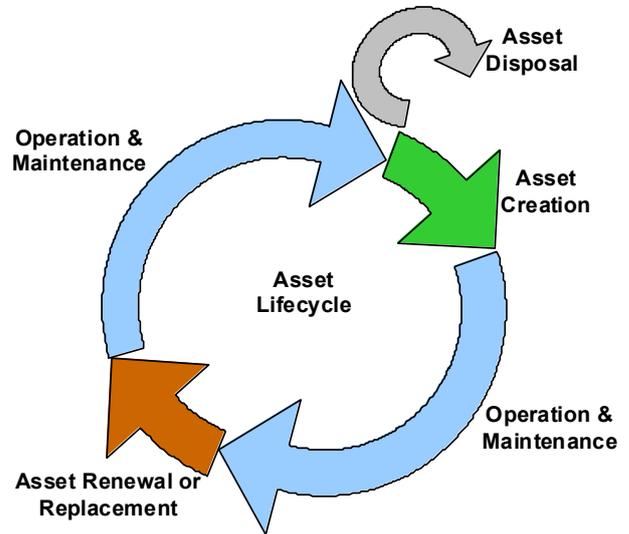

6 Life Cycle Plans

Life cycle planning covers all of the phases involved in ownership of an asset, or group of assets. These phases are:

- Creation/Acquisition
- Maintenance
- Renewal or Replacement
- Upgrading
- Disposal or Decommissioning

Different assets and elements of assets have different life expectancies, and the key to good asset management is balancing the level of investment required to get the most use out of each asset, set against the limits of available funding and the importance of each asset to the network.



- **Creation/Acquisition of the asset:** The County Council does not typically create new assets, however new highway assets are created in association with new developments, and in most cases, the County Council acquires those assets to maintain into the future. We specify the standards required for new highways and the associated assets in the Manual for Gloucestershire Streets, and provide technical approval of proposed works, and inspect constructions to ensure that these standards are met before we take on the ownership and liability for new infrastructure.
- **Operations and maintenance of the asset:** Activities undertaken to ensure the efficient operation and serviceability of the asset, typically referred to as routine maintenance. Routine maintenance activities are revenue funded and are either reactive, such as pothole repair and white line replacement, or cyclical such as gully emptying and grass cutting. Inventory data management and safety/condition inspections are carried out across all assets. Over 2/3rds of the annual revenue budget is spent on these routine maintenance activities.
- **Renewal or replacement of the asset:** Provision for progressive replacement of individual assets that have reached the end of their useful life and cannot be sustained by routine maintenance alone. Typically referred to as structural maintenance these activities are funded by capital expenditure and include reconstruction, overlay, resurfacing and surface dressing of carriageways or footways, remedial earthworks and replacement of highway drainage systems, i.e. pipe-work, manholes, etc, or major repairs to these systems. Ideally, replacement of elements of bridges such as expansion joints, or painting of structural elements are carried out as these reach the end of their lives, but before the condition starts to impact on the whole life of the individual bridge. Approximately £18m a year of capital funding is spent on renewal or replacement of assets across the county.

- **Upgrading of the asset:** Strengthening of bridges to meet modern loading standards, or replacement of traffic signal equipment with enhanced functionality, such as MOVA, are activities which upgrade the asset from its current state.
- **Disposal/decommissioning:** The nature of the highways asset means that we do not very often dispose or decommission assets; however, we do consider the ongoing requirement for individual assets as they near the end of their lives. Our strategy around decluttering means that we do not automatically replace road signs, if they are damaged or deteriorated.

Current State of Process in Gloucestershire

The Gloucestershire life cycle plans consider the condition of the highway asset and assess its future performance by considering available monies, agreed risk and investment policies. From this information it is possible to develop a strategy and works programme for both routine maintenance activities and structural maintenance renewal or replacement necessary to achieve the specified levels of service.

For most of the key assets (carriageways, footways, bridges and highway lighting) the development of the life cycle plans is simply documenting current practices. For example, Gloucestershire's carriageway lifecycle plans documents a significant amount of detail about the strategy and planning of both routine maintenance and structural maintenance works including how the works are identified and prioritised. The processes used have been robustly developed and include the use of many examples of best practice working from other authorities as well as locally developed methods of working that have been acclaimed nationally.

Life cycle plans for some assets are less developed and will continue to evolve as the TAMP is updated. In particular this includes assets such as footways where the cost of collecting the condition data far outweighs the current benefits gained by having a detailed life cycle plan developed.

Appendix 2 contains the lifecycle plans for the following assets:

- Carriageways
- Footways and Cycleways
- Structures
- Street Lighting
- Street Furniture
- Traffic Management Systems
- Drainage
- Geotechnical Assets
- Verges

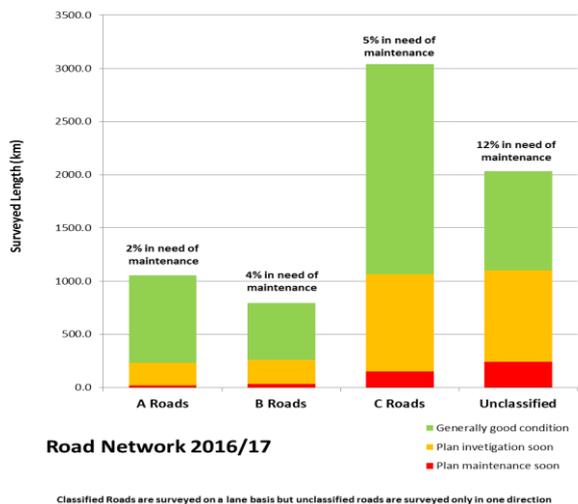
These are at different stages of development, our proposal over the next two years is to review all of the lifecycle plans and combine them with existing maintenance manuals, or develop them to become the effective maintenance manuals for each asset, so that there is only one reference point for each asset type.

Lifecycle Summaries

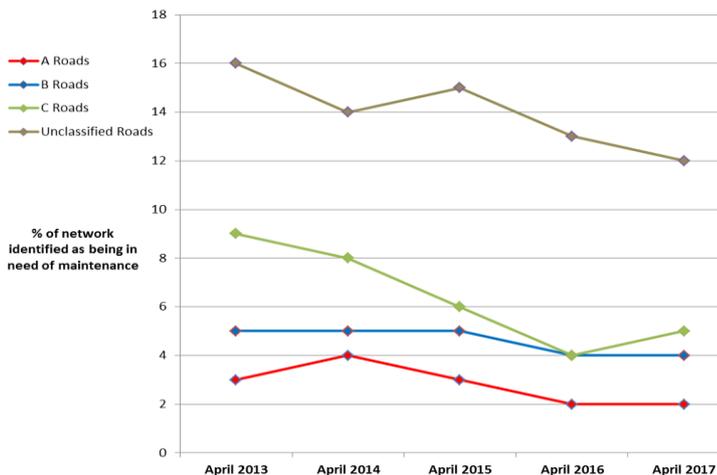
The following pages contain summaries, for each key asset, of the strategy, and revenue and capital spend profiles and processes which are applied in order to deliver that strategy.

CARRIAGEWAYS – LIFECYCLE PLAN SUMMARY

INVENTORY & CONDITION



PERFORMANCE HISTORY



CURRENT STRATEGY

TO MAINTAIN ROADS IN A STEADY STATE. MAINTAIN CURRENT ROAD CONDITION INDICATOR RESULTS WHILST TARGETING SAFETY DEFECTS IN ORDER TO REDUCE PRESSURES ON REVENUE BUDGETS. TO FIND FURTHER EFFICIENCIES AND IMPROVE PRODUCTIVITY.

ROUTINE MAINTENANCE STRATEGY (REVENUE)

Routine carriageway maintenance predominately concentrates on safety defect repairs (potholes). Driven by the Highway Safety Inspection Manual, which is based on national codes of practice, this identifies;

- frequency for routine inspections
- intervention level criteria
- time scales for defect repairs

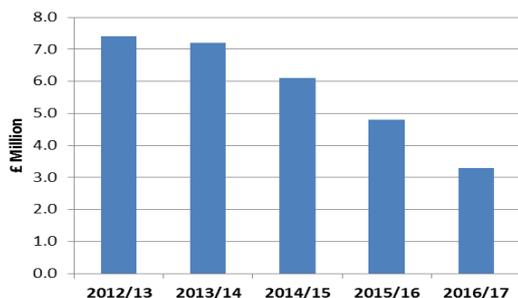
Productivity improvements have been achieved through the better use of technology when planning works. Pothole repairs are made using hot material with square cut and sealed edges producing a robust repair. Greater coordination of patching works in areas where there are significant defects provides better value and prolongs the asset life. Revenue expenditure on verge maintenance (grass cutting and tree maintenance) and drainage maintenance (gully emptying, jetting and grip cutting) have a direct impact on the performance and rate of deterioration of the carriageway network.

STRUCTURAL MAINTENANCE STRATEGY (CAPITAL)

In order to stretch capital budgets and to get the highest value out of maintenance expenditure, patching works and surface dressing programmes have been increased. Structural patching works are targeted using safety defect data in order to tackle areas of network that experience repeat pothole issues. Reconstruction and resurfacing works are prioritised using a combination of road condition and defect data to ensure both best value and customer satisfaction.

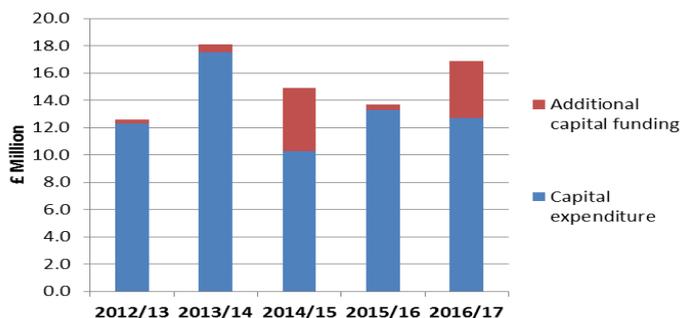
REVENUE INVESTMENT

Routine maintenance revenue expenditure



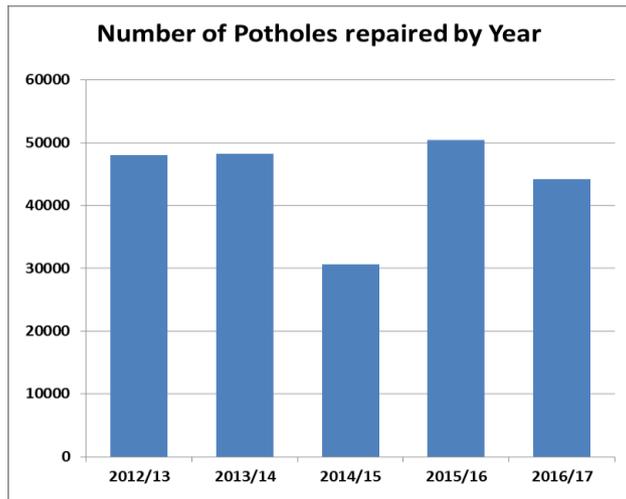
CAPITAL INVESTMENT

Capital maintenance expenditure



REVENUE INVESTMENT	CAPITAL INVESTMENT
---------------------------	---------------------------

Routine maintenance revenue funding includes both carriageway and footway safety defect repairs (potholes) as well as environmental maintenance (grass cutting and tree maintenance) and safety maintenance (line repainting and sign repairs). Spending between the three areas varies from year to year dependent on the need for safety defect repairs. For example, when network deterioration is accelerated following a bad winter, more of the budget goes direct to safety defect repairs; in a normal year approximately 75% of the budget is spent on defect repairs. As such the amount of expenditure directly on carriageway repairs is closely linked to the number of safety defects being recorded.



The chart above includes additional funding provided for severe weather and potholes.

To assist with determining how much capital funding is required, the county utilises a financial model which uses current road condition data and treatment costs. An assessment of 'standstill' costs (the amount of structural maintenance funding required to maintain the network in its current condition) is the first critical stage towards prioritisation, as it identifies the size of the existing maintenance backlog.

Standstill and backlog costs have been calculated:

Road Type	Treatment Cost (per lane km)	Standstill Cost	Backlog Cost
Principal	£86,497	£1.8 m	£8.1 m
Non-Principal	£49,028	£7.5 m	£30.0 m
Unclassified	£40,315	£7.6 m	£43.3 m
		£16.9 m	£81.4 m

ROUTINE MAINTENANCE PROCESSES	STRUCTURAL MAINTENANCE PROCESSES
--------------------------------------	---

Safety defects are recorded electronically by Highway Safety Inspectors during regular routine inspections of the network. Inspections are carried out in accordance with the County's Highways Safety Inspection Policy. Identified safety defects are generally classified for either 24 hour or 28 day repairs. Gangs undertaking repairs receive work instructions on hand-held devices which direct them to the defects. The defect is then photographed, the repair made and the repair photographed. The photos and the job completed notice are then communicated electronically back to the county's maintenance management system. This ensures quality assurance of repairs in that every repair can be evidenced.

Pothole repairs are made to a high quality standard with most (over 95%) being 'cut out' and repaired with hot material. Efforts are made to coordinate multiple pot hole repairs into patching works which provide a more permanent repair. Patching works are also coordinated with structural maintenance repairs and many patched roads then receive a surface treatment in order to seal the road and gain the greatest life expectancy from the patching works.

In order to deliver best value from structural maintenance funding, schemes are prioritised using a number of factors including road condition data, safety defect data (number and location of pothole repairs) and site assessments. The schemes listed in year one are the works programme for the next financial year.

The county aims to invest approximately 50% of its structural maintenance spending on programmed patching, surface dressing and other preventative maintenance treatments. This follows asset management principles of intervening at the right time in the life cycle of the carriageway with a lower cost treatment. As a number of roads will be beyond the threshold for low cost repairs, 50% of the programme remains dedicated to more costly resurfacing and reconstruction treatments.

The county continues to work with its suppliers to develop innovative materials which drive down the cost of structural maintenance.

FOOTWAYS & CYCLEWAYS – LIFECYCLE PLAN SUMMARY

INVENTORY	PERFORMANCE HISTORY																																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Footway/Cycle Way Description</th> <th style="width: 30%;">Length (km)</th> </tr> </thead> <tbody> <tr> <td>High category footways</td> <td style="text-align: center;">117</td> </tr> <tr> <td>Other footways</td> <td style="text-align: center;">3518 (Est)</td> </tr> <tr> <td>Segregated cycleways</td> <td style="text-align: center;">312</td> </tr> </tbody> </table>	Footway/Cycle Way Description	Length (km)	High category footways	117	Other footways	3518 (Est)	Segregated cycleways	312	<p>Footway condition</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <caption>Footway Condition Data (2013/14 - 2017/18)</caption> <thead> <tr> <th>Year</th> <th>Good / Functional condition (%)</th> <th>Functional issues (%)</th> <th>Structural Issues (%)</th> <th>Total Footway Km's surveyed</th> </tr> </thead> <tbody> <tr> <td>2013/14</td> <td>79.5%</td> <td>11.1%</td> <td>9.4%</td> <td>817</td> </tr> <tr> <td>2014/15</td> <td>82.7%</td> <td>8.7%</td> <td>8.6%</td> <td>1353</td> </tr> <tr> <td>2015/16</td> <td>80.3%</td> <td>11.0%</td> <td>8.6%</td> <td>1621</td> </tr> <tr> <td>2016/17</td> <td>81.1%</td> <td>10.5%</td> <td>8.4%</td> <td>1786</td> </tr> <tr> <td>2017/18</td> <td>81.7%</td> <td>10.1%</td> <td>8.1%</td> <td>1926</td> </tr> </tbody> </table>	Year	Good / Functional condition (%)	Functional issues (%)	Structural Issues (%)	Total Footway Km's surveyed	2013/14	79.5%	11.1%	9.4%	817	2014/15	82.7%	8.7%	8.6%	1353	2015/16	80.3%	11.0%	8.6%	1621	2016/17	81.1%	10.5%	8.4%	1786	2017/18	81.7%	10.1%	8.1%	1926
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CURRENT STRATEGY
TO MAINTAIN FOOTWAYS AND CYCLEWAYS IN A STEADY STATE AND TO REPAIR SAFETY DEFECTS IN ORDER TO CONTINUE TO SUCCESSFULLY MANAGE LIABILITY FROM CLAIMS.

ROUTINE MAINTENANCE STRATEGY (REVENUE)	STRUCTURAL MAINTENANCE STRATEGY (CAPITAL)
<p>Routine maintenance on footways and cycleways, much like carriageways, is predominately concentrated on safety defect repairs. The Highway Safety Inspection Manual, sets out,</p> <ul style="list-style-type: none"> the frequency for routine inspections intervention level criteria Repair time scales. <p>For bituminous surfaces, repairs are made using hot material with square cut and sealed edges to ensure longest possible life.</p>	<p>Capital funding is primarily targeted at footway resurfacing works. The work tends to be prioritised towards those areas of most need and in particular, where high levels of repeat safety defects are occurring.</p>

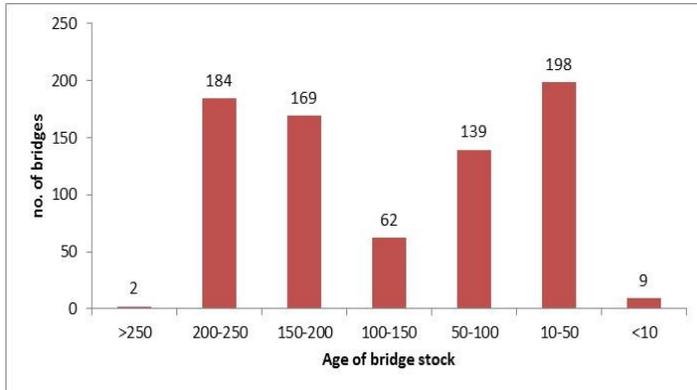
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ROUTINE MAINTENANCE PROCESSES	STRUCTURAL MAINTENANCE PROCESSES
<p>The process for the identification and repair of footway defects is the same as for carriageway defects with the criteria for defects and repair timescales being set by the Highway Safety Inspection Manual. See the carriageway routine maintenance processes section on the previous page for more details.</p>	<p>Funding is spread across the county and schemes prioritised using defect and condition data. This data is then ranked by footfall, those areas with the highest footfall are given a higher ranking than those with little. Where ever possible surface treatments (thin overlays) are used to obtain best value.</p>

STRUCTURES – LIFECYCLE PLAN SUMMARY

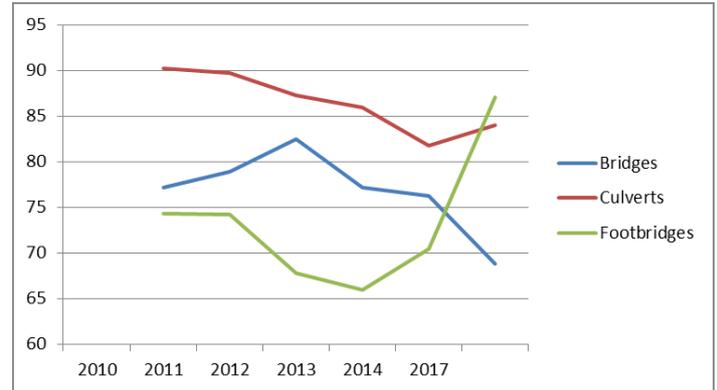
INVENTORY & CONDITION

Age of Bridges



PERFORMANCE HISTORY

BCI of Critical Bridge Elements



CURRENT STRATEGY

- KEEP THE STRUCTURES STOCK WITHIN THE “GOOD “ CONDITION BANDING.
- CONSIDER CLOSING, DISPOSING OF OR APPLYING WEIGHT RESTRICTIONS TO BRIDGES OR RETAINING WALL ASSETS WHERE POSSIBLE, TO REDUCE LIABILITIES FOR THE FUTURE
- TO MAINTAIN THE ASSETS IN A STEADY STATE WHERE POSSIBLE AND TO MINIMISE THE BUILD UP OF MAINTENANCE BACKLOGS.
- TO REDUCE THE NUMBERS OF STRUCTURES IN A POOR/VERY POOR CONDITION TO A MINIMUM BY TARGETING BCI CRITICAL DEFECTS. TO DIRECT ROUTINE MAINTENANCE TO ITEMS WHICH LEAD TO LONG TERM DAMAGE OF STRUCTURES AT AN EARLY STAGE. TO CONSIDER WHOLE LIFE COSTING OF TREATMENTS AND MAINTENANCE STRATEGIES FOR GROUPS OF STRUCTURES TO MAXIMISE EFFICIENCIES.

ROUTINE MAINTENANCE STRATEGY (REVENUE)

Inspections are carried out at least every two years, with more frequent inspections for elements of structures which are at higher risk.

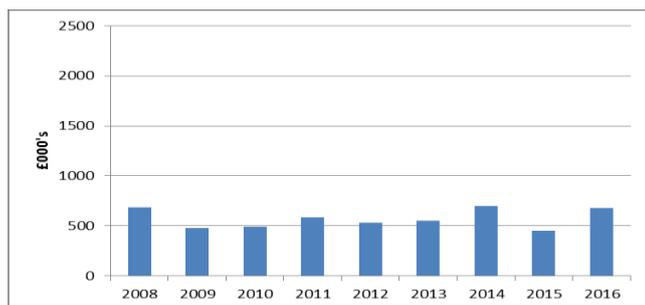
Revenue Maintenance activities also include routine maintenance such as vegetation clearance, and also reactive and planned maintenance to structures, such as parapet repairs or scour protection. Small amounts of repointing of masonry or repainting of parapets will also be done from this budget.

STRUCTURAL MAINTENANCE STRATEGY (CAPITAL)

Replacement of life limited elements of bridges are necessary to enable the whole structure to last its full lifespan (generally bridges are designed to last 120 years).

Structural reviews are targeted at substandard bridges to identify the most appropriate management strategy for them. In some instances it is appropriate to monitor the structures for the long term, accepting that these structures will have an accelerated deterioration rate. This policy of “managed deterioration” will ensure that the most life possible is obtained from these structures without increasing the risk to road users.

REVENUE INVESTMENT



CAPITAL INVESTMENT

REVENUE INVESTMENT	CAPITAL INVESTMENT
<p>The decline in revenue funding for routine maintenance of bridges is an area for concern in that if not enough funding is available to repair the routine defects being picked up by regular bridge inspections, then bridge condition will continue to decline and large more costly repair works will be required.</p>	<p>A standstill level of investment of £1.1m was identified as appropriate in 2012.</p> <p>For all of the finite life elements such as expansion joints, waterproofing and bearings, a forward programme has been prepared.</p>
PROCESSES	
<p>In order to get best value from structural maintenance funding, a value engineering matrix is used to rank maintenance schemes. This reflects the likelihood and consequence of failure, and the impact of delaying works. Socio-economic and environmental factors – increased journey lengths, segregation of communities etc are all considered so that works can be ranked in the best priority order.</p>	<p>The backlog or “workbank” of maintenance to structures needs to be established. This is partly done through the ongoing inspection programme. By splitting structures into lifecycle groups, structures with similar elements – bearings, joints, waterproofing etc, - can be more effectively managed. The development of the Structures Toolkit (being funded nationally) will enable this to be evaluated, and the Toolkit will also assist in the valuation of depreciation to the stock.</p>

HIGHWAY LIGHTING, ILLUMINATED SIGNS & BOLLARDS – LIFECYCLE PLAN SUMMARY

INVENTORY & CONDITION

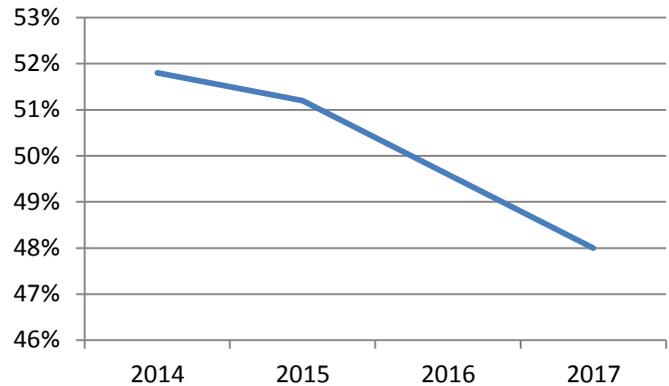
Highway Lighting

Description	QUANTITY
Lighting Columns	53617 no.
Lighting Columns on wall/pole	6542 no.
Heritage Columns	654 no.
Illuminated Bollards	1981 no.
Illuminated Signs	4142 no.

The overall condition and age of the existing lighting, illuminated traffic sign and bollard stock throughout the County is causing concern. Problems are being experienced with particular types of equipment and severely deteriorating stock needing urgent replacement.

PERFORMANCE HISTORY

% Backlog of Street Lighting columns requiring replacement



CURRENT STRATEGY

TO MAINTAIN THE CURRENT STREET LIGHTING STOCK, WHILST INVESTING IN NEW ENERGY REDUCTION TECHNOLOGIES AND THE FURTHER PROLIFERATION OF PART-NIGHT LIGHTING AND DIMMING TO REDUCE THE COUNTY'S CARBON FOOT PRINT AND CONTROL ENERGY EXPENDITURE

LED REPLACEMENT & STRUCTURAL MAINTENANCE STRATEGY (CAPITAL)

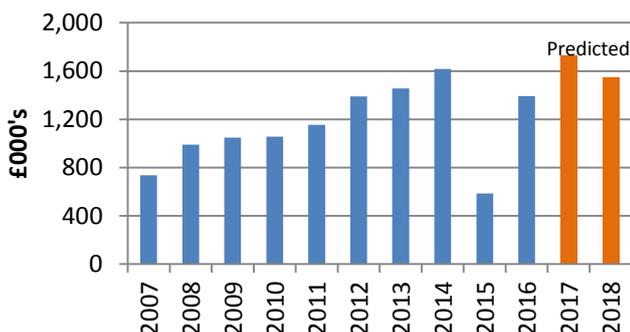
A project to replace the entire street lighting asset (60,813) to an LED light source commenced in November 2015 and is due for completion by the end of March 2019. The overall cost of this project is £13.7m and this being financed through a Department For Transport grant (£5m), Salix/SSEL'S zero percent loan (£6.17m) which will be paid back through energy cost savings and council capital receipts (£2.53m). In order to obtain all of the benefits from the LED project a programme to replace the entire concrete column asset (4,254 no.) is also being delivered with a completion target of March 2019. The final element of capital investment for the street lighting service is an annual non-destructive testing regime which was originally introduced to help focus capital expenditure for column replacement on those columns at the highest risk of collapse. This amounts to approximately £300k per year on column replacement. On completion of the concrete column replacement project this funding will be diverted to reduce the backlog of life expired lighting columns.

ROUTINE MAINTENANCE STRATEGY (REVENUE)

Street lighting faults are reported through our Central Management system fitted to LED's, by members of the public both on-line and through the customer contact centre. In addition, all strategic roads are inspected monthly with night inspections to identify faults. Efficiencies are being made on cyclical maintenance activities with the implementation of LED as the annual inspection regime will be extended to three years due to there not being a requirement to replace lamps. Energy savings continue to be delivered through LED implementation, part-night lighting and dimming projects. As the LED extends throughout the area the part night operation will be replaced with dimming profiles to allow for all lighting to remain operational at night, albeit at much reduced level. All traffic route lighting will be dimmed to 50% between the hours of 10pm and 5:30 am and all other residential lighting to 30% output between midnight and 5:30 am.

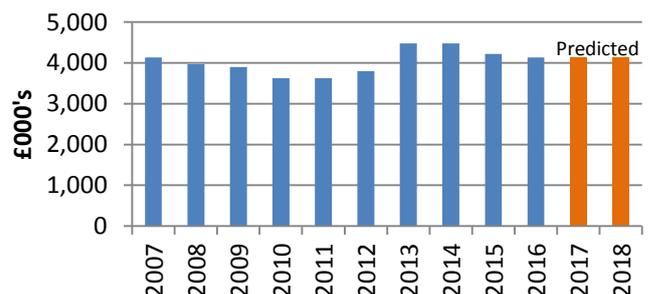
CAPITAL INVESTMENT

Street Lighting Capital Expenditure



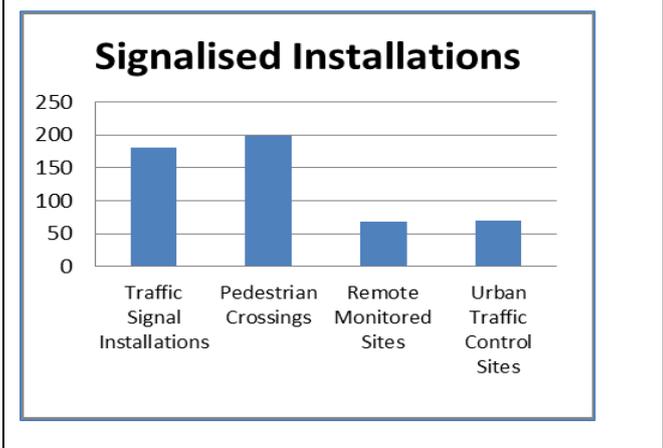
REVENUE INVESTMENT

Street Lighting Routine Maintenance & Energy Expenditure

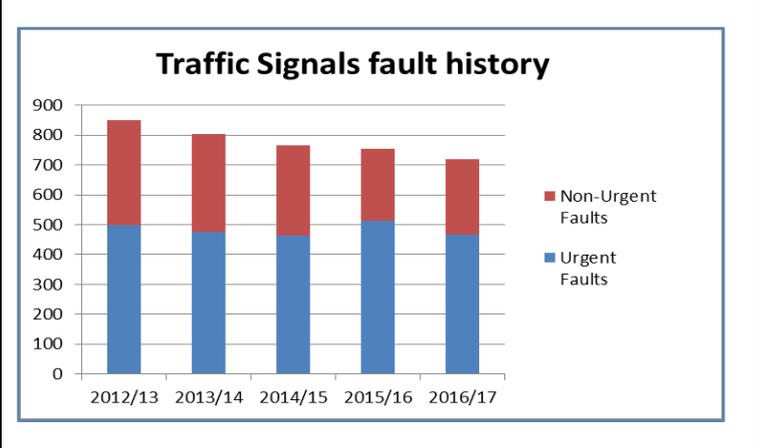


TRAFFIC MANAGEMENT SYSTEMS – LIFECYCLE PLAN SUMMARY

INVENTORY



PERFORMANCE HISTORY



CURRENT STRATEGY
TO MAINTAIN THE ASSETS IN A STEADY STATE WHERE POSSIBLE AND TO MINIMISE THE BUILD UP OF MAINTENANCE BACKLOGS.
TO COMPLETE THE ROLL-OUT OF THE FIBRE NETWORK IN GLOUCESTER CITY TO REDUCE PHONE/BROADBAND COSTS.
TO MINIMISE ENERGY USAGE. TO IMPROVE TRAFFIC THROUGHPUT, MINIMISING DELAYS, CONGESTION AND EMISSIONS.

ROUTINE MAINTENANCE PROCESSES AND STRATEGY (REVENUE)

Inspections are carried out 6 monthly, this provides a visual inspection and also clarifies that a junction is functioning correctly. Annual inspections are more detailed and include a full electrical safety check. It is estimated that 50% of traffic signal equipment is now life expired. The structural integrity and condition of some stock is questionable. Condition is assessed using fault records and visual inspection.

We will continue to explore new technologies that minimise energy usage.

STRUCTURAL MAINTENANCE STRATEGY (CAPITAL)

We will continue to convert our isolated traffic signals to MOVA strategy to improve traffic throughput, reducing delays, congestion and emissions. We will install bus priority at some traffic signal installations in Gloucester and Cheltenham.

We aim to refurbish 7 installations per year. The fibre network is financed by the capital budget.

We will review our car parking / VMS information signs and upgrade where necessary.

REVENUE INVESTMENT

Routine Maintenance Revenue Expenditure
Estimated Annual Revenue Expenditure

All road classes	£612,000
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CAPITAL INVESTMENT

Capital Expenditure

Spend in £000's	11/12	12/13	13/14	14/15	15/16	16/17
asset	470	370	450	68	413	312

PROCESSES

We have procured a new Traffic Signals Maintenance Contract from October 2017, and will use the new contract to move to a more Asset Management based process, with improved inventory collection.

We will maintain and enhance the Urban Traffic Control system controlling signals in our built-up areas using strategies to minimise vehicle delays, stops and emissions.

Approximately 20 Operational Assessments are carried out each year. In order to ensure no asset is in excess of 15 years old 25 installations would have to be refurbished each year.

The Traffic Signal system in Cheltenham is being reviewed to improve capacity within the system, particularly with respect to the proposed developments to the west and north of the town.