Transport Asset Management Plan

Asset Performance Report 2016/17

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Executive Summary

The Asset Performance Report (APR) is the annual review of Transport Asset Management at Hertfordshire County Council (HCC), including updates on performance, policy, strategy development and other issues.

As an annual review, much of the material in the APR is a matter of factual updates and statistics rather than Policy or service changes. Chapters 1 and 2 give an overview of asset management nationally and locally while Chapters 3 to 8 detail particular asset groups.

Items impacting on Policies and strategies (new or updated) include:

- DfT Incentive Funding: successful award of Band 3 status, but with continuing work required to keep this.
- Code of Practice: ongoing work to fully understand the requirements and recommendations of the new 'Well-Managed Highway Infrastructure' Code
- Local Initiatives: Development of specific areas of work to ensure more efficient or effective working as outlined in National Guidance associated with Highways Asset Management.

Introduction

Asset Management continues to be at the heart of government thinking for the delivery of efficiencies within local and national highway services. The DfT incentive element of highway maintenance funding is now well established and I'm pleased to say that Hertfordshire achieved the top 'Level 3' this year, securing the full funding available to us. 2016 saw the launch of the long-awaited revised codes of practice and reviewing and, where necessary, revising our standards to take the new guidance into account will be a significant task over the next 18 months.

The highway service in HCC has continued to evolve with the second generation of framework contracts now in place building on the experience gained so far. This year the focus will be on the two main term contracts for works and professional services. The first major break points in these contracts are in September 2019, meaning we will need to decide this year whether to extend or retender and also what changes we might want to see under either scenario in order to support the continued evolution of the service.

The apprentice, graduate and 'gap year' programmes are starting to mature and show their value with some capable young individuals joining the service; we are also actively exploring what other courses we might be able to use or see developed in order to make further development available to existing staff via the apprenticeship levy.

The HCC highways service continues to be well placed to benefit from its strong position in the field of highway asset management by incorporating further improvements and efficiencies into the service as it develops over the next few years.

Rob Smith

Deputy Director, Environment (Highways)

May 2017

1. Asset Management State of the Nation

1.1 National Initiatives

1.1.1 DfT Incentive Funding.

From 2016/17, an increasing proportion of the Department for Transport's (DfT) capital allocation for highway maintenance will be tied to local authority performance in a number of key areas, such as asset management (AM) and efficiency.

HCC's most recent application was submitted in February 2017 and met the requirements of a Band 3 rating (the highest), securing the full funding allocation. This was achieved after a lot of work was done compiling historical data, implementing changes to practices and creating/updating documents. However, as ongoing annual submissions are required, authorities must continually demonstrate they are delivering value for money, carrying out cost effective improvements and achieving planned outcomes, and continuous improvements.

Table 1: DfT Incentive Funding Levels.

Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Band 1	100%	90%	60%	30%	10%	0%
Band 2	100%	100%	90%	70%	50%	30%
Band 3	100%	100%	100%	100%	100%	100%
Planned	100%	100%	100%	100%	100%	100%
Actual	100% Band 2	100% Band 2	**100% Band 3**			

1.1.2 Approved Code of Practice (CoP) Review

The new CoP 'Well-Managed Highway Infrastructure' was released in October 2016, and Highway Authorities have until October 2018 to adopt the risk based approach it describes. The new CoP replaces the three previous individual Codes; 'Well-Maintained Highways', 'Management of Highway Structures' and 'Well-lit Highways'.

The CoP details 36 recommendations; an initial review identified some work to be done but did not identify major challenges for HCC arising from the new Code. A more in-depth review HCC's current practices has begun, comparing these against the CoP and its Recommendations. Where they differ HCC will need to change practices to suit the CoP or document the reasons for taking an alternative approach.

A paper was taken to Highways Cabinet Panel on 1 December 2016 to make the Panel aware of the new CoP and its potential implications for the highways service.

1.2 Local Initiatives

1.2.1 Highway Infrastructure Asset Management Plan (HIAMP)

A review of the previous Transport Asset Management Plan (TAMP) began in 2016 and is scheduled to be completed in 2017; when completed the resulting suite of documents will become the HIAMP. This is a large body of work that will include:

- Updating the AM Policy and Strategy - that reflects the desired coordinated whole service approach to AM;
- Incorporating recommendations arising from the DfT Incentive Fund and the new CoP (where deemed suitable);
- Reviewing the interfaces between asset maintenance, network management and customer inputs; and
- Reviewing the lifecycle planning for main asset types.

1.2.2 Highways Asset Information

Ensuring current and reliable asset data is maintained is crucial when making decisions about service delivery, such as future maintenance treatments.

In 2016 a large amount of work was done by the AM Team under the Highways Asset Information (HAI) initiative. This project developed a policy, strategy, manual, processes and templates to ensure that when any asset is modified, added or removed from the network that the asset register is updated. It has been implemented by delivery teams for the 2017/18 financial year, with, indicators to measure performance still being developed.

1.2.3 Pavement Management Strategy

Work commenced in late 2016 on the creation of a Pavement Management Strategy (PMS). Due for completion in 2017 the PMS will further document HCC's strategy for maintaining the highway networks paved carriageway areas ('pavements').

It is designed to increase the efficiency and effectiveness of carriageway asset management and maintenance. This will ensure that the physical condition of the

County's roads under is adequate for the needs of road users. In essence it aims to answer the following three questions:

1. What do we want the pavements to deliver / how do we want them to perform?
2. What is the plan to achieve this?
3. How to measure whether this has been achieved?

The PMS document is the key link between the outcome requirements detailed in the contract document and the physical works being completed.

Asset Management Plan (TAMP)	**WHAT** minimum road conditions and Service Levels are required as defined through output and performance measures
Pavement Management Strategy (PMS)	**HOW** the contract team will manage and maintain the assets to meet the contract performance measures at least Whole of Life cost (i.e. the processes and systems that will be used). **WHO** has overall responsibility for each part of the process.
Standard Operating Procedures (SOPs)	These documents comprehensively outline the key steps to undertake a maintenance activity, including resources required, work methodology, and QA requirements.
Physical Works	Getting the work done on the ground.

1.2.4 Roads in Herts update

The AM Team are working alongside Development Management in updating the 'Road in Herts' document. This document serves as a guide for how the County's roads should be designed and is especially important for developers. The changes the AM Team are recommending are closely linked to AM functions and include but are not limited to:

- Reducing future maintenance issues/obligations from new adoptions; and
- Ensuring developers provide HCC with all relevant asset information.

1.2.5 Resilience

In 2016 a project was started to identify a Resilient Network and corresponding strategy; a key piece of evidence required by the new DfT Incentive Funding.

An interim Resilient Network was agreed in December 2016, with some outstanding issues to be resolved before a final network and strategy is approved.

1.2.6 One and Done

In February 2017 guidance was issued on the concept of 'One and Done' work. This is about ensuring that when any HCC directed works are undertaken on the highway network, due consideration is given to ensuring, that from a public, financial and technical perspective, known issues in that area are considered and, where affordable and beneficial, undertaken at the same time. If successfully implemented, balances Asset vs Network vs Customer vs Affordability.

1.2.7 Maintenance Capital Funding

Historically these have been submitted as one bid for the annual maintenance of the majority of the highway assets. The 2017/18 bids (submitted early 2017) have been split into individual asset bids for structures, carriageways, footways and drainage.

The aim here is to present a better overall picture or business case of what the maintenance funding will specifically be spent on and what it will deliver as a result.

1.2.8 Restoration Fund

In 2016 the Restoration Fund Project was implemented with the aim of tackling lower priority works which the standard maintenance budget cannot always cover. The focus in 2016 was on work to signs – cleaning, clearance of obscuring vegetation, adjusting, repairs or removal where the sign was no longer needed. Under the same programme and where possible utilising the traffic management for the signage works the following operations were also delivered:

- Road marking renewal;
- Vegetation works clearance; and
- Drainage works

1.2.9 Skid Resistance

In 2016, the processes associated with the Skid Resistance Strategy were completed and are now being implemented. This includes development of a complex model categorising the entire carriageway network against the requirements in the Strategy. As a result a methodology for prioritisation of sites that require further investigation for possible remedial works has been agreed.

There is also a future desire to carry out research into the choice of materials and cost effective treatments for increasing skid resistance.

2. Highway Infrastructure Overview

2.1 Summary of Highway Inventory and Value

HCC manages a complex highway network, with equally complex assets, all working to connect people and move goods across the large County (4.5 million daily journeys on the network). Whilst HCC as the Highway Authority is responsible for A, B, C and unclassified roads, the motorway and trunk roads operated by Highways England (i.e. M25, M1, A1) are closely linked with these, and how the region operates as a whole.

Highways assets managed by HCC have a replacement value (GRC) of £21 billion, which represents the theoretical cost to rebuild HCC's assets from scratch with a modern equivalent asset. The current value (DRC) of £7 billion represents the current value of the assets, in their current deteriorated condition.

Table 2: Overview of HCC's Highway Infrastructure Inventory

Highway Infrastructure Inventory Overview*		GRC (000s)	DRC (000s)
Carriageways – All classes A, B, C and U	Section Lengths - 5,110 km Area – 32.7 million m^2	£ 6,044,234	£ 5,552,622
Footways and Cycleways	Linear – 5,456 km Area – 10.4 million m^2	£ 810,439	£ 729,568
Structures	1,600 structures	£ 1,003,068	£ 6,25,539
Street Lighting	115,500 Lamp columns 2,000 feeder pillars 5,800 illuminated bollards 13,600 illuminated signs	£ 196,375	£ 51,146
Traffic Management Equipment (ITS)	467 signal crossings 197 signal junctions Traffic counters, VM signs.	£ 61,186	£ 26,934
Street Furniture	175,000 non illuminated signs 259 km safety fencing Bus stops/shelters, grit bins	£ 121,938	£ 60,969
Land		£12,440,011	
		£20,677,251	£ 7,046,779

Deriving these asset valuations is complex and varies annually due to factors such as unit rates, condition, inflation and the inventory information held. Small unit rate changes aggregated across millions of square meters impacts the total asset value.

*Information presented in this table is approximate. Further details are provided in individual sections

There is a continual drive for better asset and condition information and use of this information to guide the service and make efficiencies. AM utilises informed decision making which only comes from robust asset inventory and condition information.

2.2 Highway Annual Programme Overview

HCC operates multiple annual work programmes continually throughout the year. Some scheme types are seasonal due to weather requirements (longer daylight hours and generally better weather means summer is preferred), whilst others are less weather dependent and can be done throughout the year. Programmes allow for mobilisation and lead in; time used to finalise site details, designs, apply for necessary permits, traffic orders and order/mobilise materials as required.

Table 3: Overview of the Annual Highway Programmes

Programme	Programme Detail	Programme Information
Carriageway, Footway & Cycleways	Preventative Treatments. (surface dressing, slurry sealing & micro surfacing)	Preventative treatments seal the surface. These are undertaken from spring through to late summer and prepare the carriageway for the winter weather. The large scale and volume of sites covered results in these projects being managed as countywide work streams. Preliminary preparation work, such as patching, precedes the preventative treatment works.
	Surfacing. (overlay, inlay, reconstruction, recycling)	Surfacing works are less weather dependant and can be programmed throughout the year although works can be delayed by wet weather and low temperatures.
Drainage	Schemes	Significant design aspects and longer lead in times require many schemes to be programmed over two years, year 1 investigation and design, year 2 construction. Works carried out throughout the year.
Structures	Maintenance & Upgrades	
Lighting & Traffic Mgmt Equipment (ITS)	Refurbishment & Replacement	Specialist design and construction with delivery throughout the year. Often lighting or ITS improvements are delivered as part of a wider project. Works carried out throughout the year.

2.3 Budget Overview – Highway Infrastructure

Table 4 shows the annual expenditure across the different asset types for the past three years. On the whole, funding proportions are kept relatively constant for asset types across years. This gives consistent expenditure trends which can be tracked against condition. There are several investment peaks in particular years which represents additional funding for specific projects.

Table 4: Expenditure Overview for all Highway Infrastructure Assets 2014/15 – 2016/17

Programme Detail	2014/15 (000)	2015/16 (000)	2016/17 (000)
Carriageway Surfacing & Surface Treatment	£ 19,055	£ 20,278	£ 19,673
Footway Surfacing & Surface Treatment	£ 2,245	£ 5,035	£ 5,101
Drainage Schemes	£ 1,295	£ 1,200	£ 1,385
Structures Capital Maintenance Schemes	£ 1,416	£ 2,460	£ 4,950
Street Lighting Replacement	£ 1,580	£ 1,000	£ 1,951
ITS Refurbishment	£ 650	£ 446	£ 403

3. Carriageways

3.1 Inventory and Value

HCC have approximately *32.7 million m^2* of carriageway – the equivalent of about 4,500 football pitches. This equates to over *5,100kms* in total section length distributed as shown in Table 5.

Table 5: Overview of HCC Carriageway Network

Road Class		Length (km)	Area (m2)	Proportion % Length.	GRC (000s)	DRC (000s)
Urban	A	307.9	2,677,101	8.2	£ 550,349	£ 455,315
	B	176.8	1,373,736	4.2	£ 272,302	£ 233,210
	C	359.6	2,319,420	7.1	£ 416,379	£ 394,236
	U	2,638.5	16,833,630	51.5	£ 2,557,425	£ 2,859,600
Rural	A	403.3	3,601,997	11.0	£ 572,746	£ 610,788
	B	154.4	1,033,605	3.2	£ 142,947	£ 177,683
	C	468.3	2,430,477	7.5	£ 296,324	£ 416,446
	U	602.5	2,391,925	7.3	£ 279,147	£ 405,341
Total		**5,111.3**	**32,661,891**		**£ 5,087,619**	
Total carriageway GRC and DRC: Including linear items like kerbing, inflation and regional factors.					£ 6,044,234	£ 5,552,620

The carriageway asset is continually growing through the adoption of roads from new developments, new road construction and occasional de-trunking.

HCC has good basic carriageway dimension information (lengths and widths). In addition most roads have further limited information about surface type and construction, but only limited data relating to age and maintenance treatments.

The HAI initiative (section 1.2.1) is aiming to improve the information held by recording more detailed asset information, based on treatment type, material information and location as part of the contractual requirements for HCC suppliers.

This data will improve the deterioration modelling which in turn enables better informed decision making about the network investment. The condition and age profile will be used together to determine the right treatment at the right time for each road section. Optimisation work is used to determine which sections get treated within the limited resource available.

3.2 Strategy and Lifecycle Planning

3.2.1 Maintenance Strategy

The basic strategy for maintaining the carriageway network is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of carriageways and ensure they reach their full service potential as efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

In implementing the strategy account is taken of:

- The agreed Objectives (currently to keep the network in steady-state);
- The Benefits to customers and road-users (busier roads, which benefit more people, typically have a higher priority); and
- The potential Costs and Risks to the authority from different actions.

The strategy is primarily delivered through the Category 1, 2 and 4 programmes.

Table 6: Category 1, 2 and 4 Programmes

Category	Purpose	Typical Work Types	Delivery
Cat 1 (Safety Focus)	Reactive service. Keep the network safe & ensure HCC discharges its legal duties in a robust and efficient way.	Fixing potholes & similar defects	HST Contractor (Ringway)
Cat 2 (Serviceability Focus)	Planned preventative maintenance & repairs. Keep the network serviceable & prevent Cat 1 defects forming & defer the need for Cat 4 work.	Localised patching works & joint sealing to fix specific localised defects or areas of deterioration.	
Cat 4 (Efficiency Focus)	Planned preventative maintenance & planned renewals. Keep the network serviceable, prevent Cat 1 defects & deliver best value by focusing on long term benefits and whole life costs of options to deliver optimised programmes of work as efficiently as possible.	Large scheme-type works &, where possible, developed & delivered as work streams in order to get economies of scale	Framework contracts

3.2.2 Lifecycle Planning

Lifecycle planning is a key AM tool using condition and performance data to gauge asset deterioration over time and plan the most effective interventions at the right time to get the best performance from the asset.

Carriageway condition data is gathered through surveys and historical trends are compiled to establish how the asset performs and what factors influence longevity and treatment lives. Using this and considering cost and function over the asset life, optimum treatment intervention points are determined. Several models are used for predicting trends through empirical condition and inventory data; these are used to support strategic maintenance planning decisions.

3.3 Condition Monitoring and Performance

3.3.1 Condition Monitoring

The following surveys (machine on A, B & C and visual on U roads) are currently used to collect carriageway condition data. This condition information is then used to plan future maintenance works and produce a range of Performance Indicators (PI's).

Table 7: Carriageway Survey Types

Survey Type	Survey Scope	Coverage	Frequency	Output
Surface **C**ondition **A**ssessment for the **N**ational **N**etwork **R**oads (**SCANNER**)	A roads	100%	Annual (Sept – Oct)	Surface Defects, Roughness, Rutting, Spatial geometry
	B, & C roads	100% in one direction		
Coarse **V**isual **I**nspection Survey (**CVI**)	U roads	100%	Annual (Sept – Oct)	Surface Defects, Rutting
Safety Inspections	Varies	Varies	Ongoing	Surface Defects, Rutting – above a given tolerance
Sideways Force **C**oefficient **R**outine **I**nvestigation **M**achine (**SCRIM**)	A roads	100% in one direction	May - Sept	Measure of wet skid resistance of the road surface
	Busy B & C Roads	Varies		
Falling **W**eight **D**eflectometer (**FWD**)	Varies	Varies	Oct - Apr	Structural information
Core Data Logs	Varies	Varies	Oct - Apr	Structural information

3.3.2 Carriageway Performance

Carriageway condition targets are based on maintaining steady-state, relative to the 2010/11 condition baseline (when targets were last reviewed) as shown in Table 8.

Table 8: HCC Carriageway Condition Data

PI Description	PI Ref	Target 2010/11 Baseline	Historic Data				
			2012/13	2013/14	2014/15	2015/16	2016/17
A Road Condition	130-01	8%	6%	4%	4%	3%	3%
B&C Road Condition	130-02	11%	17%	14%	8%	6%	5%
U Road Condition	*U/C Roads	17%	11%	17%	19%	15%	16%
A Road ACI (Average Condition Index)		5.6	6.1	6.8	5.7	4.9	4.5
B, C, U Road ACI (Average Condition Index)		10.4	8.8	14.6	10.3	10.2	10.4

**Not compulsory data.*

National Indicators (NI) - The first two PI's are official NI's which are reported to Central Government annually as part of the single data set, required under Local Government Act 1972. The third PI, covering U roads, is no longer compulsory but is still collected by most local authorities on a voluntary basis and these results are collated by DfT and published along with the compulsory NIs as part of their annual report 'Road Conditions in England.

Each of these NI's shows *'Percentage of the network where maintenance should be considered'* so a lower number is better and the measure can broadly be thought of as the percentage of the network in 'poor' condition. Consequently this only reflects the proportion of poor roads and doesn't reflect the whole network condition. So although they are national standards and useful for benchmarking, they do not reflect or take account of preventative maintenance done on the network which might prevent a road falling into 'poor' condition.

To better reflect the condition of the whole of the network, HCC has developed and reports on its own Average Condition Index (ACI), which is discussed in more detail later.

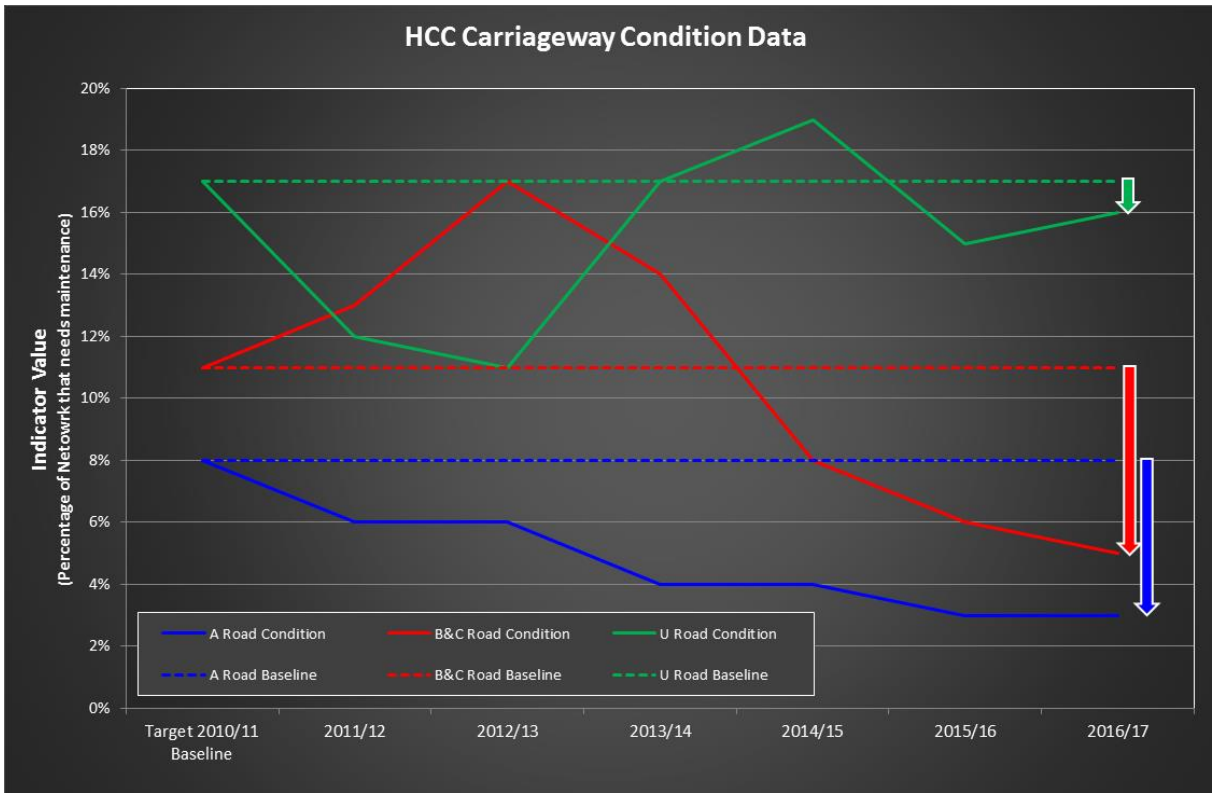

Figure 1: Historic Road Condition (NI).

The NI's recorded in HCC are generally in line with nation trends, with the condition improving, driving the lines downward.

A Roads – have fallen consistently over the 5 years from 8% down to 3% in 2015/16 with no occurrences of the condition worsening in the period. *Consistent improvement over the past 5 years*

B&C Roads – the first 3 years after the target was set at 11% saw the condition worsen with a peak level of 17% recorded in 2012/13. Since then it has fallen year on year, passing under the target for the first time in 2014/15. The latest record in 2015/16 of 6% is the lowest score on record. *Consistent improvement over the past 3 years*

U Roads – the first 3 years after the target was set at 17% saw the condition improve or stay the same. 2014/15 saw an anomaly where the condition worsened to a peak of 19%. Since then the last record is below the target at 15%. *Inconsistent -2 years improving, 2 year worsening, and 1 year improving.*

However, single-year variances must be treated with caution as condition returns can vary by up to a few percentage points from year to year and trends monitored over a longer period give a more reliable view.

Average Condition Index (ACI) - the final PI in Table 8 is ACI, which unlike the NI's is a measure of the overall condition of the network as a whole.

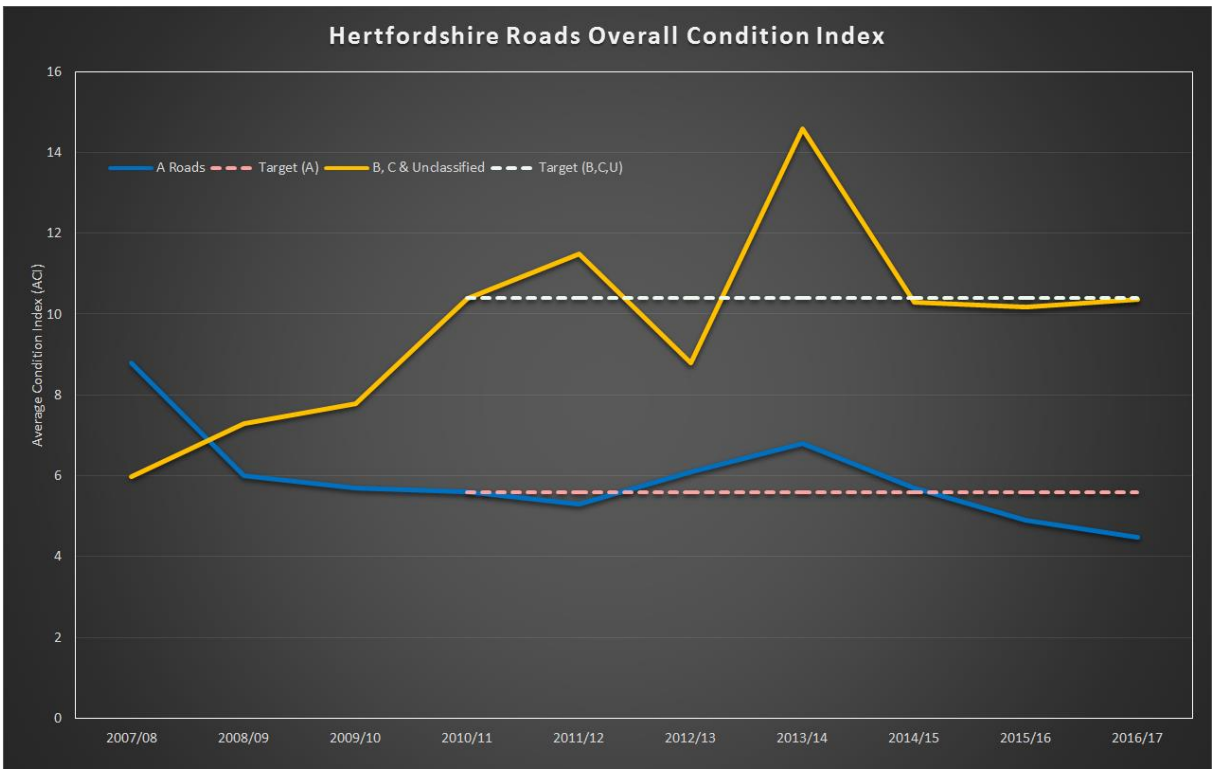

Figure 2: Historic Road Condition (ACI).

A Roads – have fallen consistently over the 5 years from 8% down to 3% in 2015/16 with no occurrences of the condition worsening in the period. *Consistent improvement over the past 5 years*

B, C & U Roads – condition has varied since the baseline was set, with it peaking at its worst in 2013/14. Since then it has improved and the past three years has seen it at or below the target.

3.4 Budget and Delivery

The overall budget for carriageway capital maintenance 2016/17 was **£19.6 million** distributed across the various work streams as shown in Table 9.

Table 9: Carriageway Capital Maintenance Programme.

Treatment Type	Delivered 2015/16		Delivered 2016/17		Proposed 2017/18	
	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)
A Road Surface Dressing	295,000	£1,475	403,000	£2,000	106,000	£750
A Road Surface Inlay	111,363	£4,485	150,185	£4,361	196,154	£5,100
Total A Roads	406,363	£5,960	553,185	£6,361	302,154	£5,850
Local Road Surface Dressing	479,000	£1,625	272,000	£900	619,000	£2,450
Local Road Micro Asphalt	793,808	£ 5,248	457,194	£ 3,405	356,700	£ 4,000
Local Road Surface Inlay	333,000	£ 7,445	490,000	£ 9,007	500,000	£ 8,669
Local Road Recycling/Recon.	-	-	-	-	-	-
Total Local Roads	1,605,808	£14,318	1,219,194	£13,312	1,475,700	£15,119
Total All Roads	2,012,171	£20,278	1,772,379	£19,673	1,777,854	£20,969

3.5 Key Issues and Improvement Actions

Condition Baseline

As detailed in 3.3.2 the condition baseline was set at those measure in 2010/11. It has been six years since that 'baseline' was set so it is due for a review; during this year, we will consider whether this baseline is still appropriate or whether it should be updated.

Pavement Management Strategy

Current work on developing this strategy will be completed during 2017/18 and will document and detail how HCC manage the carriageway assets (more detail is included in section 1.2.3).

Part of the PMS will be a ‘materials toolkit’ which in addition to its primary purpose of maximising carriageway life is to use supply chain and regional technical group discussions to gather expertise in the latest maintenance innovations and materials being used.

Maintenance in Design

Design and materials for improvement schemes need to take future maintenance into account. A whole-life cost approach is preferable to a short term view and a strategy and guidance is being developed to provide design engineers with information to assist in designing with this in mind.

Drainage

Poor drainage can contribute to and accelerate carriageway deterioration – hence there is a key link and need to provide a clear strategy/ approach to the design and regular maintenance of drainage for carriageway preservation. This will be a key section of the Pavement Management Strategy.

4. Footways and Cycleways

4.1 Inventory and Value

HCC have over *10 million m^2* of surfaced footways and cycleways. This equates to over 5,400kms of total section length distributed as shown in Table 10, all of which are operated and maintained by HCC.

Table 10: Overview of HCC Footway Network

Footway Hierarchy		Length (km)	Area (m^2)	Proportion % Length.	GRC (000s)	DRC (000s)
Urban	1	35.8	107,644	0.7	£ 8,864	£ 5,107
	2	169.6	376,630	3.1	£ 28,492	£ 22,617
	3	628.5	1,291,019	11.5	£ 87,066	£ 83,900
	4	3,971.1	7,531,630	72.8	£ 487,673	£ 531,126
Rural	1	0.0	0	0	0	0
	2	1.9	3,383	0	£ 232	0
	3	27.3	54,412	0.5	£ 3,332	£ 3,648
	4	504.4	825,763	9.2	£ 50,388	£ 67,120
Cycleway, bound surface		117.4	213,125	2.2	£ 16,123	£ 16,050
Total		**5,456**	**10,403,606**		**£ 682,170**	
Total footway and cycleway GRC and DRC including inflation and regional factor					£ 810,439	£ 729,568

This asset inventory is growing through the adoption of new developments and the creation and extension of existing features across the county. There is a continual need to ensure the footway asset inventory is up to date with accurate information.

The footway inventory is generally quite good, with a lot of available data. Basic footway dimensions have been historically collected and are held within Confirm. Previously surface material had not been updated; however the Footway Network Survey (FNS) has made this data available and has been added to the inventory. More detail about the surface material and its characteristics is being collected as surface treatments or resurfacing works are carried out.

Age profiles of footways and cycleways have not been recorded in the past and so condition has had to be related to expected age. However, for works carried out in future this data will now be recorded.

4.2 Strategy and Lifecycle Planning

4.2.1 Maintenance Strategy

The strategy is to maintain the asset as effectively and efficiently as possible by targeting resources to where they will give the greatest overall long-term benefit. Implementation of the strategy takes account of:

- Benefits to customers and pedestrians (busier footways, which will benefit more people, typically have a higher priority); and
- Potential Costs and Risks to the authority from different courses of action.

The strategy is primarily delivered through the Cat 1, 2 and 4 programmes, each of which has its own role to play (see Table 7 and section 3.3.1 for more information).

4.2.2 Lifecycle Planning

A simple lifecycle model uses the condition information collated within the FNS. Each footway is modelled for in-year treatment selection and estimated cost of works. Sites that are identified from the model are verified for suitability and extent by the project manager.

4.3 Condition Monitoring and Performance

4.3.1 Condition Monitoring

The nationally developed FNS was adopted in 2011 as the format to collect footway condition data. It is a quick network level survey tool which enables authorities to determine which footways require further consideration for possible treatment.

It is efficient for surveying of large sections of footways, as traditional surveys collected data relating to individual defects/defect types along a footway section. This was time consuming and resulted in either a very coarse or overly detailed results (depending on survey used). FNS provides a balance by using an assessment rating instead of a defect type.

Alternatives to the standard FNS have been developed as it was felt that its basic form did not provide enough detail for scheme development. HCC have created a simple lifecycle model and the additional inspection data captured is used for analysis and to update the inventory. Furthermore, the collection of ‘additional data’

will enable the creation of a deterioration model based. This is the long term objective of condition monitoring and will help provide future value for money.

Table 11: FNS

Survey Type	Survey Scope	Coverage	Frequency	Output
Footway Network Survey	All footways	100%	Network to be covered every 2 years.*	Condition banding together with the major cause of defect onsite. Asset inventory information provided for update

**The FNS Survey aims to cover the entire network every 2 years. Due to recent changes, this is not currently being achieved. The introduction of new technology and streamlined work processes should ensure that the target is met in the near future.*

Survey results provide a consistent benchmark for site comparisons and aiding scheme selection (but do not yet give a robust means of reporting overall condition). The additions to the survey methodology developed a measure that reasonably reflects the condition of the footway network as the public might perceive it.

4.3.2 Footway Performance

A simple lifecycle model is used that reports a desired treatment against each footway section based upon condition recorded during the FNS. The results are then calibrated against onsite inspections and a robust network programme is formed. In line with the footway and cycleway strategy, this work is supplemented by discussions with Ringway on issues emerging from the Cat 1 and 2 routes that need consideration for inclusion in the Cat 4 programmes.

Reporting asset performance is a key part of the longer term desired outcomes for the development of the footway survey. This will help to support both performance management and investment decisions.

4.4 Budget and Delivery

The overall budget for footway capital maintenance 2016/17 was **£5.1 million** distributed across the various work streams as shown in Table 12. Note that this includes significant footway schemes funding via the Highway Locality Budget as well as those that formed part of the core programme.

Table 12: Footway and Cycleway Capital Maintenance Programme.

Treatment Type	Delivered 2015/16		Delivered 2016/17		Proposed 2017/18	
	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)	Area (m^2)	Cost (000)
Surface treatment (micro asphalt)	78,219	£ 1,115	95,587	£ 1,223	82,155	£ 1,063
Resurfacing & Reconstruction	81,321	£ 3,920	80,470	£ 3,878	61,581	£ 2,995
Total	**159,540**	**£5,035**	**176,057**	**£5,101**	**143,736**	**£ 4,058.**

4.5 Key Issues and Improvement Actions

- Footway Lifecycle Planning Model

  The simple network level lifecycle planning model has already evolved into a footway section model. Further work and analysis will be undertaken in conjunction with the footway survey. Once the rule set for the survey has been established, a lifecycle planning model can utilise the condition information and translate this data into treatment requirements for each footway section.

- Footway Deterioration Model

  Leading on from the lifecycle planning model a deterioration model will be developed over the coming years. This model will provide an optimised programme of works and a condition forecast based on budget expenditure. This can be used to understand what investment level is needed to maintain the footway network at the current service level, or what would happen to future condition based on different budget scenarios.

5. Drainage

5.1 Inventory and Value

The HCC highway drainage system is an evolved asset comprised of several distinct asset sub-groups:

- Carriageway and footway gullies (drainage system inlets);
- Inspection and access chambers (manholes and catchpits);
- Sustainable Drainage Systems (SuDS) such as soakaways and storm cells etc.;
- Highway drains (buried pipework);
- Outfall structures (drainage system outlets to watercourses);
- Roadside grips (shallow unlined ditch inlet channels cut in verges); and
- Road-side ditches (in many cases owned by adjacent landowners).

These assets work in combination to remove surface water from the highway and transport it into a water course, utility storm system or SuDS system.

The drainage asset valuation is included in the carriageway linear items valuation and forms part of the carriageway GRC. Drainage asset inventory is not a readily available data set so general assumptions have been made based upon carriageway classification and modern equivalent design to value the drainage assets.

5.2 Strategy and Lifecycle Planning

5.2.1 Maintenance Strategy

The basic strategy for maintaining the highways drainage network is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of the highway drainage assets and ensure they meet their full service potential efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

The strategy is delivered through the Category 1, 2, 4 and 5 programmes.

Table 13: Drainage Service Delivery

Category	Purpose / Activities
Cat 1 **Emergency/Urgent Works**	Placing flood warning signs, cleaning up and jetting pipes from flood events and minor reactive repairs.
Cat 2 **Reactive Maintenance**	Minor repairs and/or adhoc clearance of non-functioning drainage assets such as grips, ditches and pipe drains etc. Investigation and escalation of more significant issues to the Cat 4 programme.
Cat 4 **IWP Drainage Schemes**	More significant drainage repairs or major improvement works identified through Cat 2 and 5 activities.
Cat 5 **Cyclical Routine Maintenance**	Cyclic cleansing / emptying of road-side gullies and similar drainage assets.

5.2.2 Lifecycle Planning

Lifecycle planning is a key AM tool using condition and performance data to gauge asset deterioration over time and predict and plan future interventions to make them as effective and efficient as possible. However, there are a number of challenges with applying this technique to drainage assets. Many drainage assets like pipes, gullies and chambers are long- or indefinite-life assets, meaning that they will not need renewal or replacement on a predictable basis within a normal lifecycle. Other assets that do need renewal or replacement, like soakaways, are difficult to access for routine condition surveys and the inventory we have is incomplete or unreliable. The confidence in the accuracy of the drainage inventory and the lack of easily obtained, consistent, repeatable condition information (many buried drainage assets require expensive CCTV surveys to assess condition) makes lifecycle planning more difficult for drainage assets than for many other asset types. Future improvements to the asset inventory and condition data techniques may address this in the future but, in the short term, the lifecycle planning focus for drainage assets is likely to focus on key assets and locations where the work will significantly improve network resilience.

Cyclical routine maintenance is delivered by the HST contractor Ringway as part of the Cat 5 ‘Contractor Led’ service and has elements of lifecycle planning in its structure. Emptying and cleaning HCC’s 168,000 gullies is undertaken on an 18 month cycle with vulnerable gullies (6,152) and those gullies on high speed roads (7,122) cleaned on a 6 and 12 month cycle respectively. A project is underway to collect and record silt levels in gullies as they are cleaned to enable future

improvements to the cyclical maintenance scheduling. Knowledge of silt levels will provide a record of asset performance and may allow cleaning schedules to be refined in the future to more closely reflect actual need.

In addition The Cat 1 and 2 service is now being used to inform the Cat 5 service and will provide further information to identify hot spot areas.

5.3 Condition and Performance

5.3.1 Condition Monitoring

Aside from the silt level measuring and general condition check on gullies during emptying described above there is no routine condition monitoring of drainage assets for the reasons touched on in 5.2.2.

5.3.2 Drainage Performance

For reasons previously addressed there is no structured measure of how the drainage asset is performing. Possible measures that could be adopted include but are not limited to:

- Number of highway flooding incidents
- Silt levels in gullies
- Road traffic collisions attributed to highway flooding/surface water

5.4 Budget and Delivery

The overall budget for drainage maintenance schemes in 2016/17 was £1.38 million distributed across the various project types as shown in Table 14.

Table 14: Drainage Capital Maintenance Programme.

Reference	Delivered 2015/16		Delivered 2016/17		Proposed 2017/18	
	No. Schemes	Total Expenditure	No. Schemes	Total Expenditure	No. Schemes	Total Expenditure
Investigation	16	£1,200,000	12	£1,385,000	10	£1,600,000
Quick Win	1		1		0	
Minor Works	2		1		1	
Major Schemes	20		18		18	
3rd Party	4		0		TBC	
Total	**43**		**32**		**29**	

5.5 Key Issues and Improvement Actions

HCC have a database of carriageway and footway gullies but little information on other drainage assets, despite the huge amount in existence. This currently means HCC cannot organise a cyclical cleaning or inspection regime on these other assets and the lack of regular maintenance could lead to premature failure of said assets.

The HAI intuitive is aiming to continually improve the accuracy and completeness of drainage assets year on year.

6. Structures

6.1 Inventory and Value

HCC has a large bridge stock being seventh on the list of highway authorities in terms of numbers of structures. HCC's ageing bridge stock is typical of similar Counties, with many historic structures but with a large proportion of reinforced concrete bridges many of which are now more than half way through their anticipated life. HCC's structures are broken down into the structure types shown in Table 15.

Table 15: Overview of Bridge Stock Valuation at April 2016

Asset Group	No. of Assets	GRC Value (000)	DRC Value (000)
Bridges	622	£ 699,971	£ 277,923
Retaining Walls	74	£ 16,644	£ 9,158
Culverts	442	£ 94.259	£ 64,017
Sign Gantries	8	£ 746	£ 546
High Masts	114	£ 3,405	£ 1,930
Tunnels & Underpasses	5	£ 61,194	£ 44,591
Other	337	£ 126,848	£ 83,250
Total	**1,602**	**£ 1,003,068**	**£ 625,540**

This large highway structures stock is currently valued at around £1 billion. The 1,600 highway structures listed above are owned and maintained by HCC, but there are 900 more structures in the county owned and maintained by Network Rail, Canals and Rivers Trust and the District and Borough Councils.

6.2 Strategy and Lifecycle Planning

6.2.1 Maintenance Strategy

The basic strategy for maintaining the highways structures assets is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To extend the life of the highway structures assets and ensure they meet their full service potential efficiently and effectively as possible by adopting an asset management approach that seeks to minimise whole life costs for a given level of service and maximise the benefits gained from the available investment.

Bridges schemes are promoted in two ways as detailed in Table 16 below.

Table 16: Bridge Schemes

Category	Purpose / Activities
Reactive Maintenance	Inspection records identify schemes to correct poor condition
Targeted Preventative Maintenance	Asset Management approach which utilises targeted preventative maintenance interventions to maximise the life and value from the DfT's **Structures Asset Management Planning Toolkit (SAMPT).** The toolkit is summarised below in Figure 3.

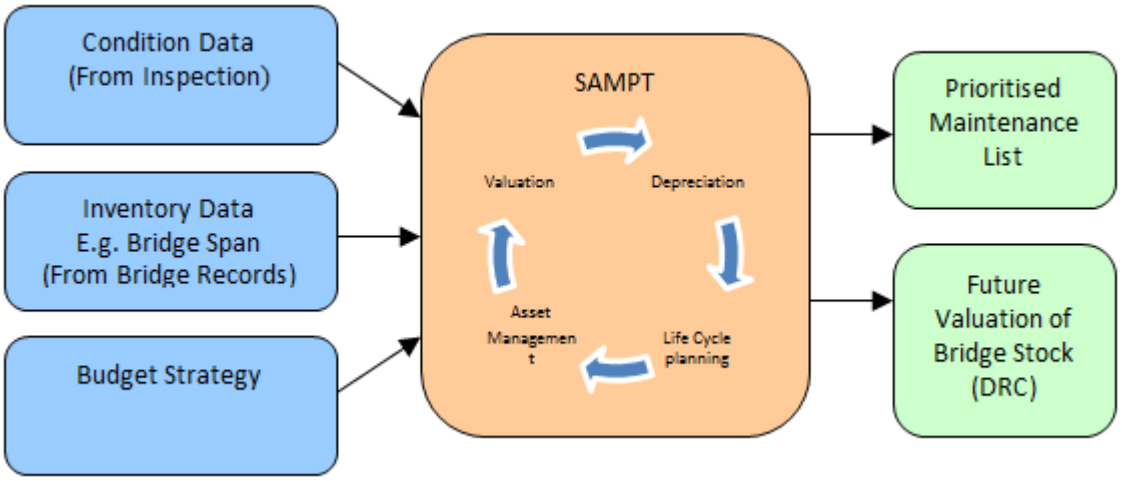

Figure 3: The Structures Asset Management Planning Toolkit

The SAMPT's valuation is used in Hertfordshire's accounts in line with Whole Government Accounting (WGA) Principles.

6.2.2 Lifecycle Planning

The introduction of the SAMPT has enabled HCC to develop a basis for lifecycle planning. HCC has developed this programme further and uses the base information for determining estimated service lives and deterioration rates for each element.

The toolkit has been used to look at future predicted condition information based on different capital expenditure. The complexities of the structural model are being further refined, to better inform the life cycle planning and maintenance prioritisation of the structure stock.

6.3 Condition Monitoring and Performance

6.3.1 Condition Monitoring

Condition monitoring of structures is undertaken as follows:

- General Inspection every two years; and
- Detailed Principal Inspection every 6-10 years.

Table 17 – Condition of Structures Stock

Structure Type	Number	Condition Band				
		Very Good	Good	Fair	Poor	Very Poor
Bridges	622	254	225	128	15	0
Retaining Walls	74	30	18	16	10	0
Culverts	442	204	144	78	13	3
Sign/Signal Gantries	8	4	3	1	0	0
High Mast Lighting	114	0	0	0	114	0
Tunnels and Vehicular U/P	5	1	4	0	0	0
Other	337	176	127	33	1	0
Full stock	**1,602**	**669**	**521**	**256**	**153**	**3**

6.3.2 Structures Performance

Condition data generates a Bridge Condition Indicator Score (BCI) for every structure. The BCI's are combined to calculate an overall Bridge Stock Condition Score (BSCI). $BCI_{AVERAGE}$ scores include all elements of the bridge. $BCI_{CRITICAL}$ score considers only load carrying and safety critical elements.

Hertfordshire's $BSCI_{AVERAGE}$ score is 89.38, $BSCI_{CRITICAL}$ score is 81.13. This places both indicators in the 'good' range.

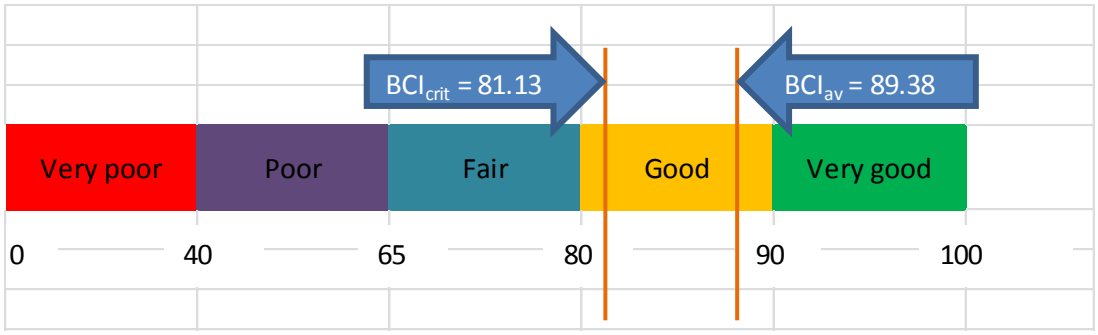

Figure 3: Hertfordshire BCI (Stock) Condition Banding

The 2017 Bridge Stock Condition Scores have changed only marginally from the previous calculation in April 2016.

Table 19: HCC Structures Condition Scores

Condition	April 2013	April 2014	April 2015	April 2016	April 2017
$BSCI_{AVERAGE}$	90	90	89	89.44	89.38
$BSCI_{CRITICAL}$	87	84	80	81.13	81.13

6.4 Budget and Delivery

The Structures budget for 2016/17 was increased significantly from previous years, based on an analysis of the risk and deterioration profile of the stock. The forward works programme is planned to deliver a continuing capital spend of £4.95m.

Table 20: IWP Scheme Delivery 2016-2017

Bridges Capital Programme	Delivered 15/16	Delivered 16/17	Planned 17/18
Highway bridge refurbishment	£2,158,478	£ 527,406	£1,515,000
Footbridge refurbishment	£ 13,562	£ 709,608	£ 985,042
Retaining wall, Culvert and "Orphan"	£ 0	£ 658,212	£ 621,734
Waterproofing and joint replacement	£ 6,793	£1,603,064	£ 798,224
Bridge capacity assessment	£ 33,841	£ 20,960	£ 110,000
Programme Management and overheads	£ 146,474	£ 226,644	£ 250,000
Overheads	£ 0	£ 500,000	£ 600,000
Asset Management	£ 105,114	£ 15,440	£ 70,000
Total	**£2,464,261**	**£4,261,335**	**£4,950,000**

7. Street Lighting

7.1 Inventory and Value

HCC has the fifth largest number of lighting units for any UK highway authority, with a gross replacement cost of almost £200 million. The various street lighting assets are summarised in Table 21.

Table 21: Street Lighting Assets

Street Lighting Assets	Number of units	GRC (000)
Columns up to 12.0m	113,637	£ 179,711
Subway Units	3,907	£ 1,102
Feeder Pillar	1,950	£ 2,954
Columns up to 15.0m	114	£ 275
Footway Street Lighting	905	£ 317
Illuminated Signs.	13,594	£ 9,059
Belisha Beacon	416	£ 383
Bus Shelter	96	£ 21
Centre Island Beacons	338	£ 203
Safety Bollard	5,815	£ 2,350
Total	**140,772**	**£ 196,375**

Since 2014 HCC has been systematically replacing street lighting lanterns with new Light Emitting Diode technology combined with a central management system (LED/CMS Project), in the following Phases:

Table 22: LED/CMS Project Summary

Phase	Description	Appx Number	CapEx
1*	A Roads	12,600	£ 7.1m
2	Exceptions (lights on all night, not A Roads) and heritage lighting on A Roads	21,000	£ 7.0m
3	Outlying settlements and remote footways that are in part night lighting	9,000	£ 3.5m
4**	Part night lit assets	70,000	£18.5m
4***	Belisha Beacons	388	£84,000

All phases of work include survey, design, installation of new LED and CMS

** includes installation of lighting control CMS (central management system) infrastructure*
*** includes other heritage lighting to be reconditioned or refurbished*
**** conversion of remaining stock to LED only*

To date, circa 45,000 units have been changed (including ad hoc replacements following column knockdowns), reducing carbon emissions by 5231 tonnes p.a.

7.2 Strategy and Lifecycle Planning

7.2.1 Maintenance Strategy

Street lighting maintenance is delivered by the HST contractor Ringway as part of the Cat 5 'Contractor Led' service. The strategy is implemented through the 'safe and operational' approach with regard to the ongoing maintenance and replacement of the existing street lighting and illuminated signs infrastructure. All replacements are installed with LED/CMS technology to ensure they fully integrate with the Council's long term strategy.

The strategy is based on **new technology** installed on **structurally sound** apparatus. This asset management approach is data driven and condition led, resulting in less wastage and making the best use of the existing infrastructure.

Works are also being carried out to develop Capital Bids for 2018/19 with regard to the replacement or renewal (where required) of the remaining street lighting assets not included within the LED/CMS project, these include high mast lighting, subways, illuminated signs, bollards, school crossing lights, and the existing underground private cable network.

7.2.2 Lifecycle Planning

The HMEP suite of tools includes a lifecycle planning toolkit for Ancillary Assets which has been reviewed by the HCC AM Team. Further work is required to complete a fully functional lifecycle plan for lighting assets; this will allow us to provide robust analysis of the works projects to optimise the budget spent.

7.3 Condition Monitoring and Performance

7.3.1 Condition Monitoring

An ongoing programme of non-destructive structural testing is being undertaken on street lighting columns 10 years old or older. Since the commencement of the HST contract, around 90,000 tests have been undertaken, some of which are now into their second 3-year cycle. A 5-year testing strategy is currently being developed.

The structural testing programme is now producing robust information, where only columns identified as life-expired are actually replaced. The remaining units which have passed the structural inspection are factored back into the rolling programme for inspection within a three or six year period. This process has ensured that the life of individual units is maximised.

7.3.2 Street Lighting Performance

Table 23 below sets out the structural testing quantities, along with the estimated number of replacements for the year following the test.

Table 23: Structural Testing Programme

Year	Total Number of Structural Tests	Estimated Number of Column Replacements
2016/17	16,483	495 (2017/18)
2017/18	10,030	301 (2018/19)
2018/19	8,215	247 (2019/20)
2019/20	7,488	225 (2020/21)

In addition to the column replacements as a consequence of the planned structural testing, an additional circa 1,500 units per annum are replaced as a consequence of accident damage, vandalism and visual detection via reactive inspections.

7.4 Budget and Delivery

The overall budget for street lighting capital maintenance 2016/17 was **£1.95 million** distributed across the various work streams as shown in Table 24.

Table 24: Street Lighting Capital Maintenance

Street Lighting Schemes	Delivered 2015/16		Delivered 2016/17		Proposed 2017/18	
	Number of units	Cost (000)	Number of units	Cost (000)	Number of units	Cost (£000)
Replacement Street Lighting	597	£ 940	1,103	£ 1,336	1,240	£ 1,500
Replacement High Masts	0	0	0	0	0	0
Sign Lighting / De-Illumination	30	£ 21	552	£ 591	600	£ 642
Cable Replacement	5	£ 18	8	£ 19	40	£ 100
Replacement Subway Fittings	4	21	12	£ 5	60	£ 25
Total	**636**	**£ 1,000**	**1,675**	**£ 1,951**	**1,940**	**£ 2,267**

7.5 Key Issues and Improvement Actions

In response to interest shown, the Council has shared its approach and lessons learned regarding the LED/CMS project at a regional (e.g. ADEPT), national (e.g. Highway Electrical Association Conference) and international level (e.g. Portugal and Singapore). The Council's paper 'from PFI to LED' has also been shortlisted for the CIHT Sustainability Award 2017.

With conversion of part night lit assets on Traffic Routes - B & C roads (part of Phase 4 of the LED/CMS project) due to be completed by June 2017, a review of the existing customer fault reporting and the night scouting process is currently being undertaken. There is potential to cease and/or reduce the night scouting of street lighting equipment and also to review the way in which subways are monitored.

The Project Team is looking at further dimming, in conjunction with the road safety team, and police.

The Council is also exploring the potential of using CMS infrastructure for new applications and to consolidate existing systems, viz.

- Dynamic dimming of street lighting based on traffic flow
- Ice detection in the carriageway
- Sensors in gullies to measure silt levels and in traffic cones to give travel information
- Wind speed and air pollution monitors

8. Intelligent Transport Systems

8.1 Inventory and Value

The Intelligent Transport System (ITS) asset is made up of a wide range of specialist electronic equipment across the County, performing a multitude of different functions, as shown in Table 25. Its purpose is to facilitate the efficient movement of vehicles, pedestrians, cyclists and ease congestion around the HCC network.

Table 25: ITS Assets

Asset Type	No of Units	GRC Value (000)
Signal controlled crossings	467	£ 25,320
Signal Controlled Road Junction	197	£ 20,370
Zebra Crossing	198	£ 5,940
Vehicle Activated Signs - (VAS)	142	£ 497
ANPR and CCTV Cameras	234	£ 1,047
Safety and speed camera equipment	219	£ 2,190
Automatic Traffic Counters	418	£ 229
E P Information Point	47	£ 470
School Crossing (flashing amber lights per sign)	157	£ 628
Fixed and Mobile EMS/VMS Signs	80	£ 1,316
Real time passenger info (display & remote comms)	131	£ 655
Real time passenger info (in vehicle)	140	£ 840
Car Park Signs	33	£ 495
Other ITS equipment	25	£ 1,191
Total	**2,553**	**£ 61,188**

The ITS assets are currently worth £61 million.

8.2 Strategy and Lifecycle Planning

8.2.1 Maintenance Strategy

The basic strategy for maintaining the highways ITS assets is:

- To discharge HCC's statutory duty under the Highways Act to maintain the public highway in a safe condition, thus ensuring the safe and efficient movement of people and goods in line with the hierarchy; and
- To ensure the expeditious movement of traffic under the Traffic Management Act (TMA) 2004.

ITS maintenance is delivered by the HST contractor Ringway as part of the Cat 5 'Contractor Led' service. The strategy is implemented through the 'safe and operational' approach with regard to the ongoing maintenance and replacement of the existing ITS infrastructure.

Many traffic signals are operating outside of their recommended life cycle (15 years). Existing equipment has become increasingly unreliable and difficult to maintain with problems including leaning poles, poor detection and connection issues and sites vulnerable to water ingress and pest infestation.

Replacing individual traffic signal components can prolong the life of the junction arrangement, but this approach is not always cost effective and does not deliver many additional benefits. Compatibility issues, maintaining outmoded spares and negligible energy savings can ultimately lead to increased maintenance costs without significantly reducing the likelihood of failures.

Renewing whole junction installations provide the means to update all the associated hardware including control equipment, resulting in improved optimised journey times, remote monitoring and operation, reduced maintenance liability and reduced energy consumption.

Works are being carried out based on the current Asset Profile to develop Capital Bids for 2018/19 with regard to the refurbishment or replacement of ITS assets that comprise:

- Traffic signal junction sites on the priority network which are in urgent need of replacement and already exceed the recommended 15 year replacement period
- Mast arms at traffic signal installations (subject to principal inspections to assess the structural condition);
- Sites which exceed the 15 year life expectancy; replacing the remaining sites within the county which use Halogen signal heads with LED signals; and
- Replacing the remote monitoring system connection to the sites (from land based Public Switched Telephone Network to Global System for Mobile communication).

8.2.2 Lifecycle Planning

The HMEP suite of tools includes a lifecycle planning toolkit for Ancillary Assets which has been reviewed by the HCC AM Team. Further work is required to complete a fully functional lifecycle plan for ITS assets, but this is required to provide robust, realistic analysis of the works projects to optimise the budget spent.

On the basis of a 15 year asset life, there are approximately 200 sites (40%) within the county which are fully or partially older than this and a further 220 sites. which will also exceed the expected life cycle within the next five years. As around 20 sites are refurbished per year, this could mean the effects of not having a lifecycle plan could be felt if funding were to be reduced/delayed.

Refurbishment is the preferred option as it allows HCC to maintain the equipment at an age limit which maximises reliability and effectiveness. Sites are selected on the basis of age, current reliability levels and the junction/crossings strategic importance.

8.3 Condition Monitoring and Performance

8.3.1 Condition Monitoring

ITS maintenance is delivered by the HST contractor Ringway as part of the Cat 5 ‘Contractor Led’ service and as such condition monitoring is integrated as part of this service. An ongoing programme of non-destructive structural and electrical testing is being undertaken on ITS assets that require it.

8.3.2 ITS Performance

The performance of ITS equipment is closely related to the Network Management function of the highway network. The safe and reliable operation of signal controlled junctions is vital to effective performance of the highway network. Signal failures at junctions quickly lead to congestion, increased journey times, accidents and environmental impacts.

As related to asset management there is currently no defined performance management system or measures in place.

8.4 Budget and Delivery

The overall budget for ITS capital maintenance 2016/17 was £403k distributed across the two work streams as shown in Table 26.

Table 26: ITS Capital Maintenance Programme

Traffic Management Equipment	Delivered 2015/16		Delivered 2016/17		Proposed 2017/18	
	No. of units	Cost (000)	No. of units	Cost (000)	No. of units	Cost (£000)
Replacement Junction	1	£115	3	£189	5	£263
Replacement Crossing	19	£331	16	£214	17	£375
Replacement CCTV	0	0	0	0	0	0
Replacement ANPR	0	0	0	0	0	0
Replacement VMS	0	0	0	0	0	0
Total	**20**	**£446**	**19**	**£403**	**22**	**£638**

8.5 Key Issues and Improvement Actions

HCC submitted a capital bid to the DfT (circa £1million) in late March 2017 for Highways Maintenance Challenge Fund (2017/18) to replace 12 traffic signal junctions on the primary route network. These sites are essential to the safe and reliable operation of the highway and provide vital resilience to the strategic road network. At the time of writing an announcement from the DfT is awaited.

Development of the Asset Profile including performance management and measures to include for example: fault rate per site per year and associated potential to reduce maintenance costs; savings accrued through the reduction in accidents, delay at a junctions, carbon emissions and energy consumption.

This will enable HCC to develop its asset management approach and robust business cases in the support of optimising budgets for maintenance, improve coordination of network operations (e.g. with Highways England and neighbouring Local Highways Authorities) and optimising journey times.

Modern equipment provides better control of through traffic by vehicle detection and optimisation of signal phases, increasing junction capacity and reducing failures.

Linking control systems provides the ability to remotely monitor and adjust traffic flow through individual junctions and wider areas in real time, for regular peak hours and “one off” situations. Priority can also be provided for buses and emergency vehicles. The physical layout of junctions can also be changed to improve turning movements for vehicles or to provide better facilities for pedestrians a pedestrian phase may also be a required improvement. The future requirements for the ability to freely distribute signal data for public use also need to be considered.