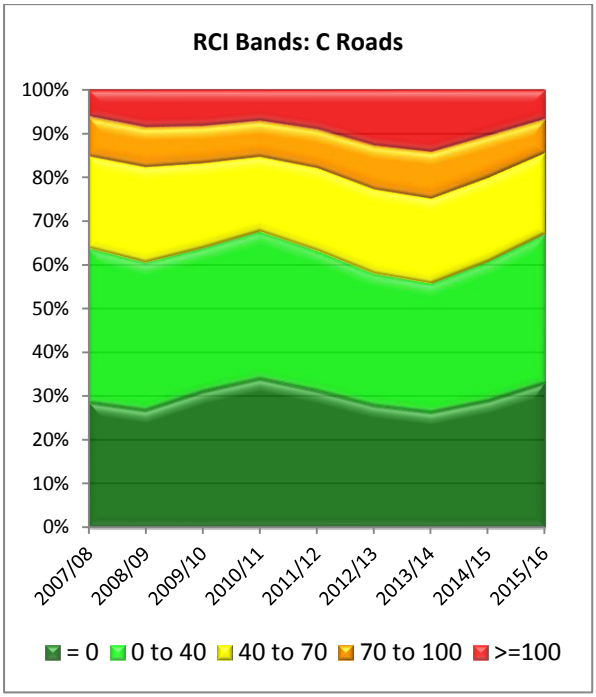
An annual programme of condition surveys is undertaken across the network. For A, B and C Roads the SCANNER machine is used to measure surface condition (RCI - Road Condition Indicator). For Unclassified Roads a visual condition survey is undertaken (CVI).

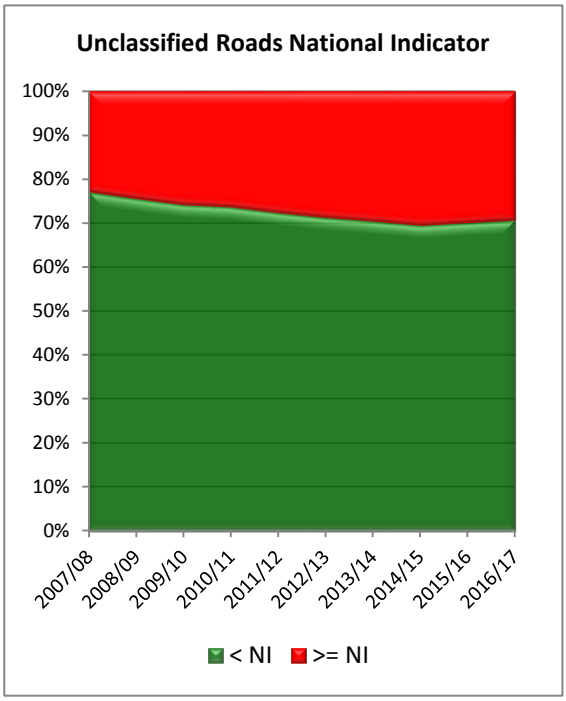
The following graphs illustrate the condition of the network using the following condition bands

- Green/Light Green - No maintenance required
- Yellow/Amber - Requires investigation for potential maintenance (SCANNER surveys only)
- Red – Planned maintenance required





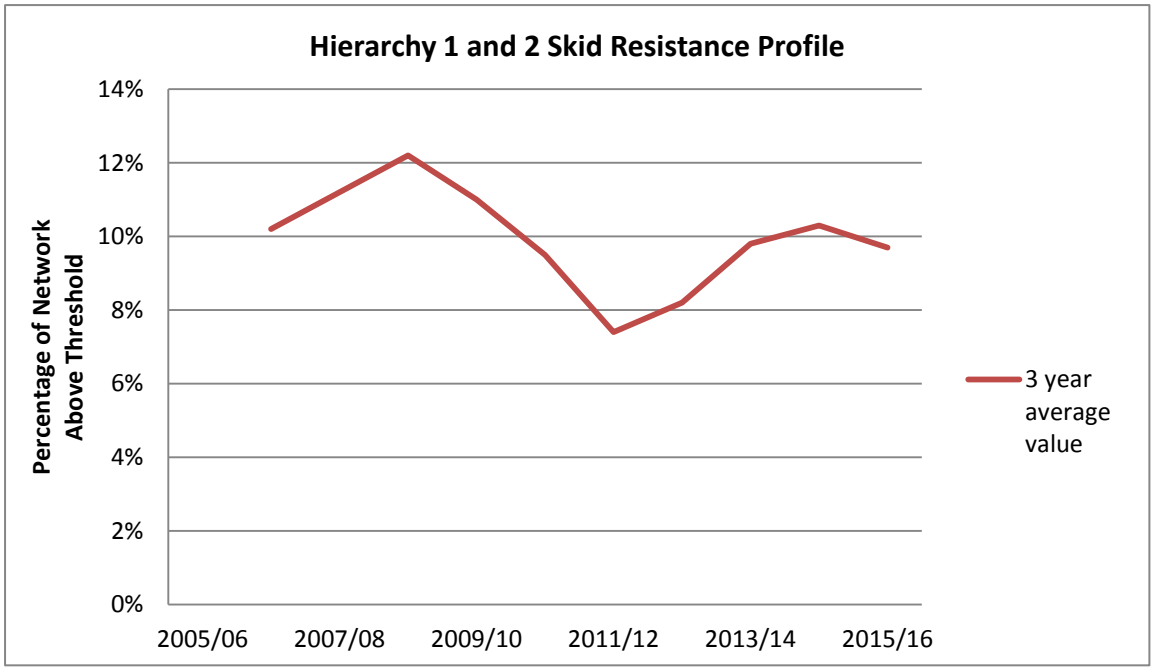


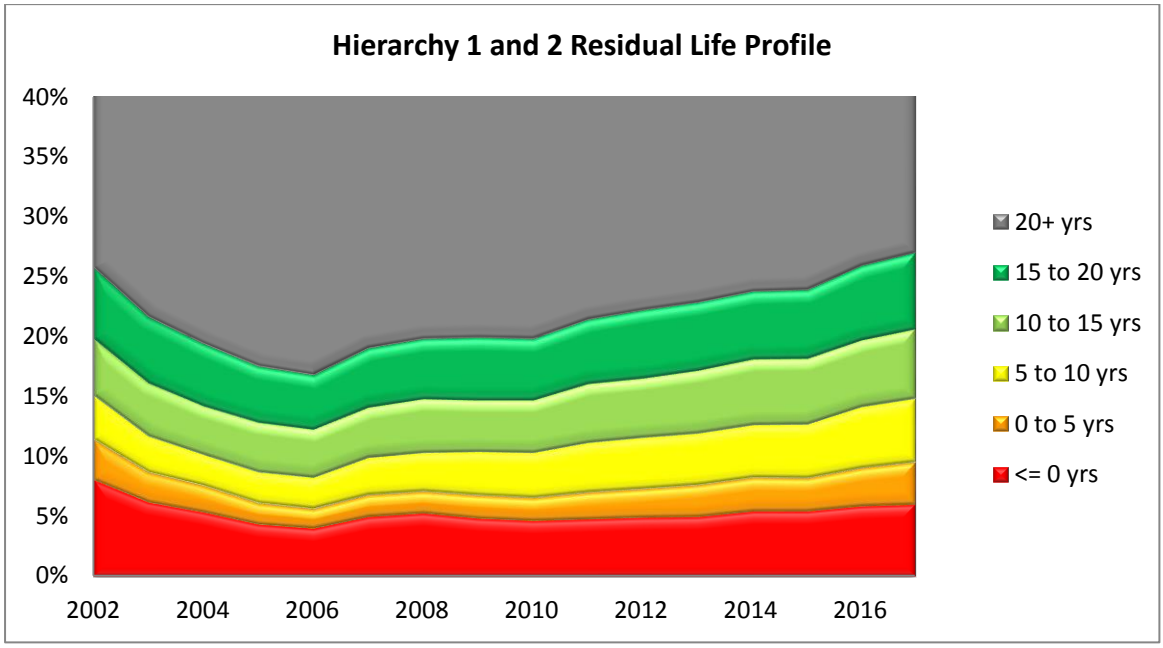


Note; There is some concern over the SCANNER survey results for the period 2012 to 2014 which may have overstated the red and amber conditions, particularly on the B and C road network. This has been audited and reviewed by the Transport Research Laboratory and a new SCANNER machine is now operating on the Lincolnshire road network.

In addition to the measurement of surface condition, surveys are also undertaken on the more heavily trafficked A & B roads (Hierarchy 1 & 2) to measure Skid Resistance (using SCRIM) and Structural condition (using Deflectograph).

The following graphs illustrate the long term trends in these measurements





Lincolnshire has managed its large road network well. The condition indicators show that the strategy of preventative maintenance is generally delivering a surface condition which is in a steady state overall. However, structural condition surveys indicate that whilst the very worst condition (below zero residual life) is being managed effectively, there has been a small but perceptible year on year deterioration in the overall structural condition of the network since 2006. This is not a cause of immediate concern but does indicate that the network will require additional investment in reconstruction and strengthening works over the longer term

Investment Requirements

The historic budgets for Carriageway Maintenance are outlined in the following table

Asset	Works	Historic Budget Allocations £000's					
		11/12	12/13	13/14	14/15	15/16	16/17
Carriageways	Planned	18,909	22,424	30,249	21,527	26,103	25,027
	Reactive	4,128	3,912	3,759	3,795	3,692	3,089

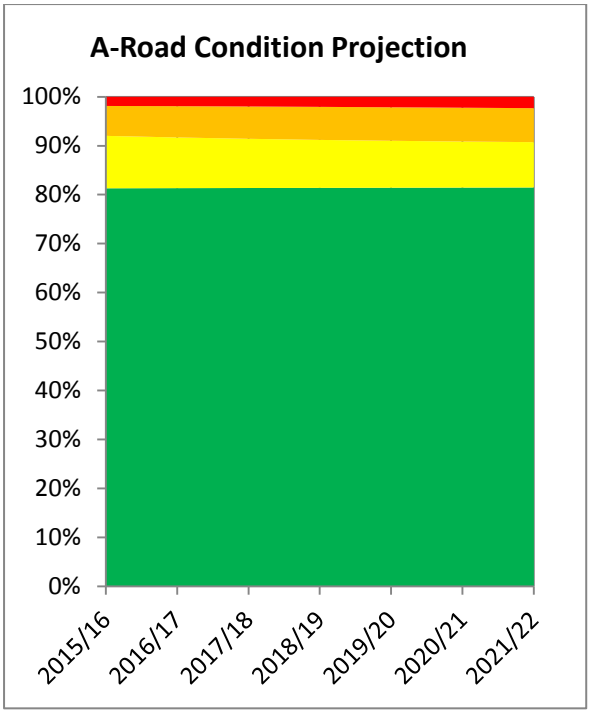
The above table illustrates that the budgets for reactive maintenance have been reducing year on year. This in part reflects our strategy to divert funding away from short term reactive repairs into planned and preventative maintenance. This approach is encouraged and supported by central government who in 2015 announced a six year capital maintenance settlement for the period from 2015 to 2021. This includes an element of incentive funding which is reliant on authorities adopting an asset management led approach to highways maintenance.

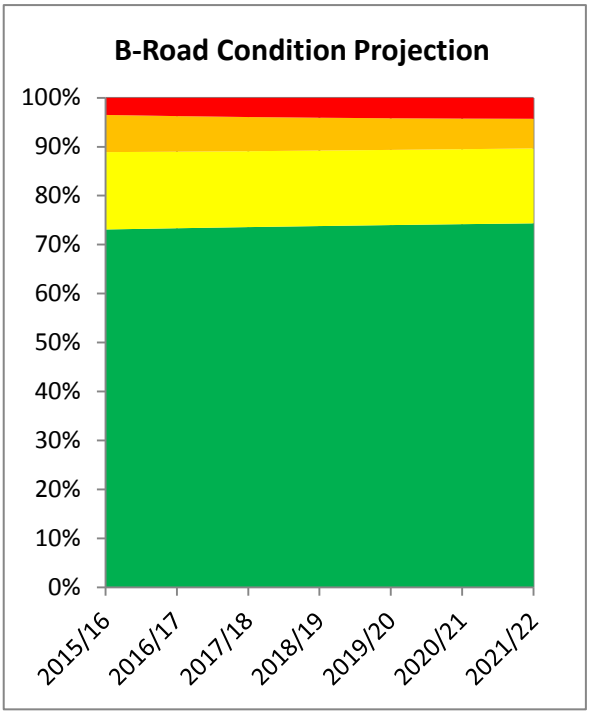
For carriageway maintenance the county council had developed a lifecycle model approach to strategic asset management planning based upon the principles of the Highways Maintenance Efficiency Programme (HMEP). This enables us to plan and adjust budgets at a strategic level to optimise the condition of the network for the available budget.

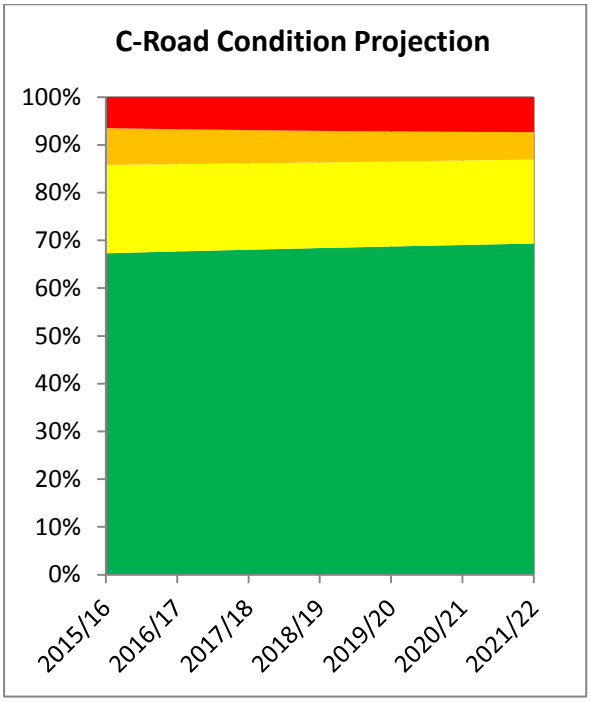
The following table outlines the current planned budget for maintaining the condition of the carriageway asset over the next four years.

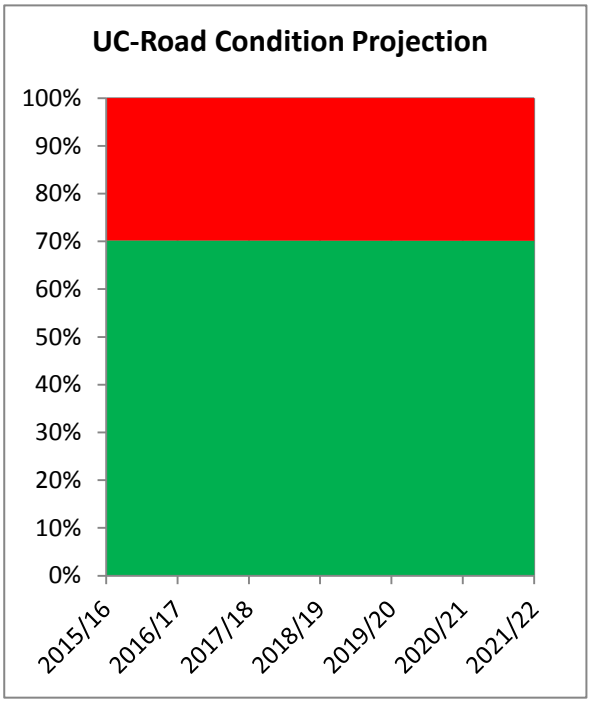
Cost Category	Projected Expenditure £000's			
	2017/18	2018/19	2019/20	2020/21
Planned (Capital)	£25.3m	£25.3m	£25.3m	£25.3m
Reactive	£3.1m	£3.1m	£3.1m	£3.1m

The following graphs model the potential surface condition of the network in future years assuming that the current level of capitalised maintenance funding is maintained. The graphs are based on deterioration models of the network which will be refined and adapted as required to reflect changes in the condition of the network and the level of funding available.









Achieving the service standards, as set out for the carriageway asset in Section 7 is critically dependent upon the level of funding available, the adoption of an Asset Management led approach to maintenance and implementing the right treatment at the right time on the network.

Appendix B – Footways

The Asset

	Km
Bituminous Footways	3,881
Block Paved Footways	69
Flagged Footways	123
Concrete Footways	65

Asset Valuation

The asset has been valued as follows:

	2016
Gross Replacement Cost (GRC)	£527m
Depreciated Replacement Cost (DRC)	£472m
Annualised Depreciation (AD)	£9.2m

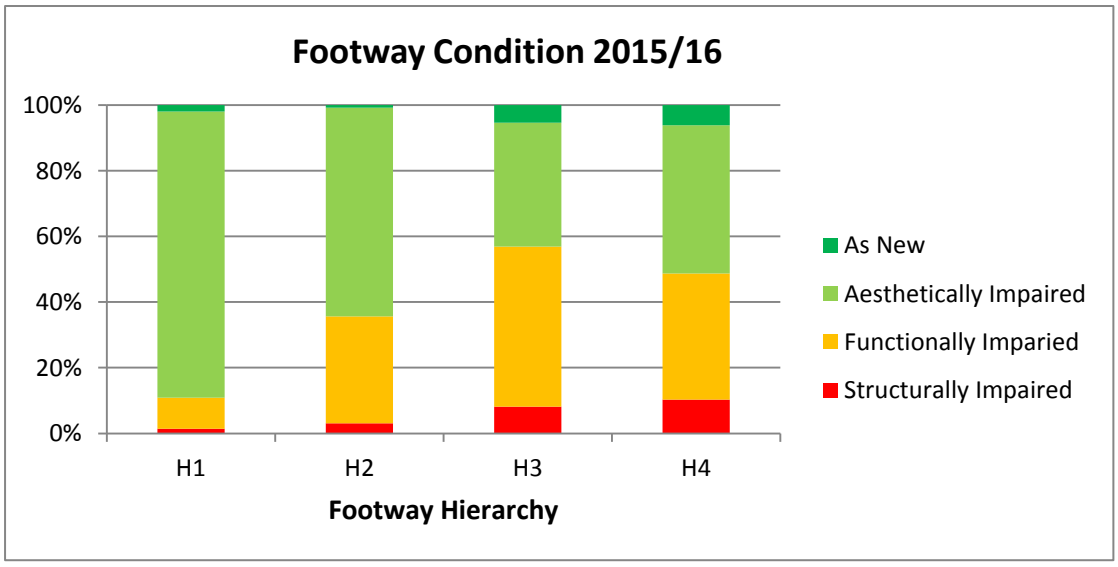
In theory the annualised depreciation represents the average amount of annual investment required in asset renewals in order to keep the asset in its current state. In practice this is significantly higher than the budget available to maintain the footway network.

Condition

For footways the condition monitoring is based upon the Footway Network Survey (FNS). This is a simplified survey which categorises the footways into one of four bands

- As New (Green)
- Aesthetically Impaired (Light Green)
- Functionally Impaired (Amber)
- Structurally Impaired (Red)

The following graph summarises the results of FNS surveys on the network:



Investment Requirements

The historic budgets for Footway Maintenance are outlined in the following table

Asset	Works	Historic Budget Allocations £000's					
		11/12	12/13	13/14	14/15	15/16	16/17
Footways	Planned	4,898	4,304	3,636	3,096	3,494	3,293
	Reactive	Included in Carriageways					

From 2013 to 2016 funding for the footway network was reduced year on year and transferred to the carriageway network due to a significant and long term deterioration in the condition of carriageways.

For maintenance purposes and the reporting of GRC and DRC it has been assumed that bituminous footways have a lifecycle of 40 years before resurfacing is required with a single surface treatment of slurry seal applied at an appropriate point during the 40 year lifecycle.

Footways comprising modular slabs, block and concrete paving represent a relatively small proportion (7%) of the Lincolnshire Footway Network.

A single full cycle of FNS surveys have now been completed however, in order to develop a model for deterioration or scheme prioritisation multiple surveys will be required over a period of years to determine the rates of deterioration. Investment levels have therefore been determined on an historic basis

The following table outlines the planned budget for maintaining the condition of the footway network over the next four years.

Cost Category	Projected Budget £000's			
	2017/18	2018/19	2019/20	2020/21
Planned (Capital)	£2,900	£2,900	£2,900	£2,900
Reactive	Included in Carriageways			

The above budgets have been adjusted to reflect the increased emphasis on preventative maintenance. The condition of the footway network will be monitored, reported and investment levels adjusted accordingly if FNS surveys indicate a significant change in their overall condition.

Appendix C – Structures

The Asset

	Number
Bridges	1516
Subways	12
Culverts	2163
Highway Footbridges	126
Retaining Walls	144
Gantries	11

Asset Valuation

The asset has been valued as follows:

	2016
Gross Replacement Cost (GRC)	£732m
Depreciated Replacement Cost (DRC)	£455m
Annualised Depreciation (AD)	£15.2m

Depreciation calculations are worked out using the "Structures Toolkit" which has been developed by the Department for Transport as part of the Whole of Governments Accounting (WGA) initiative. The toolkit has recently been built into the Confirm asset management system.

In theory the annualised depreciation represents the average amount of annual investment required in asset renewals in order to keep the asset in its current state however, in practice actual maintenance budgets and costs are significantly below this level.

Condition

The condition of the bridges asset is reflected in the following summary:

Year	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**
BSCI AVE	*	91.4	92.0	92.6	92.9
BSCI CRIT	*	86.7	86.1	86.7	85.7

NOTE: *2011/12 no data available during the introduction of Confirm. 2012/13 Inspection rotas regulated to improve consistency from year to year.*

Bridge condition is reported in a variety of ways and the most common are; Bridge Condition Index (BCI) and Bridge Stock Condition Index (BSCI).

BCI values relate to particular bridges whereas BSCI refers to the entire bridge stock and gives an overall picture of the condition of the stock. For both of these indices a value of 100 indicates that the structure or stock is in good condition and as the index reduces towards zero then the condition also reduces as can be seen from the table below (extract from ADEPT Bridges Group document – BCI Vol. 3: Evaluation of Bridge Condition Indicators).

BSCI Range	BCS Range	Bridge Stock Condition based on $BSCI_{Av}$	Bridge Stock Condition based on $BSCI_{Crit}$
100 – 95 Very Good	1.0 – 1.3	Bridge stock is in a **very good** condition. Very few bridges may be in a moderate to severe condition.	Very few critical load bearing elements may be in a moderate to severe condition. Represents **very low risk** to public safety
94 – 85 Good	1.31 – 1.8	Bridge stock is in a **good** condition. A few bridges may be in a severe condition.	A few critical load bearing elements may be in a severe condition. Represents a **low risk** to public safety.
84-65 Fair	1.81 – 2.7	Bridge stock is in a **fair** condition. Some bridges may be in a severe condition. Potential for rapid decrease in condition if sufficient maintenance funding is not provided. Moderate backlog of maintenance work.	Wide variability of conditions for critical load bearing elements, some may be in a severe condition. Some bridges may represent a **moderate risk** to public safety unless mitigation measures are in place.
64 – 40 Poor	2.71 – 3.7	Bridge stock is in a **poor** condition. A significant number of bridges may be in a severe condition. Maintenance work historically underfunded and there is a significant backlog of maintenance work.	A significant number of critical load bearing elements may be in a severe condition. Some bridges may represent a **significant risk** to public safety unless mitigation measures are in place.
39 – 0 Very Poor	3.71 – 5	Bridge stock is in a **very poor** condition. Many bridges may be unserviceable or close to it. Maintenance work historically underfunded and there is a huge backlog of work.	Many critical load bearing elements may be unserviceable or close to it and are in a dangerous condition. Some bridges may represent a **high risk** to public safety unless mitigation measures are in place.

Further insight is given into structure and stock condition by use of average (AVE) and critical (CRIT) values. The 'average' value is a measure of the overall condition of the structure or stock whereas the 'critical' value is a measure of the condition of the 'critical' elements of the structure or stock.

Critical elements are those such as those identified as being of 'Very High' importance in the table below.

Set	Item No.	Element Description		Element Importance
Deck Elements	1	Primary deck elements		Very High
	2	Secondary deck element(s)	Transverse beams	Very High
	3		Element from table 2 of Ref.2	Very High
	4	Half joints		Very High
	5	Tie beam/rod		Very High
	6	Parapet beam or cantilever		Very High
	7	Deck bracing		High
Load-Bearing Substructure	8	Foundations		High
	9	Abutments (incl. arch springing)		High
	10	Spandrel wall/head wall		High
	11	Pier/column		Very High
	12	Cross-head/capping beam		Very High
	13	Bearings		High
	14	Bearing plinth/shelf		High
Durability Elements	15	Superstructure drainage		Medium
	16	Substructure drainage		Medium
	17	Waterproofing		Medium
	18	Movement/expansion joints		High
	19	Painting: deck elements		Medium
	20	Painting: substructure elements		Medium
	21	Painting: parapets/safety fences		Medium
Safety Elements	22	Access/walkways/gantries		Medium
	23	Handrail/parapets/safety fences		High
	24	Carriageway surfacing		Medium
	25	Footway/verge/footbridge surfacing		Low
Other Bridge Elements	26	Invert/river bed		Medium
	27	Aprons		Medium
	28	Fenders/cutwaters/collision protection		Medium
	29	River training works		Medium
	30	Revetment/batter paving		Low
	31	Wing walls		High
	32	Retaining walls		Medium
	33	Embankments		Low
	34	Machinery		Medium

Investment Requirements

The Structures baseline (current) budget is outlined in the table below:

Cost Category	2016/17	% Spend
Routine and Reactive sub-total	£994,113	32%
Planned sub-total	£2,114,100	68%
TOTAL	**£3,108,213**	**100%**

The BSCI figures indicate that the overall condition of the Lincolnshire Bridge stock is "Good" and the BSCI(CRIT) indicator for the Critical elements is also just within the "Good" category.

In recent years the revenue budget has been targeted to a planned maintenance regime (with the capability to respond reactively when required), minor works having been identified from the inspection regime and prioritised according to need and risk. The capital budget is targeted towards larger maintenance schemes and reconstructions (where the latter is the only economic option). The overall objective has been to work towards 'steady state' condition and this appears to be reflected in the BSCI scores.

Whilst the theoretical annual depreciation value for the structures stock (£15.2m) is significantly higher than the projected capital budget available (£2.1m) this is an average value over the whole life of the structures stock and in practice the condition can be maintained in a steady state with lower levels of funding.

It can be seen that after the next three years of planned maintenance, there are some larger projects which require significant expenditure. In addition as some of the larger bridges reach the end of their serviceable lifespan a number of much larger projects have been identified which will incur significant costs in the longer term. These structures will continue to be monitored, repaired and reported on until such time as major works become unavoidable. These structures are

- Pelham Bridge - Waterproofing and Joints (£600k) Programmed for 2019 (Following completion of Lincoln Eastern By-Pass)
- Cross keys Swing Bridge – Repainting (£1m) Programmed for 2021
- Langrick Bridge – Rebuild off-line? (£12m)
- Bardney Bridge – Rebuild off-line? (£6m)
- A17 Sleaford Bypass – Embankments and safety Fencing (£1.8m)

The following table outlines the projected budget available (at current prices) to maintaining the overall bridge stock over the next four years. These budgets exclude provision for the larger schemes identified above and will be subject to ongoing review as part of the annual budget setting process.

Cost Category	Projected Budgets £000's			
	2017/18	2018/19	2019/20	2020/21
Routine and Reactive	£1,000	£1,000	£1,000	£1,000
Planned (Capital)	£2,100	£2,100	£2,100	£2,100
TOTAL	**£3,100**	**£3,100**	**£3,100**	**£3,100**

Appendix D – Street Lighting

The street lighting stock is currently being upgraded as part of the Street Lighting Transformation project to improve its energy efficiency. An assessment of the asset will be undertaken during 2017 following completion of the project.

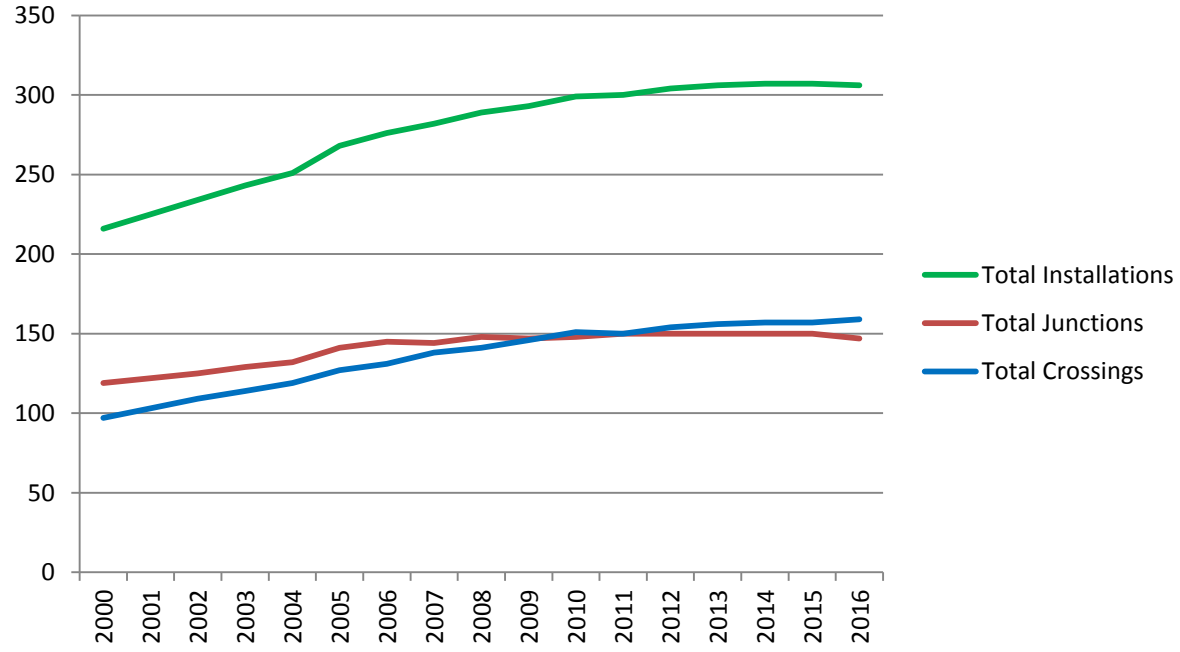
Appendix E – Traffic Signals

The Asset

	No
Traffic Signals at Junctions	147
Traffic Signals at pedestrian crossings	125
Traffic Signals at pedestrian and cycle crossings	33
Traffic Signals at equestrian crossing	1
Outstation Monitoring Units	210
Outstation Transmission Units (including 3 no. Fire Station greenwave units)	97
CCTV camera installations	35
Tidal Flow System (including 41 overhead and 8 approach VMS)	1

In addition to the above on-street equipment the Traffic Signals Team manage assets associated with the Urban Traffic Control, Remote Monitoring, Common Database and CCTV systems within the Lincoln based traffic control room.

Asset Growth

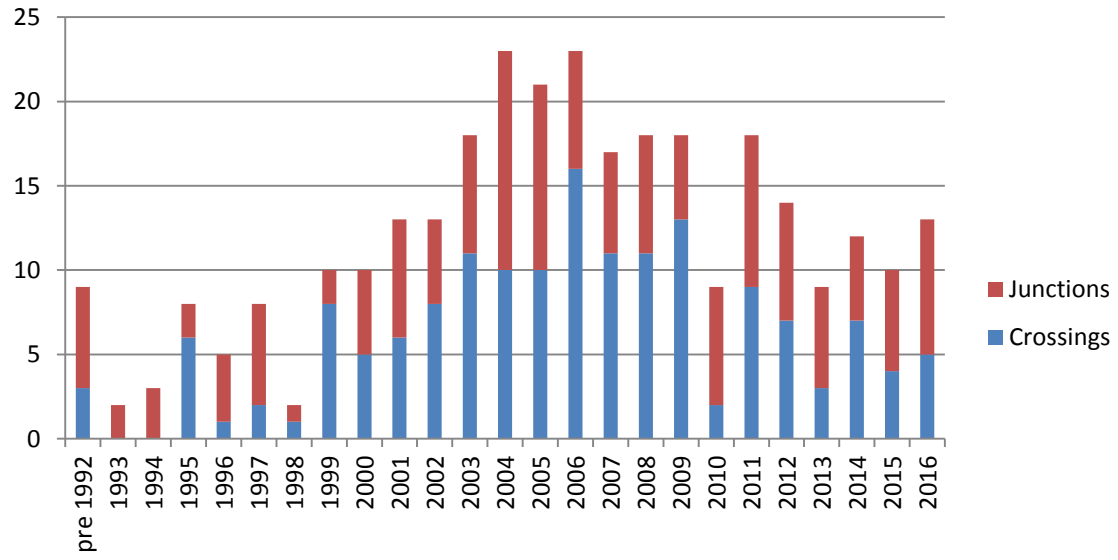


The overall annual rate of asset growth has reduced significantly since 2010 as the general economic environment has led to a reduction in additional installations funded through new developments. In addition new initiatives which have historically contributed to the increase in Signals installations such as "Community Travel Zones" have also declined.

Improved controller technology has also made it easier to combine two or more neighbouring but previously separate assets into larger single assets thus reducing the total number of assets. This has been introduced when practical at new and replacement installation schemes to reduce initial capital and ongoing revenue costs. Additionally some installations have been removed due to local area schemes or asset rationalisation.

Asset Age Profile

In the period 2010 to 2015 the asset benefitted from large capital and development schemes which funded or contributed towards the replacement of some aging but not end of life assets. This, with the pre 2010 growth and the recent move to a 25 year replacement cycle, has created a distorted installation age and future replacement profile requirement for the asset as indicated in the chart below.



Asset Valuation

The traffic signal assets have been valued as follows:

	2015 (20 yr. basis)	2016 (25 yr. basis)
Gross Replacement Cost (GRC)	£12.1m	£12.1m
Depreciated Replacement Cost (DRC)	£6.0m	£6.8m
Annualised Depreciation (AD)	£0.6m	£0.5m

In theory the annualised depreciation represents the average amount of annual investment required in order to keep the asset in a steady state condition. However it should be noted that the current valuations do not represent the actual cost of signals installations replacements due to the cost of the associated Civil Engineering works.

Historic Investment

Asset	Works	Historical Budget Allocations £ 000's						
		10/11	11/12	12/13	13/14	14/15	15/16	16/17
Traffic Signals	Reactive	£895	£795	£827	£833	£840	£844	£844
	Planned	£600	£600	£600	£600	£600	£600	£600

Issues

For the purpose of this options assessment it is assumed that the electrical and civil engineering infrastructure are replaced at the same time on a like for like basis at the end of an extended 25 year design life. The replacement programme and previous Asset Management strategies used a 20 year design life based around annual condition assessments and need.

In practice installations age at different rates due to location and usage. Existing equipment especially controllers can be declared obsolete 7-10 years after production ends and will need to be replaced if it can no longer be supported. Total replacement or modifications to an installation also occur at various stages of its design life due to larger network improvement or development lead schemes.

Actual replacement costs vary widely (£30,000 to £150,000) based on the scale and condition of individual installations, the requirements of current standards and developing technologies. Installations are rarely replaced on a like for like basis; schemes usually include corrective works and improvements. Such works can also be fully or partly funded from other sources and costs can be reduced when possible by inclusion of the works within multi-asset replacement schemes.

Other Key Assets

These include

- Urban Traffic Management Control (UTMC) systems
- Urban Traffic Control (UTC)
- Remote Monitoring System Equipment (RMS)

The UTMC system servers, operating equipment and associated software is nearing end of its operational life and maintenance support. Replacement options have been considered based on the renewal of LCC owned equipment or transfer to a "cloud" based hosted service provided by the system supplier. System replacement or conversion costs are expected to be in the region of £50,000 and will be funded from the capital allocation in 2017/18.

The UTC system on-street transmission equipment (97 sites) was replaced and converted to digital communications prior to the previously planned 2017/18 project as part of the property review and UTMC control room relocation in 2015.

The RMS on-street transmission equipment (210 sites) is analogue based and whilst not currently obsolete will require replacement and conversion to digital communications over the next 5-6 years. Monitoring and reporting options exist offering differing levels of control and functionality. Replacement or conversion costs vary depending on level of service and type of equipment used. The proposed strategy will be funded from the current capital allocation in preparation for full transfer to the next generation systems around 2023.

CCTV System Equipment

The BT Redcare leased lines were redirected to Orchard House as part of the control room relocation in 2015 and converted to digital fibre connections. CCTV system replacement options include conversion to broadband but current charging policies would significantly increase annual revenue costs if the existing 24/7 usage is to be maintained. Technology, service level, communications charges and control room location will lead any system replacement decision.

The varying age pre-existing columns used for the 2010 camera replacement project were inspected in 2014 and were not found to be in need of replacement.

CCTV System Installation date	2010
Expected replacement cycle (years)	10
Cost est.	£110,000 (excluding any comms costs)
Camera installation dates	2010 (25) + 2014-16 (10)
Expected replacement cycle (years)	10
Cost per unit including column	£5,000/£10,000

Tidal Flow System

The system controller, approach Variable Message Signs and all system cabling were replaced in 2015. The overhead LED lane control signs were installed in 2008. The signs have aluminium casings which are designed to last at least 20 years. The individual internal components are industry standard units which are replaceable from the stock of spares held at the Term Contractor's depot.

The original overhead gantry structures date from 1985. They were inspected in 2014 and no issues were found. Three gantries were replaced with new mast arm poles as part of the 2015 works. These and the original gantries form part of the Structures Asset.

Expected replacement cycle (years)	15
Cost est.	Unknown
System (excluding gantries and mast arms)	£130,000
Variable Message Signs	£70,000

Future Budget Implications

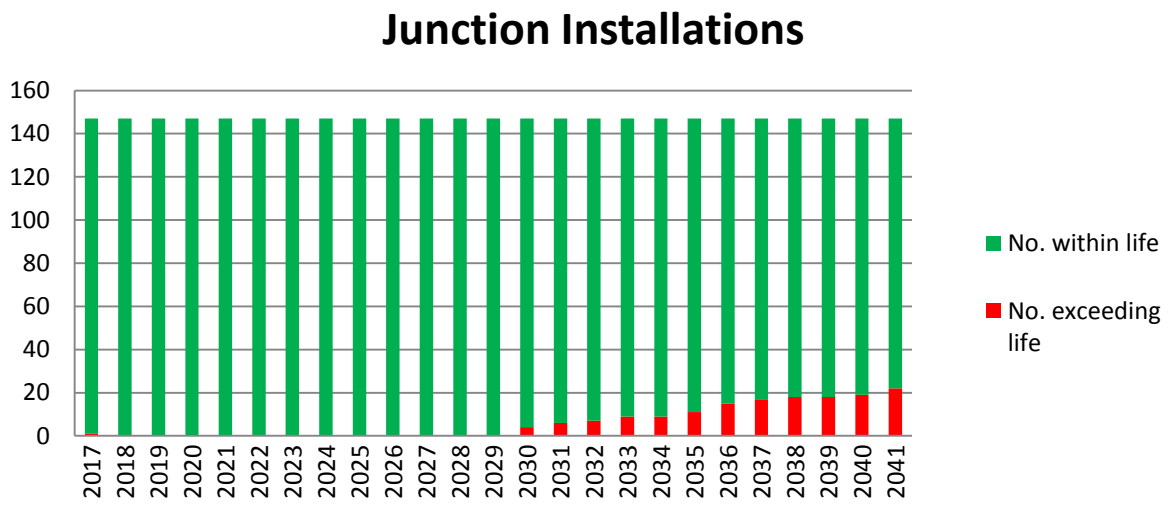
HAMP Cost Category	Expenditure (£000's) (2016/17)	% Spend
Routine - Reactive Repairs	£844	59%
Planned Maintenance	£590	41%
TOTAL	**£1,434**	

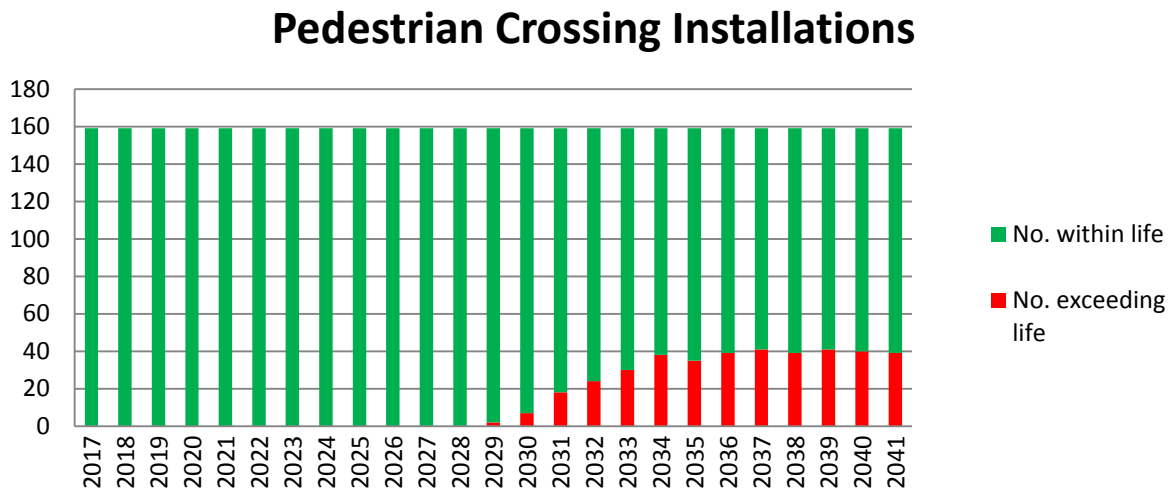
Continuance of current funding

This reflects the current budget allocation of £590,000 in relation to the planned maintenance funded replacement of the traffic and pedestrian signal installation asset only.

Note: *This funding level does not include the additional budget pressures to replace the CCTV system and cameras, the Tidal Flow system and the Urban Traffic Management Control Systems at the end of their expected life. These are separately identified in the budget projection table. It does however include the conversion of traffic signal equipment and communications from analogue to digital at the 200+ remotely monitored installations over the next 6 years.*

The chart below illustrates the use of the current budget of £600,000 over the next 25 years with the existing asset level and estimated average replacement costs of £80,000 for junctions and £35,000 for pedestrian crossings. For analysis purposes this has been split to fund an average of 5 no. junction installations and 4 no. pedestrian crossing installations to 2023 reverting to 5 no. thereafter. The analysis also assumes that the signal equipment is replaced at the end of design life 25 year cycle in conjunction with minor associated works to the civil engineering infrastructure.





It can be seen from the above charts that the extended design life offers a theoretical period of asset decline control until 2029-30. In reality installations will have to be addressed on an individual assessment basis during the 20-25 year age range especially with pre 2004 Term Contract installations having been built to lower standards. Beyond 2030 this level of expenditure will not be sufficient to ensure that the traffic signal junction and crossing installation equipment can be replaced within the new extended design life cycle.

Reactive Maintenance

With the extended design life it can be expected that there will be an increased need for more reactive repairs and this would impact on the revenue funded budgets. It is also likely that the installation controllers will have to be replaced during the 25 year period. Each generation of controller released to date has had a 6-7 year production lifespan. This is generally followed by a period of up to 10 years of guaranteed maintenance support but this varies by manufacturer. Due to ongoing advances in technology associated equipment is also becoming obsolete at an increasing rate as new products and alternative solutions enter the market.

Maintenance Backlog

The ongoing maintenance backlog will increase in extent if the revenue budgets are not supported. If insufficiently funded the installation replacement backlog beyond 2030 could lead to an increasing level of installation failures and associated short and medium term service losses.

Customer Satisfaction

This approach could initially result in a decreasing level of customer satisfaction if the anticipated increasing reactive maintenance requirements cannot be fulfilled. The longer term post 2030 installation replacement issue would result in an increasing level of complaints if the potential service losses were realised.

Taking into account the other asset elements, the forecast estimated budgetary requirements for the continuance of the £590,000 current funding option based on 16/17 values for 2017 to 2023 is as follows:

Year	Asset Costs				Whole Asset Costs
	Signals	CCTV	UTC/SCOOT System	Tidal Flow System	
2017	£540,000	£0	£50,000	£0	£590,000
2018	£540,000	£0	£50,000	£0	£590,000
2019	£540,000	£0	£50,000	£0	£590,000
2020	£540,000	£0	£50,000	£0	£590,000
2021	£540,000	£250,0000	£50,000	£0	£840,000
2022	£540,000	£0	£50,000	£0	£590,000
2023	£590,000	£0	£100,000	£0	£690,000

Continuance of current condition beyond 2023

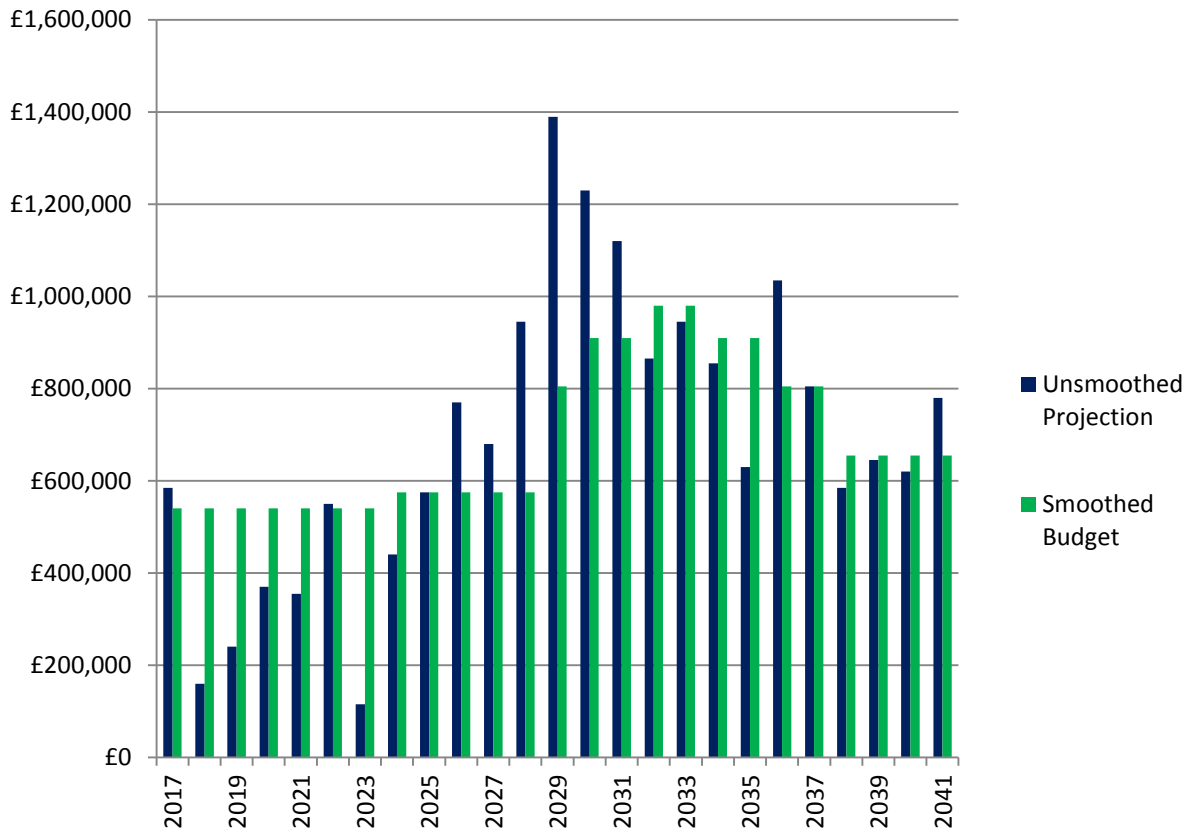
The chart below indicates the asset age profile of the junction and crossing installations and indicates the budget allocation required to maintain a steady state with the number of installations exceeding the extended 25 year expected life being controlled and kept to an absolute minimum.

Note: *This funding level does not include the additional budget pressures to replace the CCTV system and cameras, the Tidal Flow system and the Urban Traffic Management Control Systems at the end of their expected life.*

The chart shows the use of a varying budget over the next 25 years with the existing asset level and the estimated average replacement costs of £80,000 for junctions and £35,000 for pedestrian crossings. Again this has been split to fund an average of 5 no. junction installations and 4 no. pedestrian crossing installations to 2023.

Thereafter the replacement rate rises to control the number of installations exceeding the 25 year design life with a smoothed budget profile to minimise the impact of future year annual budget increases. The analysis again assumes that the signal equipment is replaced at the end of design life 25 year cycle in conjunction with minor associated works to the civil engineering infrastructure.

Budget Profile



To achieve this it is identified that expenditure on the replacement of traffic signal installations only should follow the following pattern:

Years	Potential Capital Expenditure
2017 – 2023	£540,000
2024 – 2028	£590,000
2029	£805,000
2030 – 2031	£910,000
2032 – 2033	£980,000
2034 - 2035	£910,000
2036 - 2037	£805,000
2038 - 2041	£655,000

Summary

It is clear from the above analysis that due to the planned and externally funded schemes of recent years, the state of the asset in 2017 now offers a period of condition and service level control up to the year 2030 if funding is retained at current levels.

The historic installation profile of the junctions and crossings has however created what will become an increasing asset replacement challenge beyond 2030 in terms of funding and the associated design and construction resource requirements.

If left to develop, this challenge will have a significant impact on the future condition of the asset and budget managers with the associated potential for reduced levels of service and customer satisfaction.

The option exists to minimise the future impact on budgets through a controlled and smoothed asset replacement programme. This adopts a degree of flexibility around the 25 year replacement target but avoids peaks and troughs, minimises unnecessary early intervention and excessive additional life expectancy requirements.

The budget profile options include measures to deal with the immediate need to modernise the remotely monitored installations communication equipment connected to the UTMC system. Due to the above mentioned state of the asset this can be achieved within the current equivalent junction and crossings budget allocation until 2023.

Other significant investment requirements for the related Traffic Signals assets will be programmed to minimise the impact of the additional budget pressures in the year undertaken.

Traffic Signals systems technology continues to develop at an increasing pace. This assessment is based on the equipment which is currently available to the market but it is unrealistic to project on this basis to 2041. It is highly likely that within this timeframe traffic control systems and installation replacement options will differ markedly with the anticipated introduction of increased vehicle interconnectivity and cooperative systems. Future asset assessments will have to be reviewed at an appropriate point in the development and release of such systems.

Appendix F – Risk Register

ID	Description of Risk		Risk Owner	Controls	Current Risk Score		Overall Risk Score	Review Date
	Source	Consequence			Likelihood	Impact		
1	The plan makes the assumption that will be normal rather than "severe" or "extreme" as defined in the Winter Maintenance Plan	Adverse weather will create higher levels of defects and deterioration than have been allowed for.	Infrastructure Commissioner	Budgets and predictions will be revised and this plan updated if abnormally harsh winters occur.	3	4	12	Annual
2	The plan is based on the assumption of no further drought event affecting the network.	Drought events create higher levels of defects and deterioration	Infrastructure Commissioner	Budgets and predictions will be revised and this plan updated if further drought events take place.	3	2	6	Annual
3	The plan is based on the assumption of no significant flood damage occurring.	Flood damage will create higher levels of defects and deterioration. Significant events could result in failure of key structures.	Infrastructure Commissioner	Budgets and predictions will be revised and this plan updated if flood damage occurs.	3	4	12	Annual
4	Available budgets have been assumed as shown in section 7.	External pressures mean that government further reduce the funding available for highways.	Infrastructure Commissioner	Target service standards will be revised to affordable levels.	3	3	9	Annual
5	Construction inflation will remain at level similar to the last 5 years.	Construction inflation will increase the cost of works (particularly oil costs as they affect the cost of road surfacing materials).	Infrastructure Commissioner	Target service standards will be revised to affordable levels.	2	3	6	Annual
6	Levels of defect and deterioration are based on current data which is limited for some assets (e.g. footways)	Assets deteriorate more rapidly than predicted and the investment required to meet targets is insufficient.	Infrastructure Commissioner	Split between planned and reactive maintenance budgets will be revised.	2	3	6	Annual
7	Resources are available to deliver the improvement actions.	Pressures on resources mean that staff is not allocated to service improvement tasks such that the predicted benefits cannot be fully achieved.	Infrastructure Commissioner	Target dates will be revised and reported.	4	3	12	Annual
8	Any increase in assets will be matched by sufficient additional maintenance funding	New requirements e.g. Floods and Water Management Act and developments result in increased assets to maintain.	Infrastructure Commissioner	Budgets and predictions will be revised and this plan updated	4	3	12	Annual
9	Reductions in revenue funding	Impacts on the long term condition of key assets	Infrastructure Commissioner	Budgets and predictions will be revised and this plan updated	4	3	12	Annual