A safer, more sustainable and more resilient highway network

Highways Asset Management Plan 2021/22 to 2025/26

An Investment Strategy and Action Plan for the next 5 Years

Version	Author	Date	Comment
1.0	Alan Casson	27/5/21	Draft for Corporate Board

Contents

Foreword

Our local highway network is the most valuable asset we own in Kent, with a replacement value of around £24 billion. It plays a vital part in delivering council objectives by enabling safe and reliable journeys around and through the county. In doing so, it supports social wellbeing and economic prosperity. It is also essential for emergency services to execute their work: policing, healthcare, fire, and emergency response provision all require an effective highway network. These services are a key part of a functioning society and cannot exist without well-maintained and well-managed highway assets.

It has long been accepted that the rate of highway asset deterioration has far exceeded the rate of investment from central government both in terms of capital grant and revenue support. Whilst that is a national issue affecting the majority of local authorities, arguably it affects our county disproportionately given that we have one of the largest networks including a high proportion of classified or urban roads, difficult geology, a large population, and high volumes of heavy goods vehicles and other traffic as a result of our proximity to London and our position as the gateway to Europe. Our road maintenance backlog alone is £464 million.

Against that challenging backdrop, we have made some significant advances in our management and delivery of highway maintenance in recent years. We have improved our knowledge of our highway assets, their condition, and how they perform over their lifecycle. This has meant that we are able to make better-informed decisions around service levels, priorities, risks, and our future approach, so that resource is allocated appropriately. It has also meant that we can evidence the need for additional Department for Transport funding, including around £8 million of Challenge Fund resource that we were awarded in 2020.

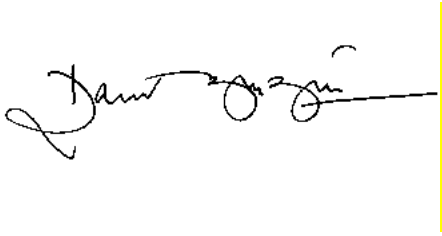
Using the same data, we have also been able to evidence the need to invest more of our own resource in this key enabling service, and have significantly increased capital funding for planned maintenance, addressing high-risk problem sites and increasing our annual Pothole Blitz campaign. Much of this has been focussed on road maintenance, resulting in a significant slowing down of deterioration. As a key part of this, our Pothole Blitz campaign now carries out larger, mechanical repairs which last longer than smaller hand-laid repairs. All this is good news for reducing potholes, which we know are a major concern for Kent's residents.

We have also introduced a new technical approvals process for works such as highway improvement schemes and new developments that add assets to our network and made improvements to the Kent Design Guide, both seeking to get designers to think at an early stage about the lifespan, lifecycle cost and maintainability of new assets. The aim is to ensure that these vital improvements and developments are more affordable to maintain, and will therefore look more attractive and fulfil their purpose for longer.

However, there are further improvements to make to enable us to deliver a fully integrated, efficient and optimised highway asset management service that supports Kent's recovery from the COVID-19 pandemic in the short- to medium-term, and delivers on Kent's longer-term strategic objectives. These include further work to improve our knowledge of our highway assets and our ability to forecast the effect of different investment levels and approaches. They also include actions to further explore how we can improve lifespans, reduce costs and improve future maintainability of new or improved highway assets when they are added to the network.

This Highways Asset Management Plan, which replaces various documents we have published in recent years, seeks to set out our approach to highways asset management over the next five years. It is important to consider this function as a multi-year activity rather than an annual one. Whilst we live in uncertain financial times, certainty of approach and of the broad levels of funding will enable us to deliver a more efficient and planned service, resulting in assets that are in better condition than otherwise would be the case. As such, the various parts and appendices of the document set out what we know about our assets' current condition; what the future might look like if current levels of funding are maintained, increased or reduced; what our service levels are, including a full explanation of those services we provide given existing resource levels and those we do not, and detailed risk assessments on those service levels; and a five year forward works programme.

I am confident that this Investment Strategy and Action Plan for the next five years will deliver a more efficient highway maintenance service with better outcomes, and enable us to deliver a safer, more sustainable and more resilient highway network.



David Brazier
Cabinet Member for Highways and Transport, Kent County Council.

Executive Summary

In Kent County Council we have significantly developed our approach to asset management in highways in recent years, including introducing measures to implement the Well-managed Highway Infrastructure code of practice. As a result we have been able to maximise Department for Transport Incentive Fund resource, secure additional funding, and continue successfully defending claims.

Despite making substantial progress in recent years, we recognise we are in an increasingly challenging environment, with deteriorating assets, increasing traffic volumes, uncertainty around future funding and, more recently, coronavirus impacts.

We have therefore developed this comprehensive Highways Asset Management Plan. This is a forward-looking document covering the next five years which:

- includes a vision statement
- sets out how asset management contributes to achieving strategic outcomes, including environmental, active travel and road safety priorities
- describes how we manage our assets and make decisions based on risk
- explains what we know about current and predicted asset condition
- sets out our service levels alongside an assessment of associated risks
- outlines our significant improvements and achievements
- includes a five-year forward works programme, and
- includes an action plan to further improve our approach to asset management, contributing to achieving environmental, active travel and road safety objectives.

This document should also be seen as an Investment Strategy and Action Plan for the next five years. Importantly, it seeks to move towards treating the management and maintenance of our highway assets as a multi-year endeavour and highlights the importance of consistency of funding and approach over that longer period, to enable us to deliver a more efficient service with better condition outcomes.

This document also sets out in detail what the continuation of current funding levels would buy in terms of highway asset condition, the services we provide (and equally those we do not), and the level of risk associated with that balance. It also illustrates how changes in our budgets would affect future asset condition.

If that available resource over the next five years is considerably different to the broad levels of funding assumed in our analyses, the new document provides detailed information to enable informed decision-making around how we may prioritise investment going forward, and how we may adjust the services we provide understanding associated risks.

Introduction

Kent County Council (hereafter 'we') maintains around 5,400 miles of highway network and associated assets including bridges and other structures, gullies and drains, street lights, traffic signals, trees, grass verges, signs and road markings.

Asset	**Quantity**	**Estimated Value**[i] (The cost of a like for like replacement)
Roads	5,400 miles (8,700 kilometres) of roads	£6,400 million
Footways	4,000 miles (6,400 kilometres) of footways	£1,200 million
Drainage	275,000 roadside drains 41,250 chambers/manholes 3,850 miles (6,200 kilometres) of gully leads and carrier lines 8,500 soakaways 250 ponds and lagoons 15 pumping stations 346 small culverts	£3,700 million
Structures	1,100 bridges and viaducts 570 large culverts 450 other structures 2 tunnels and an underpass	£1,300 million
Crash Barriers	160 miles (250 kilometres) of safety barriers	£61 million
Street Lighting	122,500 street lights 17,700 illuminated signs 4,100 illuminated bollards	£175 million
Intelligent Traffic Systems	740 sets of permanent traffic signals 470 electronic information signs 170 CCTV cameras	£54 million
Signs and Lines	196,400 unlit signs 80 miles (130 kilometres) of pedestrian guardrail 9,200 miles (14,800 kilometres) of road markings 700,000 cats' eyes	£42 million
Soft Landscape	505,000 trees 3,200,000 m^2 of urban grass verges 2,900 miles (4,600 kilometres) of rural grass verges 572,200 m^2 of conservation verges	*These are not currently included in the valuation estimate*

[i] Figures from the 2019/20 valuation prepared for Whole of Government Accounts

Land	28 square miles (73 square kilometres)	£11,600 million

Our highway network is the most valuable asset we own, with an estimated like-for-like replacement value of over £24.4 billion, and we have statutory obligations under the Highways Act 1980 and other legislation to maintain the highway in an appropriately safe and functioning condition.

Highways asset management describes a common sense, systematic approach to designing, constructing, maintaining, modifying and replacing assets in the most cost-effective manner whilst also taking into consideration the performance of the asset and the risks involved in managing it. Asset management has been widely accepted by central and local government as a way of using knowledge and forward planning to manage the highway network efficiently and effectively, and whilst we have always taken a largely asset management-based approach to maintaining our highway assets, the introduction of the Department for Transport's Incentive Fund and of *Well-Managed Highway Infrastructure: a Code of Practice* several years ago required us to take a fresh look at our polices and processes and to document and develop them.

Whilst we are very confident that we continue to meet the requirements for an Incentive Fund Band 3 (top-ranked) authority, we recognise that this is dependent on continually monitoring and developing the ways in which we embed asset management principles in the management of our highway network, and we are committed to doing this in order to best meet the current and future needs of our residents, businesses, visitors and communities.

This document, which replaces the suite of documents *Our Approach to Asset Management in Highways, Implementing Our Approach to Asset Management in Highways*, *Developing Our Approach to Asset Management in Highways*, *Applying the Code of Practice in Kent, Implementing the Code of Practice in Kent and A Risk Based Approach – Service Level Risk Assessments*, sets out our approach to highways asset management over the next five years, specific actions to further improve that approach and a multi-year investment plan. It comprises six parts:

Part 1: Background and Context describes the background to our adoption of highways asset management principles and sets it in the context of our legal obligations and strategic objectives.

Part 2: Implementing *Well-managed Highway Infrastructure: A Code of Practice* describes the introduction of a new Code of Practice for highway maintenance and our subsequent implementation of key components of it.

Part 3: Implementing Asset Management Principles in Highways sets out how we are implementing highways asset management principles.

Part 4: Applying Asset Management Principles to Each of Our Asset Groups takes a detailed look at what our approach to asset management means for each of our asset groups, and what that means for each group over the next five years.

Part 5: Asset Management Improvements and Achievements lists our main improvements and achievements in highways asset management over the last two years.

Part 6: Our Future Approach and Action Plan sets out our Five-Year Vision, describes our strategic approach to highways asset management over the next five years and lists specific actions we will be carrying out in the coming years to further improve how we manage highway assets.

Part 1: Background and Context

Background

Our highway network enables safe and reliable journeys to be made around and through the county, and in doing so supports social wellbeing and economic prosperity. It is also essential for emergency services to execute their work: policing, healthcare, fire, and emergency response provision all require an effective highway network. Furthermore, the highway network is critical to the NHS emergency medical response, and enables patients, medical supplies and equipment to be transported quickly and safely. These services are a key part of a functioning society and cannot exist without well-maintained and well-managed highway assets.

We are committed to excellent management of our highway network, not only in order to meet the present needs of our residents, businesses, visitors and communities, but also taking into account the needs of future generations. Despite significant investment over the years, our highway assets are continuing to deteriorate. An ever-increasing number of repairs, renewals and improvements are required and the countywide maintenance backlog for our roads alone is estimated to be £464 million[i].

Funding of highway maintenance

Funding of highway maintenance comes from three sources. The majority is through capital grant funding from the Department for Transport (DfT), along with the council's revenue budget and capital borrowing.

During the six years to 2020/21, DfT capital funding has largely remain static, and is insufficient to maintain a multi-asset highway network as large and complex as Kent's. In addition, funding has not increased with inflation, nor to reflect traffic and network growth.

Given the impacts of the coronavirus pandemic, the government announced in October 2020 that it would be conducting a one-year spending review to prioritise its response to the pandemic. Following that, in mid-February, the DfT wrote to local authorities to say that there will be a single year capital settlement for 2021/22, and confirmed allocations. These allocations are, in real terms, 20% lower than in 2020/21 though higher than in 2019/20. The DfT has not provided details of future funding levels or any regime they may follow to allocate that resource, though a multi-year allocation is expected, most likely based on a developed and expanded Incentive Fund mechanism with an increased focus on sustainability.

[i] Value from the 2020/21 modelling

Against this backdrop, it is vital that we invest the budget we have in the most effective way we can for the benefit of our customers now and in the future. In recent years, our approach to delivering highway maintenance has evolved dramatically as we have sought innovation and efficiency, undertaken intelligent commissioning and procurement exercises and built productive and positive working relationships with partner organisations.

It is recognised by national commentators that in the past few decades government funding for local highway maintenance has been insufficient. This has in turn led to the rate at which local roads, footways and other highway assets deteriorate exceeding the rate of investment. Whilst we regularly lobby the government on this matter, we have recognised the challenge of highway maintenance and in the past couple of years have significantly increased highway maintenance investment. This has already had a positive effect and slowed down deterioration, but significant challenges remain. These are discussed later in this document.

The Department for Transport (DfT) Incentive Fund

In 2016 the DfT changed the way it funded highway maintenance through a phased introduction of the Incentive Fund, the aim being to encourage local authorities to embed the use of asset management principles into their management of their highway network and to clearly link investment and budget decisions with an understanding of their outcomes and associated risks.

Up until 2020/21, authorities were required to assess themselves against 22 questions covering asset management, resilience, customers, operational delivery, benchmarking and efficiency, leading to an overall score from Band 1 (the lowest) to Band 3 (the highest). The completed questionnaire is submitted annually to DfT and the score achieved determined the level of funding received during the following financial year. In mid-February, the DfT confirmed that we are required to submit a completed questionnaire for 2021/22.

Whilst we have always taken a largely asset management-based approach to maintaining our highway assets, the introduction of the Incentive Fund required us to document and develop our policies and processes. In a trial run early in 2016, we conservatively rated ourselves as a Band 1 authority, but during 2016 policy and strategy documents were developed and lifecycle planning for roads and footways introduced with the result that we were able to evidence Band 2. Further work in 2017 meant that by January 2018 we were able to evidence Band 3, and we have remained at that top level ever since.

In 2020/21, a little over 15% of our capital maintenance grant from DfT was dependent on being able to demonstrate that we are practicing good, risk-based asset management. Whilst we remain very confident that we are a Band 3 authority, we recognise that in order to continue evidencing this we need to be able to

demonstrate that the use of good practice is being continually monitored and developed.

The extent to which we have so far implemented asset management principles varies across our asset groups. For some, such as roads, we have comprehensive data, a detailed understanding of the asset lifecycle, and the tools needed to model different maintenance strategies and investment scenarios. For these assets, we are continuing to develop and refine a more sophisticated approach to asset management. For other asset groups, such as signs, lines and drainage, whilst there have been significant improvement in the last two years, the information we hold is more limited and although we have a good understanding of the asset lifecycle, we are still developing our ability to carry out detailed modelling of different performance or service levels. For these asset groups a simpler but valid approach has been adopted. The approach taken for each asset group is described in more detail in Part 4 of this document.

Well-managed Highway Infrastructure: A Code of Practice

In October 2016, the UK Roads Liaison Group published *Well-Managed Highway Infrastructure.* This code of practice is non-statutory; however, it will be deemed to be guidance of best practice by the courts. To comply with the code of practice we are required to demonstrate a robust decision-making process and an understanding of the consequences of those decisions and of how the associated risks are managed to ensure highway safety.

The code of practice is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment. It recognises that the delivery of a safe and well-maintained highway network relies on good evidence and sound engineering judgement. A risk-based approach to highway maintenance needs to be founded on information that is sufficiently robust to enable decisions on levels of service, delivery methods and priorities for improvements can be taken and reviewed over time. Our asset information strategy details how information to support a risk-based approach to highway maintenance is collected, managed and made available in ways that are sustainable, secure, meet statutory obligations and facilitate transparency for network users.

Well-managed Highway Infrastructure provides guidance to support the development of approaches to highway maintenance that are in accordance with local needs, priorities and affordability. In the interest of route consistency for highway users, all authorities are encouraged to collaborate in determining levels of service, especially across boundaries with neighbours responsible for strategic and local highway networks. Moreover, the principles set out in *Well-managed Highway Infrastructure* are intended to influence the ongoing development and evolution of the approach taken to asset management in highways. In accordance with asset management

principles, the highway network should be considered as an integrated set of assets with due consideration given to the need to balancing the needs and interdependencies of different asset groups.

Well-managed Highway Infrastructure states that “Where authorities elect in the light of local circumstances to adopt policies or approaches different from those suggested by the Code, it is essential that they are identified, together with the reasoning for such differences, be approved by the authority’s Executive and published.” However, our Constitution states that “The Leader and Cabinet Members should…(d) participate in the approval by the full Council of Kent-wide policies and budgets; (e) lead the development of policies for the delivery of services to the whole community of Kent” [Article 2(2)]. Therefore, in addition to approving any deviations from the code of practice, the adoption of the principles of the code of practice and any fundamental changes to existing policies or service standards will be subject to Executive approval and publication.

This document outlines how we apply the principles in the Code of Practice to the way we work and measure our success to ensure continuous improvement and a focus on our Strategic Outcomes. Details of our approach will be actively communicated through engagement with stakeholders in setting requirements, making decisions and reporting performance.

Our Legal Obligations

We have legal obligations to keep public highways available and safe for the passage of the travelling public. Our statutory duties are outlined in several pieces of legislation including:

The Highways Act 1980 - outlines our duty of care to maintain the highway in a safe condition and protect the rights of the travelling public to use the highway.

The Traffic Management Act 2004 - conveys a network management duty whereby we are required to facilitate and secure the efficient movement of traffic on the highway network.

The New Roads & Street Works Act 1991 - requires us to co-ordinate road works and to protect and make best use of the existing network.

The Road Traffic Act 1991 - describes our statutory responsibility to promote road safety and take measures to prevent collisions.

Traffic Signs Regulations and General Directions 2016 - prescribes the design and conditions of use of traffic signs on or near roads in England, Scotland and Wales.

The Construction (Design and Management) Regulations 2015 - details our duties to ensure that the work we do is designed and built competently and that

risks to the work force and road users are properly considered and effectively managed throughout the lifecycle of a highway asset. These regulations places controls on how and when works are carried out.

The Equality Act 2010 – created the public equality duty which requires us to have due regard for advancing equality by removing or minimising disadvantage, encouraging participation and taking steps to meet the needs of all people from protected groups where these are different from the needs of other people.

Town and Country Planning Act 1990 – provides planning protection to trees in conservation areas or protected by Tree Preservation Orders (TPOs).

The Wildlife & Countryside Act 1981 – details the environmental legislation that we need to follow to ensure that we minimise our impact on local biodiversity whilst carrying out highway asset maintenance.

Public Nuisance – an action without lawful cause or excuse which causes anger, injures health or damages property.

A systematic, asset management and risk-based approach contributes to our ability to meet our legal obligations and to deliver and develop our services.

Our Strategic Objectives

In summer 2019, we began developing a new five-year strategic plan which would replace KCC's previous strategic statement, *Increasing Opportunities, Improving Outcomes*, which covered 2015-20. The new plan, *Kent's Future, Our Priority*, covering 2020-25 was to be approved at the County Council meeting in March 2020, but this meeting was cancelled as the country entered the first national COVID-19 lockdown. Further work on the plan was halted given the need to focus efforts of responding to the pandemic.

It was later decided that, given the severe impacts of the pandemic, a new interim strategic plan was needed. This plan, *Setting the Course*, was agreed at the December 2020 County Council meeting. It explains the immediate challenges Kent is facing and the actions KCC will prioritise to lead Kent through the next eighteen months. Development of a new 5 Year Plan to set KCC's longer-term priorities and ambitions for the county will begin later in 2021.

Our interim strategic plan *Setting the Course* recognises the importance of efficient highways asset management and the role this plays in both our short- to medium-term recovery from the effects of the pandemic and our long-term economic prosperity. This Highway Asset Management Plan document outlines our approach over the next five years to managing our highway assets, including our improvement action plan, investment strategy and forward works programme. This is centred around improving our knowledge of our assets, and having consistency of funding and approach, recognising that highway maintenance is a multi-year activity.

Following this approach will, over the period, improve quality, efficiency, and value for money, resulting in a highway network that is better able to support Kent's recovery from the pandemic and improve social and economic wellbeing.

Whilst Kent County Council's next five-year strategic plan will likely differ from the version that was to be agreed at the March 2020 County Council meeting, many of the themes and outcomes included in *Kent's Future, Our Priority* are likely to remain relevant to how and why we maintain our highways. As this Highways Asset Management Plan document covers the next five years, we have used these themes to illustrate below how our approach to highways asset management and planned improvements support the people, services and businesses of Kent. In the event that the next five-year strategic plan differs significantly in terms of outcomes we will review this analysis.

Enterprise and investment

A well-managed highway network is essential to attracting business enterprise and investment and to making the county a great place to live and work. In support of this outcome we will:

- Ensure, through reviewing our highway maintenance hierarchy and refining our scheme identification process, that we prioritise maintenance of key routes essential for the movement of goods and people within and through the county, including our Resilient Highway Network.
- Recognise that the way we manage our highway network has a role to play in creating places where people choose to live and work, and liaise with developers and district councils to encourage the design of residential developments and town centre enhancements which will continue to look good and serve their intended purpose well into the future.
- Support economic growth with a focus on deprived communities by ensuring that those parts of the county which have suffered economic hardship are not disadvantaged by the way we manage our highway network, including prioritising such areas where appropriate.
- Encourage a culture of innovation in the way we manage our highway network, including supporting the Live Labs project and continuing to develop our process for trialling and adopting new or alternative materials and technologies including the use of waste materials.

Securing sustainable infrastructure

We will work with developers, district and borough councils and others to:

- Develop and share best practice on the design of highway assets through the Kent Design Guide and supplementary technical guidance including a new Kent Pavement Construction and Maintenance Manual.

- Continue to roll out and refine our Technical Approval Process for new and renewed highway assets, encouraging designers to consider lifecycle costs, embedded carbon and maintainability early in the design process.
- Recognise the need for transport infrastructure to adapt to such diverse issues as climate change, electric and autonomous vehicles, and the county's ageing demographic, and review the impact of such changes on the way in which we manage our highway network.

Connected transport and communities

Following on from successful projects to introduce an asset management approach and implement the code of practice *Well-managed Highway Infrastructure* (WMHI), we will further improve the way highway maintenance is managed to make our highways safer, more sustainable and more resilient by:

- Continuing to develop our knowledge of our highway assets and their lifecycle cost and performance, including improving the ways in which we survey our roads, footways and cycle tracks and use relevant IT systems to analyse the data and model investment strategies.
- Implementing new highway maintenance hierarchies based on WMHI recommendations and assessing each road or other asset against the new categories.
- Optimising our risk-based approach to highway maintenance with the aim of re-focussing finite resource towards higher risks, looking at the full range of highways asset management services and considering the scope for introducing risk-based investigatory levels based on our maintenance hierarchies.
- Publishing a five-year Forward Works Programme to facilitate forward planning and cooperation, minimising the disruption caused by roadworks and keeping our residents and businesses informed about works which may affect them.

A cleaner and greener Kent

The ways in which we manage our highway network have an important part to play in improving quality of life, health and wellbeing for our residents, and in protecting the environment for future generations. Going forward, we will:

- Support the promotion of viable alternatives to the car and encourage active travel by increasing the priority which we give to our footway and cycle track network, including launching a targeted programme to improve the quality of our footways, and reviewing and developing our network of cycle routes.
- Introduce a programme of tree planting to address the loss of street trees and improve the quality of our urban environments, and continue to improve the

ways in which we manage our grass verges and other soft landscaped areas to support biodiversity.
- Consider the environmental impact of the ways in which we manage and maintain our highway assets and seek to identify, trial and implement changes which will reduce our carbon footprint.

Stronger and safer Kent communities

We recognise that the quality and condition of our highway network impacts on people's perception of the area in which they live, and on their ability to travel safely and actively engage with their local community.

We will support the development of schemes to tackle speeding and improve road safety to ensure that any additional maintenance costs are proportionate to the benefits achieved, and that such schemes are designed to remain fit for purpose well into the future.

Opportunities for children and young people

We recognise that the quality and condition of our highway network impacts on the ability of children and young people to access education, health and leisure opportunities.

When reviewing the ways in which we manage our highway network we will consider the specific needs of children and young people, including seeking to improve our network of cycle routes so that as far as practicable they are suitable for use by unaccompanied older children.

Quality health, care and support

We recognise that the quality and condition of our highway network impacts on the ability of people to travel to health and care services, to receive support in their homes, and to engage in leisure activities which promote good mental and physical health.

In particular, we are aware that the condition of footways can have a disproportionate impact on disabled and older people, a demographic continually increasing both in size and as a proportion of Kent's population, and we intend to review the way we prioritise footway maintenance to take into account areas used by a higher proportion of older or disabled people.

Local Transport Plan 4: Delivering Growth without Gridlock 2016–2031

Highway maintenance and asset management are included in our current Local Transport Plan (LTP4) *Delivering Growth without Gridlock 2016-2031*. The evidence base for this plan is the *Growth Infrastructure Framework* (GIF), a document we developed with the twelve districts and Medway Council to identify infrastructure requirements up to 2031.

In March 2017, as a sister document to LTP4, we adopted our *Active Travel Strategy*, which has the vision to 'make active travel an attractive and realistic choice for short journeys'. The condition, maintenance and management of existing walking and cycle routes is a central feature of this strategy and outlines the importance of maintaining highways assets that enable alternatives to travel by motor vehicles.

Since LTP4 was adopted, the policy, economic and social context in which we are operating has substantially changed. We are therefore planning to prepare a new Local Transport Plan to respond to the challenges and opportunities that come from this new context.

Whilst the policy direction and proposals are yet to be determined, the inevitable outcome is that our highway assets remain as important than ever. We will not be able to respond to emerging policy on walking and cycling, or create an environment for future forms of mobility that can help decarbonise the transport sector and improve people's health if the condition of the highway network's assets cannot provide a fit-for-purpose level of service. As such the continued priority that a new plan will champion is the need for securing a sustained and sufficient investment in asset maintenance as set out in this document.

An Expanding Highway Network

The highway network increases in size year on year and so too do the number of assets we maintain.

Although we are not obliged to adopt new roads, the Highways Act 1980 gives us the power to adopt highways by Agreement. In doing so, we support economic growth and can ensure that the roads and other highway assets constructed are installed to an acceptable standard that will benefit the residents, businesses, local communities and public/emergency/health services. When a new section of highway is adopted, a commuted sum is paid for some assets to fund future maintenance.

In some instances, developers choose not to enter into an Agreement with us and these streets remain under private ownership. Equally, if the developer fails to construct the adoptable highway assets to the required standard it will not be adopted.

Funding and Approach

Highway assets typically have a serviceable life of many years, in some case several decades, though this is affected by factors such as traffic loadings, weather, utility openings, and third-party damage. Given this and the scale of the highway network in Kent, it is important to recognise that highway maintenance is a multi-year activity, rather than an annual one. The current focus on annual budgets, forecasts and programmes, together with a lack of funding and approach certainty means that the service delivered is less efficient and optimised than it could be, ultimately resulting in poorer asset condition.

Part 2: Implementing *Well-managed Highway Infrastructure: A Code of Practice*

The Highway Network

Network Hierarchies

There are several classifications and hierarchies used for the planning and prioritisation of highway inspections, maintenance, renewals, improvements and new installations:

- **Road Classifications** (and reclassifications) are administered by local authorities, following the Department for Transport's statutory guidance on road classification and the primary route network. To the user, the road network is a single entity. In order to help road users navigate from one place to another, and to help with effective management of the network, there are three systems through which roads are organised and classified nationwide - the strategic road network, the primary route network and roads classification.
- **The Resilient Highway Network** is "the portion of our highway network that is vital to maintaining economic activity and access to key services during extreme weather emergencies and other major incidents". The purpose of defining this network is to identify the most important routes and associated critical highway assets, such as bridges, so that planned whole asset maintenance on that part of the network may be prioritised so that they are more resilient. Details of our Resilient Highway Network are published on our website.
- **Maintenance Hierarchies** are used to prioritise planned and reactive maintenance and safety inspections.
- **Critical Highway Infrastructure** is considered to be those assets where failure would result in significant impact to the local, and potentially the national, economy. Critical infrastructure assets form a crucial part of the highway network.
- The **Winter Network** is divided into primary and secondary routes and provides a minimum essential service to the public which includes links to the strategic network, access to key facilities and local communities. Precautionary salting of these routes is undertaken in accordance with the Winter Service Policy which is published on our website and reviewed annually.
- **Flooding Hotspots** are defined as 'flood prone sections of the highway network' and are identified using drainage and flooding enquiry data. They are used to prioritise drainage maintenance, renewals and improvement works, where appropriate.

Whilst it is inevitable that different asset types might have their own hierarchies, all should be related such that each asset type can be considered in relation to others and to the whole highway network.

Defining our Integrated Highway Network

The system of road classification used by the government does not necessarily reflect local needs or actual use now and in the future.

It is important that hierarchies are defined and published for all elements of the local highway network. The inherent links between some asset groups such as signs, lines and roads may mean that these network groupings are subsumed into a single hierarchy. Where asset hierarchies differ, they will all be founded on the principle of highway functionality and the desirability for a consistent approach with a view to achieving a high degree of compatibility.

A particular issue which we are seeking to address by the introduction of a specific hierarchy for our footways is that of footways alongside main roads outside of urban areas. Whereas the road hierarchy may attribute a higher priority to these sections due to the nature of the road, in truth the accompanying footways are often not of the same importance, but are disproportionately costly to maintain. Formally placing such little-used footways in a lower category and maintaining them accordingly would enable more of the budget to be spent in town centres and other areas where footways are regularly used, and where we have higher populations of older or disabled people.

A further issue we are intending to tackle, as a result of our review of the main maintenance hierarchy, is that of little used rural lanes. There are several of these that are used infrequently, sometimes impassable and given their condition would be disproportionately costly to maintain. The current hierarchy categorises all minor roads the same, when in reality this category of road includes a wide range of road types, uses and construction.

Specific considerations will be dependent on the nature of the asset type. However there will be consistent themes that underpin the hierarchy definition, as below:

- **Importance** – this may include key routes between towns, connecting the strategic road network and main routes to critical infrastructure such as hospitals, schools and power stations
- **Environment** - rural, urban, busy shopping streets, residential streets, country lanes etc.
- **Usage** – this may include factors such as the volume and type of users, designations as traffic sensitive, diversion or ceremonial routes and the character and volume of traffic on the adjoining road
- **Site history** - this may include factors such as historic casualty data, historic flooding data and crime statistics

- **Asset specific considerations** – this may include factors such as height or weight restrictions, historic structures, construction materials or the position with respect to the road, footway or cycleway.

Risk Based Approach

Context

As an organisation concerned with service provision and the social and economic development of the county, efficient and effective risk management is essential. By implementing sound management of our risks and the consequential threats and opportunities, we will be in a stronger position to deliver our business objectives, services that reflect local needs and achieve better value for money. Risk management is therefore at the heart of good management practice and corporate governance arrangements. Our approach to risk management is proactive and enables decisions to be based on properly assessed actions and events that balance risk and reward with a view to ensuring that the right actions are taken at the right time.

It is not possible to eliminate all risk. Whilst some mitigation is often possible, it is important to understand the degree of risk and the potential consequences. These can then be balanced against the cost of reducing or eliminating the risk and the benefits of accommodating the risk.

We have a mandatory approach to risk management called the Risk Management Policy & Strategy 2020-2023 which is published on our website.

Risk Management in Highways

Meaningful risk management is an intrinsic part of the management of our highway infrastructure. Inspections, maintenance, renewals and improvements present extensive choices and therefore it is vital that the impact of implementation and the consequences of failure are fully understood. In addition, there is a variety of external influences which impact on the performance of the highway network. Weather, budget, political direction and demand from other service areas also need to be considered when determining the approach to maintenance and investment.

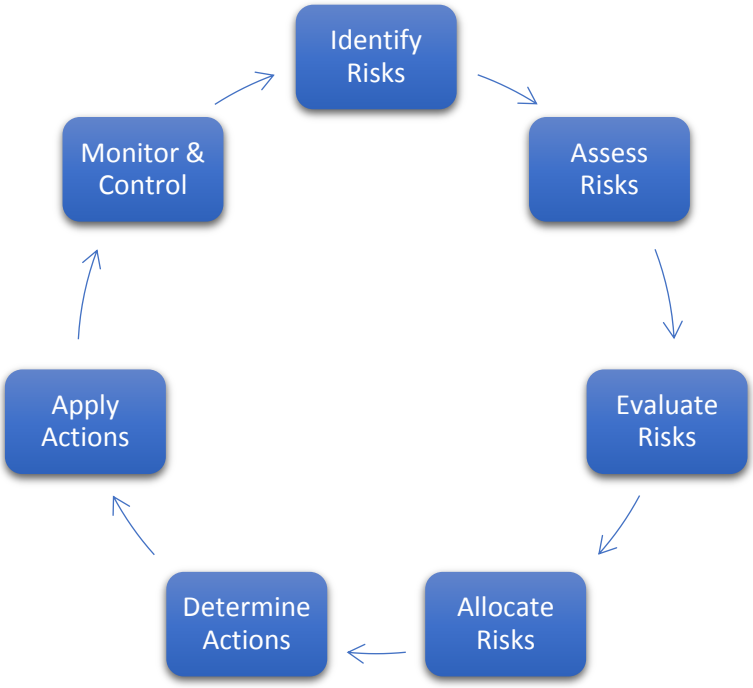
Adopting a risk-based approach has facilitated the establishment and implementation of levels of asset condition and service standards that are appropriate to their circumstances.

We have adopted a risk-based approach for all aspects of highway infrastructure maintenance, including setting levels of service, inspections, response, resilience, priorities and programmes. The management of current and future risks has been embedded within our approach to asset management and service delivery.

Strategic, tactical and operational risks have been included as have appropriate mitigation measures.

Risk Management

We have adopted a risk management approach which aligns with the Office of Government Commerce recognised best practice guidance – Management of Risk: Guidance for Practitioners. The approach is an iterative process to enable continuous improvement and is summarised below:



Identify Risks

Identifying risks is a crucial opportunity to ensure that risks are visible throughout the organisation. At this point risks are considered in their unmitigated state to allow for later prioritisation. Issues to be considered as part of the risk identification process may include:

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

A common approach is to commence the risk identification at a high level to obtain an assessment for the level of overall risk exposure. This may then be followed by a detailed assessment of more specific risks where critical assets, critical failure modes and high-risk areas can be defined and analysed in greater detail.

Assess Risks

Having identified the risks it is important to understand the potential consequences, positive or negative, and the likelihood of that impact being realised.

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

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

Likelihood is the chance of an event such as an asset failure or a fatality on the highway happening. It can be measured objectively, subjectively, qualitatively or quantitatively depending on the level of information available. However, there are several issues that need to be considered, including the following:

- changes in policy and funding
- current and historic performance (severity and extent) of the asset
- rate of deterioration and/or current age of the asset
- asset type, material type, mode of failure, extent of failure, etc.
- exposure to incidents of all types
- human behaviour and workmanship
- vulnerability to climate change
- quality of asset management approach and systems.

The likelihood of physical failure of an asset is related to the current condition of the asset, hence the importance of accurate condition assessment. The likelihood of

natural events is determined less easily but scientific studies are usually available. The likelihood of other events, such as poor work practices or planning issues can be difficult to ascertain. We have an established matrix-based approach for determining risk levels.

Risk Rating Matrix			Impact				
			1	2	3	4	5
			Minor	Moderate	Significant	Serious	Major
Likelihood	1	Very Unlikely	1 Low	2 Low	3 Low	4 Low	5 Low
	2	Unlikely	2 Low	4 Low	6 Low	8 Medium	10 Medium
	3	Possible	3 Low	6 Low	9 Medium	12 Medium	15 Medium
	4	Likely	4 Low	8 Medium	12 Medium	16 High	20 High
	5	Very Likely	5 Low	10 Medium	15 Medium	20 High	25 High

Our Standard for Determining Risk Levels

The target residual rating for a risk is “medium” or lower.

Evaluate Risks

All identified risks need to be evaluated against the risk appetite, and risk tolerance provides an assurance of a consistent approach to the measurement of risk and appropriate management and escalation. We recognise that risk is inherent in delivering and commissioning services, including highways services, and aims to have an open approach to risk, appropriately balancing risk against reward, with risks managed in a proportionate manner.

With increasing spending demands, a higher level of risk may need to be accepted in the future. This will require an approach that allows flexibility and support for well-informed and considered risk taking, promoting transparency and effective risk management, while maintaining accountability.

Allocate Risk

It is important that risks are suitably allocated to a stakeholder who is best placed to take ownership and manage them effectively. For example, the risk of a critical asset failure is best allocated to the asset manager who has the level of understanding to determine potential actions and the consequences of those actions, the authority to apply the selected action and the information and knowledge to monitor and control the risk in both the short and longer term.

Determine Actions

Mitigation options need be identified for all risks assessed to be unacceptable and there will often be many options to reduce the likelihood and/or consequence. It is therefore important that a logical approach to determining appropriate, proportionate and viable solutions to eliminate, reduce or control risk and enhance opportunities is established.

Some risks can be addressed more easily and effectively than others and costs may range significantly. Therefore, analysis of the costs of risk reduction against different options will facilitate identification of the optimum solution. It should be noted that in addition to the financial implications, the potential actions need to be considered in the wider context of our strategic objectives and legal obligations i.e. the most cost-effective action is not appropriate if it contradicts our strategic objectives, breaches our legal obligations or could significantly damage our reputation.

Apply Actions

Prior to applying actions, the assessment and evaluation stages need to be revisited to determine the residual risk and therefore the effect of the risk action. Having confirmed that this is satisfactory, the Action Owner is confirmed as are the appropriate reporting arrangements. For example, if the action involves significant service reductions, or significant changes in the way that services are delivered, approval by the Cabinet Member, Cabinet or Leader will be required. Moreover, if significant service changes are being made due to efficiency, economy or effectivity then formal consultation will be necessary.

Monitor and Control

Risks are not static and external and internal events can alter the likelihood and impact of risks. It is essential to continue reviewing risks and checking that actions to manage them are progressing to plan. All highway risks are routinely reviewed alongside other business management activities such as performance and financial reporting. Moreover, when emerging events or emergencies occur new and existing risks are assessed and responded to.

Inspections and Surveys

We are not statutorily obliged to carry out inspections of all highway elements but are strongly advised to undertake safety inspections in accordance with the principles of *Well-managed Highway Infrastructure*. Inspection and survey regimes should be planned using a risk-based approach to provide increased levels of scrutiny to areas or assets deemed to be of higher risk.

An effective regime of inspection, survey and recording is the most crucial component of highway infrastructure maintenance and intrinsic to the management

of risk. It provides basic information for addressing the core objectives of highway maintenance namely:

- network safety
- network serviceability
- network sustainability

The characteristics of the regime are defined following an assessment of the relative risks associated with potential circumstances of location, agreed level of service and condition. For example, an eighty-year-old bridge carrying a main road over a live railway line has greater risks associated with it than a new footbridge over a ditch on a rural footpath. The former may require two-yearly visual inspections and six-yearly detailed inspections supported by detailed reporting to reflect the complex nature of the structure. For the latter, it may be sufficient to carry out two-yearly visual inspections with a “check list” style report and no detailed inspections if the simplistic nature of the structure means that all components are easily accessed and visible.

Regardless of the specifics of the regime, it is crucial that they are applied systematically and consistently. Moreover, it is important to recognise that all information recorded, even if not primarily intended for network safety purposes, may have implications for safety. As such these records may be relevant to legal proceedings and consequently have to be made available for public inspection and reference.

We undertake a range of inspections and surveys with respect to the highway and its components:

Safety Inspections

The safety inspection regime forms a key aspect of our approach to managing liabilities and risks. A countywide team of inspectors is tasked with the identification of all defects likely to create danger or serious inconvenience to users of the network or the wider community. The risk of danger is assessed on site and the defect identified with an appropriate priority response. The regime has been developed using a risk-based approach and provides a practical and reasonable approach to the risks and potential consequences identified. Moreover, it takes account of potential risks to all users, particularly the most vulnerable.

The processes and standards that underpin this regime are detailed in the Safety Inspections Manual and are reviewed annually.

Service-specific Inspections

The inspection requirements of different asset groups can vary significantly due to their composition and the way in which they function. Service inspections are tailored to the requirements of specific highway assets and elements to ensure that

they meet requirements for serviceability. Examples of these types of inspections include electrical testing of lit signs and structural testing of street lighting columns. These inspections also include inspections for network integrity and for regulatory purposes intended to maintain network availability and reliability.

Condition Surveys

Condition surveys are primarily intended to identify asset deterioration which, if untreated, are likely to adversely affect long term performance, serviceability and safety. The data collected can be used to forecast life expectancy, to determine when intervention may be appropriate, to model the impact of different intervention strategies and to compare the likely costs. In addition, the information collected informs government indicators and the annual valuation of the highway network.

We will continue to implement asset condition surveys based on asset management need and in accordance with our statutory reporting requirements.

Structural Assessments

Structural Assessments are carried out on a targeted basis to determine the capacity of a structure to carry the loads which are imposed upon it and increases in load that may be reasonably expected in the foreseeable future.

Reactive Inspections

We proactively encourage our customers to report highway defects via our Online Fault Reporting Tool and a dedicated highways line to our Contact Point.

Reports from members of the public provide a further source of knowledge on the condition of the highway network. To maximise the value of this information, appropriate quality assurance measures are needed. As such, a regime of reactive inspections is in place to support the validation of reports, ensure duplicate reports are identified and combined, and to maintain auditability of information. It is not always necessary to inspect a defect to determine the required response but the decision to inspect or not, and the outcome of any inspection should be recorded systematically and consistently.

In order to maximise the benefits of the risk-based approach prescribed by WMHI and ensure so far as is practicable the safety of road users, we have developed and continue to improve our approach to identifying and resolving defects on the highway. This is now embedded in our works asset management system which records the relevant risk and timeframe for resolution including mitigating or aggravating factors. These principles extend to all asset groups.

Defect Recording and Repair

All defects observed during service, safety, condition and reactive inspections need to be recorded and the type and speed of response determined on the basis of a risk assessment.

Defects that require urgent attention should be corrected or made safe at the time of the inspection, if reasonably practicable. In this context, making an asset safe may constitute displaying warning notices or fencing off to protect the public from the defect. If it is not possible to correct or make safe the defect at the time of inspection, repairs of a permanent or temporary nature should be carried out as soon as possible. If temporary repairs have been used, permanent repair should be carried out within a reasonable period.

Defects that do not represent an immediate or imminent hazard or risk of short-term structural deterioration may have safety implications, although of far less significance than those which are considered to require urgent attention. They are more likely to have serviceability or sustainability implications. If repairs are to be undertaken these are likely to be within a planned programme of works with their priority determined by risk assessment. For example defects in highway trees may be identified during condition inspections and if the defect does not present an immediate safety threat, works will be ordered to reduce the risk of failure, eliminate the hazard or improve life expectancy of the tree. Access requirements, other works on the network, traffic levels, and the desirability of efficient traffic management, should also be considered as part of prioritising and scheduling the works.

We have developed and implemented a risk-based defect repair regime for all highway assets.

Managing the safety and other risks associated with the delivery of highway infrastructure maintenance requires effective and co-ordinated information systems to record inspections, defect reports, condition assessment and activity. The accuracy and quality of information recorded is crucial to the effective management of the service and to demonstrating that we are a competent highway authority.

All information obtained from inspections and surveys, together with the nature of response, including nil returns, should be consistently recorded. It is important that the data from inspections and surveys can be reviewed and analysed both independently and in conjunction with other information to enable a holistic understanding of the future maintenance need, asset condition and trends related to network characteristics and use.

We have developed and implemented mechanisms for recording all inspections and subsequent activities to justify decisions made, inform future decision making and protect us from unjustified or fraudulent claims.

Competence and Training

To ensure that inspections, risk assessments and the analysis of the resulting information is meaningful and valid, appropriate competencies for all staff are required. Continued professional development is key to this and should be embedded in the annual Learning and Development cycle.

We will ensure that the appropriate competency required for asset maintenance and management is identified and that training is provided where necessary. This will include an eLearning module currently being developed.

All Highway Stewards and Inspectors are trained in compliance with the CIHT Highway Inspector Competence Framework and registered on the National Register of Highway Inspectors, additionally specialist training is delivered on topics such as basic arboriculture to equip them fully to competently inspect and ensure the safety of the highway.

Resilience and Sustainability

Kent, which provides key transport links between the capital and the continent, has some of the most intensively used roads in the country. Any disruption to the network has an immediate impact on road users, the economy, and services. Ensuring these roads are as resilient and sustainable as is practicable must be a priority.

Managing Highways for Resilience

Resilience as defined by the Cabinet Office is the “ability of the community, services, are or infrastructure, to detect, prevent and if necessary, to withstand, handle and recover from disruptive challenges”. Resilience in the context of highway infrastructure is the ability of a highway network to withstand not only the impacts of extreme weather (snow, ice or flooding) but also industrial action, major incidents and other local risks. The level of resilience sought for any length of highway needs to be commensurate with its intensity of use, economic or social importance and the availability of alternatives. The more intensively used and economically or socially important a route is, the shorter the disruption that is acceptable.

We have long had robust systems in place to respond effectively to severe weather emergencies and we already take a hierarchical approach to the management of our 5,400 miles of highway network. In September 2017, this approach was enhanced further when The Environment & Transport Cabinet Committee endorsed the *Definition of the Resilient Highway Network in Kent*.

In addition to the physical resilience of highway infrastructure, the management of disruption and speed of recovery are also key. There are several potential situations which could have a significant effect on the highway including inclement weather, subsidence, landslip or collapses, oil spills or local events such as Operation Stack.

We have operational plans and procedures in place with respect to winter service, severe weather events, unforeseen events, and civil emergencies. These plans have been developed in consultation with partner organisations and include roles, responsibilities and contingency plans and procedures to enable timely and effective response. Clear communication plans are also in place to ensure that weather and flood forecasts are received by operational teams and disseminated to staff, contractors and our customers.

Responses to severe weather, emergency exercises and actual response are used to identify training opportunities and potential improvements to operational plans and procedures. Where appropriate, reviews are carried out in consultation with multiple parts of the council and other responding organisations impacted by the event.

Critical Infrastructure

Critical Infrastructure refers to routes and assets where failure would result in a significant impact to the local, and potentially the national, economy, and affect the ability of public/emergency/health services to carry out their responsibilities. Critical infrastructure assets form a crucial part of the highway network and can be divided into two types. Firstly, the critical infrastructure that we maintain, for example strategic routes such as the Thanet Way. Secondly, the critical infrastructure that others maintain but that is reliant on highway assets, for example Ramsgate Port is heavily reliant on access via the Ramsgate Tunnel. There are many potential risks and threats to the function of critical infrastructure, such as climate change, including impacts from flooding, rising temperature, changing sea levels, high winds and drought.

We need to ensure the adequate management of critical assets, including appropriate investment to ensure that they are sufficiently resilient to cope with potential threats.

We have identified our critical assets and understand both their current performance and the impact of their failure. This knowledge informs our maintenance priorities and investment decisions. The document *Definition of Kent's Resilient Highway Network* details not only the critical network but also how it was derived and how it is treated.

Climate Change and Adaptation

The Climate Change Act 2008 established a statutory framework for climate change mitigation and adaptation and set in place a five-year cycle for government carbon budgets, to report on the risk to the UK of climate change and to publish a programme setting out how these impacts will be addressed. In 2019, the government increased its ambition and declared its commitment to achieve net-zero carbon emissions by 2050, incorporating this target within the Act.

We have also committed to achieving net-zero carbon emissions by 2030 for our own estate and operations and working with partners by 2050 for the county. This commitment extends to our contracted services and requires providers to:

- Confirm their own organisational commitment to working towards net-zero emissions for services they provide to us
- Identify and apply innovative approaches to avoid or minimise carbon emissions/embedded carbon from materials, equipment, vehicles and working practices
- Report on progress towards net-zero carbon emissions at least annually, providing a breakdown of data to identify scope 1, 2 and 3 emissions.

The government released the second National Adaptation Programme in 2018 containing a series of objectives and associated actions, most notably with regards to highway infrastructure. These actions included:

- To ensure infrastructure is located, planned, designed, and maintained to be resilient to climate change, including extreme weather events.
- To better understand the vulnerabilities facing local infrastructure from extreme weather and long-term climate change to determine actions to address the risks.
- To consider adaptation pathways and holistic lifecycle planning of assets to accommodate development in uncertainty and future changes.

As such, it is important that due consideration is given to how the impacts of climate change, such as intense or prolonged rainfall, hotter temperatures and higher windspeed will impact on the types of highway assets that we manage over the course of the asset's lifetime. Some of the risks may have the potential to be reduced by mitigation action and options for mitigating the greatest risks should be explored with a view to prioritising those measures that will provide the greatest return on investment in terms of reduced risk.

We are continually assessing the risk of extreme weather events on highway infrastructure and identifying ways to mitigate the impacts, and this has led to real change already. This has naturally focussed on flooding and drainage assets. For example, we are now pre-inspecting highway gullies on our main roads and cleansing flooding hotspot locations every six months. We are trialling the use of gully sensors in strategic locations and have mapped our flooding hotspots for areas which require drainage system renewal or enhancement using capital resource so that these may be prioritised.

We are moving towards implementing an asset management system to plot our drainage assets, in order to develop a smarter, evidence- and risk-based maintenance regime.

We are considering the effect of temperature rises on road surface material selection, both during contract awards and also in technical specifications that we are developing.

It needs to be recognised that some of the solutions to reduce the environmental impact of maintaining highway infrastructure are likely to be more expensive than current materials and methods, and this extra cost is currently not funded.

Sustainability

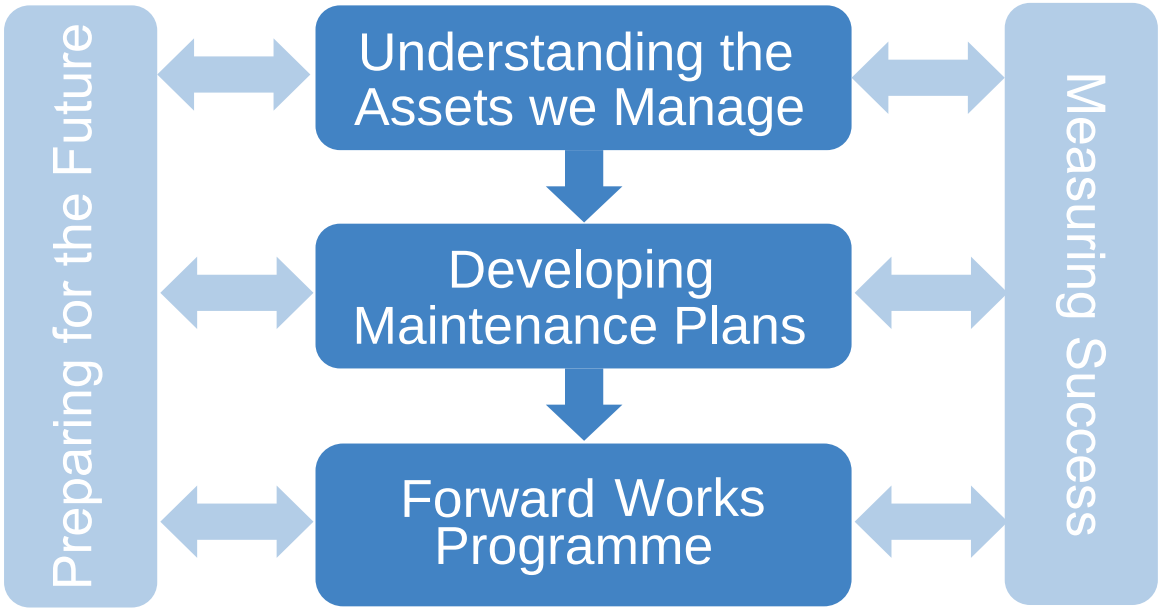
We have an important role in ensuring our residents and businesses benefit from sustainable growth and a competitive, innovative and resilient economy. This should be balanced with protecting and improving our natural and historic assets, for their unique value and positive impact on our society, economy, health and wellbeing. Materials and treatments used for highway maintenance can have a positive contribution to the public realm. There are a wide range of options, some of which are obligatory, but many of which provide for sympathetic application in particular circumstances. For example, the selection of appropriate vegetation and trees during the planning stage of new schemes can bring environmental, drainage and social benefits.

We will endeavour to balance the character of the area as well as whole life cost, environmental impact and sustainability when determining materials, products and treatments.

The management and maintenance of highway infrastructure have an inevitable impact on the environment and we therefore have a responsibility to make sure environmental risks and opportunities are managed positively and our use of natural resources is minimised for the benefit of future generations. Our Environmental Policy outlines the actions and objectives that underpin our approach. In accordance with this policy statement highway verges, trees and landscaped areas are managed with regards to their nature conservation value and biodiversity principles as well as highway safety and serviceability.

The Incentive Fund questionnaire, which determines a portion of highway maintenance capital grant the DfT provides authorities for 2021/22, includes a number of additional questions relating to sustainability and climate change challenges. For 2021/22 these questions do not affect funding levels but, in our view it is likely that this will change going forward. As such, this document includes a number of specific actions to meet our climate change and sustainability aims.

Part 3: Implementing Asset Management Principles in Highways



Understanding the Assets We Manage

The highway network is made up of a diverse range of assets including around 5,400 miles (8,700 kilometres) of roads, more than 2,500 structures, 250,000 roadside drains, 500,000 trees, 120,000 streetlights as well as 4,000 miles (6,400 kilometres) of footways and over 700 traffic lights. The replacement value of these assets is estimated to be in the region of £24 billion.

We understand different assets have different characteristics and so need to be managed differently.

Asset Information

Understanding both our assets and the effect they have on each other is central to effective asset management and informed decision making. We therefore do not consider the asset groups in isolation but as an integrated whole.

The information we need can be broken down into three categories:

Inventory and Condition Information

This data describes the full extent of an asset and can include location, age, size, construction, and details of previous maintenance. Examples of how we collect this data include digitalisation of historic records and data collection exercises included as part of routine maintenance works.

Inventory and condition information helps us to plan maintenance activities and communicate with the public. It also helps us to understand the cost of replacing our assets with equivalent new assets.

Performance Information

This is the data we use to determine whether assets are doing what we need them to do to keep the highway safe, reliable, and meeting the needs of our residents, businesses, visitors, and local communities. Examples of how we collect this data include condition surveys, routine inspections and testing, customer enquiries, third party claims, crash records, traffic flows and energy bills.

This data helps us to understand where we need to carry out maintenance activities, where our assets are going to need replacing now or in the future and where we need to think about changing, adding or removing assets. It also helps us to understand the cost of replacing an asset with its modern equivalent, less deductions for all physical deteriorations.

Financial Information

This is the data we use to assess cost: for example, how much it will cost to maintain or replace an asset or how much it will cost to deliver a certain level of service. Our schedule of rates for different maintenance activities is one example of this kind of data.

Collection of Asset Information

We continually collect information about our new, replacement and improved assets. It is important that the data we collect is accurate, reliable, and useful but data collection can be expensive. We therefore take a risk-based approach to the collection of information, prioritising high risk assets and information that will support our approach to asset management.

The quality, appropriateness and completeness of our asset data are reviewed regularly by our asset managers, as part of the Asset Information Plan, to ensure that it fully supports our approach to asset management.

Storage of Asset Information

We store all collected asset data, for each asset group, in an appropriate asset management system in a cost effective and appropriate format to ensure it is readily available to those that need it. Effective asset management relies on systems that can be used to support decision making at all levels.

Our asset inventory, condition and defect data are currently stored and interpreted in a number of ways.

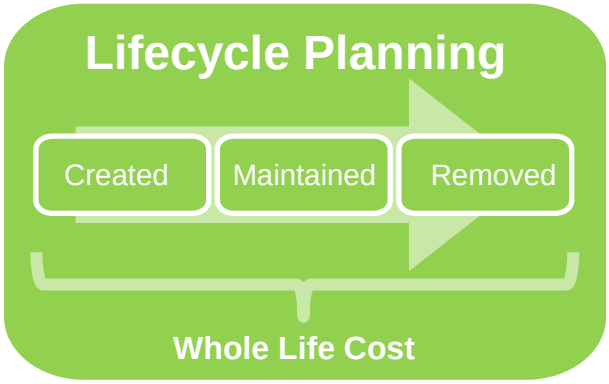
Asset Group	Systems Used
Roads and Footways	Works and Asset Management System (WAMS) and Horizons, a specialist pavement asset management system
Drainage	WAMS and Map 16
Bridges, Tunnels & Highway Structures	WAMS and AMX, a specialist database with details of inspection records
Street Lighting (including lit signs/bollards)	WAMS and Central Management System
Intelligent Traffic Systems	Information Management for Traffic Control (IMTRAC)
Soft Landscape	WAMS
Safety Barriers	WAMS
Unlit Signs, Lines & Cats' Eyes	We do not record details of this asset group but do undertake regular inspections and respond to customer requests to carry out ad-hoc visits to specific locations.

The systems that we use are also regularly reviewed and monitored by Asset Managers through the *Asset Information Plan*. This enables us to ensure that they are providing reliable information in a format that can be used to inform the delivery of our highway maintenance, renewals, and improvements effectively.

Developing Maintenance Plans

We have a three-step approach to developing maintenance plans for each asset group:

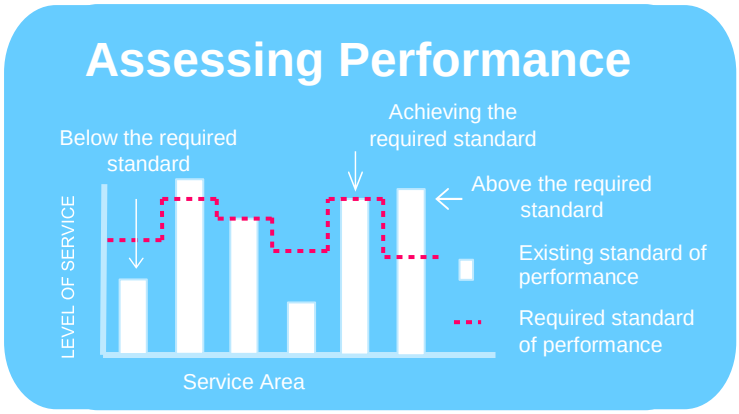
Lifecycle Planning



Firstly, we need to understand the 'lifecycle' of our assets.

All our assets are created, maintained, and eventually replaced or removed. We need to understand what is involved at each stage, when it needs to happen and how much it will cost. If we understand the lifecycle of our assets we can calculate the whole life cost, i.e. how much the asset will cost to create, maintain throughout its life span and finally decommission. We can also predict the impact of different maintenance strategies and determine whether we can afford them.

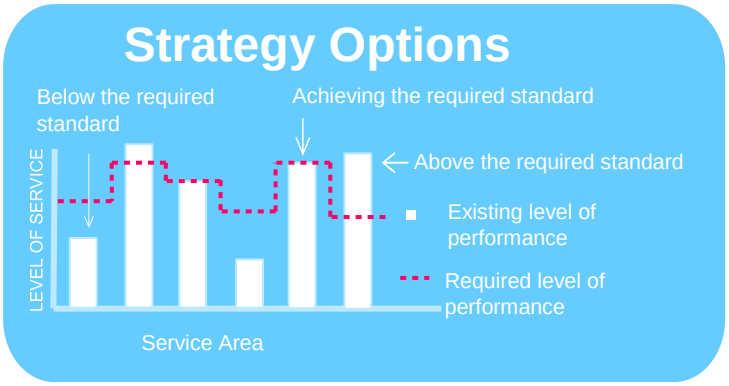
Assessing Performance



Secondly, we need to understand whether we are already delivering our required standard of service or performance. We can do this by measuring performance at three different levels:

Type of Performance Measure	**What are we measuring?**	**Example**
Strategic Performance	A snapshot of overall performance which tells us whether or not we are delivering the intended benefits to the county's residents, businesses, visitors and communities	**We want to**: deliver services that are shaped by the needs of the county's residents, businesses, visitors and communities. **Strategic Performance Measure**: we report key measures to Cabinet and use surveys such as the NHT public satisfaction survey and CQC efficiency network surveys to do this.
Asset Performance	More detailed information that tells us which asset groups are succeeding or failing to deliver the intended benefits to the county's residents, businesses, visitors and communities.	**We want to**: deliver services that are shaped by the needs of the county's residents, businesses, visitors and communities. **Asset Performance Measure**: we use condition data from a variety of asset specific surveys to understand if our assets are performing in accordance with our asset management plans. Key metrics are also included in Highways and Transportation's Divisional Operating Plan, and monitored in regular performance review meetings.
Operational Performance	Operational information that tells us why a specific asset group is succeeding or failing to deliver the intended service standards/ benefits to the county's residents, businesses, visitors and communities	**We want to**: deliver services that are shaped by the needs of the county's residents, businesses, visitors and communities. **Operational Performance Measure**: we use monthly measures to ensure we are delivering our published service standards such as 'the average time taken to fix a pothole'.

Defining a Maintenance Strategy



Finally, once we know where we are and where we want to be, we need to decide on our maintenance strategy.

- **Reduce the level of performance:** If the level of performance exceeds the required standard or is unaffordable it should be reduced. For example, the frequency of maintenance might be reduced, or the intervention level might be increased.
- **Sustain the current level of performance:** If the level of performance meets the required standard and is affordable it should be sustained.
- **Enhance the level of performance:** If the level of performance is below the required standard, investment to enhance the performance should be found. For example, the frequency of maintenance might be increased, or the intervention level might be reduced.

We must work within the constraints of our budget, particularly during difficult financial times, so it is also important to identify the most efficient and affordable way of delivering services.

- **Minimising whole life cost:** When considering different maintenance strategies, it is important to think about the future and keep costs to a minimum for the whole life of the asset. For example, repairing potholes might be cheaper than surface dressing a road in the short term but not if a consequence of this strategy is that the road deteriorates faster and needs to be reconstructed and resurfaced in five years' time.

When required levels of performance are not financially viable it is important that we know the risks and prioritise accordingly:

- **Managing risk**: We need to understand and document the risks associated with different maintenance strategies and manage them effectively. For example, increasing the investigatory level for a road pothole from 50mm to 100mm will save money but would increase the safety risk, perhaps to an unacceptable level.

- **Enhance priority areas of the service**: Where it is not financially viable to enhance the level of performance across all assets within an asset group, key areas should be prioritised. For example, the frequency of maintenance on main roads might be increased whilst the current frequency is maintained or reduced on minor roads.

We publish information about how and when we do maintenance on our website. This lets members of the public see how we look after our assets, the levels of performance they can expect and when the work will be carried out.

Forward Works Programmes

Forward works programmes provide an effective and efficient way of delivering maintenance, repairs and improvements. They enable prioritisation and optimisation of schemes to meet available budgets.

Developing a works programme is a five-stage process:

Identification

Potential schemes may be identified from a range of sources including inspections, surveys, local knowledge, customer enquiries, complaints and wider transport or corporate objectives. These schemes are collated into an initial works programme for each asset group.

Prioritisation

The following things are considered when prioritising schemes:

- the maintenance hierarchy of the road
- the safety of road users
- the impact on the movement of traffic if the asset fails
- value for money
- the cost of bringing forward or delaying works
- the lifecycle cost of our highway asset
- the impact on future use of the highway
- the environmental impact
- the impact on the community including damage to property or impacts on local businesses

Selection

The lists of schemes for each asset group are combined, costed and listed in priority order. The “cut off” point is then determined by totalling up the cost to the point where the budget is fully utilised.

Programming & Optimisation

Selected schemes are optimised within the works programme, based on many factors including deliverability. This is done by coordinating or combining works to minimise both cost and disruption.

Delivery

Finally, a multi-year works programme is confirmed and delivered from the available budget.

We publish our programmes of work on our website, so that members of the public can see where and when we plan to do works. Our Forward Works Programme for the next five years is attached at Appendix C.

Measuring Success

We follow an asset management approach to deliver the following benefits:

- a service that is shaped by the needs of our residents, communities, visitors and businesses now and in the future
- a service that makes best use of the available resources, maximising efficiency to meet with our legal obligations
- a service that is resilient and able to respond to changes and financial challenges.

It is important that we record and demonstrate that these benefits are being delivered. We can do so at a number of levels and in a number of ways:

Monitoring Outcomes

We need to ensure that our approach is being implemented as planned and is delivering the intended outcomes. For example, if our maintenance strategy for roads is to ensure that 85% of our main roads are in good or very good condition, we need to carry out condition assessments to determine whether or not this is being achieved.

By routinely monitoring outcomes and reporting on their delivery we can ensure that we remain focused on the needs of our residents, businesses, visitors and communities, meeting with our legal obligations and responding to changes and financial challenges. Whilst our approach to highways asset management and our forward works programme should be considered multi-year activities, the delivery of outcomes is reviewed and reported on annually through a number of channels.

Performance Measures and Targets

We use a range of metrics and targets to monitor our performance against our levels of service and determine how well we are delivering the intended benefits.

Examples of these measures and targets include national indicators such as the Bridge Condition Index which measure the overall condition of our assets, the percentage of residents satisfied with street lighting repairs, and the number of damage and personal injury claims upheld against us.

By reviewing performance we can ensure that we are continuously improving the way we work. We routinely review the performance of the service, identify areas where performance is not where we would like it to be and understand why this is the case. Having recognised opportunities for improvement, options to address any issues are identified and implemented. Performance is reported on a regular basis to key decision makers, elected representatives and members of the public.

Benchmarking

By comparing our service with the services provided by others, we can identify better ways of working at all levels. For example, we might compare the outcomes we are achieving using asset management with the outcomes other councils are achieving. Equally we might compare two of our own services, for example residents might be more satisfied with the street lighting service than they are with the drainage service. By comparing the two, lessons can be learnt and improvements can be implemented.

For several years, until 2017, we commissioned an annual Highways Tracker Survey to help understand residents' perception of the highway service we deliver. This survey enabled us to compare the satisfaction levels from different parts of the service but being unique to Kent did not allow comparisons to be made with other councils.

In 2018 we joined the National Highway and Transport (NHT) Network, a performance improvement organisation that enables members to measure, share and compare performance in order to identify areas for improvement. This is done through 26 key benchmark indicators, divided between six highway and transport themes. Currently over a hundred councils are members of the NHT network.

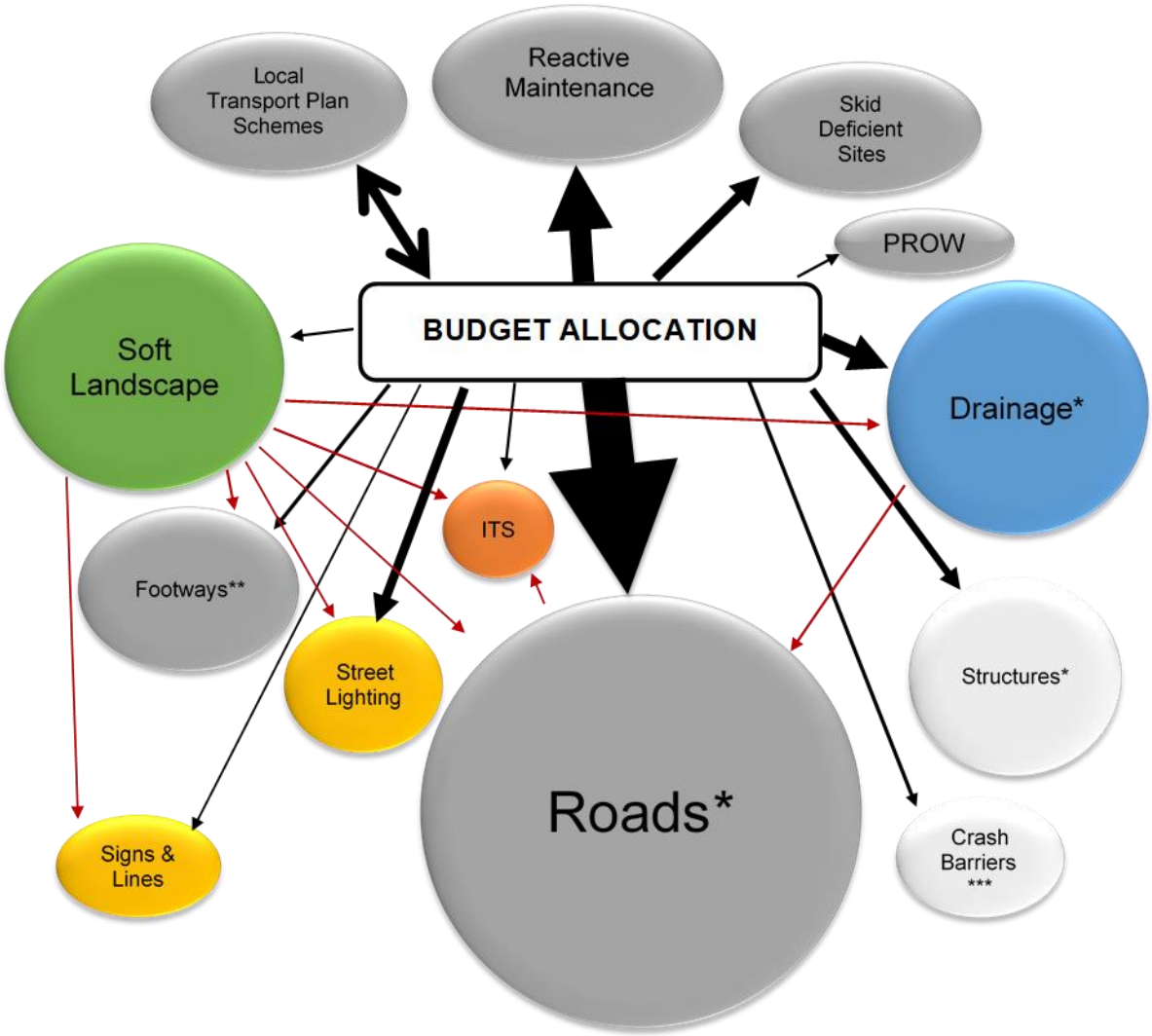
As well as allowing us to make a year on year comparison of public satisfaction with the service we provide it also enables us to compare the levels of satisfaction with our services to those achieved by other councils. A summary report on the latest surveys can be found on our website.

The NHT Network has also developed a consistent way of measuring and comparing efficiency within and between highway authorities. This is achieved in a balanced and objective way by providing a basis for assessment of performance by combining views of customers, from the NHT Public Satisfaction Survey, with quality and cost data provided by each individual member. We can then identify and implement service improvements. A summary report on the latest survey can also be found on our website.

Part 4: Applying Asset Management Principles to Each of Our Asset Groups

Overview

We recognise that although the highway network is made up of individual asset groups, each managed by a separate team, the assets do not operate in isolation and we therefore consider them as an integrated set, as illustrated indicatively below.



Key Asset Interdependencies

Notes:
The black lines represent the relative size of the allocation
The red lines show the interdependencies between asset groups.
* includes critical assets on the Resilient Highway Network
** asset with most impact on Equality Act duties
*** safety critical asset

Although the complexity of our approach to asset management varies across the asset groups, the same principles have been applied in all areas of the highway service.

The Asset

It is important to understand the type, quantity and value of the assets we maintain as well as their purpose and the effect their condition has on the condition and performance of other assets. For example, roads are our largest and most valuable asset and by comparison, our bridges, tunnels and highway structures make up a much smaller asset group with a much smaller financial value, but they form essential links that connect our roads and footways and are therefore intrinsic to the roads asset fulfilling its purpose.

By understanding the type, quantity, value and purpose of each asset group we can identify key interdependencies and make informed decision about the extent to which we need to develop our approach to asset management in respect to that asset group.

The condition and hence maintenance need of any asset is not only influenced by the use it gets but also by its original condition and that of other assets around it.

As can be seen above we consider soft landscaping and drainage have the greatest potential to adversely affect the performance and condition of other highway assets. Both of these are predominantly revenue activities, a funding stream that is supported by the government and that has seen the most significant budget reductions in recent years.

Condition Assessments and Inspections

All of our asset groups are subject to condition assessments and/or inspections. The information collected is used to identify the maintenance and improvement works needed to meet the required service standard and, with varying degrees of accuracy, to estimate maintenance backlogs and future investment needs.

The frequency and complexity of condition assessments and inspections is determined by the quantity, value, and most importantly the criticality of the asset. For example, our road network is our largest highway asset and consequently we invest significant resources into understanding its condition, but we do not take a ‘one size fits all’ approach. We carry out mechanical condition surveys on our main roads and visual surveys on our minor roads. Similarly, higher risk areas such as high-speed roads and main roads are inspected by our team of highway inspectors more often than minor roads because the likelihood of risk to safety is greater should a defect occur. This principle applies to all of our asset groups, with priority given to understanding the condition of our highest risk assets

Prioritisation of Investment

All assets are important, and we have a statutory duty to ensure that the highway is safe. We also endeavour to make sure our highway network is resilient and can support economic growth and local communities. However, we have to work within an overall budget and therefore, during fiscally challenging times and given increasing customer expectations, we need to prioritise investment effectively.

The methodology used to prioritise investment varies between the asset groups but in all cases, the approach to deciding where to spend our money is primarily risk based. Consideration is also given to the extent of the work required, whether or not the existing arrangement is meeting the needs of highway users, the impact on other highway assets, and the practicalities of future maintenance.

Finally, having assessed the investment needs for each asset group, we consider this in the wider context of the whole highways service as we endeavour to undertake the right repairs at the right time in the lifecycle of all our assets.

This is how we currently allocate capital resource.

Standards of Service or Asset Performance

The accuracy with which we can assess the cost and impact of providing various levels of asset performance or standards of service varies depending on the quality of information and tools available to us. For example, in the case of roads we have excellent condition data, a good understanding of deterioration and the technology to model the impact of differing levels of investment. For drainage, we do not have the same level of information or modelling capability, so a simpler approach based on past experience and engineering judgement has historically been adopted.

In the past, our approach to managing the condition of our highway assets has been based on an assessment of the backlog of maintenance: for roads, this means an estimate of the value of surfacing schemes that have been identified as a result of our condition surveys. The principal limitation of this approach is that it only provides a snapshot in time; it does not enable us to consider the effect of funding decisions on the whole life cost of assets. For example, a reduction in funding in one year may have the effect of increasing the total cost of maintenance over the life of an asset.

The introduction of the DfT Incentive Fund several years ago led us to review this approach, and to introduce lifecycle planning for many asset groups. This has improved the accuracy of modelling data and our estimate of the backlog.

When determining standards of service and asset performance, we consider up to four options in the context of our statutory obligations, Strategic Objectives, customer expectations and the available budget:

Asset Performance or Service Standard Enhancement

An approach that fulfils our statutory obligations and enables the overall condition of the asset group to be enhanced. Interventions such as maintenance, asset renewals and improvements are undertaken on a planned, prioritised basis with a view to increasing the proportion of the asset group in a very good or good condition.

Steady State

A standard of service or asset performance and investment that fulfils our statutory obligations and preserves the overall condition of the asset in its current state. Interventions such as maintenance and asset renewals are undertaken on a planned, prioritised basis with a view to keeping the same proportions of the asset group in a very good, good, poor and very poor condition. Any investment less than this would mean that a steady state condition or existing service could not be achieved.

Asset Performance or Service Standard Reduction

A standard of service or asset performance that fulfils our statutory duties and facilitates a more controlled approach. Interventions such as maintenance and asset renewals are undertaken on a planned, optimised basis.

Statutory Minimum

The minimum standard of service or asset performance that fulfils our statutory duties. Asset condition is allowed to decline with interventions such as maintenance and asset renewals undertaken on a reactive basis if and only if they are necessary to fulfil our legal obligations. This is an extremely inefficient approach and will cost us more over the lifecycle of our assets and therefore cannot be recommended.

Using asset appropriate data with lifecycle and deterioration modelling, we have modelled some of these outcomes and associated required investment levels. The results of this modelling are included in the following sections of this document.

The modelling we have undertaken assumes normal deterioration rates and no allowance as been made for any significant damage caused by severe weather. There has also been no allowance made for significant single projects requiring large investment.

The Roads Asset

	Road Classification				
	A	**B**	**C**	**U**	**Total**
miles	616	279	1,171	3,329	5,395
kilometres	991	449	1,885	5,358	8,683

The primary objective of our road assets is to enable residents, businesses and visitors to make vehicular and cycle journeys safely and efficiently. To achieve this our road assets need to:

- transfer vehicle weights from the road surface through to the underlying ground without deformation of the road surface
- maintain an acceptable level of skid resistance
- maintain their structural integrity and maximise their lifespan to provide maximum value for money from investment.

The majority of our roads are of bituminous construction, of varying age and specification. In rural areas many of our unclassified roads have not been designed but have 'evolved' over many years of use, presenting us with particular maintenance challenges. We also have around 300 miles (480 kilometres) of roads that are either of concrete or covered concrete construction, most of which are unclassified roads in residential areas.

For maintenance purposes the network is currently split into the following priorities:

- Major Strategic – routes, or parts of routes, linking major urban centres where these are not linked by trunk roads
- Other Strategic – routes or part of routes, between other urban centres or centres of industry/commerce
- Locally Important – routes or part of routes, of local importance in distribution of goods or people
- Minor Roads – all other routes, including estate roads and rural lanes.

However, following a detailed review, we have recently decided to implement a new maintenance hierarchy. This is based on that suggested in *Well-managed Highway Infrastructure*, though with the addition of a new top category comprising Kent's Resilient Highway Network. Over the coming years, we will review the current network against this hierarchy. The new hierarchy is as below.

Category	Type of Road	Description
Resilient Highway Network	Principally main roads that are vital to protecting economic activity in and through the county, access to key services and access to key infrastructure.	The portion of our highway network that is absolutely vital to maintaining economic activity and access to key services during extreme weather emergencies and other major incidents.
Strategic Route	Principally A class roads between Primary Destinations	Routes for fast-moving, long-distance traffic with little frontage access or pedestrian traffic. Speed limits are usually in excess of 40 mph and there are few junctions. Pedestrian crossings are either segregated or controlled and parked vehicles are generally prohibited.
Main Distributor	Major Urban Network and Inter-Primary Links Short – medium distance traffic	Routes between Strategic Routes and linking urban centres to the strategic network with limited frontage access. In urban areas speed limits are usually 40 mph or less, parking is restricted at peak times and there are positive measures for pedestrian safety.
Secondary Distributor	B and C class roads and some unclassified urban routes carrying bus, HGV and local traffic with frontage access and frequent junctions	In residential and other built up areas these roads have 20 or 30 mph speed limits and very high levels of pedestrian activity with some crossing facilities including zebra crossings. On-street parking is generally unrestricted except for safety reasons. In rural areas these roads link the larger villages, bus routes and HGV generators to the Strategic and Main Distributor Network.
Link Road	Roads linking between the Main and Secondary Distributor Network with frontage access and frequent junctions	In urban areas these are residential or industrial interconnecting roads with 20 or 30 mph speed limits, random pedestrian movements and uncontrolled parking. In rural areas these roads link the smaller villages to the distributor roads. They are of varying width and not always capable of carrying two-way traffic.
Local Access Road	Roads serving limited numbers of properties carrying only access traffic	In rural areas these roads serve small settlements and provide access to individual properties and land. They are often only single lane width and unsuitable for HGVs. In urban areas they are often residential loop roads or cul-de-sacs.
Minor road	Little used roads serving very limited numbers of properties	Locally defined roads.

Condition Assessments and Inspections

We check our roads on a regular basis, using both mechanical and visual means. We carry out two types of check, condition surveys and safety inspections.

Condition Surveys

Our condition surveys conform to national standards and are processed using accredited systems. The surveys establish key characteristics of the network including ride quality, rutting, surface texture, and skid resistance. We survey our classified roads every year, and our unclassified roads every two years.

Safety Inspections

Our team of highway inspectors carry out visual checks to make sure highway assets are in a safe condition. This includes checking for defects in the road surface that present a safety concern. We carry out this kind of check at least once every twelve months.

We also carry out reactive inspections in response to enquiries and raise orders for ad-hoc and emergency works, for example repairing potholes and other surface failures.

Prioritisation of Investment

Investment decisions are made based on a robust understanding of their effect on the future condition of the asset and the whole-life cost of maintaining it. Within the funds available for planned road maintenance, we prioritise the works we do to ensure that they will have the greatest benefit, taking a whole-county approach rather than apportioning funds by district. To do this we consider the condition of each road, the amount and type of traffic it carries, its importance to our economy, and any safety hazards that may be present, as well as the cost of the optimum treatment identified by our pavement management system and its effect on lifespan and the whole-life cost of maintaining the asset.

Other Significant Factors Affecting Road Maintenance

The Geology of Kent

Every year, we have to deal with a number of major failures in roads. These are often caused by underlying geological features such as landslips, deneholes, sink holes and other subsidence and can result in significant unfunded pressures. Kent's geological make-up is highly variable and while these geological features are more common in certain areas, much of the county is susceptible to some type of failure and they cannot be predicted before they occur.

Road failures are often also caused or exacerbated by damaged or failed utility apparatus. To reduce the financial impact, all major failures are now managed in a consistent manner to protect our position. This ensures that utility companies are held to account and that they pay for damage their failed equipment has caused to our assets. For example, we recently recovered £1.3m in relation to a serious road collapse in Leeds.

Utility Works

Utility companies have statutory rights to lay, maintain and improve their apparatus within our highway network in order to provide water, sewerage, gas, electricity, and telecommunications services to our residents, visitors, businesses and public services. Our role as highway authority is to ensure that these works are coordinated and managed in a way that minimises inconvenience and disruption.

In line with national guidance we also carry out a substantial programme of inspections each year to ensure that our roads are properly reinstated after works have been completed in order to minimise damage to our network. The statutory amount of inspections is 30%, though to improve and sustain the quality of street works and reinstatements we check around 40% of all utility works, with above 90% passing these inspections. We also have an ongoing core testing programme looking at the thickness and quality of material used in reinstatements. The pass rate for the tests has risen steadily to in excess of 80%. This work has led to a significant improvement in the quality of reinstatements.

Notwithstanding our inspection and testing regime, any works which involve cutting into an unbroken and otherwise sound road surface, even if carried out to a high standard, will affect a road's structural integrity. This will accelerate its deterioration and shorten its life, resulting in the need for premature maintenance which increases the pressure on highway budgets. It should also be recognised that many of the highway maintenance issues linked to utility works relate to reinstatements carried out many years ago.

Heavy Goods Vehicles

One of the challenges of economic growth and Kent's position as the gateway to Europe is an increase in the number of heavy good vehicles using Kent's roads. This is particularly a challenge in rural areas where many of our roads have 'evolved' over many years rather than having been specifically designed for modern use.

Applying Asset Management Principles to the Roads Asset

We have excellent condition data on our roads asset, and a good understanding of how the asset deteriorates, based to a large extent on past deterioration rates. The data has been collected over many years. Originally the primary driver for this data collection was to develop evidence-based maintenance programmes; however, due to its comprehensive nature, the data can also be used for lifecycle planning and for modelling the effects of different levels of investment.

Our current pavement management system is Yotta's 'Horizons'. We have moved to this system over the last year and it represents a significant improvement in our ability to accurately understand and forecast the condition of our road network.

This software enables us to assess the current condition of our road network, to develop works programmes, and to model the effects of various investment strategies on the future condition of our network. Using this system we are able to do this in more detail than ever before. Unlike some other systems, the future forecasting and the scheme identification models are intrinsically linked. This allows the outputs from one element to be checked against the other to increase accuracy and confidence in the results.

Horizons selects optimum treatments based on a range of user defined interventions and triggers. When the deterioration of a road, as measured by our condition surveys, reaches predetermined trigger levels, Horizons identifies the most appropriate treatment, and can be used to rank maintenance schemes on either a 'worst-first' or an economic basis. This list is sense-checked on site by our pavement engineers before being used to develop our forward works programme, which also takes into account local needs through liaison with our highway and district managers. Our forward works programme now includes a wider variety of maintenance methods and is a balance between preserving existing roads to extend their life, and renewing assets. It also increasingly includes specialist repairs and for the first time a specific programme to maintain our concrete roads.

Planned and Reactive Road Maintenance

The figures below relate primarily to proactive, planned capital investment in our road network, predominantly in the form of road renewal such as resurfacing, or preservation treatments such as micro asphalt or surface dressing. They do not include the sums we spend each year on reactively repairing road defects, including work carried out as part of Pothole Blitz campaigns, although in forecasting the future condition of our roads asset some allowance has been made for this.

Whilst surface defects will always occur, and are made worse by extreme weather events such as those which the county has experienced over the past decade, they are primarily a symptom of a lack of planned investment in the network. Put simply, the less resource invested in planned maintenance, the more surface defects such as potholes will occur. Reactive repairs are, on average, twice as expensive per square metre as planned resurfacing and do not last as long, so while they are essential to keep the highway safe, they represent a less cost-effective use of our budgets.

It is very difficult to model accurately the relationship between road condition and the number and cost of surface defects that will occur. However, investment less than that modelled to achieve a steady state condition will result in an increase in defects, increasing the pressure on revenue and capital funds and in turn reducing the amount of capital funding that can be spent on planned maintenance.

Typically, we spend £8-12 million per year on reactive road surface repairs, including our annual Pothole Blitz campaigns. These reactive repairs do not deliver the same

improvement in the condition of our roads as our planned maintenance. Also some of the improvement it does generate will not last as long because it does not involve the deep structural repair more likely to be part of planned maintenance.

However, there is still a positive impact that can be measured. In recent years, significant progress has been made in delivering larger and higher quality repairs through the Pothole Blitz programme. As a result we would expect about £4 million of Pothole Blitz works to deliver the same impact as £2-3 million of planned maintenance works.

Understanding the Current Condition of our Roads Asset

To understand the condition of our roads we use the nationally-recognised Road Condition Index (RCI). This includes three categories for our classified network:

Green roads which are in a good state of repair

Amber roads where some deterioration is apparent

Red roads in poor condition and likely to require maintenance within the next twelve months.

And two for our unclassified network

Green roads which are in a reasonable state of repair

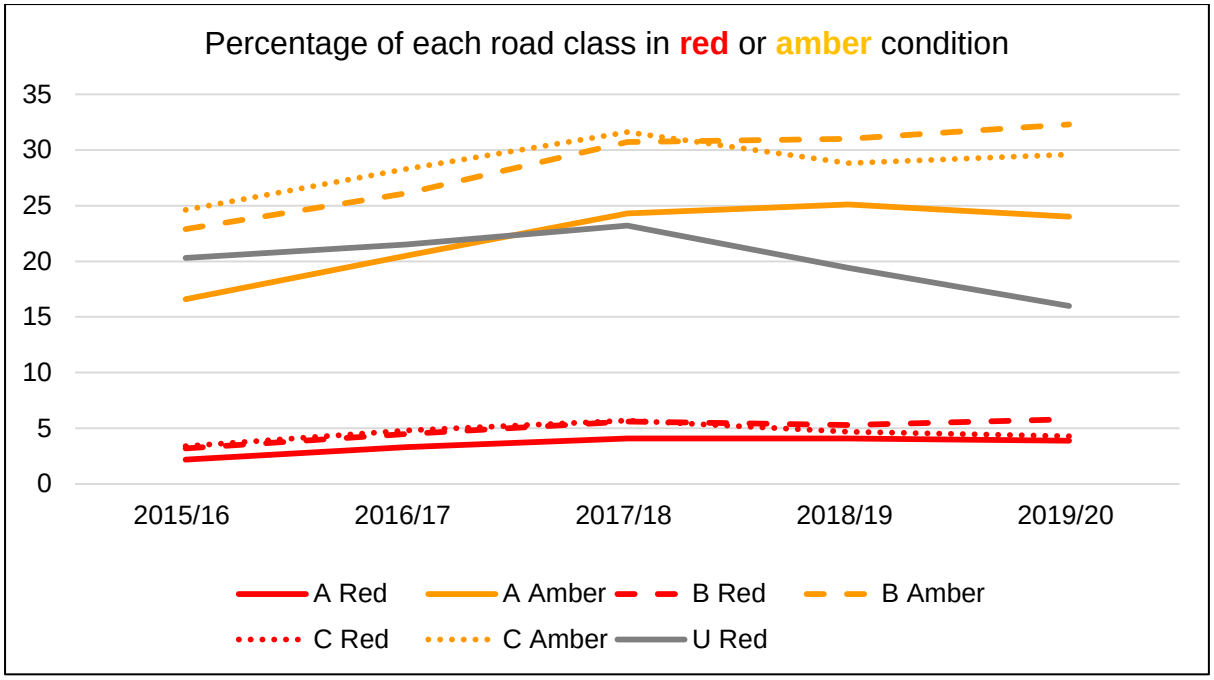
Red roads in poor condition which likely require maintenance within the next twelve months.

Following completion of the 2019/20 road condition surveys, the percentage of our road network in **red** condition is: 3.9% of A roads, 5.8% of B roads, 4.3% of C roads and 16% of unclassified roads.

The following table and graph compare these percentages with those for the previous years.

Road Class	Year				
	2015/16	2016/17	2017/18	2018/19	2019/20
A roads - red	2.2%	3.3%	4.1%	4.1%	3.9%
A roads - amber	16.6%	20.5%	24.3%	25.1%	24%
B roads - red	3.2%	4.5%	5.6%	5.3%	5.8%
B roads - amber	22.9%	26.1%	30.7%	31%	32.3%
C roads - red	3.4%	4.8%	5.7%	4.7%	4.3%
C roads - amber	24.6%	28.3%	31.6%	28.8%	29.6%
U roads - red	20.3%	21.5%	23.2%	19.4%	16%

Percentage of each road class in red and amber condition 2015/16 - 2019/20



Percentage of each road class in red and amber condition 2015/16 - 2019/20

These figures reflect past levels of investment in our road network, though there is some lag between investment and recorded change in condition due to the survey regime. For example, maintenance undertaken during year 1 may not be surveyed until year 2 or 3, so the full effect across the network of changes in investment will not show immediately.

The budgets for 2015/16 and 2016/17 were the lowest we have seen for many years at £16 million and £13 million. This is reflected in a rise in the percentage of roads which are showing deterioration, or are in poor condition, between 2015/16 and 2017/8.

Since 2017/18 we have received substantial additional investment, both in planned maintenance and also in higher quality reactive repairs through the Pothole Blitz programme. This is reflected in the most recent condition data (2019/20), which shows that overall our network is still deteriorating but this has slowed considerably compared to five years ago. Indeed, we have managed to maintain the percentage of classified roads in poor condition at a near steady state in the last couple of years. However, this has not addressed the fact that the overall condition of classified roads has continued to deteriorate as shown by the percentage in amber condition illustrated in the table and chart above. The growing percentage of classified roads in amber condition may result in a significant maintenance challenge in the next five years.

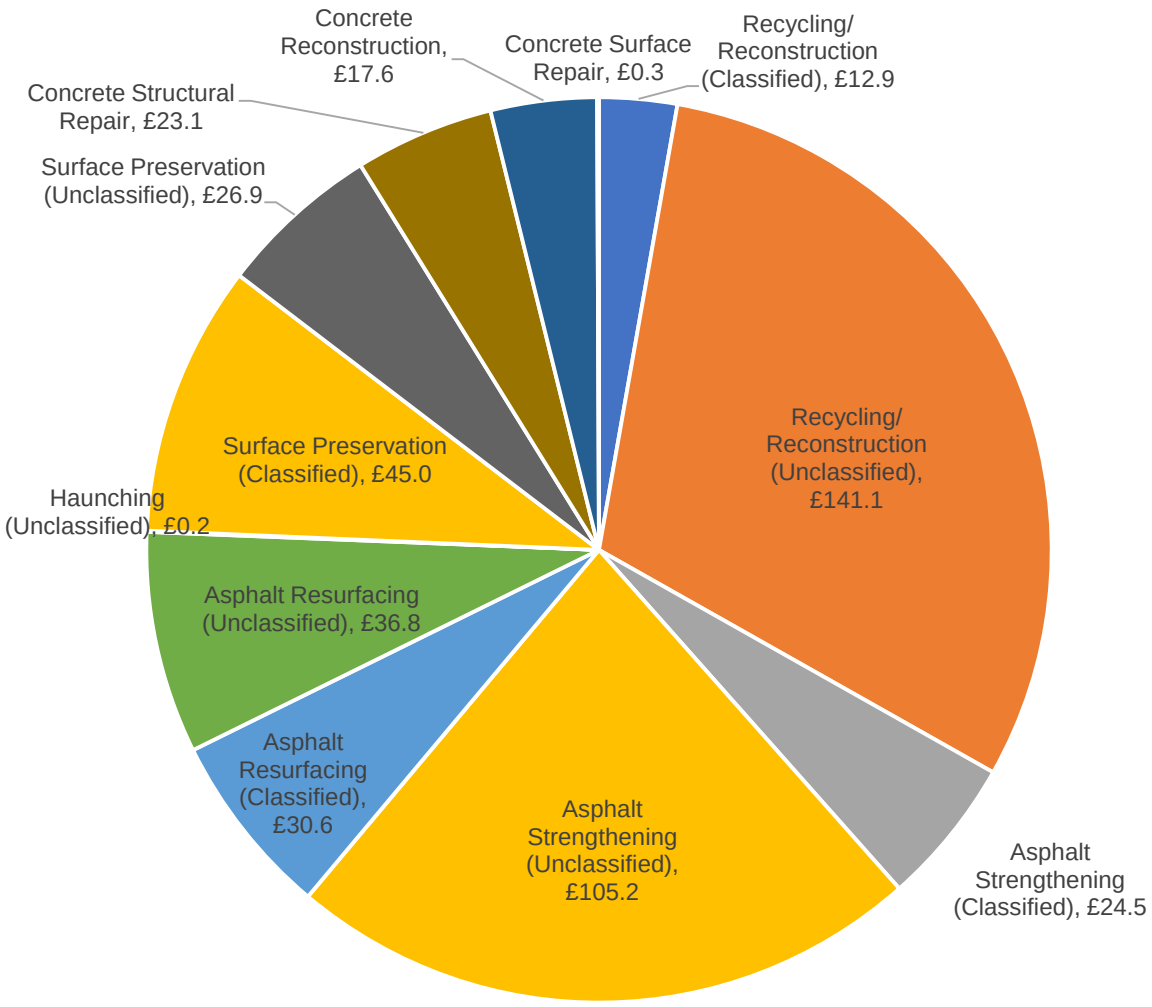
The data shows an apparent improvement in the condition of unclassified roads. Whilst a portion of this improvement may be attributed to our larger surface treatment programme and improved Pothole Blitz campaigns in recent years, we

have some concerns about the accuracy of this data and intend to investigate this further.

Current Maintenance Requirements

Before we can look at what different levels of funding will deliver in terms of the condition of our road network, we must first understand the volume of maintenance works needed to bring the network up to a good condition and the cost of this.

Our asset management system has identified a backlog of £464 million. This figure is less than that reported in previous years. However, this does not represent a real-world reduction in the backlog. Instead, this is due to the improvement in modelling accuracy.

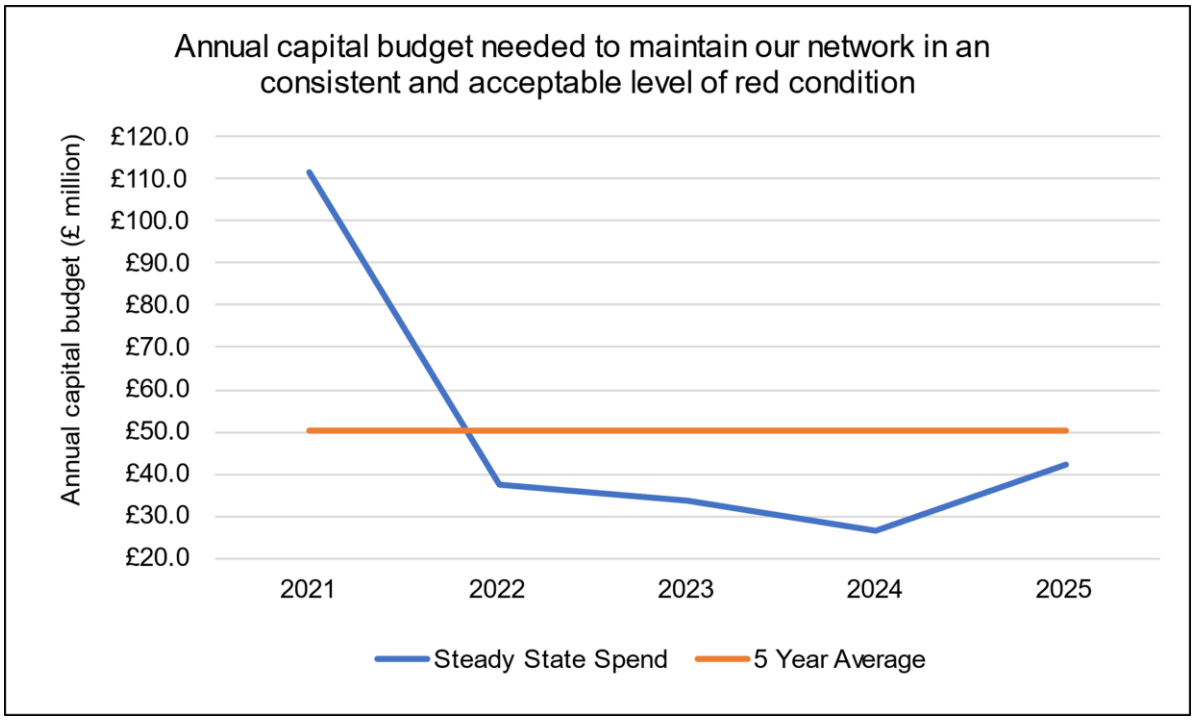


Current maintenance backlog by treatment type (£ million)

Treatment	Value (£ million)
Recycling/ Reconstruction (Unclassified)	£141.1
Asphalt Strengthening (Unclassified)	£105.2
Surface Preservation (Classified)	£45.0
Asphalt Resurfacing (Unclassified)	£36.8
Asphalt Resurfacing (Classified)	£30.6
Surface Preservation (Unclassified)	£26.9
Asphalt Strengthening (Classified)	£24.5
Concrete Structural Repair	£23.1
Concrete Reconstruction	£17.6
Recycling / Reconstruction (Classified)	£12.9
Concrete Surface Repair	£0.3
Haunching (Unclassified)	£0.2

Current maintenance backlog by treatment type

We have also modelled the annual capital budget needed to maintain our network in a consistent and acceptable level of red condition over the next five years. This shows that we would need to deliver an average of £50.3 million of maintenance works each year to maintain steady state condition over the next five years.



Year	Modelled Steady State Spend (£ million)	5 Year Average (£ million)
2021	£111.8	£50.3
2022	£37.3	£50.3
2023	£33.5	£50.3
2024	£26.7	£50.3
2025	£42.2	£50.3

Annual capital budget needed to maintain our network in a consistent and acceptable level of red condition

In 2019/20 we invested around £40 million in planned road maintenance works. For the purposes of this document, we are assuming that similar levels of funding will continue. Alongside this we are also spending around £10 million annually on Pothole Blitz works, which delivers a similar impact to about £5-7.5 million of additional planned maintenance. This means we are spending the equivalent of £45-47.5 million on maintenance works. This appears to indicate that we are only around £2.5-5.0 million away from the funding level needed to maintain our road network in steady state condition.

Beyond this, it would only take a relatively small further increase in budget to enable us to begin addressing the backlog of deterioration which has built up over years of underinvestment in our road network, and prevent an increase in pothole numbers.

We have analysed national condition data which records the percentage of classified roads in poor condition, and we compare acceptably with other authorities in the south east whose networks are of comparable size and use to ours. In our view, an acceptable level of A roads in red condition is around 4-5% and for B and C roads it is around 6-7%. As such, the percentage of our network in poor condition is not at an unacceptable level. Any significant increase above this range would be cause for concern.

A further key consideration is whether we should focus on our classified or unclassified networks. Our classified network has traditionally been prioritised, as it carries significantly more traffic, is used by more people and is often far more sensitive to the impact of reactive works. As such, classified roads should be maintained to a higher standard.

While we have focussed on the classified network, this has not been to the exclusion of the unclassified network. We believe that this approach remains the appropriate one for our network.

Forecasting the Future Condition of our Roads Asset

To understand the longer-term results that can be expected from various levels of funding we have undertaken modelling based on the following three funding scenarios:

- Scenario 1 - Current budget
- Scenario 2 - Budget reduction
- Scenario 3 - Additional investment

Scenario 1 – Current Budget

We have modelled the effect of our planned maintenance works on road condition if we continue with our current annual investment level of £40 million of planned works and £10 million of reactive works through the Pothole Blitz contract, for the next five years.

Road Class	Year				
	2021	2022	2023	2024	2025
A Roads	3.8	4.7	4.9	5.1	5.2
B&C Roads	4.5	5.4	5.7	6.2	6.6
U Roads	17.3	17.4	17.6	17.9	18.0

The forecast % of road requiring maintenance soon.

With a continuation of the current investment levels, the amount of our network requiring maintenance will continue to increase slowly over the next five years. This will lead to an increase in potholes and other defects. However, this increase is expected to be slight and manageable.

Scenario 2 – Budget Reduction

We have modelled the effect of a £10 million reduction in our current budget, to £30 million, whilst assuming a continuation of the current £10 million spend on reactive works.

Road Class	Year				
	2021	2022	2023	2024	2025
A Roads	3.8	5.5	6.2	6.6	6.8
B&C Roads	4.5	7.1	9.3	10.1	10.3
U Roads	17.3	17.6	17.9	18.5	18.7

The forecast % of road requiring maintenance soon with scenario 2

The reduction in the investment levels will result in network that is in poorer condition than Scenario 1. The number of potholes will increase significantly over the coming years, although it is not anticipated that they will quickly reach unmanageable levels. It will become harder for us to fulfil our statutory duties under the Highways Act and the demands on our reactive budget especially may increase towards unsustainable levels.

Scenario 3 – Current Budget plus additional investment for Years 1 to 5

The only way to improve the overall condition of our road network and reduce the number of potholes in the long term, is to tackle the backlog in maintenance works. While this is too large to tackle in a short period of time, a sustained period of investment above steady state levels of funding would begin to bring this down and deliver a real improvement in the condition of our network. We have modelled the effect of an increase in our budget to £10million above steady state (£60.3million)

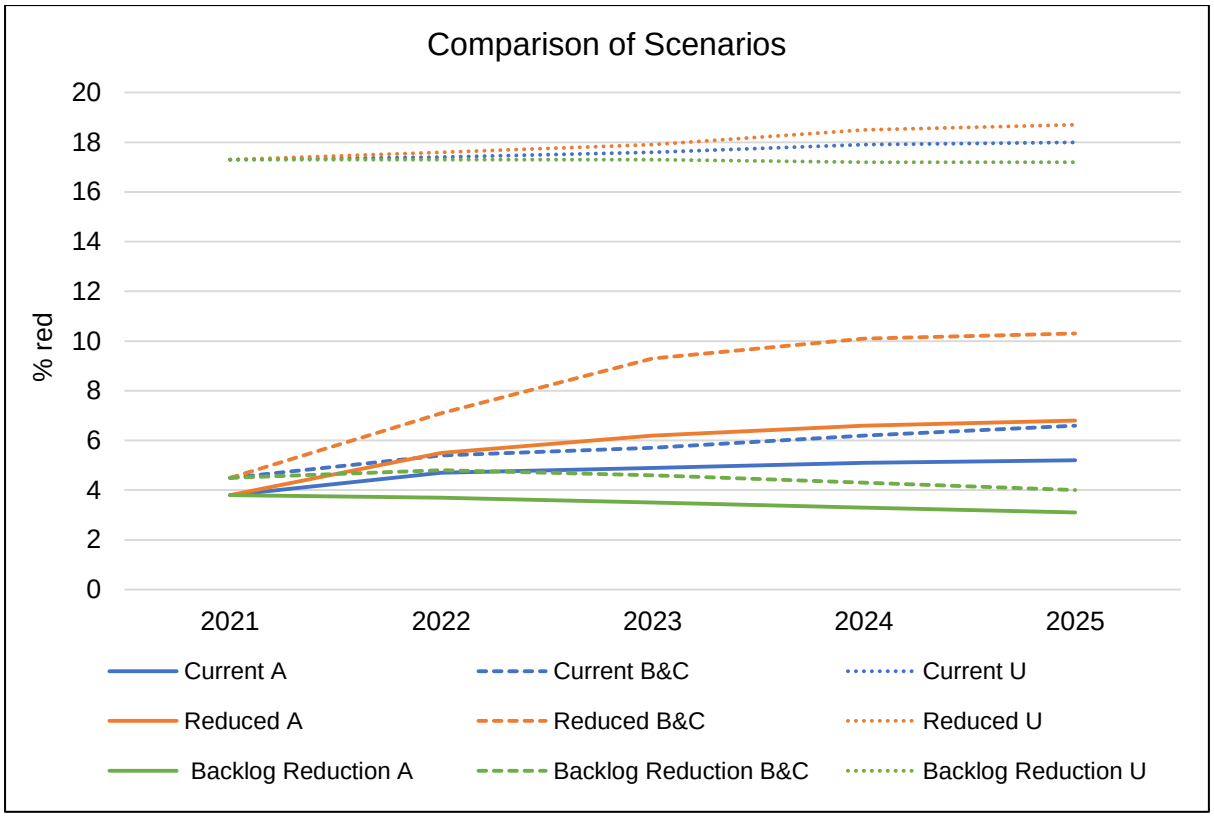
Road Class	**Year**				
	2021	**2022**	**2023**	**2024**	**2025**
A Roads	3.8	3.7	3.5	3.3	3.1
B&C Roads	4.5	4.8	4.6	4.3	4.0
U Roads	17.3	17.3	17.3	17.2	17.2

The forecast % of road requiring maintenance soon with scenario 3.

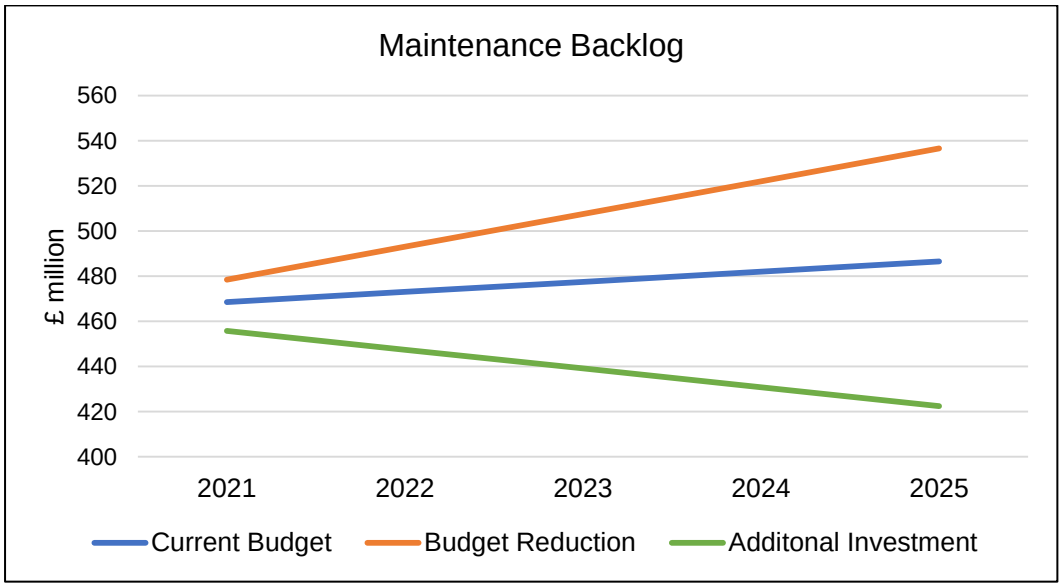
This strategy would deliver a real improvement in the condition of our highway network. In five years, the maintenance backlog would be reduced by over 10% and we would expect the number of potholes to reduce.

Comparison of Forecasts

Condition



Maintenance Backlog



	Backlog £ million				
	2021	**2022**	**2023**	**2024**	**2025**
Current Budget	468.5	473	477.5	482	486.5
Budget Reduction	478.5	493	507.5	522	536.5
Additional Investment	455.7	447.4	439.1	430.8	422.5

The Footways and Cycle Tracks Asset

Footway Type	Bituminous	Slabs	Block Paved	Concrete	Total
Miles	3565	253	130	73	4021
kilometres	5705	405	207	117	6434

This asset group includes footways and a number of cycle tracks that are alongside a road or footway. It does not include Public Rights of Way (PRoW), which are managed separately, or any footpaths and alleyways which are managed by borough or district councils.

The footway and cycle track asset group has recently been extended to include segregated cycle tracks that are publicly maintainable. These segregated cycle tracks have been generally constructed for use by cyclists and are not alongside a road or footway, though they may connect to them. We do not currently have detailed knowledge of the extent of segregated cycle tracks or their condition, though are commissioning work to address this during the coming years.

The primary objectives of our footway and cycle track assets are to:

- enable our residents, businesses, and visitors to travel the county on foot, in wheelchairs and mobility scooters, or by cycle safely and efficiently, thereby contributing to improving outcomes and opportunities for our people and businesses
- withstand normal usage by pedestrians and, where appropriate, cyclists and vehicles (via appropriately constructed vehicle crossings) by transferring loads through to underlying ground without deformation of the surface, maintaining safety and minimising nuisance
- maintain their structural integrity and maximise their lifespan to provide maximum value for money from investment.

The majority (89%) of our footways are of bituminous construction of varying age and specification. However, we also have footways that have slab (6%), block paving (3%) and concrete (2%) surfaces. Around 70 miles (112 kilometres) of our footway asset is classified as high usage.

Condition Assessments and Inspections

Condition Surveys

Our footway network is a substantial highway asset and consequently we have historically invested significant resource into understanding its condition and likely future deterioration. Over a period of three years we inspected our entire footway network. This was carried out similarly to the way we survey roads.

The data collection methodology conformed to national standards and the data was processed using accredited systems. This data has been used to assess the condition of the entire network, calculate the percentage of the network requiring maintenance, estimate the maintenance backlog and produce accurate whole government accounts. We also use this data to aid with lifecycle and deterioration modelling.

The condition assessment criteria for segregated sections of our cycle track network are currently being developed.

Safety Inspections

In addition to the condition surveys we carry out safety inspections.

- Our team of highway inspectors carry out visual checks to make sure the highway assets are in a safe condition. This includes checking for defects in the footway surface that present a safety concern. We carry out this kind of check at various frequencies dependant on the nature of the section of footway concerned. These frequencies could be either monthly, quarterly or annually.
- Reactive inspections are carried out in response to enquiries from the public or other stakeholders and generate ad-hoc and emergency works, for example repairing footway potholes and other surface failures.

Prioritisation of Investment

As well as our statutory duty to ensure our footways are safe, we also need to maintain the confidence and positive perceptions of the travelling public using our asset. We also need to ensure our footway network is maintained to protect against insurance claims resulting from injuries or damage caused by incidents on our network.

To ensure the most benefit to our footway network we seek, where possible, to address sites of local need, and we do so via our district highway managers who liaise closely with local elected representatives and other groups.

Our engineers assess and verify identified schemes by the type of defects present and then prioritise high-usage footways and cycle tracks as well as targeting resource on those areas with larger populations of older and disabled people. In this way we help to deliver our active travel strategy and ensure that these more vulnerable groups are not disproportionately affected by a deteriorating asset condition.

Budgets are not allocated on a district or regional basis.

Our approach to footway and cycle track asset management is a balance between asset renewal, where such assets have reached the end of their serviceable life, and

asset preservation, where we apply a treatment to seal the surface and extend the life of footway assets that would otherwise need replacement as considerable higher. In broad terms, around 25% of our annual budget is spent on preservation treatments, which significantly slows down overall network deterioration.

Other Significant Factors affecting Footway Maintenance

Parking

Our substantial footway network is increasingly becoming a concern in maintenance terms, principally because of parking and vehicle over-run issues. This particularly affects older residential urban areas that were not designed to accommodate the number of vehicles per household that is now typical. The narrow nature of many of these locations does lead to residents parking either wholly or partly on the footway.

This type of parking accelerates the normally slow rate of footway deterioration (in comparison to roads). It also disproportionally affects people with visual or mobility impairments, those assisted by guide dogs, families with pushchairs and wheelchair and mobility scooter users.

To make the footways a safer environment the government launched a consultation on pavement parking in August 2020. The consultation is the government's latest step to deliver on commitments to make transport equally accessible for all users by 2030, as set out in the Inclusive Transport Strategy.

The three options proposed in the consultation are improving the traffic regulation order process to make it easier for councils to prohibit pavement parking in their areas, giving councils powers to fine drivers who park on paths, and a London-style nationwide ban on pavement parking.

The principal risk on footways is from trip hazards, particularly in high footfall locations. However, where vehicles do regularly park on or traverse our footways even small defects can escalate quickly. This both increases the replacement costs and shortens the life of the asset.

Applying Asset Management Principles to the Footways and Cycle Tracks Asset

As discussed above, in previous years footway condition surveys collected comprehensive sets of condition data. This data has been used to complete the Whole of Government Accounts (WGA), giving details of the size of our network along with information on its current condition. Subsequently, these nationally recognised surveys can then be reviewed and analysed further to assist with future predictions of the condition of the asset.

Unlike roads, due to the nature of the survey data required, our current software is not capable of comprehensively producing forecasts of future conditions or calculating the maintenance backlog of the asset.

Currently, to effectively produce this information, the Highways Maintenance Efficiency Programme (HMEP) footway toolkit is being used in conjunction with the WGA valuations. This allows for the creation of forecasts based on the current asset condition, producing predicted future deteriorations (or improvements) for the asset based on various funding and treatment scenarios. It also enables us to calculate the funding required to maintain our footway network in a 'steady state'.

Footway Survey Review

The condition survey which has been carried out over a number of years has successfully allowed for network condition reporting and strategic modelling. This has demonstrated the need for additional funding, and has brought about a year-on-year increase of the proportion of the capital budget being attributed to the footway network. However, whilst we need our future surveys to continue to serve this purpose, we also need to evolve the way in which we collect survey data to allow a more versatile manipulation and interrogation of the outputs.

To understand how best to achieve this we are carrying out a thorough review of our current survey regime. This review is also comprehensively looking at national best practice, the outcomes we require, and other types of survey available, in order to identify the type of survey which would best meet our needs going forward. This review will ensure that any future surveys commissioned will be shaped to meet our requirements and to produce a thorough, adaptable set of survey data that will enable us to carry out:

- assessment of overall footway condition
- lifecycle and deterioration modelling
- identification of a programme of schemes, including suggested treatment type, taking into account factors such as hierarchy, usage, and areas with high populations of older or disabled people.

We have also reviewed the hierarchy we use to manage our footway network, and have decided to adopt the hierarchy proposed in *Well-managed Highway Infrastructure*, as shown in the table below:

Category	**Description**
Prestige Walking Zones	Very busy areas of towns and cities with high public space and street scene contribution.
Primary Walking Routes	Busy urban shopping and business areas and main pedestrian routes.

Secondary Walking Routes	Medium usage routes through local areas feeding into primary routes, local shopping centres etc.
Link Footways	Linking local access footways through urban areas and busy rural footways.
Local Access Footways	Footways associated with low usage, short estate roads to the main routes and cul-de-sacs.
Minor Footways	Little used rural footways serving very limited numbers of properties.

Whilst the hierarchy is unlikely to affect the condition survey itself, it is crucial to the success of using the data to develop works programmes and lifecycle plans.

Reacting to Surface Defects

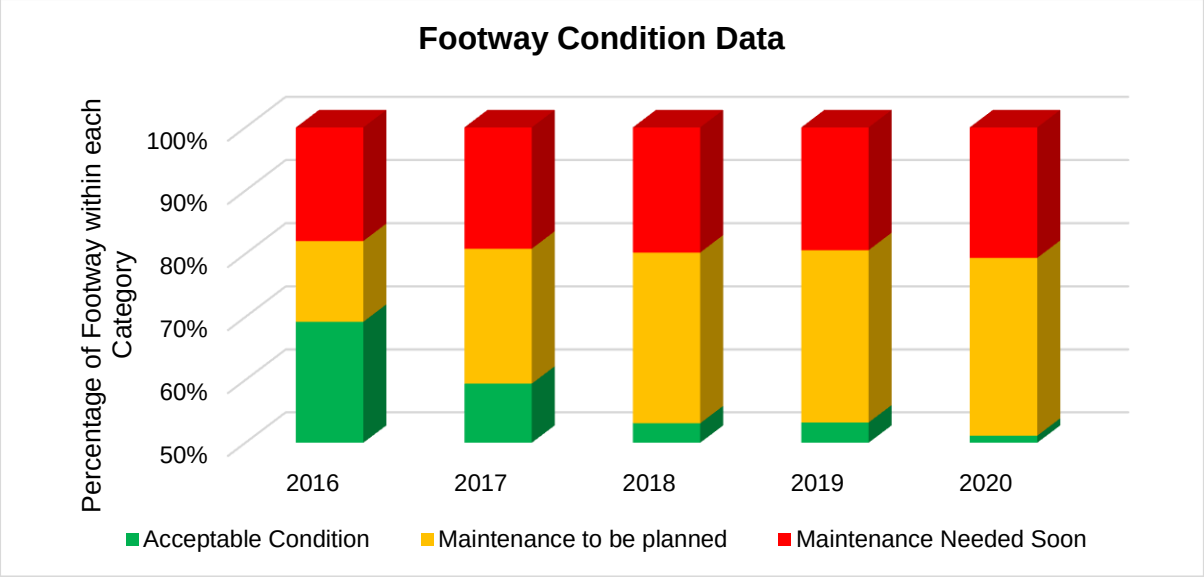
The figures used below only relate to proactive, planned investment in our footway network. They do not include any allowance for the funds spent each year to reactively repair footway surface defects. In 2019/20 we spent around £1.6 million on this activity. In recent years, the annual average spend has been around £1.4 million.

It is difficult to forecast accurately how much we will need to spend on reactively fixing surface defects each year; however, we can assume that, as footways deteriorate given lack of investment, the number of defects will increase. This will lead to an increasing amount of resource being spent on such repairs. If that resource is taken from that used for planned maintenance, the problem would be exponentially exacerbated.

Current Condition

The table and graph below illustrate the change in condition of the network from 2017 – 2020. Over this period there have been a range of deterioration and improvements over the three categories, and this a reflection of the work undertaken each financial year.

	2016	2017	2018	2019	2020
Maintenance needed soon	18.0%	19.2%	19.8%	19.43%	20.66%
Maintenance should be planned	12.8%	21.4%	27.1%	27.35%	28.23%
Acceptable condition	69.3%	59.4%	53.1%	53.23%	51.12%



As set out earlier, it needs to be recognised that whilst the data-led approach has led to an increase in the capital budget allocated to the footway network, this increase may not immediately result in a visible slowing of the decline. This is due to the survey taking place over a three-year period, with roughly a third of the county's footways being surveyed each year. If works are carried out in an area that has recently been surveyed, the change from "maintenance needed soon" to "acceptable condition" will not be recognised until the next survey in that area has been completed and assessed.

Also, the type of work which needs to be undertaken in a financial year has a marked effect. When footway condition deteriorates, the material type and construction dictate the work required, and this can alter the figures quite dramatically if areas that consist of expensive materials are focused on more than those of cheaper construction. For example, block paving can typically cost around £70 per square metre in comparison to bituminous materials with a cost of around £38 per square metre. Across the network block paving only accounts for 3% of our footway asset, with bituminous footways currently accounting for 89%. With this in mind, as the cost of block paving is almost double that of bituminous footways, if there is a focus on repairing areas of block paving it immediately decreases the number of schemes that can be completed due to the cost, with a knock-on negative effect on overall network condition and more potholes.

Condition Forecasts

We have undertaken modelling of the asset condition over a ten-year period based on four funding scenarios:

Scenario 1 – no budget (no planned maintenance, reactive maintenance only)

Scenario 2 - £3.5 million per year (the current budget)

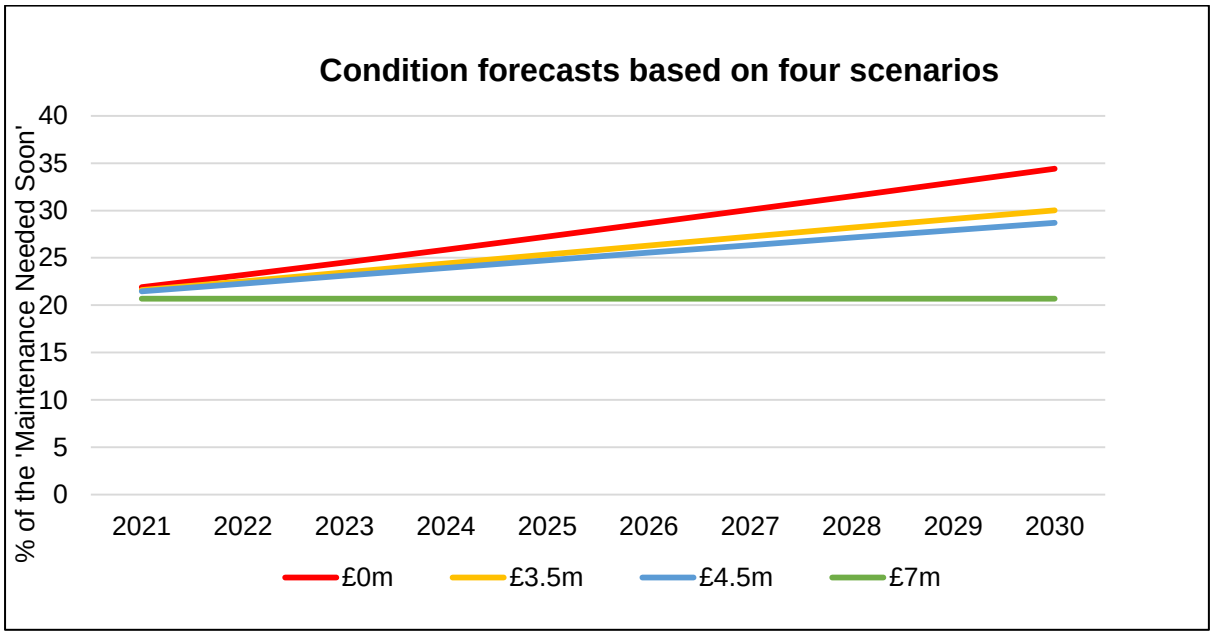
Scenario 3 - £4.5 million per year (a £1 million increase on the current budget)

Scenario 4 - £7 million per year (the budget required to maintain steady state)

The table and graph below demonstrate the deterioration modelling that has been completed. It suggests that in order to achieve a steady state of condition throughout the network for the next ten years, £7 million per year is required to be spent across the network. These scenarios are adjusted to take into account the latest condition data as well as the annual increase in unit rate costs attributed to the various treatment types for both preservation techniques and asset renewal.

		Percentage of footway in need of immediate maintenance		
Scenario	**Budget**	**2021**	**2030**	**Difference**
Scenario 1	£0m	21.9%	34.4%	12.5%
Scenario 2	£3.5m	21.6%	30.0%	8.44%
Scenario 3	£4.5m	21.5%	28.7%	7.22%
Scenario 4	£7m	20.7%	20.7%	0%

Condition forecasts based on four scenarios



Budget required to maintain steady state condition

The deterioration modelling illustrates the impact on the 'percentage of footway in need of immediate maintenance' for each scenario across a ten-year period. There

would be a 12.5% increase if there is no money spent on this part of the asset, compared to an 8.4% increase if current funding levels are maintained. To maintain a steady state condition over the next decade, an annual investment of £7 million is required.

Maintenance Backlog

We estimate that it would cost in the region of £102 million to address the part of the footway network that our condition surveys have identified as “maintenance needed soon”.

In general terms, investment in planned footway maintenance had fallen behind that for roads. That is principally because the previous lack of condition data and deterioration modelling made it difficult to support and inform investment decisions. Also, road maintenance has understandably been prioritised given that the safety implications of not maintaining roads are more significant than for footways.

However, since the introduction of the full footway network survey and lifecycle modelling and planning, we can now better understand the condition of our footway network and demonstrate the outcomes of various funding scenarios. The other benefit is a more accurate determination of the entire maintenance backlog of this asset group. This has, in recent years, had the effect of successfully proving the need for a greater part of the capital budget to be allocated to the footway network.

Since 2017/18, when the budget was around £1 million for planned maintenance, we have seen a year-on-year increase in investment. In 2020/21 the budget for this type of work had increased to £3.5 million, which is an increase of 250% from 2017/18. This has allowed for a dramatic increase in the number of footway schemes being delivered. It has also allowed us to focus on some of the more difficult areas that have been due for replacement for some time, but where works had previously been put on hold due to lack of funding.

This positive additional capital investment has meant that we have, with good prioritisation, been able to considerably slow the increase in the percentage of the footway network where maintenance is needed soon, although our current budget is not yet in line with the funding required to maintain steady state.

It is anticipated that with the work being carried out by the footway survey review, the data-led targeted scheme identification will also have a significant positive impact on reducing the rate of deterioration going forward.

The Drainage Asset

Asset	Quantity
Roadside drains	275,000
Ponds and lagoons	250
Pumping stations	15
Soakaways	8,500
Culverts below 0.9m span	346
Headwalls	692
Gully leads	4,125,000 metres
Carrier lines	2,062,500 metres
Chambers/manholes	41,250

These figures are indicative following reviews of historical data and recent inspections. Therefore, they are likely to increase.

The drainage asset's primary objectives are:

- removal of highway surface water (from our roads) to maintain road safety and minimise nuisance
- effective sub-surface drainage to prevent damage to the structural integrity of the highway and maximise its lifespan, and
- minimise the impact of highway surface water on the adjacent environment, including properties.

The number of drainage assets is currently increasing each year due to new housing and business developments.

Condition Assessments and Inspections

There are two types of checks carried out on the drainage system: planned inspections and reactive inspections.

Planned Inspections

Planned inspections include highway safety inspections and condition checks carried out as part of our cyclical maintenance regime:

- Our team of highway inspectors carry out visual checks to make sure that highway assets are in a safe condition. This includes checking that drain covers are not blocked, broken or missing. We carry out this kind of check at least once every twelve months.
- Our drainage cleansing crews look at the condition of the drains on main roads and test each one by filling it with water and checking that it is able to

flow away. We carry out these kinds of checks at least once every twelve months.
- Our pumping stations are serviced annually to check they are working properly and ensure that any faults or damage are repaired quickly.

We do not undertake planned inspections on our other drainage assets (underground pipes, culverts, soakaways, ponds, lagoon and ditches). These are all checked on a reactive basis.

Reactive Inspections

Reactive inspections are carried out in response to enquiries and generate ad-hoc and emergency works, for example, cleaning blocked drains that are causing the road to flood and repairing collapsed road drains. They may also result in us serving notice under the Highways Act 1980 requesting the landowner maintain their ditch or prevent water flowing from their land onto the highway. Where this is not completed in the required time we may undertake the work and seek to recover the costs from the landowner.

Prioritisation of Investment

As with all our assets, we take a risk-based approach to deciding where to invest our funding and some of the things we consider for this asset group include:

- What is the risk to road users if the road floods?
    - Is the road a high-speed or Resilient Highway Network road, a main road, an estate road or a country lane?
    - Is the road used by high volumes of traffic?
    - Does the road layout increase risk, for example, is the flooding on a blind bend?
    - Does the speed of traffic increase risk?
- How much disruption is caused if the road floods?
    - Is the road a high-speed or Resilient Highway Network road, a main road, an estate road or a country lane?
    - Is the road used by high volumes of traffic?
    - Are there suitable alternative routes available to road users?
    - Is access to critical infrastructure such as powers stations or hospitals affected?
- How are homes and businesses affected by the flooding?
    - Are buildings being internally flooded?
    - Are businesses prevented from operating?

Investment is prioritised where the risk is highest.

We then consider how to invest our budget.

It is also important to understand whether our assets are doing their job effectively and the practicalities of maintenance in both the short and longer term. If an asset is in the wrong place or is the wrong size there is no point simply patching it up or replacing it like-for-like. We also endeavour to undertake the right repairs at the right time in the lifecycle of our drainage assets.

Having assessed each site, we collate a prioritised list of works which are included in forward works programmes.

We do not undertake works to mitigate minor nuisance factors. We prioritise works at locations where highway surface water presents a risk to highway safety or a risk of internal flooding to inhabited areas of property.

Other Significant Factors affecting Drainage Maintenance

Damaged and Ageing Infrastructure

Much of the County's drainage infrastructure was installed when the roads were originally constructed, some of which date back to late 1800s/early 1900s. Over time settlement, ingress of tree roots and roadworks by third parties has caused widespread deterioration and damage. Years of under-investment have exacerbated this problem.

Limited Capacity

In recent years prolonged and heavy rainfall events appear to have become a more frequent occurrence. Development and changes in land use have also resulted in increased volumes of surface water being discharged into the drainage system which is designed to cope with moderate to heavy rainfall. In many places drainage systems are now running at capacity.

Where capacity is insufficient the only options are to divert the highway drainage elsewhere or install an entirely new, larger system. This requires significant investment and in the past cost had tended to make this kind of scheme unaffordable. Instead, the impact of flooding has been managed by installing permanent warning signs, increasing the height of kerbs and re-profiling the road to divert water elsewhere.

Reliance on Third Party Infrastructure

In many places the highway is drained into public sewers, which are owned and maintained by the sewerage authority, or privately-owned third-party assets such as ditches or ponds. In these instances, our influence over maintenance regimes and improvements is limited.

Land Drainage

Water being discharged from adjacent land onto the road is also becoming an increasingly common cause of highway flooding. A more stringent enforcement process utilising our Highways Act powers has been developed. However, to date the vast majority of cases have been resolved via constructive discussion with the land owner.

Reductions in other services

A frequent cause of highway flooding is debris obstructing drain covers, particularly during autumn and winter. The need for financial savings has necessitated reductions in services such as street sweeping, delivered by district and borough councils, and soft landscaping services. These have resulted in increased debris collecting on the highway and finding its way to the roadside drains.

Revenue Budgets

Revenue funding pressures affect the lifecycle performance of drainage assets where we are unable to carry out pro-active maintenance on all assets.

Keeping our existing drainage assets operational and effective will help to reduce the risk of flooding occurring. It is vital to ensure that maintenance and drainage improvements are focussed on priority locations and that operational maintenance and enhancements are undertaken when and where it is needed.

We have been exploring ways to improve the maintenance of the drainage network. As part of the ‘Live Labs’ project, information about how the drainage system is constructed and performs is being collected. This information will provide intelligence on how various drainage assets fail and the speed of failure to be collected. Armed with this knowledge new intervention regimes can be developed so that only those gullies, pipes and the like that need intervention are addressed.

Applying Asset Management Principles to the Drainage Asset

Highway drainage assets are critical to the operation of the highway network and ensuring that customers can use the network safely. If failures occur to the drainage assets there are significant effects to road safety, residential and commercial property, other asset groups and customer dissatisfaction if not addressed in a timely manner. Therefore, improved management of this asset group is a priority for us.

It is evident that an increasing frequency of severe flooding events is impacting upon on our infrastructure. Highway drainage is a key factor to providing network resilience, and the safe movement of goods, people and services around the county.

Our major challenge is asset deterioration due to historical under-investment. In addition, the location and condition of this asset in roads, footways or third-party land has been poorly recorded.

As a result, we have a system which is outdated and that we hold very little information on. This has resulted in a lack of prioritised investment and has reduced our ability to target maintenance effectively. Our existing practice to maintaining this asset is mainly reactive, which is costly and does not address the issue of understanding where to invest to halt deterioration of the asset or reduce the risk of flooding from surface water.

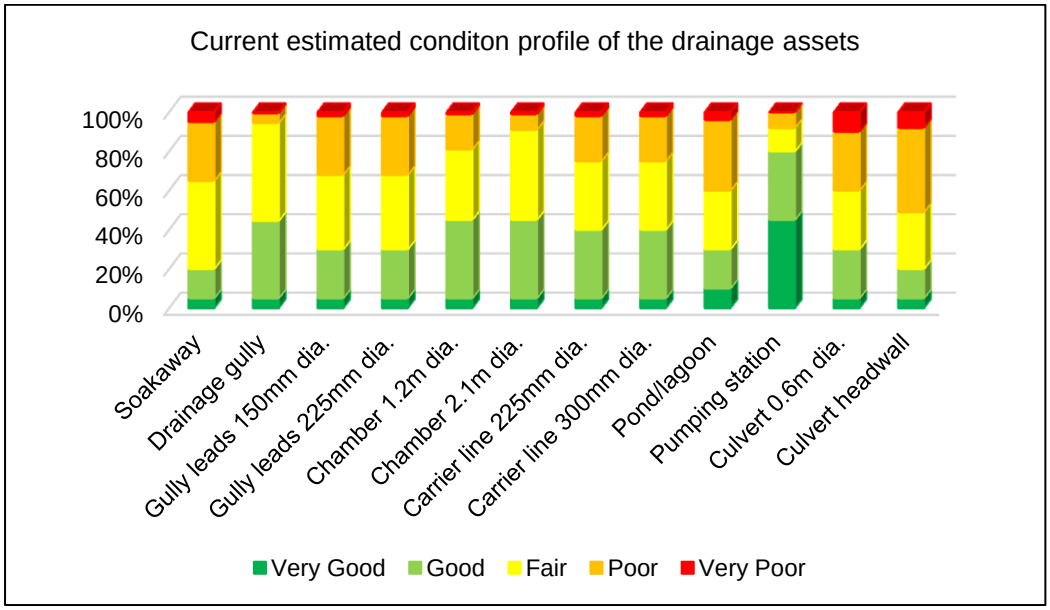
We have a good understanding of the lifecycle of drainage assets, and have invested in live data capture technologies which enables asset data capture on site as part of routine maintenance works. This will support a better understanding of the asset inventory over time. This will also aid us in complying with Recommendation 22 of *Well Managed Highway Infrastructure*:

"Drainage assets should be maintained in good working order to reduce the threat and scale of flooding. Particular attention should be paid to locations known to be prone to problems, so that drainage systems operate close to their designed efficiency."

We have undertaken lifecycle modelling of known assets and made necessary assumptions of unknown drainage asset information including all underground highway drainage assets, which have identified that an investment of £40.2 million would be required, followed by an annual budget averaging at £23.8 million if we had no budgetary constraints and were able to replace all assets in a very poor condition.

This assumption was made on the estimated lifecycle of different drainage asset groups. Although investment has shown benefits to other asset groups, if we do not maintain the highway drainage assets in a steady state condition this will have adetrimental effect on the lifecycle of the other asset groups.

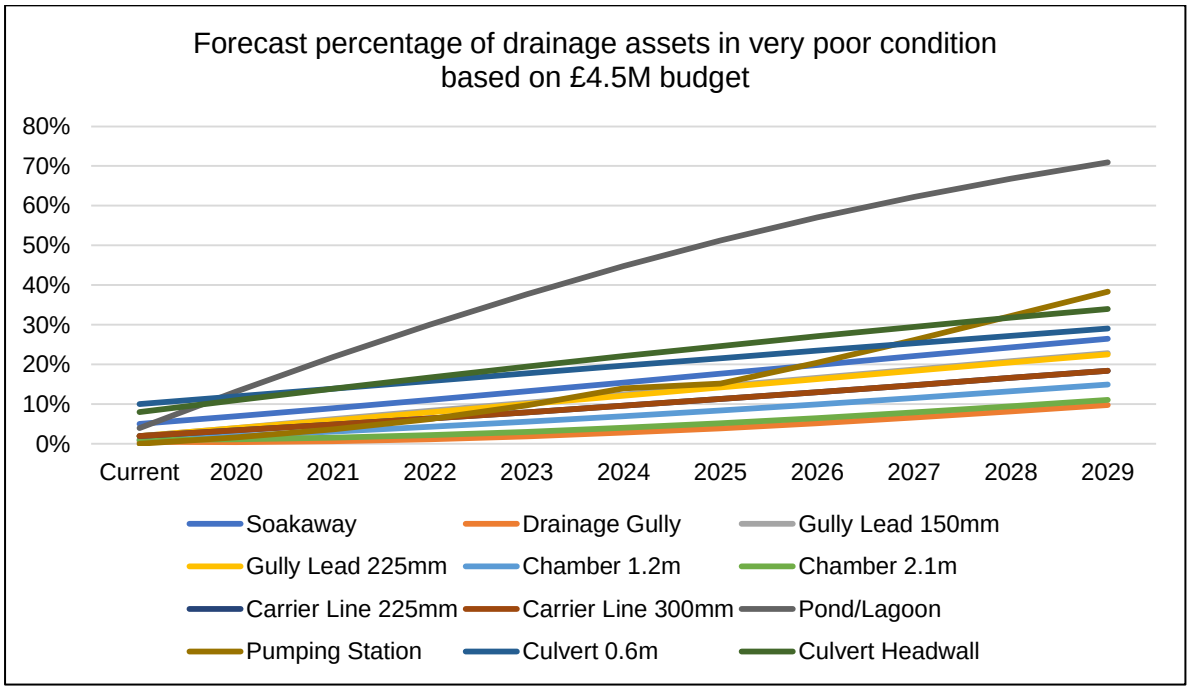
Our current estimated condition of drainage assets is shown in the chart and table below:



	Percentage in each Condition Band				
	Very Good	**Good**	**Fair**	**Poor**	**Very Poor**
Soakaway	5%	15%	45%	30%	5%
Drainage gully	5%	40%	50%	5%	1%
Gully leads 150mm dia.	5%	25%	38%	30%	2%
Gully leads 225mm dia.	5%	25%	38%	30%	2%
Chamber 1.2m dia.	5%	40%	36%	18%	1%
Chamber 2.1m dia.	5%	40%	46%	8%	1%
Carrier line 225mm dia.	5%	35%	35%	23%	2%
Carrier line 300mm dia.	5%	35%	35%	23%	2%
Pond/lagoon	10%	20%	30%	36%	4%
Pumping station	45%	35%	12%	8%	0%
Culvert 0.6m dia.	5%	25%	30%	30%	10%
Culvert headwall	5%	15%	29%	43%	8%

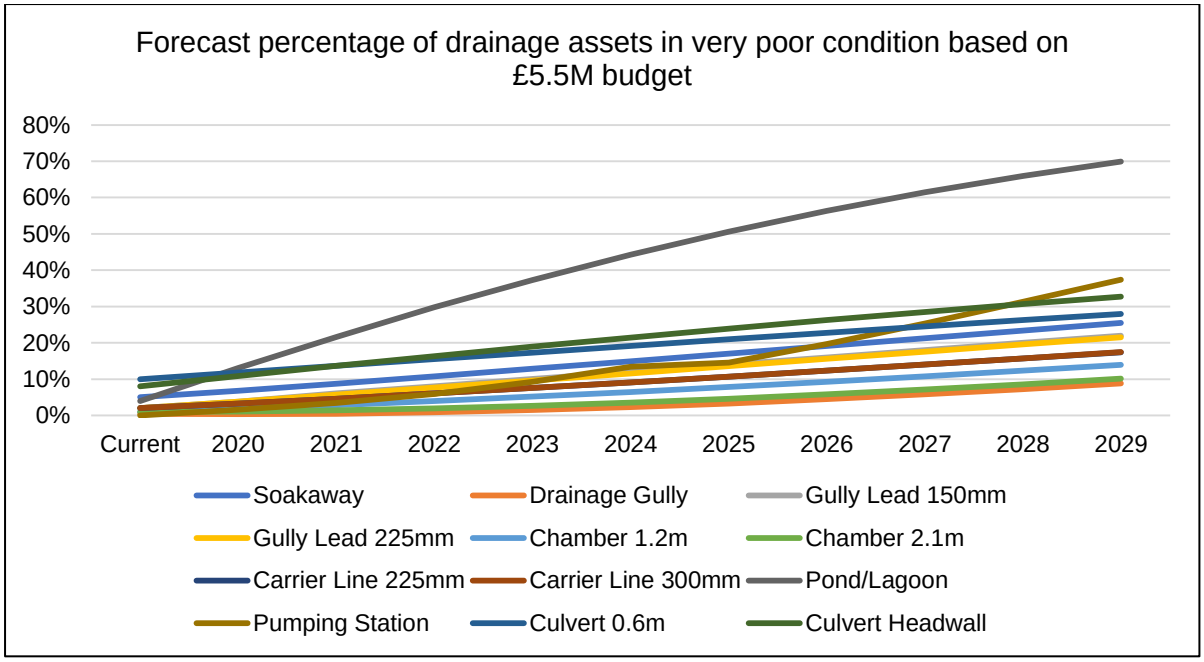
Current estimated condition profile of the drainage assets

Our current budget is £4.5 million per year which currently shows a managed decline in the assets being defined as being in a very poor condition over a ten-year period.



	Forecast percentage of drainage assets in very poor condition based on £4.5 million budget										
	Cur-rent	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Soakaway	5%	7%	9%	11%	13%	15%	18%	20%	22%	24%	26%
Drainage Gully	1%	0%	1%	1%	2%	3%	4%	5%	7%	8%	10%
Gully Lead 150mm	2%	4%	6%	8%	10%	12%	15%	17%	19%	21%	23%
Gully Lead 225mm	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%	23%
Chamber 1.2m	1%	2%	3%	4%	6%	7%	8%	10%	12%	13%	15%
Chamber 2.1m	1%	1%	2%	2%	3%	4%	5%	7%	8%	9%	11%
Carrier Line 225mm	2%	3%	5%	6%	8%	10%	11%	13%	15%	17%	18%
Carrier Line 300mm	2%	3%	5%	6%	8%	10%	11%	13%	15%	17%	18%
Pond/Lagoon	4%	13%	22%	30%	38%	45%	51%	57%	62%	67%	71%
Pumping Station	0%	2%	4%	6%	10%	14%	15%	20%	26%	32%	38%
Culvert 0.6m	10%	12%	14%	16%	18%	20%	22%	23%	25%	27%	29%
Culvert Headwall	8%	11%	14%	17%	19%	22%	25%	27%	29%	32%	34%

With a modelled budget of £5.5 million per year there is only a 1% improvement over a ten-year period to drainage assets in a very poor condition compared to the £4.5 million as shown below, however as stated above there could be a decline as a result of revenue budget uncertainties.



	Forecast percentage of drainage assets in very poor condition based on £5.5 million budget										
	Cur-rent	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Soakaway	5%	7%	9%	11%	13%	15%	17%	19%	21%	23%	25%
Drainage Gully	1%	0%	0%	1%	1%	2%	3%	4%	6%	7%	9%
Gully Lead 150mm	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%
Gully Lead 225mm	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%
Chamber 1.2m	1%	2%	3%	4%	5%	6%	8%	9%	11%	12%	14%
Chamber 2.1m	1%	1%	1%	2%	3%	4%	5%	6%	7%	9%	10%
Carrier Line 225mm	2%	3%	5%	6%	8%	9%	11%	12%	14%	16%	17%
Carrier Line 300mm	2%	3%	5%	6%	8%	9%	11%	12%	14%	16%	17%
Pond/Lagoon	4%	13%	22%	30%	37%	44%	51%	56%	61%	66%	70%
Pumping Station	0%	2%	3%	6%	9%	13%	15%	20%	25%	31%	37%
Culvert 0.6m	10%	12%	14%	16%	17%	19%	21%	23%	25%	26%	28%
Culvert Headwall	8%	11%	14%	16%	19%	21%	24%	26%	28%	31%	33%

The Structures Asset

Asset	Quantity
Bridges	985
Viaducts	4
Footbridges	96
Culverts	568
Gantries	10
Retaining walls	315
Pedestrian subways	31
Special structures	109

Bridges and other highway structures form essential links in the highway network; their purpose is to connect roads and footways to facilitate safe and efficient travel around the county.

This asset group is particularly complex and varied in composition when compared with other asset groups, and this makes accurate modelling challenging. Unlike other asset groups the age range of the assets is vast, ranging from medieval bridges to modern day structures. Structures comprise numerous types and construction forms, from simple timber and masonry structures to complex steel and post-tensioned concrete multi-span structures.

Condition Assessments and Inspections

There are two types of checks, planned inspections and reactive inspections.

Planned Inspections

Planned inspections are carried out as part of our cyclical maintenance regime:

- **General Inspections**: Visual inspection of the asset based on a two-year rolling programme.
- **Principal Inspections**: Detailed inspection of the main assets based on a rolling programme with each structure having a risk assessed inspection period between six and twelve years
- **Underwater Inspections**: Annual inspection of those bridges which are sensitive to scour action.
- **Trackside Inspections**: Biennial visual inspection of our structures that cross Network Rail lines and cannot be fully seen as part of the general inspection programme
- **Boat Inspections**: Biennial inspection of our structures that require access via a boat. These inspections are done alternately with Trackside Inspections.

The result of these inspections is captured in our database and this data is analysed to determine the condition of each individual asset and the overall condition of the asset stock. This information is used to identify the maintenance and repair works required for each individual structure and creates the forward programme.

Reactive Inspections

Reactive inspections are carried out in response to enquiries and generate ad hoc and emergency works, for example repairs to brickwork and parapets following a road traffic collision.

Prioritisation of Investment

We take a risk-based approach to decide where to invest our money and use the asset information we have about the bridges and highway structures to do this. Some of the things we consider include the following:

- Where is the defect? Is a “critical element” (a part of the asset that is vital to its structural integrity) affected?
- What is the risk to highway users? Does the structure carry/support a Resilient Highway Network road, high-speed road, main road, minor road or footway? Does the structure span a high-speed road, main road, minor road or footway? Does the structure carry high volumes of traffic? Are there suitable alternative routes if the structure fails?
- What is the risk to third party assets? Does the structure support or span a railway, river, watercourse or other third-party asset? Is access to critical infrastructure such as powers stations or hospitals affected?

Investment is prioritised where the risk is highest.

We also consider how to invest our budget based on the condition of our assets. This enables us to determine how much work is needed to restore them and whether it is more cost effective to replace them completely. In many cases we can protect our bridges and highway structures and maximise their lifespan by undertaking minor maintenance, cleaning, painting and waterproofing them. This work requires a commitment to repeat investment but can significantly reduce costs in the longer term. Nevertheless, in some instances the asset has been damaged beyond repair or simply reached the end of its useful life. In these instances, renewal is the only option.

Finally, we need to consider our investment in the wider context of the highways service.

Having assessed each site, we are able to collate a prioritised list of works.

Applying Asset Management Principles to the Structures Asset

There is an extensive inventory database and well established, nationally recognised inspection regimes for structures. This has resulted in a wealth of information on this asset group which until recently has been held on a bespoke database. A recent review of data collection and management within this asset group concluded that while the data collection regimes were fit for purpose, the data management systems no longer were. As a result, work was undertaken to established what was now required from a structures management system and a new Asset Management eXpert for Bridges and Structures (AMX) database has been procured. Data migration has now been completed although further development of the system is still required to achieve full implementation of the new structures management system.

The following forecasts of asset condition have been determined from the new AMX database and modelled using the Structures Asset Valuation and Investment (SAVI) Tool. It should be noted that these results are not directly comparable to those obtained previously using the HMEP ancillary assets toolkit populated with Kent-specific data. Therefore, the current condition provided below is not directly comparable with the comparison results provided for earlier years and should be regarded as a new baseline.

Maintenance Backlog

Based on the condition information collected at each inspection, a work bank of repairs and maintenance works is held for each structure. As part of the development and full implementation of the AMX database, the current work bank is being checked and reviewed to provide a more accurate picture of the structures maintenance backlog. The total value of the work bank currently stands at approximately £20 million although this it is considered to be a significant underestimate and it will increase as we improve our analysis. In addition to the review of the current work bank, planned improvements to our asset management approach e.g. accelerating structural reviews and assessments together with improved inspection coverage for our most difficult to access structures, will increase the maintenance back log assigned at an individual structure level.

Future Management of the Structures Asset

Following the procurement and migration of existing data to the new AMX database we are currently developing the software in conjunction with the supplier to implement new asset management processes. This will enable us to take advantage of the enhancements available within the AMX database.

During the AMX database implementation phase, a number of anomalies with the existing data have become apparent and it will be necessary to re-populate these data fields for each structure. This would require significant extra resources if this

were carried out as a stand-alone exercise so it has been decided that data will be collected and input into the database over the next two-year cycle of general inspections.

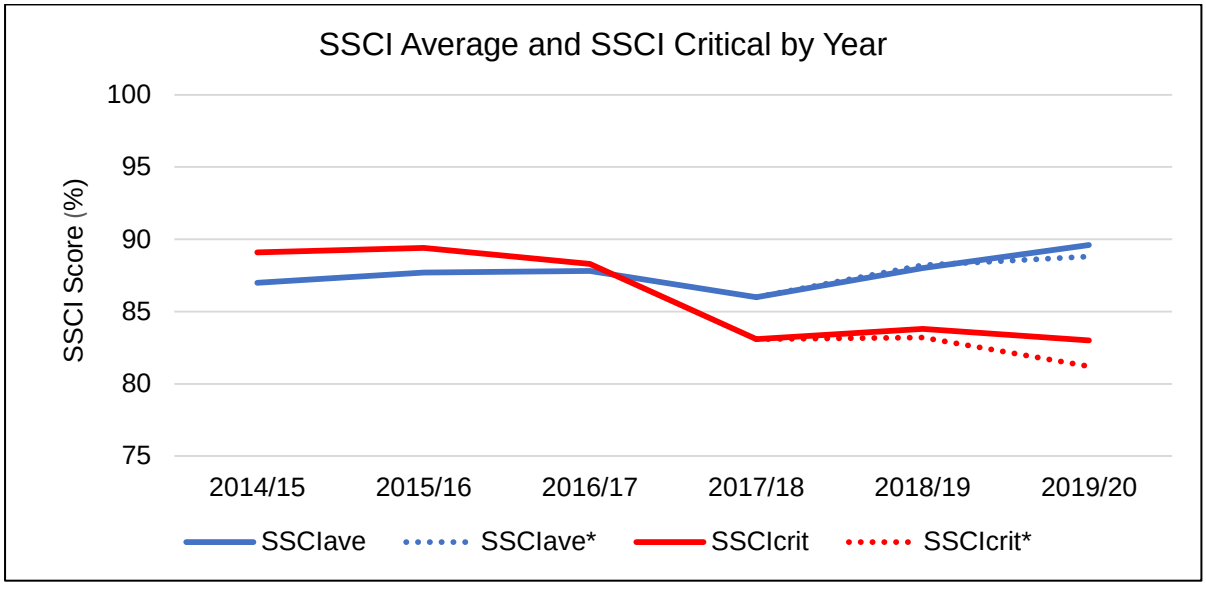
Once the new structures management system has been updated to reflect our current processes and the data anomalies corrected, the AMX database should enable us to model budgetary requirements in greater detail to provide forecast condition outcomes and maintenance backlogs for a number of intervention and investment scenarios.

Current Condition

The current and recent condition of our structures assets can be best represented by a plot of the overall Structure Stock Condition Index (SSCI) as reported as part of the Whole Government Accounts (WGA).

SSCI Average is an aggregate condition score of all parts of each structure regardless of type and provides a good measure of the overall state of the structures stock.

SSCI Critical is an aggregate condition score of the most important parts of each structure only and provides a better measure of increasing risk of failure and the need for urgent repairs or maintenance to ensure ongoing safety of the structure for road users.



Year	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Number of Structures Reported under Whole Government Accounts (WGA)	1557	1557	1520	1554	1711 *	1779 *
SSCI Average	87	87.7	87.8	86	88	89.6
SSCI Average*				86	88.2	88.8
SSCI Critical	89.1	89.4	88.3	83.1	83.8	83
SSCI Critical*				83.1	83.2	81.2

* The basis of our annual WGA valuation was changed for 2018/19 to include around 220 smaller diameter culverts which had not previously been reported. These additional culverts have distorted the recent worsening trends of both SSCI Average and SSCI Critical due the typically higher values (92.0% and 98.5% respectively in 2019/20) recorded for these often difficult to access inspections. Revised figures for SSCI Average and SSCI Critical with the culverts removed have been calculate and shown in the table and chart above.

Forecasting the Future Condition of our Structures Asset

To understand the longer-term results that can be expected from various levels of funding we have undertaken modelling based on the following three funding scenarios:

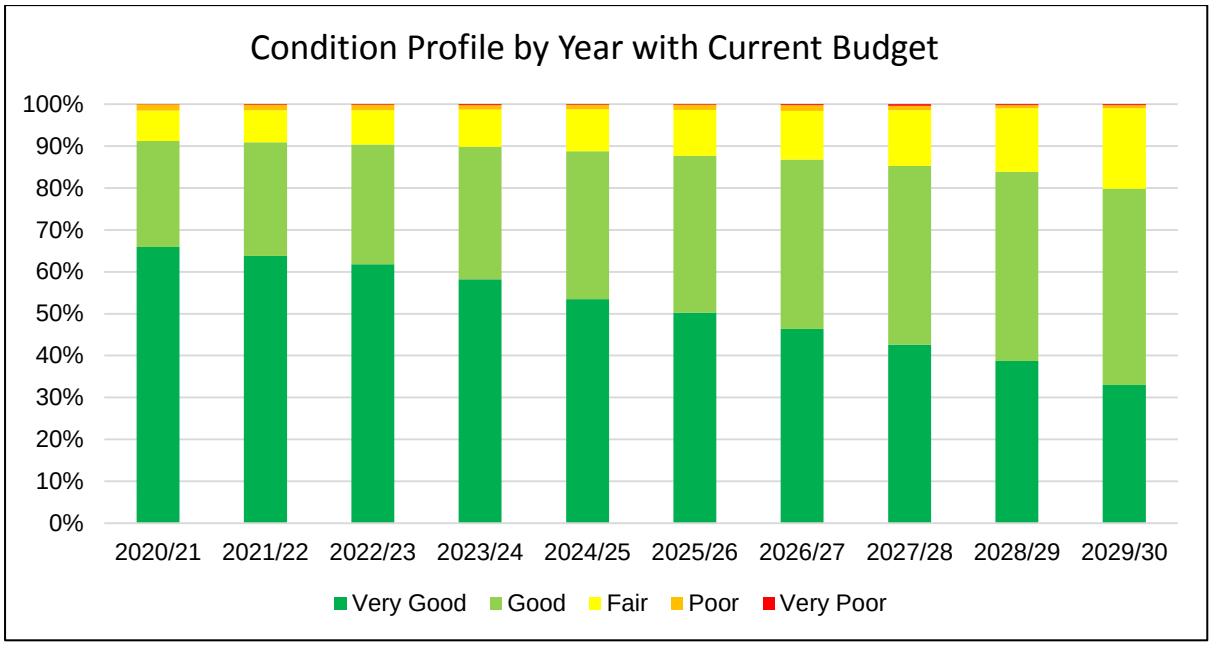
- Scenario 1 - Current budget
- Scenario 2 - Budget reduction
- Scenario 3 - Forecast budget required to maintain current overall condition profile

Scenario 1 - Current Budget

The current annual budget for planned structures asset management is £4.5m. We have modelled the effect on the condition of our structures if this current level of funding remains unchanged.

Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	1172	1134	1099	1035	950	894	824	757	688	587
Good	449	481	507	562	627	664	718	758	803	832
Fair	129	136	145	157	179	195	206	236	269	341
Poor	26	24	24	19	19	21	25	20	13	13
Very Poor	1	2	2	4	2	3	4	6	4	4

Forecast Number of Structures in each Condition Band with Current Budget



Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	66%	64%	62%	58%	53%	50%	46%	43%	39%	33%
Good	25%	27%	29%	32%	35%	37%	40%	43%	45%	47%
Fair	7%	8%	8%	9%	10%	11%	12%	13%	15%	19%
Poor	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Very Poor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

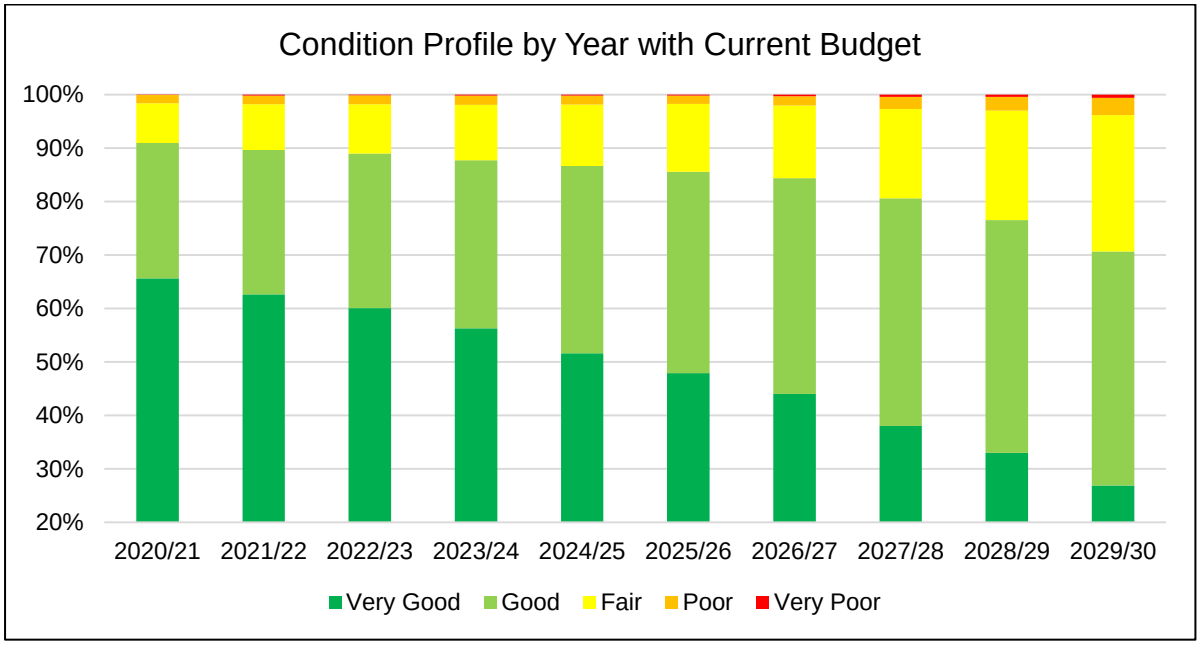
Forecast Percentage of Structures in each Condition Band with Current Budget

Scenario 2 – Budget Reduction

We have modelled the effect of a £2 million reduction in our current budget, to £2.5 million.

Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	1166	1113	1067	1000	917	851	782	676	586	478
Good	450	480	514	559	623	669	717	756	774	777
Fair	132	152	164	184	204	226	241	297	364	454
Poor	28	29	30	30	29	28	31	40	45	57
Very Poor	1	3	2	4	4	3	6	8	8	11

Forecast Number of Structures in each Condition Band with Reduced Budget



Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	66%	63%	60%	56%	52%	48%	44%	38%	33%	27%
Good	25%	27%	29%	31%	35%	38%	40%	43%	44%	44%
Fair	7%	9%	9%	10%	11%	13%	14%	17%	20%	26%
Poor	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%
Very Poor	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%

Forecast Percentage of Structures in each Condition Band with Reduced Budget

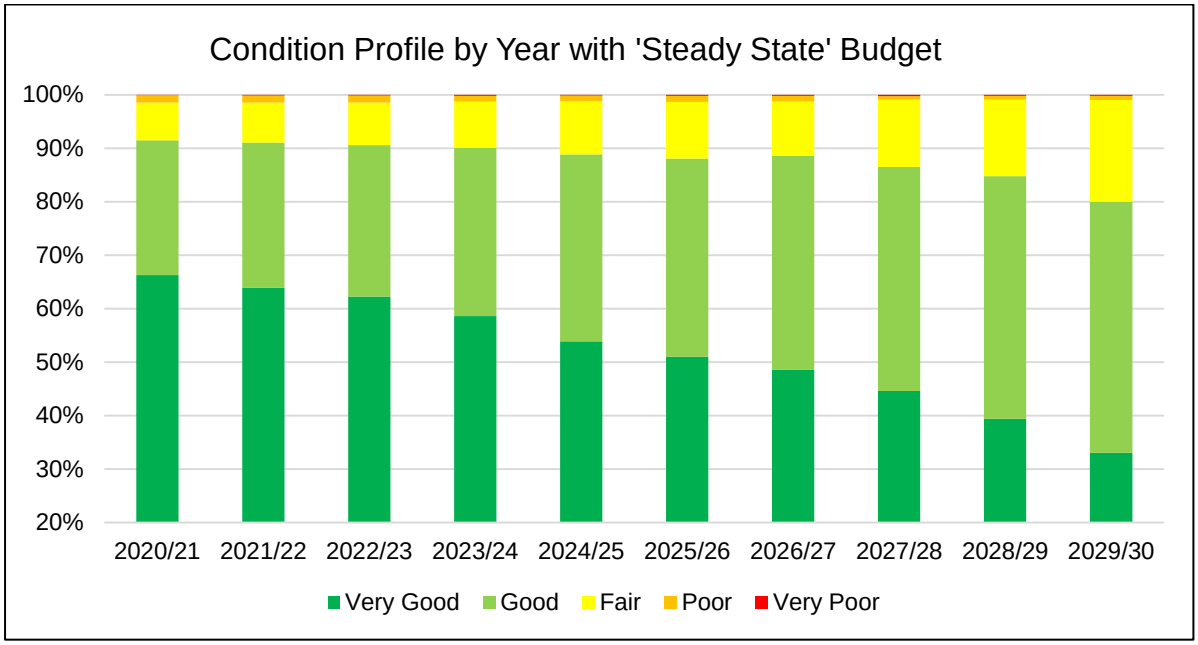
Scenario 3 - Forecast Budget Required to Maintain Current Overall Condition Profile

Using these modelling forecasts, it has been estimated that the annual average budget needed to maintain the current overall condition profile would be £5 million.

It should be noted that it is not possible to get a true steady state across the condition bands, due to the complexity of the stock and the limitations of the SAVI modelling. The graph and table show limited change over time of the poor and very poor condition bands.

Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	1178	1136	1106	1042	958	907	863	793	700	587
Good	448	482	504	558	621	658	712	744	806	834
Fair	125	133	141	154	177	188	180	224	255	339
Poor	25	24	24	19	19	21	18	11	12	13
Very Poor	1	2	2	4	2	3	4	5	4	4

Forecast Number of Structures in each Condition Band with ‘Steady State’ Budget



Condition Band	2020/ 21	2021/ 22	2022/ 23	2023/ 24	2024/ 25	2025/ 26	2026/ 27	2027/ 28	2028/ 29	2029/ 30
Very Good	66%	64%	62%	59%	54%	51%	49%	45%	39%	33%
Good	25%	27%	28%	31%	35%	37%	40%	42%	45%	47%
Fair	7%	7%	8%	9%	10%	11%	10%	13%	14%	19%
Poor	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Very Poor	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Forecast Percentage of Structures in each Condition Band with 'Steady State' Budget

The Crash Barriers Asset

This asset group includes approximately 250 kilometres of barrier with the majority on our strategic road network. It is an important element in maintaining the safety of road users on our highway network.

The main purpose of crash barrier is to prevent vehicles impacting hazards. A high percentage of crash barrier is located within the central reserve and ensures segregation between traffic travelling in opposite directions, preventing high-speed head-on crashes. Additionally, objects next to the road can present a significant hazard to the road user and there is a clear need to ensure that they are reasonably protected. Examples of such objects would be structures, large signs, lamp posts, or where there is a large difference in level near to the road edge.

The crash barriers asset has been split between legacy and proprietary systems. Legacy crash barrier systems are older systems and a significant percentage are non-compliant to current standards.

Condition Assessments and Inspections

There are two types of checks, planned inspections and reactive inspections.

Planned Inspections

Planned inspections include general highway safety inspections and are carried out as part of our cyclical maintenance regime:

- Our team of highway inspectors carry out visual safety checks to make sure the highway assets are in a safe condition. This includes visually checking that the barrier is not damaged or missing. We carry out this kind of check at least once every twelve months.
- Our Highway Structures Team carry out cyclic inspections of highway structures and inspect crash barriers which are adjacent to the structure, for the purpose of the protection of that structure.
- Our contractor undertakes five yearly principal inspections of the crash barriers on A and B roads. This information is collated and barriers are graded from one to five (very poor) to five (very good) for priority repair.

Reactive Inspections

Reactive inspections are carried out in response to enquiries and generate ad-hoc and emergency works orders for repair. These enquiries may be initiated by colleagues within partner organisations such as the Police or Highways England and from members of the general public.

Prioritisation of Investment

When deciding where to spend our money we think about the risks posed to the road users, including:

- If the crash barrier fails, does it create a hazard to road users?
- If the barrier is breached, is there likely to be a secondary event, i.e. a structure, another road or railway?
- Serviceability of the crash barrier system.
- Compliance of the crash barrier system.

We also consider:

- The type of road, for example, whether it is a high-speed or Resilient Highway Network road, a main road, an estate road or a country lane.
- The volume of traffic that uses the road, for example is it a main route in and out of a town or is it a minor road only used by a handful of drivers each day?
- The crash history of the road.

By knowing the condition of our assets, we can determine how much work is needed to get them to an acceptable condition or whether it is more cost effective to replace them. It is important to understand whether it is still required and fit for purpose before repairing a crash barrier.

We assess each site using a risk-based approach and have a prioritised list of improvements. This is compared with the lists for other asset groups and is used to allocate budgets and compile forward works programmes.

Other Significant Factors affecting Crash Barrier Maintenance

Proportion of asset at end of life

Crash barriers, like many assets, have not historically been asset managed and as a result, a significant proportion could be considered life-expired or no longer compliant. There will be crash barrier assets on the network that could be in excess of 45 years of age, especially on the lower classification of roads. As part of the ongoing upgrade programme, sections of life-expired legacy crash barriers on the strategic road network have been replaced, including the majority of the crash barrier on A229 Blue Bell and A228 Hale Street Bypass.

RTC damage and non-recoverable costs

Damage by third parties accounts for the majority of reactive repairs. Significant efforts are made to recover costs from third parties where driver details are available. There are, however, crashes where the barrier keeps vehicles on the road and drivers are able to leave the site without police or our involvement.

High Speed Roads

The most critical crash barriers are on the high-speed strategic road network. This network is difficult to access without creating local congestion and therefore the majority of repair and upgrade works are undertaken at night, which has a cost implication. We operate an annual high-speed road programme as a series of planned closures, to undertake works on this part of the network, however, each closure offers limited time to undertake any significant repairs. This programme is used to undertake the majority of the required re-tensioning.

Applying Asset Management Principles to the Crash Barriers Asset

Crash barriers fulfil a critical role and their failure to perform as designed has serious implications for highway safety.

There has been an improvement in the management of the crash barrier asset with principal inspections being undertaken by specialist contractors. A survey of the non-strategic roads was undertaken in 2017 and the strategic roads in 2018, with the next survey planned for 2023.

The 2017 and 2018 surveys were the first time that a systematic approach has been used to collect the asset information, such as location, type, extents and both the serviceability and compliance of the barrier. The barrier was graded from one (very poor) to five (very good) with the data uploaded into an asset inventory system.

The asset inventory system can be used to visualise the barrier information which enables a targeted approach when selecting upgrades. As sections of barrier are upgraded, the information within the system is amended.

Prior to the 2017/2018 surveys, the information collected was of poor quality and we have no reliable information to determine deterioration rates of the asset and we have therefore used the existing grading information, in conjunction with the HMEP Ancillary Assets Toolkit, to forecast future replacement needs for this asset group. This approach has its limitations, mainly due to the age of the data, but it will still allow us to estimate the size of the problem we already know we have with ageing assets.

Re-tensioning of tensioned barrier systems is on a two-year cycle, based on a current annual cost of £100,000; and a current annual budget of £250,000 for non-recoverable damage repair. The amount allocated to be spent on non-recoverable damage repairs has been reduced from £450,000 in previous years due to the improvement in claims recovery.

Maintenance Backlog

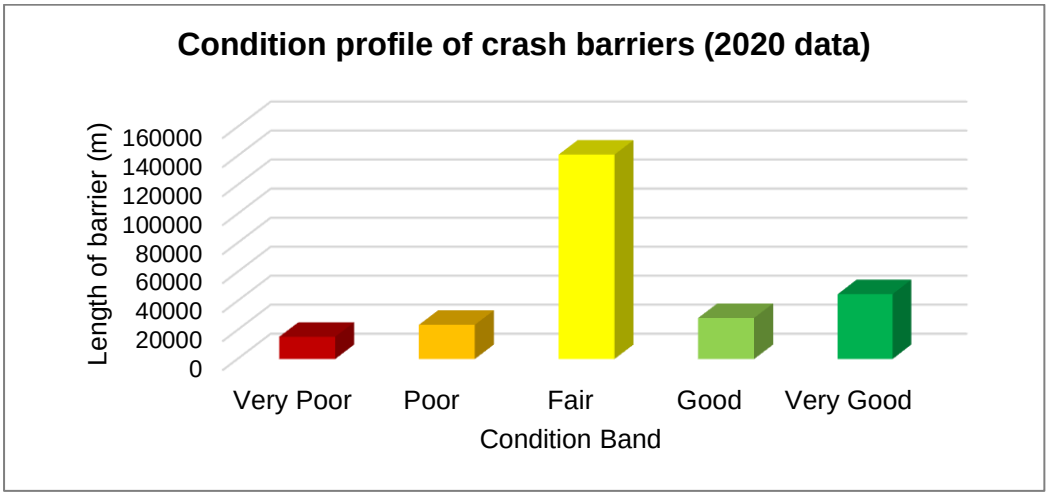
It is estimated that the lack of maintenance investment in this asset in the past has resulted in over 12% of the asset needing total replacement.

Future Management of the Crash Barrier Asset

We recognise that until recently there has been limited asset management, including condition surveying of crash barriers. When the network is resurveyed in 2023 it will enable us to determine the rate of deterioration and this will help us improve the management of this asset.

When we have the data and tools in place, we will be carrying out the same analysis as other asset groups. This will enable us to determine more robustly the maintenance backlog, the effect on asset condition of various funding scenarios and enable us to produce an evidence-based forward works programme.

Current Condition



	Length of Asset in Each Condition Band (m)					
	Total	**Very Poor**	**Poor**	**Fair**	**Good**	**Very Good**
Total Crash Barrier	252,919	15,361	23,559	140,941	28,356	44,702
Legacy Crash Barrier	203,687	14,258	22,406	142,581	22,405	2,037
Proprietary Crash Barrier	49,232	0	0	492	6,400	42,3340

Condition Profile of Crash Barriers (2020 data)

Based on the finding of the previous asset management plan (2018), unfunded capital budget was secured for the upgrade of the legacy crash barrier on the strategic road network and this is starting to improve the asset condition. However, this does not take account of the legacy crash barrier that will be non-compliant, due to its age.

Approximately 45% of the very poor and poor crash barrier is located on the non-strategic road network. Capital funding has been secured to improve its condition over the next few years.

An issue that needs to be resolved is the ownership of the approach and departure crash barrier local to Highways England (HE) bridge parapets. The maintenance/ replacement of these barriers has been neglected due to a lack of agreement over responsibility. A new guidance document has been agreed between ADEPT and HE.

Condition Forecasts

Current budget

After allowing for re-tensioning and damage repair, the current annual core budget for replacement and upgrading this asset is £735,000, with £250,000 allocated for crash repairs.

In addition to the core capital budget an additional capital budget was secured in 2018 of £3.7 million (2019 – 2021) to upgrade the crash barrier asset on the strategic network. The table below shows the improvement in the asset condition to date.

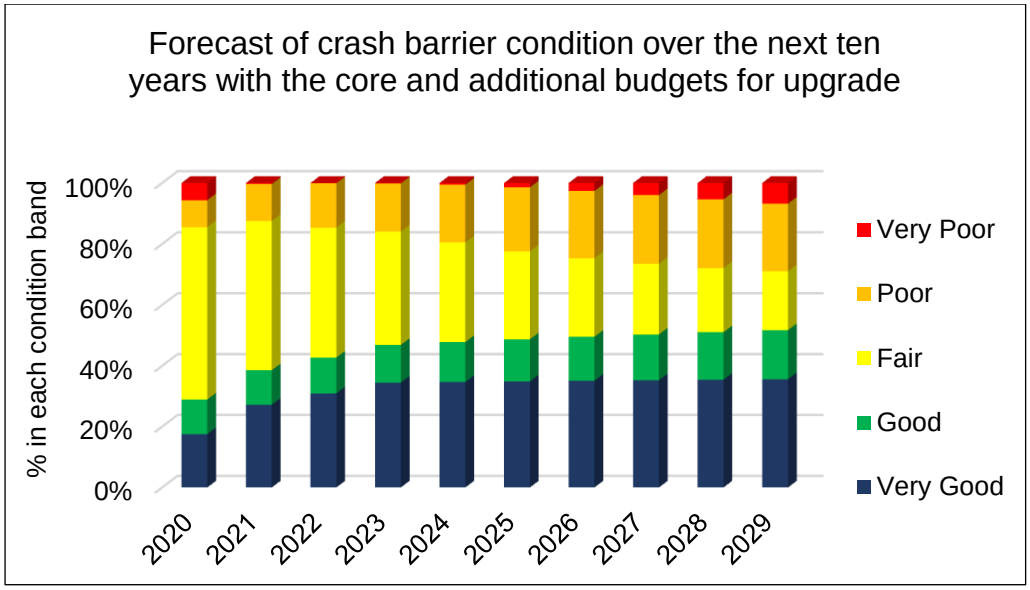
	Year	Very Poor	Poor	Fair	Good	Very Good
Percentage crash barrier in each band	2017/18	10	8	57	12	13
	2020	6	9	57	11	18

In 2019, a further £3.6 million (2020-23) was secured to upgrade crash barrier on the non-strategic road network. These works are currently being prioritised.

The core and additional capital budgets will significantly reduce the percentage of poor and very poor assets on our road network. The capital budgets used in the following assessment are as follows:

- 2020/21 - £3,994,465
- 2021/22 - £1,935,000
- 2022/23 - £1,935,000
- 2023/30 - £735,000 (current baseline budget)

We estimate that the replacement/upgrade backlog by 2030 will be £11.3 million based on the current budget allocations.



	Crash Barrier – percentage in each condition band										
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Very Good	18	27	31	34	35	35	35	35	35	36	36
Good	11	11	12	12	13	14	14	15	16	16	17
Fair	57	49	43	37	33	29	26	23	21	19	18
Poor	9	12	15	16	19	21	22	23	23	22	22
Very Poor	6	0	0	0	1	1	3	4	5	7	8

Forecast of Crash Barrier Condition over the next ten years with the core and additional budgets for upgrade

Condition Forecast

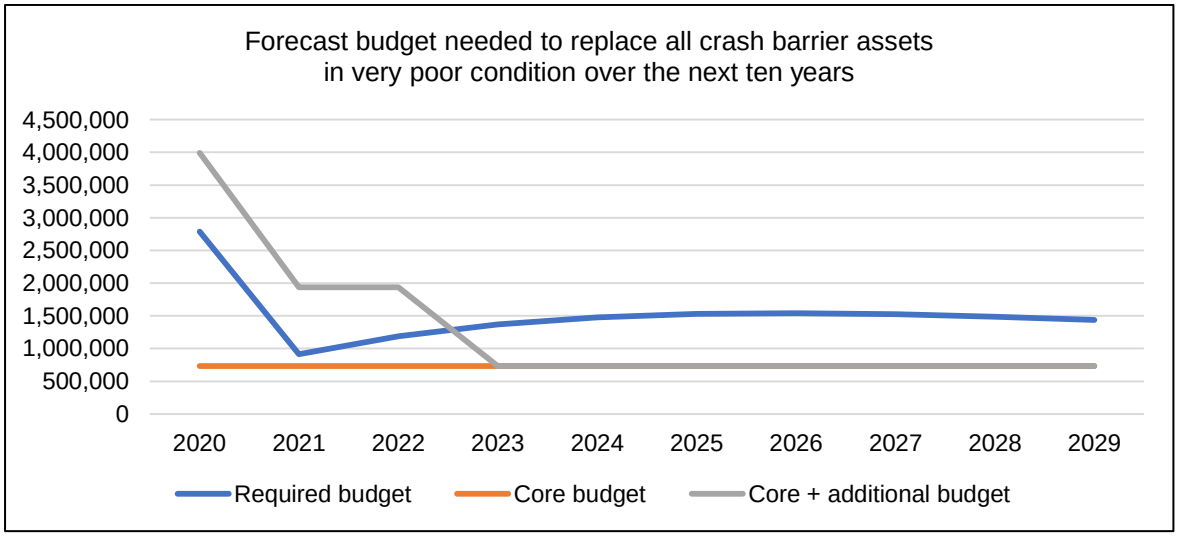
The two tables below show the percentage split between the older legacy crash barrier and newer proprietary crash barrier systems. All upgrades of legacy crash barrier will automatically become proprietary crash barrier, as shown in table in the below.

	Legacy Systems – percentage in each condition band										
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Very Good	1	0	0	0	0	0	0	0	0	0	0
Good	9	8	8	8	9	9	9	10	10	11	11
Fair	56	49	42	36	32	28	24	21	19	17	15
Poor	9	12	15	16	19	21	22	22	22	21	21
Very Poor	6	0	0	0	1	1	3	4	5	7	8

	Proprietary Systems – percentage in each condition band										
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Very Good	17	27	31	34	35	35	35	35	35	36	36
Good	3	3	4	4	5	5	5	5	5	6	6
Fair	0	0	1	1	1	1	2	2	2	2	3
Poor	0	0	0	0	0	0	0	0	1	1	1
Very Poor	0	0	0	0	0	0	0	0	0	0	0

Budget required to maintain steady state condition

The modelling forecasts an annual average replacement budget of £1.5 million to maintain the percentage of crash barriers in very poor condition at the current level.



	Forecast Budget (£ million)									
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Required Budget	2.788	0.913	1.190	1.371	1.478	1.531	1.546	1.525	1.487	1.436
Core Budget	0.735	0.735	0.735	0.735	0.735	0.735	0.735	0.735	0.735	0.735
Additional Budget	2.259	1.200	1.200							
Total Budget	3.994	1.935	1.935	0.735	0.735	0.735	0.735	0.735	0.735	0.735

Forecast budget needed to replace all crash barrier assets in very poor condition over the next ten years

The Tunnels Asset

We have a number of other structures assets that require additional reviews due to their nature. These include the following all of which are on the A299 and are considered critical assets and part of our Resilient Highway Network:

a) Ramsgate Tunnel on the approach road to Ramsgate port was opened in 2000. It is an 800m long bi-directional traffic flow tunnel.
b) Chestfield Tunnel, between Whitstable and Herne Bay was opened in 1998. It is a 315m long dual carriageway tunnel.
c) Cliffsend Underpass was opened in 2012 as part of the East Kent access route. It is a 128m long dual carriageway underpass. Whilst this is not technically classified as a tunnel it contains some substantial mechanical and electrical (M&E) equipment.

These highway structures form essential links in the highway network; their purpose is to connect roads to facilitate safe and efficient travel around the county.

The tunnels and underpass consist of a number of key assets:

- The actual structure itself
- Mechanical components such as pumps, fans, lighting, CCTV
- Electrical components such as the computer systems that drive the mechanical components, lighting and the wiring that links the mechanical components together

Each of these assets has completely different drivers for their maintenance and replacement. The fabric of the tunnels and underpass has a design life of 120 years whilst the M&E components have design lives of between twenty and fifty years but with appropriate maintenance these can be extended.

Currently there is an overall annual revenue budget of around £670,000 for maintaining the Chestfield and Ramsgate tunnels in a serviceable state. This is made up as shown in the table below.

There is no specific revenue budget for Cliffsend underpass. It is anticipated that this will require funding in the region of £50,000 per year to cover wall cleaning, general serviceability maintenance of the lighting and pumps.

Description of spend	Makeup of costs	Revenue Budget
Tunnel Maintenance	• costs of closures • cost of employing specialist contractors for the different components of tunnels • cleaning tunnel walls	£325,000

Tunnel Management	• the provision of an external Tunnel Operations and Maintenance Manager • 24/7 manning of control building at Ramsgate	£345,000

The above figures do not include for capital replacement of major components of the tunnels. These are currently being addressed through the capital bid process.

Condition Assessments and Inspections

The Design Manual for Roads and Bridges (DMRB) classifies the maintenance inspections as periodic as defined below.

Periodic Inspections

Planned inspections are carried out as part of our cyclical maintenance regime:

- **Superficial Inspections**: regular, informal visual inspections to identify deficiencies and defects which can lead to accidents or unnecessarily high maintenance costs based on regular driven, CCTV monitoring and reports from the public. These should be no longer than weekly.
- **General Inspections**: visual inspections of all accessible parts of the road tunnel and its M&E equipment. The frequency is every 24 months for the structure and twelve months for M&E.
- **Principal Inspections**: a review of all relevant as-built drawings, wiring diagrams, operation manuals for maintenance and inspection for the road tunnel, followed by close and detailed examinations of all accessible parts of the tunnel, and can involve removal of cladding, casings, mountings to fans etc. The frequency is 72 months for the structure and 36 months for the M&E. The underpass frequency is in line with other bridges with the structure inspection frequency being six years and thirty-six months for the M&E.
- **Special Inspections**: close examination and investigations (including testing) of a particular area of a defect which is of structural or operational concern. These are carried out when identified from other inspections.

The result of these inspections is captured in various systems but a review of a more centralised system is needed that would give greater understanding of the individual asset and the overall condition of the asset.

Maintenance

Routine maintenance on the tunnels and their associated equipment is undertaken as follows:

- Ramsgate Tunnel has quarterly single day time closures from 8am to 6pm.
- Chestfield Tunnel have two consecutive night closures every quarter from 8pm to 6am.

- Cliffsend Underpass does not follow a formal maintenance schedule but is being reviewed to bring it in line with the tunnels. Currently any maintenance is carried out under the high-speed road closure programme.

Tunnel maintenance is organised and carried out by tunnel specialists and is based upon the operating recommendations made by the manufacturers of the equipment.

Investment

Whilst we take a risk-based approach to deciding where to invest our money we rely heavily on the manufacturer's recommendations with regards to their end of life replacement. This is then reviewed regularly based upon the maintenance and observations regarding any increasing ad-hoc maintenance and its impact on its replacement. Some of the things we consider include the following:

- Where is the defect?
  - Is a "critical element" (a part of the asset that is vital to its structural/operational integrity) affected?
- What is the risk to highway users?
  - What is the impact in the event of an accident in these structures?
  - Do the tunnels and underpass carry high volumes of traffic?
  - Are there suitable alternative routes if the structure/equipment fails?
- What is the risk to third party assets?
  - Is access to critical infrastructure such as powers stations or hospitals affected?
  - What risk is there to the police/ambulance/fire brigade in attending an accident?

Investment is prioritised where the risk is highest.

We also consider how to invest our budget which is done by knowing what condition our assets are in. This enables us to determine how much work is needed to restore them and whether it is more cost effective to replace them completely. In many cases we can protect our tunnels and underpass and maximise their lifespan by cleaning, painting, carrying out manufacturers regular specified maintenance (such as replacing filters, greasing components etc). This work requires a commitment to repeat investment but can save more significant costs in the longer term. Nevertheless, in some instances the asset has been damaged beyond repair or simply reached the end of its useful life. In these instances, renewal is the only option.

The long-term condition of the two tunnels and Cliffsend Underpass are assessed and recorded in accordance with BD53/95 Inspection and Records for Road Tunnels (DMRB 3.1.6). The benefit of regular maintenance intervals for such an asset improves the overall performance, longevity and avoids any unscheduled closures for emergency repairs.

Although the tunnels and the underpass have provided years of undisrupted service to the public and businesses, it will require targeted investment on key assets such as the lighting infrastructure.

Immediate Actions

Using an asset management approach to understanding these assets, their condition and lifecycle performance. Produce evidence of the levels of investment needed, in order to evidence need for funding for future cycles of maintenance.

Review the full inventory of all M&E components within the Tunnels for maximised efficiency in maintenance.

Future Priorities

To continue to keep the tunnels and underpass in constant serviceability for public use and safety.

Continue expanding the lifespan of the tunnels and underpass assets through a methodical asset management approach.

Look at structures data base or Confirm to determine if this can be used for logging all the assets and their maintenance history.

Applying Asset Management Principles to the Tunnels Asset

Whilst there is good knowledge about the maintenance of the tunnel and underpass assets they are not contained in a centralised database and there is no effective way of doing long-term analysis of future needs. A full review is needed to identify a suitable database that could help in future asset management principles.

Maintenance Backlog

Currently we do not have a database for the individual components that make up these structures which means that most judgements on the maintenance and their future replacement are based upon experience and knowledge. Whilst this works well it means the information is centred on one person and provides no business continuity.

Currently it is believed the yearly maintenance with major refurbishment of parts or all of the asset has produced an overall well-maintained asset which has allowed the design life of the assets to be extended. An assessment of the extended life of the assets has been undertaken together with estimated replacement values. This has highlighted the critical components and the timing of their replacement.

Although we have condition information on the tunnels and underpass that informs the programme of maintenance works, the modelling we are currently able to undertake for this asset group is at the strategic level only. This modelling, based on

the overall condition of asset as determined by the whole government accounts process, provides us with information that informs the budget allocation process across all highway asset groups.

Future Management of the Tunnels Asset

Following a review of both the data held on this asset and the processes employed in its management, we recognised that due to the complexity of the individual components of this asset group, the processes and software we are using are no longer fit for purpose. Having determined what is required, a new structures management system has been procured that will also provide information at an operational level.

The Street Lighting Asset

Asset	Quantity
Street Lights (including subways, wall and pole mounted)	122,541
Illuminated Signs	17,695
Belisha Beacons	677
Refuge Beacons	1,447
Illuminated Bollards	4,072

Street lighting assets form a highly visible and vital part of the streetscape. Whilst there is no legal requirement to provide street lighting, it is considered important in enabling the safe use of the highway for road users and pedestrians. Street lighting also helps to promote strong and safe communities. Since 2016 we have converted most of our street lights to light-emitting diode (LED) units controlled by a central management system (CMS).

This asset base is increasing by approximately 1% annually through new developments and improvements to the existing road network.

Condition Assessments and Inspections

Where street lighting is provided, we must take reasonable action to ensure that lighting assets do not pose a risk to the highway user. There are two types of checks: planned inspections and reactive inspections.

Planned Inspections

Planned inspections include structural and electrical testing and night patrols:

- **Structural testing** -There is a robust annual structural testing programme of street lighting columns and illuminated sign posts via non-destructive testing (NDT). The testing results classify the structural integrity of each asset into a lighting column index (LCI) which incorporates the structural condition of a column with non-structural factors picked up via a visual inspection. This gives a full picture of the condition of the asset.

  The scores are split into three bands and those assets with a higher score (red) are considered to be in need of immediate attention and these assets are included in the replacement programme for the current year. As the LCI banding is quite wide and covers a range of defects, the structural testing dashboards in our asset management system are being refined so that the records can be used for lifecycle planning in the future. In this way, the LCI will be used to forecast future budget needs based on the predicted number of assets that will require replacing.

The aim for 2021-22 is to include Belisha beacons and refuge beacons in the structural testing programme.

- Electrical testing is carried out every six years. Lanterns replaced under the LED conversion project all have a valid electrical test certificate. Renewal of these will need to commence in 2022.
- Night patrols are visual checks, carried out on a monthly basis, to ensure that street lighting assets that are not included in the central management system are operational and safe.
- Our team of highway inspectors carry out visual safety checks to make sure the highway assets are in a safe condition. This includes visually checking that the lighting column is not damaged or the door loose or missing. We carry out this kind of check at least once every twelve months.

The results of these inspections are captured in our asset management system and the data analysed to determine the condition of the asset stock. This information is used to identify the maintenance and repair works required for each individual asset.

Reactive Inspections

Reactive inspections are carried out in response to enquiries and emergencies and generate ad-hoc works, for example lantern or bollard replacements. Every time the asset is visited under these circumstances, a visual survey is carried out and information about its condition is reported back.

Prioritisation of Investment

When deciding where to spend our money, we think about the risk to road users and residents and if there is still a requirement for the asset:

- If the asset fails will it create a hazard to road users or residents?
- If the asset fails will it cause a lot of disruption?
- Is the existing asset energy efficient?
- Is the existing asset still needed?
- Does the existing lit sign or bollard still need to be lit?

We prioritise works at locations where there is a risk to safety and do not undertake works to mitigate nuisance factors.

We also consider where the risk to road users and residents is the highest by thinking about the following:

- The type of road, for example, whether it is a high-speed road, a main road, an estate road or a country lane.
- The amount of traffic that uses the road at night time. For example, is it a main route in and out of a town or is it a minor road only used by a handful of drivers each night?

- The impact if the road is closed. For example, the road might only be used by a handful of people, but it may be the only route to get to their homes.
- Road safety statistics
- Requirements of the Traffic Signs Regulations and General Directions (TSRGD) 2016.

Using data from the structural testing programme combined with lifecycle and deterioration modelling, we forecast the number of assets likely to need replacement each year for the next ten years. We also calculate the budget required to meet these forecasts. We assess each site using a risk-based approach and have a prioritised list of improvements which is used when allocating budgets and compiling the forward works programmes.

We think about the ongoing and future maintenance of the asset. We therefore try to standardise on materials used and encourage third parties, such as developers, to use our approved materials. Approved materials now include a suite of LED luminaires which will reduce future maintenance and energy costs.

Other Significant Factors affecting Street Lighting Maintenance

Ageing Infrastructure

Our robust structural testing programme resulted in the provision of additional capital funding for the replacement of life-expired steel street lights in the three years to 2016. This enabled us to make sure that this type of street light now poses a low risk of failure. However, the on-going programme of testing will identify further steel assets which will require replacing.

Following a recent review of our testing programmes, the scope of the structural testing was extended and now includes illuminated signs and we will include Belisha beacons and refuge beacons in the structural testing programme starting in 2021. Previously there was little information on these assets, and they were maintained on a reactive basis.

Energy and Carbon Emissions

The cost of energy is the subject of concern for all councils. Whilst increases in the cost of energy have steadied in recent years, the future is not predictable.

In 2016 a project to convert all of our lights to LED with a central management system was commenced. Over 120,000 lights have been converted to LED. This has provided a much more energy efficient light source and the ability to remotely control the lights through the CMS. To ensure we keep control of energy consumption and carbon emissions we constantly assess our asset and look to remove surplus lights where they are no longer required. We also look to apply adaptive lighting via the CMS which defines the operation of lighting at different levels during periods of darkness. This may include adjusting the lighting class based upon highway use at

certain times of the night (dimming), making lights come on later or go off earlier (trimming), or part-night lighting.

Our objective is to provide the most efficient lighting solution possible to promote the concept of ‘right light, in the right place, at the right time’.

The CMS also enables actual energy consumption to be monitored and we will no longer pay for energy based on unmetered supply calculations.

Non-recoverable damage by third parties.

Damage by third parties occurs frequently and recovery of costs is an increasing challenge. Damage to a street light as a result of a road traffic collision frequently results in significant damage to the vehicle involved which means there is often the opportunity to recharge the cost of replacement. However, this is not the case for lit signs and bollards. The street lighting team spends in excess of £200,000 per year on replacing these assets that have been damaged by third parties.

Adoption of assets

Whilst we own most of the street lights there are approximately 13,000 which are owned by district, parish and town councils. These assets are typically in poor condition, not having benefitted from a planned inspection regime or replacement programme. There is increasing pressure from these councils for us to adopt these lights which, if progressed, will add to the financial pressure to ensure that the assets are in an appropriate condition.

Ashford Borough Council has recently completed an upgrade programme of their street lights to an adoptable standard and it is anticipated that approximately 550 of their assets will be adopted onto our inventory in 2021. Other District Councils are also reviewing their street lights with a view to us adopting them in the next few years.

Applying Asset Management Principles to the Street Lighting Asset

We have an extensive inventory and condition database of its Street Lighting asset group and this has been used in conjunction with lifecycle modelling to forecast future asset replacement needs.

Maintenance Backlog

The calculation of the maintenance backlog for the street lighting assets is different to some other highway assets, such as roads and footways. The latter will continue to operate safely in a deteriorated state and it is possible to apply differing levels of treatment at various stages of deterioration to restore the condition of the road and extend its life, without the need for total replacement. This isn’t the case with street lighting assets. While there are a limited number of preventative treatments that we could apply, such as painting, there are no treatments to improve their structural

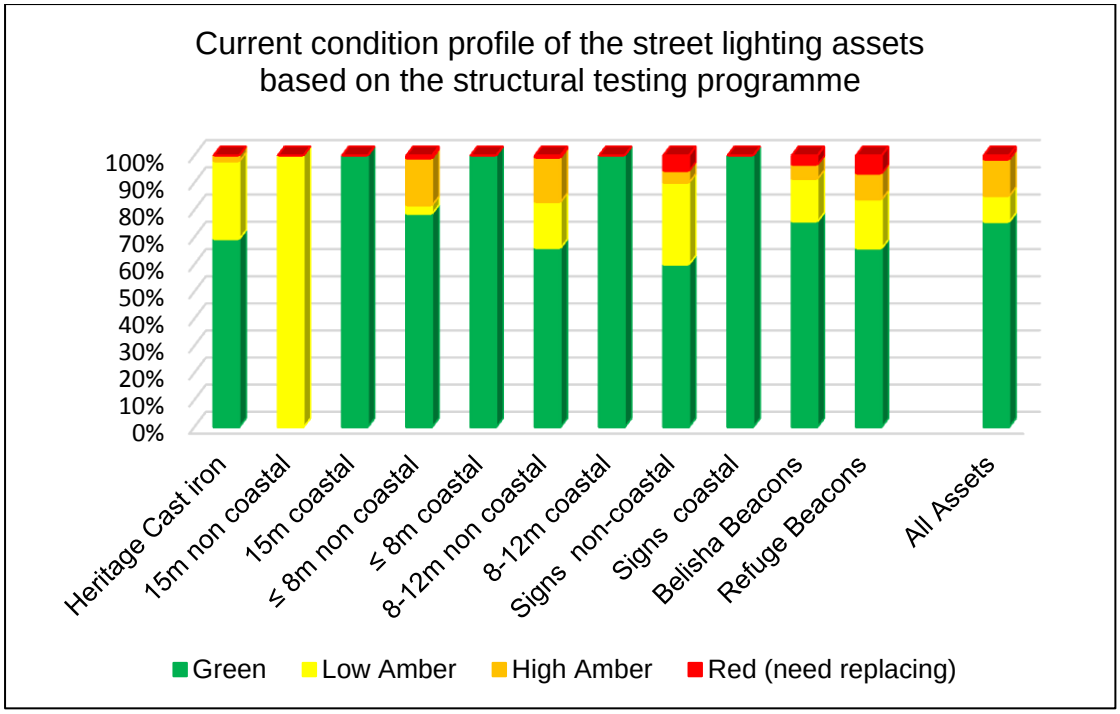
integrity. To ensure the safety of road users, once an asset has been deemed structurally unsound it must be removed. This could either be permanently or by being replaced with a new asset, depending on the available budget. Similarly, replacing the asset before it nears this end of life condition is undesirable as it's full value will not be realised.

Although it would be possible to have a backlog of columns in need of replacement following completion of the annual structural testing programme, we do not let this happen on safety grounds. If future budgets are insufficient to replace all of these assets each year we will need to implement a programme of permanent asset removal to fulfil our duties under the highways act of maintaining the network in a safe condition.

Current Condition

The current condition profile is based on the results of the most recent annual structural testing programme completed in March 2020.

	Percentage in each Condition Band			
	Green	**Low Amber**	**High Amber**	**Red** (need replacing)
Columns - heritage cast iron	69%	28%	2%	0%
Columns - 15m non coastal	0%	100%	0%	0%
Columns - 15m coastal	100%	0%	0%	0%
Columns - ≤ 8m non coastal	79%	3%	17%	1%
Columns - ≤ 8m coastal	100%	0%	0%	0%
Columns - 8-12m non coastal	66%	17%	16%	1%
Columns 8-12m coastal	100%	0%	0%	0%
Signs - non-coastal	60%	30%	4%	6%
Signs - coastal	100%	0%	0%	0%
Belisha beacons	76%	16%	5%	3%
Refuge beacons	66%	18%	10%	7%
All Assets	76%	9%	13%	1%



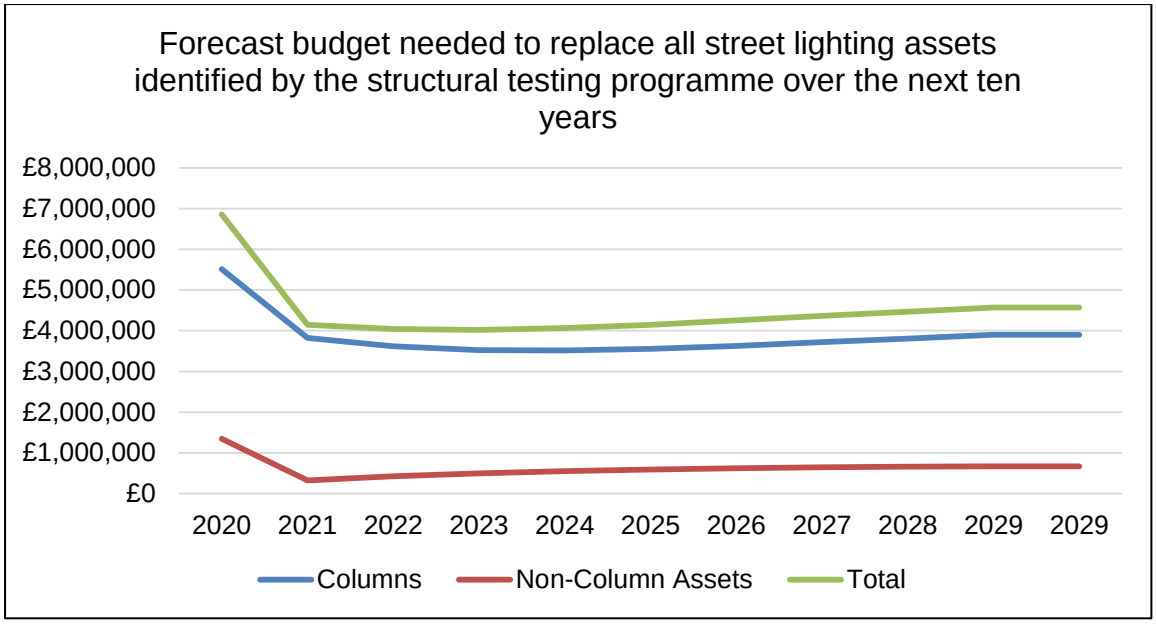
Budget Forecasts

These budget forecasts are based on the number of street lighting assets predicted to be classified as 'Red' from each year's structural testing programme. This means the risk of columns failing is considered too high for them not to be included in the replacement programme for the respective year. If the available budget becomes insufficient to replace the required number of assets a programme to permanently remove these failed assets will need to be implemented.

The table and graph below show the expected budget that will be needed to replace columns and other street lighting assets as they reach the end of their useful life. It is estimated that the average annual budget required to replace these assets is around £4.5 million. The high proportion of non-column assets forecast to need replacement in the next few years is the result of their recent inclusion in the structural testing programme. Previously there was no information on these assets, and they were maintained on a reactive basis.

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2029
Columns	5.51	3.82	3.62	3.52	3.51	3.55	3.63	3.72	3.81	3.90	3.90
Non-Column Assets	1.35	0.32	0.42	0.49	0.55	0.59	0.62	0.65	0.66	0.67	0.67
Total	6.86	4.15	4.04	4.02	4.07	4.15	4.25	4.36	4.47	4.57	4.57

Forecast budget needed to replace all street lighting assets identified by the structural testing programme over the next ten years (£ million)


Forecast budget needed to replace all street lighting assets identified by the structural testing programme over the next ten years
£8,000,000
£7,000,000
£6,000,000
£5,000,000
£4,000,000
£3,000,000
£2,000,000
£1,000,000
£0
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2029
Columns
Non-Column Assets
Total

.

The Intelligent Traffic Systems (ITS) Asset

The purpose of ITS assets is to monitor, manage and control vehicle movements on the highway network. This asset currently comprises around 350 signalled junctions, 390 signalled crossings, 170 CCTV cameras and over 500 other interactive warning, bus real time information and electronic message signs. The number of ITS assets is currently increasing annually due to new housing and business developments as well as third party requests for safety schemes.

Condition Assessments and Inspections

There are two types of checks, planned inspections and reactive inspections.

Planned Inspections

Planned inspections include highway safety inspections and condition checks carried out as part of our cyclical maintenance regime:

- Our team undertakes **visual checks** to make sure the ITS assets are in a safe condition. This includes checking that interactive warning signs are facing the correct direction and pedestrian crossing push buttons are working. We aim to carry out this kind of check at least once every four months.
- Our term maintenance contractor carries out an **electrical safety test** of all ITS assets once every twelve months.

Reactive Inspections

Reactive inspections are carried out in response to enquiries and generate ad hoc and emergency works, for example fault repairs, replacement of traffic lights damaged by third parties during a road traffic crash, or modifications to signal timing plans. During each visit by our maintenance contractor to an asset, a site check is carried out upon completion to minimise repeat fault reports.

Prioritisation of Investment

When deciding where to spend our money, we think about the risk that system failures pose to road users and residents, including:

- What do we need to do to make sure that the ITS equipment does not fail?
- If it fails, does it create a hazard to road users?
- If it fails, does it cause congestion/disruption?

We also consider:

- The type of road; for example, whether it is a high-speed road, a main road, an estate road or a country lane and the risk presented by the volume of conflicting traffic movements, including pedestrians.

- The amount of traffic that uses the road; for example, is it a main route in a town or is it a minor road only used by a limited volume of traffic each day.
- The impact if the road is closed; for example, the road may only be used by a low number of people but might be the only route to get to their homes.
- The number of pedestrians affected; for example, if the traffic signal crossings fail is there a safe alternative route with provision for vulnerable users.

When deciding which assets need to be prioritised for maintenance, fault rates, asset condition, equipment age and the impact on vulnerable users are taken into consideration. It is also important we understand whether or not the asset is doing its job effectively and in the correct location. By considering all of these factors we can determine how much work is needed to repair the asset and whether or not it will be more cost effective to replace it completely.

We continually manage issues from the Highway Management Centre using data available to us through our central control systems, CCTV images and live fault reporting tools. These range from significant congestion problems affecting busy roads through to faulty roadside message signs that fail to provide drivers with information on highway incidents.

Whilst we know we need to react and fix dangerous situations promptly, this is not a cost-effective way of working, as we have to send engineers specifically to these locations and more time is spent travelling between sites rather than dealing with the issues. We can clearly achieve more with our budget if we plan the work that needs to be done to minimise unproductive travel time.

Other Significant Factors affecting ITS Maintenance

Ageing Infrastructure

As technology advances, older equipment becomes obsolete and is no longer supported by the manufacturer. Some components can be repaired or replaced which will prolong the effective life of the asset, but this is not always possible. However, during any site refurbishment any re-usable equipment is salvaged and made available for use in routine maintenance to extend the life of other signals.

Limited Capacity

With the demand for additional housing and the increasing population there are additional pressures put on the highway network. Modifications are often made to existing assets to accommodate pedestrians or buses which can impact on the efficiency and capacity of signalised junctions. Where there is a significant impact on the network there may be the potential to mitigate this by implementing a revised method of signal operation. However, with multiple developments in a limited area,

consideration must also be given to the effects on the wider network requiring greater financial contributions to provide more comprehensive improvements.

Reliance on Third Party Infrastructure

The ITS asset may require equipment to be installed that has an impact on another asset, e.g. detector loops in the road surface. When these ITS assets fail, alternatives are considered to separate the issue and avoid a repeat situation, but it is not always possible to implement such systems due to constraints with safety requirements.

External Factors

There are short notice demands made of the ITS team from external third parties which can potentially divert limited resources and disrupt maintenance plans. When considering third party requests for equipment, such as interactive warning signs, these will be assessed based on their safety benefits, maintenance requirements and likely whole lifecycle costs. This may result in some proposals being rejected at the concept stage and alternative engineering measures being promoted.

Specialist materials

We minimise the use of specialist equipment or materials which can be expensive to install and costly to maintain. During the design and approval stage the location, quantity and type of traffic signal detection equipment is scrutinised to minimise the long-term maintenance liabilities, some of which may affect other asset groups. New technologies and equipment will always become available and these will be assessed by limited trials as per the agreed process.

Applying Asset Management Principles to the ITS Asset

We have excellent inventory and condition data on this asset group that has been built up over many years which is continually checked and updated. Modelling of the asset condition and renewal needs for the next ten years has been developed but will be reviewed to represent the binary nature of traffic signal equipment more accurately.

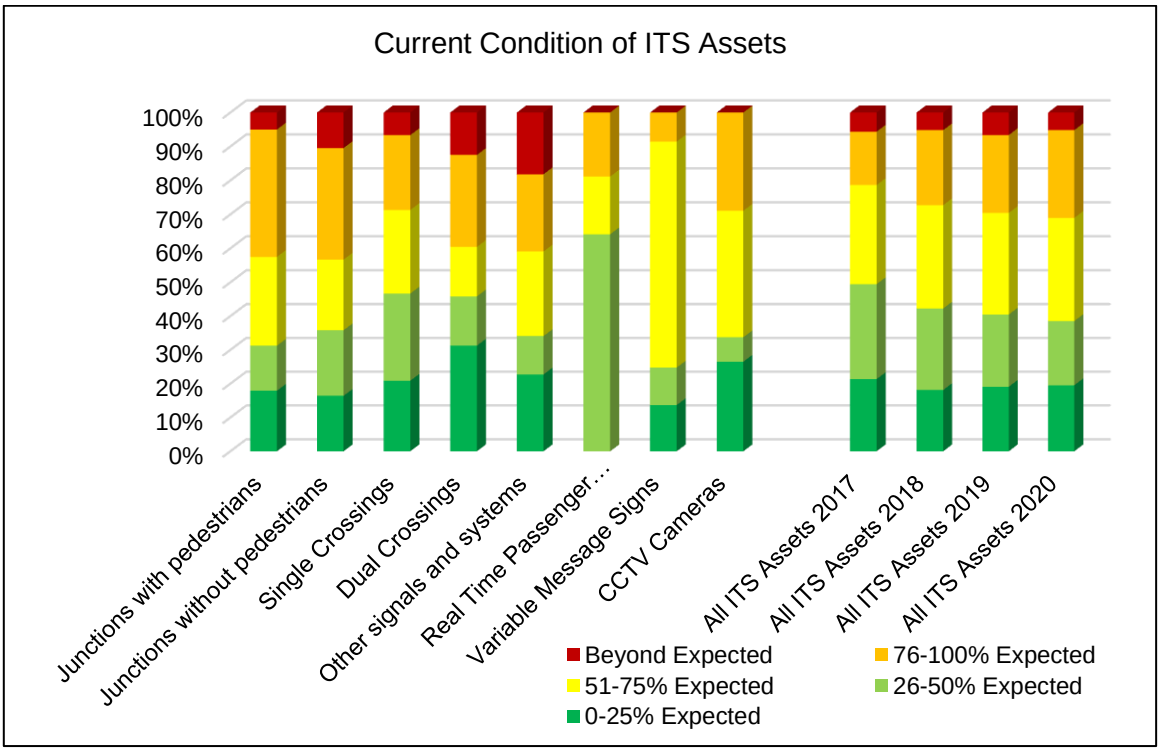
The current approach to modelling is based solely on asset age which has limitations. Due to the relatively low number of assets, compared to other asset groups, and the limited treatment options available at high cost this modelling approach needs further consideration. In practice, the determination of refurbishment priorities is not based on age alone but includes other criteria such as fault rates, equipment maintenance and third-party contributions. There are also a number of other measures than can be used to extend the life of an asset, rather than total asset replacement. These need to be considered within the model and an assessment made of the benefits for each.

Maintenance Backlog

We have excellent data on the age of all our ITS assets and currently calculate the maintenance backlog based on how much it will cost to replace any asset at the end of its expected life. As fault rates and other factors are also used when determining which assets should be repaired or replaced we recognise that in future we need to refine our backlog calculations by also taking these into consideration.

There will also be other lower cost treatment options to consider, e.g. replacement of obsolete controller types but without renewing heads, cables and posts. Each intervention will have to be determined on a site-by-site basis and the impact on the life span assessed. This may ease the current financial pressures but potentially at the expense of further difficulties in the future.

Current Age Profile of the ITS Asset



	Total No. of Assets	Condition Band (% of Expected Life)				
		0-25	26-50	51-75	76-100	>100
Junctions with pedestrians	240	43	32	63	90	12
Junctions without pedestrians	67	11	13	14	22	7
Single Crossings	345	72	89	85	76	23
Dual Crossings	48	15	7	7	13	6
Other signals and systems	44	10	5	11	10	8
Real Time Passenger Information	53	0	34	9	10	0
Variable Message Signs	117	16	13	78	10	0
CCTV Cameras	166	44	12	62	48	0
All ITS Assets 2020	**1080**	**211**	**205**	**329**	**279**	**56**

Percentage of ITS asset sub-groups in each condition band

It is estimated this current asset condition represents a renewal backlog of £4.18M.

Age Profile Forecasts

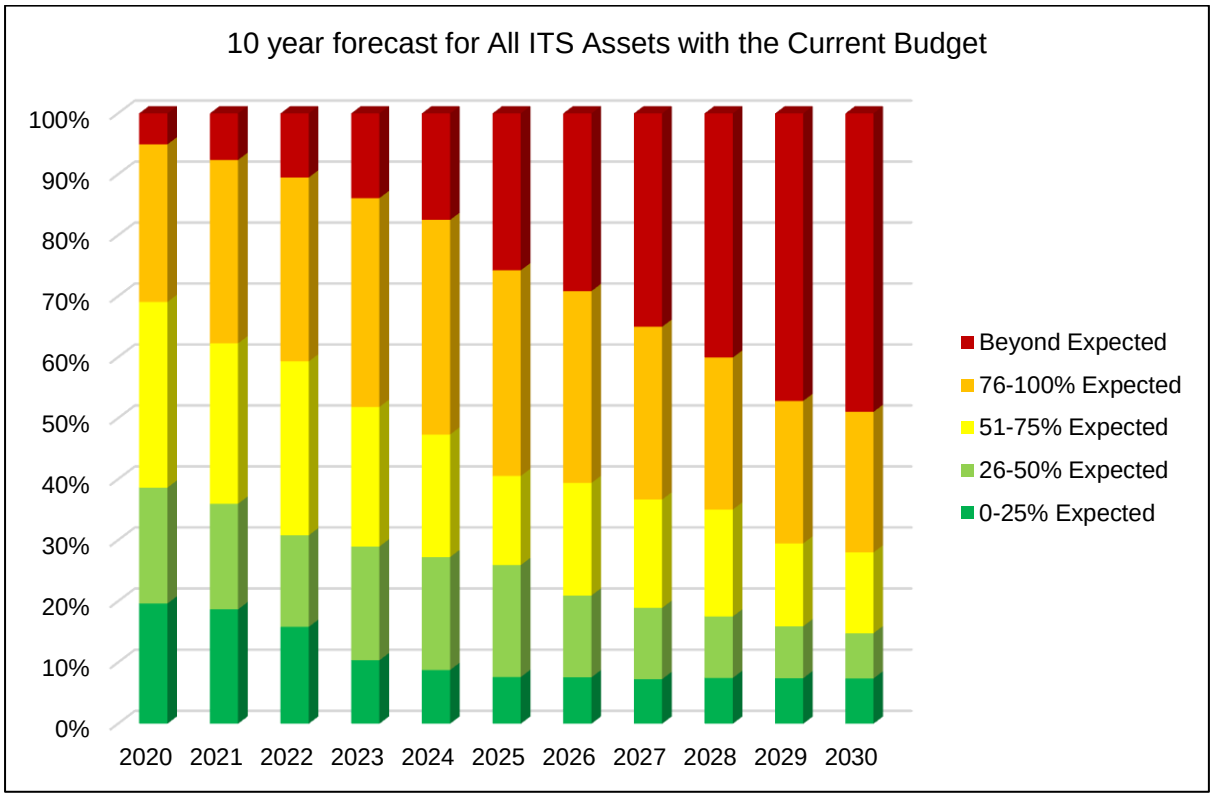
The above information has been used to model the budget requirements, and the age profile of the asset to forecast expected outcomes from three scenarios:

- The condition over the next ten years based on the current budget
- The budget required to keep the asset at a steady state over the next ten years
- The budget required to clear the current backlog over the next ten years

Current Budget

The age profile of the ITS asset has been modelled for the next ten years using the current annual renewal budget of £678,000. It is estimated this will result in a decline of the asset condition and create a renewal backlog of around £30.8m by 2030.

An asset that has reached the end of its expected life is unlikely to stop working immediately. However, at this point in the lifecycle it is likely to develop faults more frequently which will require more expensive reactive type maintenance with a dwindling number of suitable components due to equipment obsolescence.



Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
0-25% of expected life	212	203	173	114	97	85	85	82	85	85	85
26-50% of expected life	205	188	164	205	204	204	150	131	114	97	85
51-75% of expected life	329	286	312	252	222	163	207	200	199	155	152
76-100% of expected life	279	327	330	377	389	376	353	319	283	267	265
Beyond expected Life	55	83	115	153	193	287	327	394	455	539	563

Steady State

Over the past 20 years there has been a significant increase in the use of ITS to mitigate the impact of housing developments and manage increased vehicle flows on the highway network. This has led to a growth in the number of traffic systems and signals installed every year, which outpaces the number of interventions/ refurbishments that can be completed within the current budget allocation. Whilst the number of assets that can be renewed each year has remained broadly constant, there is an increasing number exceeding their expected lifespan which results in an increasing backlog. We have estimated the budget profile over the next ten years needed to maintain the same level of backlog for ITS assets beyond their expected life, and address an increasing number of assets every year. It is estimated that this amounts to an additional £26.6 million of unfunded works up to 2030, which equates to an average annual renewal budget of around £3.3 million to retain the existing backlog at £4.18 million.

Clear Backlog

In order to address the current backlog by 2030, a further £4.18M is required during the period, which equates to an average annual renewal budget of around £3.8M.

The Soft Landscape Asset

Trees and vegetation play an important role in the landscape and help make Kent's roads and footways a more attractive place. In addition to their visual role, trees. shrubs and hedges can remove a range of atmospheric pollutants, provide shelter and shade, reduce glare, stabilise banks, reduce perception of noise and contribute to ecological diversity. Grass verges soften the hard look of roads provide amenity value and have widespread benefits for pollinators and wildlife.

It is our aim to maintain and keep our soft landscape assets safe through a programmed and adaptive management regime which improves the asset's sustainability and biodiversity, and increases the overall tree canopy coverage for the whole of the county.

Asset Inventory

The table below identifies the larger groups within the soft landscape asset.

Asset	Quantity
Individual Street Trees	55,000
Groups of Trees or Tree Belts	450,000
Urban Grass	3.2million m²
Visibility Verges	734,000 m^2
Rural Verges	4,600 km
Conservation Verges	572,200 m^2
Shrub beds	242,000 m^2
Hedges (Rural & Urban)	110 km
Weeding	4,700 km
Off Road Cycle Routes	116 km

Condition Assessments and Inspections

We undertake two types of checks or inspections on our soft landscape asset, planned and reactive:

Planned Inspections

Planned inspections include general highway safety inspections and one, three and five yearly tree safety inspections:

- Our team of highway inspectors carry out driven and walked highway inspections. They have a basic understanding of arboriculture and check for trees that are clearly leaning towards the highway and may cause a hazard, identify visible loose branches and encroachment onto roads and footways, obstructions and trip hazards. They also inspect grass, shrubs and hedges

for encroachment and obstruction which may affect visibility and safe use of the highway network. The frequency of inspections is dictated by road category ranging from annual for minor roads to monthly for major roads.

- Planned inspections of trees in the highway take place on a one, three or five-year cycle dependant on classification and are carried out by qualified arboriculturists. Our tree assets are recorded in our highway database and the inspector will update the asset details including the tree condition at each inspection. When we carry out planned tree inspections, we also take note of private trees within falling distance of the highway. This is a ground level, basic visual inspection undertaken from the confines of the highway boundary only and therefore limited in its scope.

We do not undertake planned inspections on our other soft landscape assets (grass, hedges and shrubs) as they are subject to planned maintenance activity which is then subject to a sample quality control inspection.

Part of every procurement includes a check of the assets included and the accuracy of data that has been gathered previously. Asset data is then gathered through the life of the contract and added to our mapping systems to ensure that we always have an up to date asset register.

Reactive Inspections

Reactive inspections of trees, grass verges, shrubs and hedges are carried out in response to customer enquiries. They may generate ad-hoc or emergency works or result in us serving notice under Section 154 of the Highways Act 1980 requesting the landowner to trim or deal with a vegetation issue. Where this is not completed in the stated time, we will undertake the work and seek to recover the costs from the landowner.

Prioritisation of Investment

When we are deciding where to spend our money, we think about the risks posed to road users and residents, the impact on the surrounding environment and the age and condition of the asset:

- Is the tree or vegetation creating a hazard to road users or residents?
- Is the tree or vegetation having an adverse effect on the surrounding environment?
- Is the tree or vegetation damaged, diseased or dying?
- Is the tree or vegetation adversely affecting adjacent highway assets?

Trees are the highest risk assets within the soft landscaping group of assets. Some trees are given a higher priority because of their size, age, history or legal status.

When prioritising where we spend our money we also consider the type of road, its speed, location and its use by both vehicles and pedestrians.

For example, a damaged tree near a pavement may present an immediate risk to pedestrians. Within two hours of becoming aware of the problem we will make the site safe and put barriers around the area with signs to warn people of the hazard. Minor die back to a tree within a large open space with no risk to the highway may be programmed for works within one to three months dependent on size.

We regularly manage issues through our fault management system. These range from safety critical problems affecting busy roads to nuisance and quality of life complaints. Whilst we know we need to react and fix dangerous situations quickly, this is not a cost-effective way of working as we have to send landscape officers specifically to these locations and more time is spent travelling rather than fixing. We can clearly get more done for our budget if we plan the work that needs to be done in advance.

We assess each site using a risk-based approach and have a prioritised list of improvements.

Other Significant Factors affecting the Soft Landscape Asset

Pest and Disease

Soft Landscape assets are natural living organisms in their own right. As such, they grow and are subject to disease or even death. Where this occurs on a large scale there can be unforeseen impacts on maintenance budgets. A good example of this is Ash dieback (*Hymenoscyphus fraxineus*) which affects tree populations.

Private Trees and Vegetation

There are a large number of trees, hedges and shrubs located on private land adjacent to our public highway. These are privately owned and we work with the local community to encourage landowners to maintain them appropriately. In law, the courts have accepted the principle that people with responsibility for trees, whether owners, tenants or agents should inspect their trees and vegetation at regular intervals. If following an inspection, symptoms of ill-health or unusual growth are observed, expert advice should be sought. Failure to obtain or act upon such advice could lead to claims of negligence or failure to comply with their ‘Duty of Care’. If necessary, we have powers under the Highways Act to notify landowners of their responsibilities. If they do not carry out necessary maintenance work, we may exercise our powers to carry out the works and recover costs from the landowner.

Environmental matters

Climate change has meant that more flooding is seen through Autumn to Spring with hotter dryer summers. This impacts the ability of native species to grow and thrive in the local environment as well as increasing growth rates for grass and other vegetation. Imbalance in this regard has the potential to impact on landscape “safe useful life expectancy” and “lifecycle planning” when installing new landscape assets

such as trees and shrubs. The above factors all need to be balanced with available funding when planning future schemes, services and frequency of maintenance.

Weed Treatment

We currently undertake our programmed weed sprays using the herbicide glyphosate to keep the highway safe and to reduce road and footway asset deterioration. There is concern within the public that the usage of glyphosate should be reduced on environmental and health grounds despite its approval by the Health and Safety Executive.

As part of our continuous review of the products we use within the highway we have explored alternatives to the use of glyphosate. One of these involved the use of hot foam to control weeds as well as cultural methods such as burners and brushes.

These alternatives do not currently accomplish a similar level of weed control without increasing costs and in some cases may well increase CO_2 emissions as well. DEFRA guidance published in 2015 estimated a cost increase of up to eight times for non-chemical control over glyphosate. To remove glyphosate completely from our current programmes could therefore create a significant unfunded revenue pressure on our budgets.

We will continue to review how we manage weeds within the highway, investigating alternative methodologies to glyphosate as and when they arise, and will present options to elected members when available.

Interaction with other Highway Infrastructure

The condition of the soft landscape assets and its ability to negatively impact adjoining assets is also directly associated with the level of maintenance provided.

Adoption of assets

As development increases and more residential properties are built more assets are added to our asset inventory. This inevitably leads to financial pressure on our budgets. There are also instances where the quality of the asset adopted could be improved or designed more efficiently for maintenance, both have an impact on the assets long term future.

Recognising the Values of the Tree Asset.

Damage by third parties and removal of our tree asset is quite common. A system of valuing trees based on the Capital Asset Valuation of Amenity Trees (CAVAT) system has been included within our fees and charges register. However, there is still more education required to inform people of the value of mature trees and their contribution to the street scene. Recovery of costs associated with utility damage, developments or third-party damage is still quite challenging.

Applying Asset Management Principles to the Soft Landscape Asset

We have collected extensive data on our soft landscape asset but due to the nature of the asset and type of maintenance involved we consider a forecast of service levels for different funding scenarios to be more appropriate than the lifecycle planning approach taken for other asset groups.

Maintenance Frequencies

Maintenance frequencies are reviewed periodically in accordance with available funding. We are aware that both the current and proposed frequencies fall short of what is required to prevent both medium and long-term asset deterioration. We also understand that the long-term deterioration of landscape assets can impact on surrounding assets. Established weed growth and tree roots in hard surfaces can cause hundreds of thousands of pounds worth of damage in subsequent repairs to ensure a safe highway. Moreover, unmaintained overhanging vegetation can block street lighting, visibility at junctions, obstruct the safe passage of vehicles and pedestrians and obscure the visual condition surveys of crash barriers. Some of these issues have safety implications for road users and others have the potential to become legal claims from third parties.

Previous Maintenance Frequencies

The table below gives an overview of the history of soft landscape maintenance frequencies. The notable reductions since 2009/10 are a result of ongoing financial pressures.

Service Provision	**Maintenance Frequency**		
	(2009/2010)	(2016/17)	(2020/21)
Urban Grass Cutting	10-16	8	6
Conservation verges	N/A	1	1
Shrub Bed Maintenance	2-12	1	1
Urban Hedges	2	1	1
Weed Spraying (Hard surface)	2-3	1	1
Rural Swathe Cutting	2-3	1	1
Visibility cuts	3	3	3
Rural Hedge Cutting	1-2	1	1
High Speed Road (HSR)	2	1	1
Bus Routes	Ad-Hoc Safety Critical Work		
Tree Maintenance	Ad-Hoc Safety Critical Work		

Forecasts of Maintenance Frequencies (Revenue Budget)

The table below summarises the forecast maintenance frequencies for three levels of revenue funding.

Service Provision	Steady State Service (£4.42m)	Current Budget Reduced Service (£3.42m)	Statutory Minimum Service (£2.42m)
Urban Grass Cutting	8	6	1-3
Conservation verges	1(increase qty)	1	0
Shrub Bed Maintenance	2	1	0
Urban Hedges	2	1	0
Weed Spraying (Hard surface)	2	1	0
Rural Swathe Cutting	2	1	1
Visibility cuts	3	3	3
Rural Hedge Cutting	1 - 2	1	every other year
High Speed Road (HSR)	2	1	1
Bus Routes	Safety & amenity	Safety critical only	
Tree Maintenance	Safety, amenity & nuisance	Safety critical only	

Environmental Focus

With the recognition of climate change there has been an increased focus on the highway soft landscape asset and how this can deliver the environmental benefits necessary to reach both the council's and government's targets regarding biodiversity.

The table below represents the current asset register which is being managed for the benefit of biodiversity.

Environmental Asset	Number of sites	Number of roads/paths	Area (m²)
Roadside Nature Reserves (RNR)	123	108	101,000
Sites of Scientific Interest (SSSI)	55	279	318,000
Bee Roads	3	39	145,000
Conservation Verges (urban)	17	17	5,000

As part of our approach to managing this asset we will do the following:

- Provide verge management regimes that actively encourage and enhance biodiversity for pollinators and wildlife.
- Manage the tree asset to deliver canopy coverage increases within the urban environment to provide gains in carbon sequestration, pollution removal, thermal cooling, avoided runoff through rainwater interception and biodiversity for a sustainable future.

Wildlife Verges and Bee Pollinators

As part of our approach to asset management we identify sites within our asset registers that are best suited to this type of management routine. Knowing our asset and what can be achieved has allowed us to develop the following environmental assets:

- Enhancing Bee Pollinator Verges in line with our bee pollinator strategy by delaying cutting to later in the year. This allows flowers to bloom, provide nectar sources and seed before being cut.
- Improving Roadside Nature Reserves through collaborative work with our Kent Wildlife Trust stakeholders and detailed auditing, which has increased this asset and improved the biodiversity of the highway natural environment.
- Defining our Sites of Special Scientific Interest and working with Natural England to provide more detail on the management of these sites and the ecology present.
- Working with highway inspectors as part of our continual asset audit of rural roads that may be suitable for alternative management regimes.

There is a shortfall in the funding required to meet these initiatives and as part of the continual refinement of our asset knowledge we will quantify the benefits and costs of the above to present funding scenarios for the council's long-term plans regarding biodiversity.

Canopy Coverage

All of the trees within Kent are now mapped on a Geographic Information System (GIS) canopy layer detailing the size and extent of the overall tree asset. This detail will be refined to determine where future trees are replanted and will influence our future strategies for increasing canopy coverage within the tree asset. The table below illustrates the canopy coverage for the whole of the county compared with that for which we are responsible.

	Canopy Area (ha)	**Canopy Cover %**
County	373,942.60	17%

KCC	354,739.45	18%

As part of wider initiatives to increase the tree canopy within Kent this data could be used to set some clear aims regarding canopy coverage which is specific to the highway tree asset. The average canopy coverage across England's towns and cities is 16%. The Urban Forestry and Woodland Advisory Committee suggest that 20% canopy coverage is a good aspiration to as part of a long-term strategy whilst the government has set targets of 19% for the UK by 2050.

Our approach to targeted tree planting should take into account landscape character, road hierarchy, existing tree stock, and local demographics to maximise the potential for our tree assets to deliver real benefits to the residents of Kent.

Tree Planting (Capital Budget)

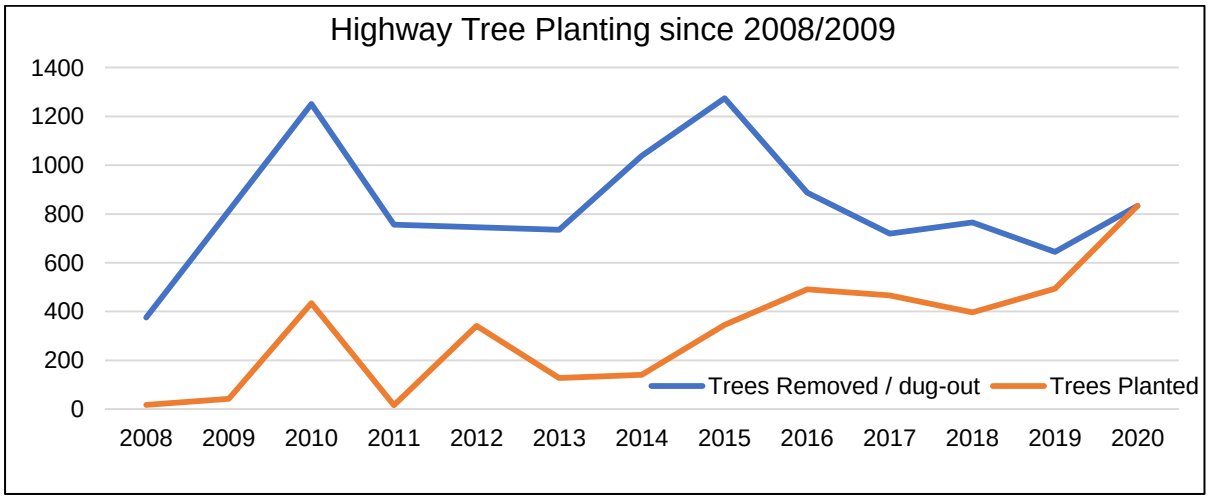
Since 2009 there has been no capital funding for general tree replacement with only those trees that are protected by a Tree Preservation Order (TPO) being replanted within 2 years of removal using the revenue budget. This is a statutory requirement and will continue to be funded by the revenue budget.

The absence of capital funding for this asset has meant that since 2009 tree numbers have declined as more trees are removed than replanted.

In 2019 a £75k capital budget was provided to allow for larger tree planting schemes to be undertaken to improve the tree asset. In 2020 this budget was increased to £200k to allow for the tree planting numbers to match the number of those trees that were removed.

Steady State Tree Stock

The graph below illustrates the rate of planting since 2009 and shows that the gap between removal and replanting has been closed in 2020 with the current level of funding.



Year	Trees Removed/ dug out	Trees Planted
2008	375	17
2009	812	42
2010	1,251	434
2011	756	16
2012	746	342
2013	735	128
2014	1,038	140
2015	1,274	345
2016	887	491
2017	719	466
2018	765	396
2019	645	493
2020	833	833

Highway Tree Planting since 2008/2009

This is the steady state situation where the previous trend of declining tree stock has been reversed but not exceeded.

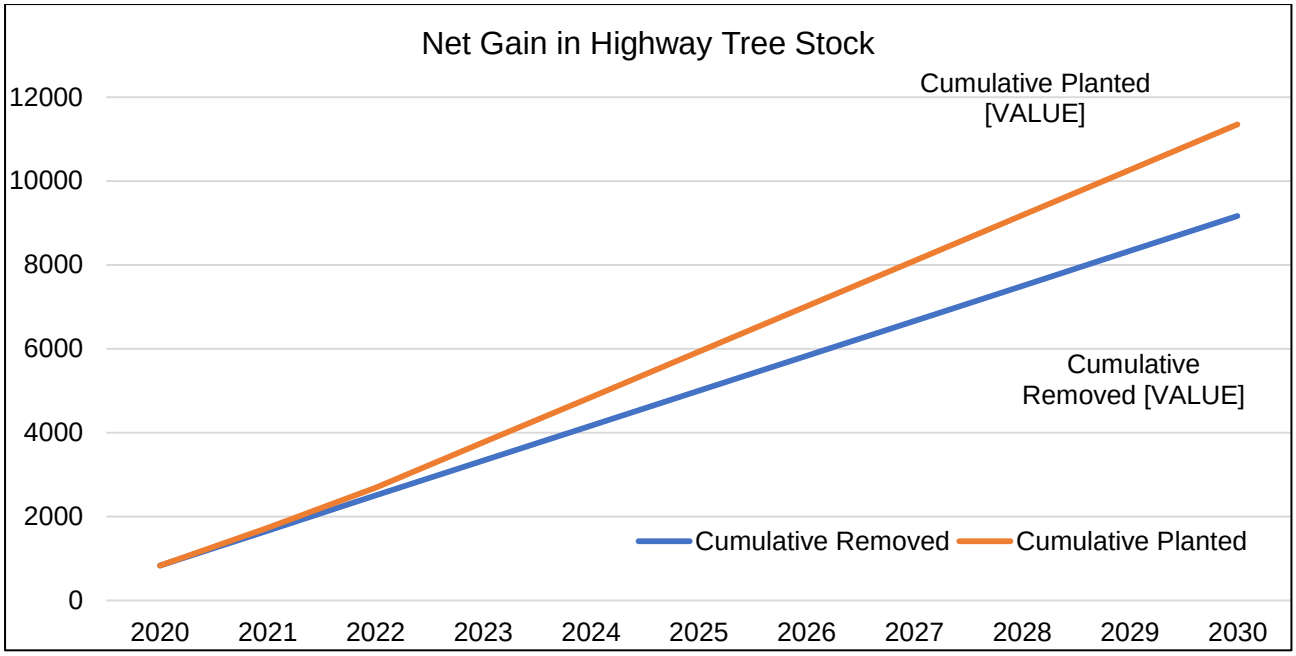
Net Gain in Tree Stock

Both Kent County Council and government have ambitious targets to increase the amount of tree planting beyond the steady state. To improve the asset and to address the deficit built up since 2009, further planting would be required.

However, our asset management approach to tree planting should provide a sustainable future for our tree stock and should consider prevailing diseases such as Ash Die Back. It is essential to have a long-term plan to implement tree planting. The risk of dramatically increasing planting in a short time period would lead to a tree stock that reached maturity at a broadly similar time reducing resilience and storing up issues for the future.

Planting costs in a highway environment can range from £300 in a soft verge to £700 in hard surfaces due to the increased need for civils works. The average cost of planting a tree is £400, meaning that for each additional £100k of funding a further 250 trees may be planted.

The following graph outlines the effect that this additional funding would have on the tree asset numbers for the next 10 years working on an average tree cost of £400.



Year	Cumulative Trees Removed	Cumulative Trees Planted
2020	833	833
2021	1,666	1,733
2022	2,499	2,683
2023	3,332	3,766
2024	4,165	4,849
2025	4,998	5,932
2026	5,831	7,015
2027	6,664	8,098
2028	7,497	9,181
2029	8,330	10,264
2030	9,163	11,347

Net Gain in Highway Tree Stock 2020 to 2031

Forecasts of Tree Numbers (Capital Budget)

The table below summarises the forecast maintenance frequencies for three levels of capital funding.

Service Provision	Improving Service (£300k)	Steady State Service (£200k)	Statutory Minimum Service (£0)
Tree Planting Schemes	Net Gain in Tree Stock	No net loss of Tree Stock	Rapidly declining tree stock

The Signs & Lines Asset

This asset group comprises unlit traffic signs (lit signs are managed as part of the street lighting asset group), road markings and cats' eyes, and pedestrian guard rail.

The Unlit Traffic Signs Asset

Traffic Signs are categorised into four types; warning, regulatory, direction and information, and are provided to convey messages to highway users including equestrians, cyclists and pedestrians. The message must be clear and at the right time for users travelling at the normal speed for the road, footway or cycle track facility. They are therefore sited at appropriate distances for the speed of the road and the message they convey and should be reflective or lit as required.

All signs are designed and installed in accordance with Traffic Signs Regulations and General Directions (TSRGD) 2016 and amendments thereof. We have set up a departmental working group to review the recent changes to TSRGD and how these changes can be implemented to improve effective and efficient management of the signs asset. In 2010 we also produced a guidance document *KCC Signs Technical Directive 2010* showing any adopted variances and to assist engineers and practitioners in achieving a consistent approach throughout the county.

Partner agencies are also responsible for some signing on our highway network, and we liaise closely with Highways England, district and borough councils to influence a consistent approach within the county.

We are mindful that redundant signs and street furniture work against inclusive mobility in the street environment and can cause access problems for pedestrians. There is a commitment to rationalising existing signing on the highway to reduce clutter where possible. Removal of unnecessary signing is carried out as part of the assessment when reviewing plans for new developments to optimise what is required.

As with many councils, we do not hold any inventory or condition data for unlit signs and there is currently no dedicated maintenance budget for this asset group, with repairs undertaken using general reactive revenue funds.

We do not have a record of the location for all the unlit road signs in the county but using the 'Hertfordshire' model in the Whole Government Accounts (WGA) valuation process we estimate there are around 190,000 of them.

The Road Markings & Cats' Eyes Assets

The primary objectives of road markings and cats' eyes are to:

- Assist with the safe movement of traffic on the highway network.
- Protect highway users by guiding, warning, directing and informing them

- Define features on the highway such as junctions, road edges and traffic lanes.

This is achieved through the use of:

- Centre line white lane markings (extrusion)
- White edge lines (extrusion)
- Rib edge lining (spray for refresh sites)
- Pedestrian crossing and junction markings (screed)
- Yellow box junction markings (screed)
- Lettering and arrow markings (screed)
- Cats' eyes (milled, stick on and intelligent road studs)

We do not hold any specific inventory or condition data for road markings or cats' eyes but using some broad assumptions we estimate this asset includes around 4,000 miles (6,500 kilometres) of centre line white lane markings, 1,800 miles (3,000 kilometres) of junction markings, 240,000 letters and arrows marked on the road and over 700,000 cats' eyes.

The Pedestrian Guard Rail Asset

The main purpose of pedestrian guard rail is to pedestrians away from crossing the road at an inappropriate place or from straying into the road inadvertently. It can also be used to keep pedestrians away from the swept path of large vehicles such as buses and heavy goods vehicles. It should be noted that pedestrian guard rail is not intended to protect pedestrians from vehicles.

As with many other councils, we do not hold any specific location or condition data for pedestrian guard rail due to the low value and limited extent of the asset, but using the 'Hertfordshire' model in the Whole of Government Accounts (WGA) valuation process we estimate there is in the region of 130 kilometres of it. There is currently no dedicated maintenance budget for this asset group and repairs are currently undertaken using general reactive revenue funds.

Condition Assessments and Inspections

We carry out two types of checks to assess the condition of our signs, lines, cats' eyes and pedestrian guard rail assets: planned inspections and reactive inspections.

Planned Inspections

Planned inspections are carried out as part of our cyclical maintenance regime. This involves visual checks by our team of highway inspectors to make sure all highway assets are in a safe condition.

For unlit signs this includes visually checking that signs are not broken, missing or faded and that posts are in a sound, stable condition. We carry out this kind of check at least once every twelve months, with major routes being checked monthly.

For road markings this includes checking that the markings are sufficiently visible during the day time and if applicable that cats' eyes are present. We carry out this kind of check at least once every six months.

For pedestrian guard railing, this includes visually checking that barrier components are not broken or missing. We carry out this kind of check at least once every twelve months.

For cats' eye, our highway inspectors visually check that they are sufficiently visible.

Reactive Inspections

Reactive inspections are carried out in response to enquiries we receive from members of the public or from partner organisations such as district councils. Site visits may also be prompted by reports received from the Police or from teams investigating injury crashes.

For road markings, we survey the surrounding area so that any other road markings that require refreshing can be included for more efficient delivery. We also assess the condition of road markings when travelling to and from sites.

In all cases, we use a risk-based approach to determine whether ad-hoc or emergency works are appropriate.

Prioritisation of Investment

Traffic Signs

Due to budget pressure, sign maintenance has long been a reactive process with little or no proactive approach in relation to preventative or cyclic maintenance. In many circumstances wholesale replacement is more cost effective than repairing the existing sign unit.

In the absence of asset specific condition data, decisions on where we need to spend money on unlit signs are based on dealing with situations picked up by routine inspections and public enquiries, rather than performance of the asset itself.

When deciding where to spend money on our defective signs we think about the risks to safety and the benefit the sign provides, including:

- Is the sign in a safe condition?
- Is the sign sufficiently visible to drivers?
- Is the sign communicating the correct message effectively?

- Is the sign needed to warn highway users of a potential danger or traffic restriction?
- Will a new sign improve highway safety?

We also consider the type of road/footway/cycle track, the amount and speed of traffic, cyclists and pedestrians using it, and the surrounding environment.

It is also important that we understand whether or not the sign is still doing its job effectively. If it is in the wrong place or is not providing correct, easily understood information, there is no point in simply replacing it. It may also be that the sign is no longer needed and therefore it can be removed completely to reduce the amount of sign clutter.

We assess each site using a risk-based approach and prioritise repairs on the basis of safety.

Road Markings and Cats' Eyes

When deciding where to spend our money on road markings and cats' eyes, we think about the risk associated with the condition of the asset to ensure it provides highway users with sufficient guidance, warning, direction and information.

We use the following questions as part of our risk assessment matrix to prioritise our response:

- What do we need to do, such as road sweeping, to make sure that the road markings and cats' eyes are sufficiently visible before they should be considered for refreshing?
- Is there a need to replace the existing road markings/cats' eyes?
- If the road markings and cats' eyes are not reflective, does it increase the hazard to drivers?

We also consider:

- The type of road, for example, whether it is a high-speed road, a main road, an estate road or a country lane.
- The amount of traffic that uses the road. For example, is it a main route in and out of a town or is it a minor road only used by a handful of drivers each day?
- High risk areas, such as pedestrian crossings and 'STOP' lines.
- For lining on footways and cycle tracks, whether these are in areas of high use or high risk

We assess each site using a risk-based approach and have a prioritised list of renewal works. This list is used when determining budget allocations and compiling forward works programmes.

Pedestrian Guard Rail

In the absence of asset specific condition data, decisions on where we need to spend money on this asset is based on our response to dealing with situations, rather than performance of the asset itself. We also think about the risks posed to the road users and pedestrians. If the pedestrian guard rail fails, are pedestrians more likely to cross the road in an inappropriate place, to stray into the road, or to trip or fall within the highway?

As with all assets we also consider the type of road and the amount of vehicular and pedestrian traffic using it and whether or not the asset is doing an effective job.

Other Significant Factors affecting Maintenance of the Signs & Lines Asset

Traffic Signs

Damaged and Ageing Asset

Although traffic signing is now designed with the environment in mind, including the need to reduce unnecessary street clutter and the use of weather resistant materials, past practice has left the county with many ageing and deteriorating signs. Plastic coated signs and posts were developed in the 1950s, and were widely used across the county. Due to problems of internal rusting many are now in a poor or unknown condition.

Passive Sign Post Assessment

Passive posts are designed to minimise damage to vehicles that leave the road and strike them. Their use can have a very high initial cost but there can be longer term cost benefits, for example where foundations do not have to be replaced. By selecting products appropriately from a wide range of materials available, passive posts can offer a long and maintenance free life, as well as safety benefits at locations where collisions are likely. The type and specification of passive posts is not always obvious at the location and therefore continuity can be problematic between initial installation and future maintenance.

Increased theft/collision damage and non-recoverable costs

Damage by third parties is common, with cost recovery increasing all the time. Street graffiti also requires an immediate response for some regulatory and warning signs. This increases the burden on existing highway budgets and reduces cyclic and preventative maintenance, such as cleaning.

Ownership of Sign Strategies

There has been a number of signing strategies across the county that deal with cross-district and agency issues (HGV management etc.). There is a risk that ownership of these strategies is lost and their effectiveness diminishes over time.

This in turn can then work against the county's aspiration of LTP4, growth without gridlock.

Reductions in other services

With the reduction in rural verge maintenance, signs in these areas can become significantly overgrown and fall into disrepair. Warning signs can become obscured causing increased risk of collisions.

External/political pressure

With the focus on safety critical repairs we can be under greater external and political pressure to respond to damaged non-safety critical signing such as village gateways. However, this is not a funded activity.

Road Markings and Cats' Eyes

Life of the Asset

Thermoplastic road markings in a location that is constantly over-run can last as little as eighteen months before it requires refreshing. This is a particular problem in busy town centres especially on transverse lining such as junctions and zebra crossing markings. Small patching and pothole repairs often require relining and this leads to sections of road having lining of varying condition.

Traffic Management

High speed roads are considered the highest risk as they carry the highest volumes of traffic at speeds in excess of 50mph. This network is difficult to access without creating local congestion and can be costly. We operate an annual high-speed road maintenance programme which involves a series of planned closures that allows work to be undertaken on this part of the network. However, each closure offers limited time to undertake any significant lining works.

Strategic Approach

Other than following our road surfacing works, when all lining is renewed, the asset is currently only maintained on a reactive basis and there are no strategic plans in place to cyclically refresh the network. This means that lining works are difficult to programme and deliver effectively on an ad hoc basis.

New methods and materials are available on the market and opportunities to explore these are limited without a countywide strategy.

Heavy Goods Routes

Cats' eyes are more likely to be removed by the constant overrunning of heavy goods vehicles. Routes with a high proportion of heavy goods vehicles are likely to require frequent replacement. Alternative forms of increasing road visibility are

considered before cats' eyes are replaced at these locations, especially in locations likely to be over-run.

Noise

Cats' eyes in locations which are frequently over-run, particularly by heavy and large goods vehicles, can create a significant noise nuisance to residents. Placement of cats' eyes within 30mph urban environments is only allowed if there is a clear safety need.

Pedestrian Guard Rail

Proportion of asset at end of life

The maintenance of pedestrian guard rail has not hitherto been proactively managed using asset management methodology, and as a result a significant proportion of the asset is considered to be at the end of its life.

Collision damage and non-recoverable costs

Damage by third parties accounts for the majority of reactive repairs and it is difficult to recover these costs.

Removal of pedestrian guard rail

In the 1960s and 1970s pedestrian guard rail was used extensively as urban highways were developed and expanded. There was no guidance at the time on where it should be used and this has left a legacy of over-use of this asset. The Department for Transport recognised this in 2009 and published guidance (LTN 2/09) which provided an assessment framework to reduce the need for pedestrian guard rails on the highway network. We undertook a full assessment of town centre pedestrian guard rail across the county but local concerns about residual safety meant that the majority of local Joint Transportation Boards decided against removal.

In order to support both the amenity value of the highway network, particularly in town centres, and the desire to balance pedestrian and vehicular traffic through shared spaces and well-designed streets, Local Transport Note 2/09 should be fully implemented.

Applying Asset Management Principles to the Signs & Lines Asset

Due to their relatively low value and the generally reactive nature of their maintenance, we have very little data on these assets. However, we have made estimates of their respective numbers. This has been done to help us quantify the likely levels of condition or serviceability that can be expected with different levels of funding.

Estimated Extent of the Assets

Asset		Road Classification				
		A	B	C	U	All
Type	**Sub Group**					
Unlit Signs (No.)	Warning	6,946	5,199	15,993	19,084	47,222
	Regulatory	7,801	3,638	10,070	35,426	56,935
	Directional	6,659	3,127	6,993	8,952	25,731
	Information	1,142	295	842	7,165	9,444
	Boundary	1,001	817	2,934	26,153	30,905
	Parking Directional	284	73	6	280	643
	Other	712	810	2,578	21,442	25,542
	Total	24,546	13,959	39,416	118,503	196,422
Pedestrian Guard Rail (Lin. metre)		53,306	12,396	13,133	52,142	130,977
Road Markings (Linear metre)	Centre line[1]	986,160	448,490	1,885,620	3,021,984	6,342,254
	Edge line[2]	891,814	531,160	2,866,700	-	4,289,674
	Rib edge line[3]	382,206	-	-	-	382,206
	Pedestrian crossings[4]	75,000	31,000	-	-	106,000
	Junction markings[5]	1,000,000	1,000,000	500,000	500,000	3,000,000
	Yellow box junctions[6]	140,000	-	-	-	140,000
	Lettering & Arrows[7]	240,000	240,000	-	-	480,000
	Total	3,715,180	2,250,650	5,252,320	3,521,984	14,740,134
Cats' eyes[8] (No.)		187,053	79,674	430,006	-	696,734

Assumptions made in estimating the size of this asset:

- Centre line[1] – all A, B, C & urban U roads, no rural U roads
- Edge line[2] – all rural A, B & C roads minus rib edge lining
- Rib edge lines[3] – on 30% of rural A roads
- Pedestrian crossings[4] – estimate 400 signal-controlled crossings & 2,000 zebra crossings, assume 15 metres of line per signal-controlled crossing and 50m of line per zebra crossing (including zig-zags) = (400 x 15) + (2,000 x 50) = 106,000 metres of lining
- Junction markings[4] – estimate 200,000 junctions at 15 metres each = 3,000,000 metres

- Yellow box junctions[6] – estimate 350 at 400 metres each = 140,000 metres
- Lettering and arrows[7] – Twelve districts have an estimate of 20,000 letters and arrows each = 240,000 markings; estimate of 2 metres each marking = 480,000 metres of marking
- Cats' eyes[8] – estimate 1 for every 2 metres of centre line for 60% of all classified roads
- The number of unlit signs has been estimated from the 'Hertfordshire' model in the Whole of Government Accounts valuation process.

Current Levels of Funding

The current level of funding on these assets is:

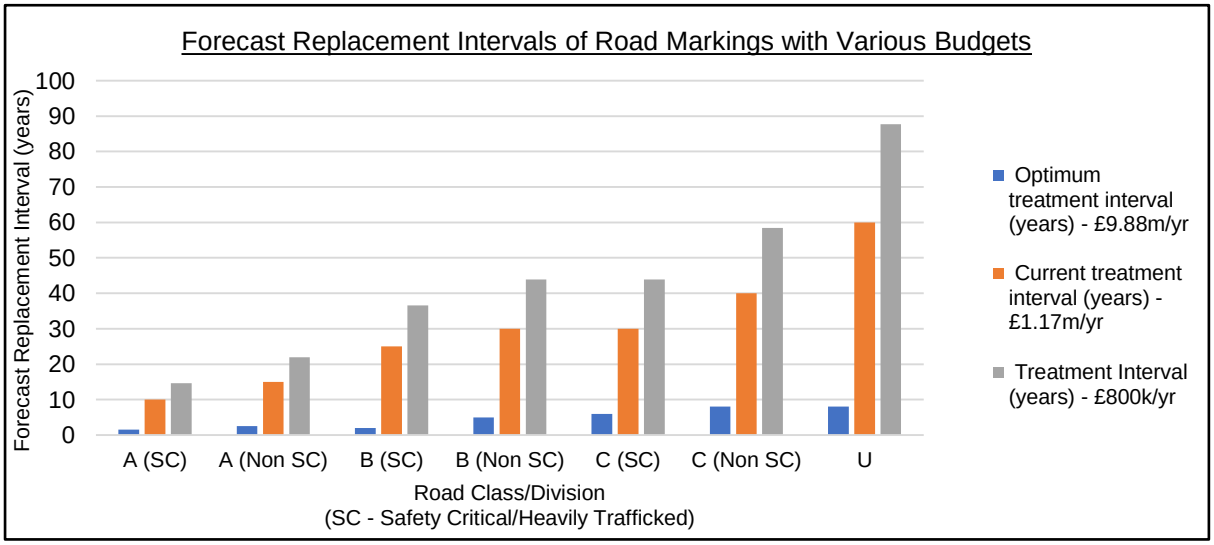
Asset	Total Funding	Capital/Planned Funding	Revenue/Reactive Funding*
Road Markings & Cats' eyes	£608,000	£400,000	£208,000
Pedestrian Guard Rail	£95,000	-	£95,000
Unlit Signs	£1,780,000	£400,000	£1,380,000

*- this is not from the budget allocated to these assets but the actual spend from reactive budgets in 2018/2019.

Treatment/Replacement Intervals and Condition Forecasts

Based on the current treatment/replacement costs and our estimates of the size and extent of these assets we have forecast the likely replacement intervals or condition that various levels of funding will support.

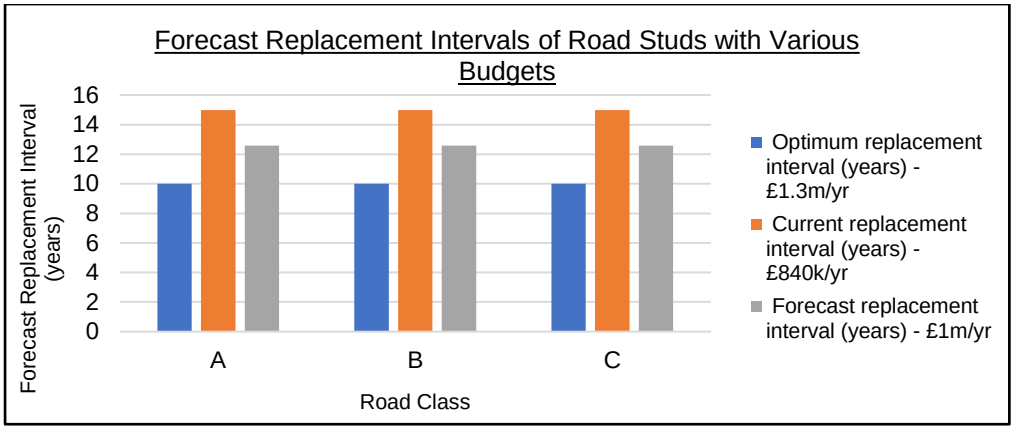
Road Markings



		Road Class/Division SC = Safety Critical/Heavily Trafficked						
Treatment scenario	**Annual budget**	**A (SC)**	**A (non SC)**	**B (SC)**	**B (non SC)**	**C (SC)**	**C (non SC)**	**U**
Optimum treatment interval	£9.88m	1.5	2.5	2	5	6	8	8
Current treatment interval	£1.17m	10	15	25	30	30	40	60
Reduced service treatment interval	£800k	15	22	37	44	44	58	88

Forecast replacement intervals in years for road markings under three budget scenarios

Cats' Eyes

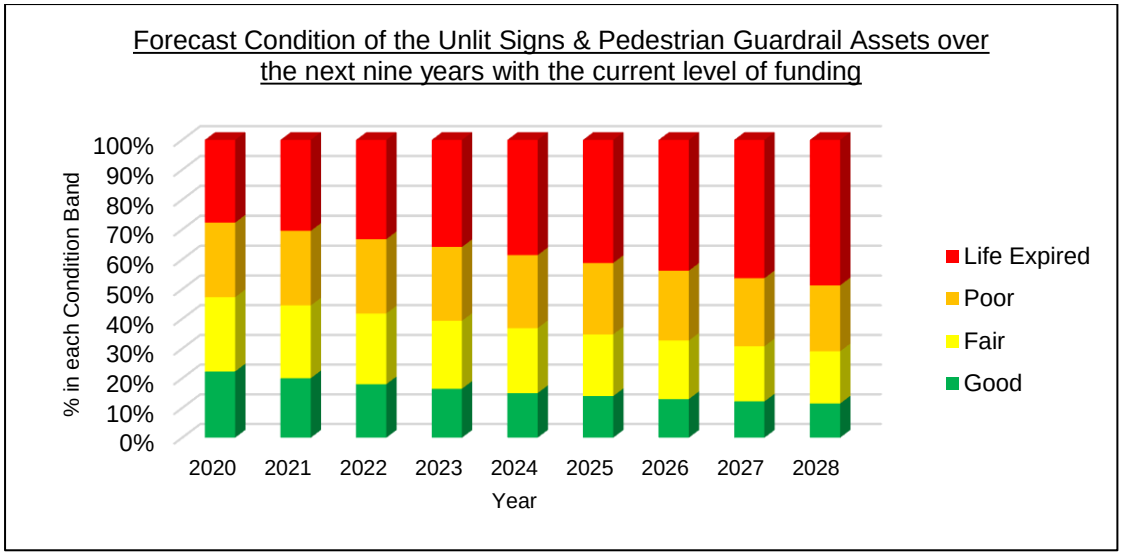


		Road Class		
Treatment scenario	**Annual budget**	**A**	**B**	**C**
Optimum treatment interval	£1.3m	10	10	10
Current treatment interval	£840k	15	15	15
Improved service treatment interval	£1m	13	13	13

Forecast replacement intervals in years for road markings under three budget scenarios

Unlit Signs and Pedestrian Guard Rail

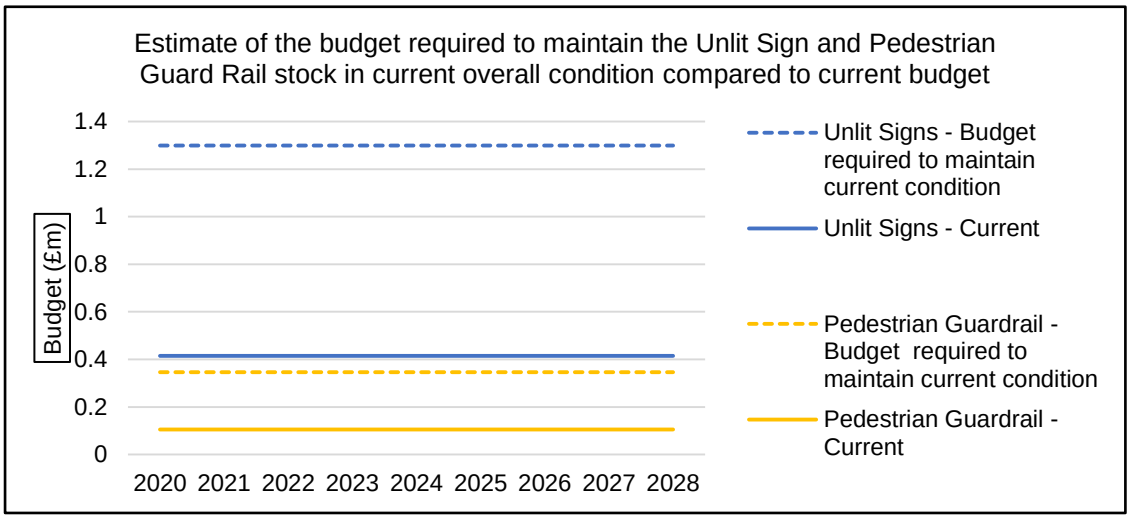
We do not routinely collect condition information these assets. However, by making the same assumptions as the WGA valuation process we have used the HMEP Ancillary Assets Lifecycle Planning toolkit to predict the effect the current level of funding will have on the overall condition of these asset groups, over the next ten years.



	Forecast percentage in each condition band								
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Good	22.3	20	18	16.5	15	14	13	12.2	11.5
Fair	25	24.5	23.8	22.9	21.9	20.8	19.7	18.6	17.6
Poor	25	25	24.9	24.8	24.5	24	23.5	22.9	22.2
Life expired	27.7	30.45	33.2	35.9	38.6	41.2	43.8	46.3	48.7

Forecast condition of the unlit signs and pedestrian guard rail assets over the next ten years with the current level of funding

We have also used this method to predict the budget required to maintain the current overall condition of these asset groups.



	Forecast percentage in each condition band								
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Unlit signs – 'steady state' budget (£m)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Unlit signs – current budget (£m)	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415
Pedestrian guard rail – 'steady state' budget (£m)	0.346	0.346	0.346	0.346	0.346	0.346	0.346	0.346	0.346
Pedestrian guard rail – current budget (£m)	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105

Estimate of the annual budget required to maintain the unlit signs and pedestrian guard rail stock in current overall condition ('steady state') compared to current budget

Forecast Levels of Service Outcomes

With the current level of funding:

Road Markings and Cats' Eyes

- Safety critical lining and cats' eyes can be maintained on 20% of the A road network and 15% of the B road network, as reactive repairs.
- No non-safety critical lining and cats' eyes can currently be maintained.

Pedestrian Guard Rail

- We are able to remove, repair or make safe all damaged pedestrian guardrail which is assessed as being safety critical, as reactive repairs.

Unlit Signs

- We have to carefully consider what safety critical signs we replace on all parts of the network.
- Unlit safety critical signs can be maintained on 25% of the A road network, where we prioritise the high-speed road network, and 20% of the B road network, as reactive repairs.
- No non-safety critical signing is currently maintained.

Part 5: Asset Management Improvements and Achievements

Since the Department for Transport introduced its Incentive Fund several years ago, we have successfully implemented a considerable range of measures to embed the use of Asset Management (AM) methodology into our approach to highway maintenance. This has enabled us to secure and retain an Incentive Fund Band 3 rating, thereby maximising Department for Transport funding. We have also successfully implemented key components of the new non-statutory code of practice for highway maintenance, *Well-managed Highway Infrastructure* (WMHI). These workstreams are already paying dividends in the way we manage and maintain our highway assets.

The constituent parts of this document and appendices bring together these improvements, enabling us to set out a medium-term plan and investment strategy for highway maintenance that is both efficient and fit for purpose. Funding over the next few years is uncertain, but assuming that current levels are broadly maintained, they remain insufficient to maintain highway assets in steady state condition. The investment strategy for the coming years we have set out in this document is based on an improved knowledge of our assets and on an understanding of service levels and associated risks, managing highway assets as a collective whole and optimised to delivered a balanced efficient service.

Appendix A sets out a summary of asset condition and service outcomes over the next five years based on current levels of funding. If funding levels are significantly higher or lower than assumed, either overall or in respect of individual asset areas, these forecasts will need to revised.

Appendix B sets our service levels and risk assessments for the next five years based on current funding levels. If funding is significantly reduced or increased, either overall or in respect of individual asset areas, these will need to be reviewed and any changes signed off by the Executive, ensuring that the effect on service levels and risk is fully understood. This requirement is a core element of *Well-managed Highway Infrastructure*.

Appendix C sets out our five year Forward Works Programme. It reflects the need to move away from annual programmes and to consider asset management activity a multi-year one. It is in two parts: the first concerns the next two financial years, and most of the sites included have already been verified by our engineers. The second part relates to years three to five of our five-year programme, and is largely based on data from our asset management systems, so may be subject to more changes as the schemes are verified. Any schemes involving the potential use of non-standard materials, for example in conservation areas, or requiring detailed design will remain

in the second part until those elements have been resolved and agreed, so that there is cost certainty prior to delivery on the ground.

Our main improvements and achievements over the last two years are outlined below.

General improvements and achievements

- We have improved our knowledge of our assets and their lifecycle, including improving our ability to model their future deterioration and to cost treatment options, enabling us to make informed decisions when prioritising investment in our highway assets.
- We have introduced risk-based decision making, as recommended in WMHI, and have moved from managing each asset group separately towards treating our highway assets as an overall integrated asset.
- Our improved knowledge of our highways assets and their future condition has enabled officers to submit robust business cases for additional resource, leading to a significant increase in capital funding in recent years.
- Given our implementation of WMHI and the introduction of risk-based management and assessment, we have continued to be well placed to defend claims.
- We have introduced a technical approval process giving asset managers more influence over the design of new assets to be added to the highway network, as they have experience of maintaining these assets.
- As part of the overall review of the Kent Design Guide, we have revised the sections on highway assets to encourage an earlier and greater focus on asset management considerations when designing new developments or highway improvements.
- We have introduced a formal process for trialling new or alternative highway materials and technologies to encourage innovation and share best practice. This ensures that lessons are learned and recorded, that there is a clear understanding of how such trials will be evaluation and that any decision to adopt new materials or technologies is clearly evidenced.
- We have developed new maintenance hierarchies for roads and footways, based on WMHI models whilst also, in the case of roads, recognising the priority of our Resilient Highway Network.
- We have started work to produce a rolling five-year Forward Works Programme and Investment Strategy for all asset groups based on informed outcomes.

- We have used data to successfully apply for around £8m of DfT Challenge Fund resource to deliver major structural and infrastructure improvements to the A299 Thanet Way. These improvements will be delivered in 2021/22.

Asset specific improvements and achievements

Roads

- We have completed a thorough review of asphalt material and contract specification to ensure we are getting the best lifecycle performance and cost from our new Road Asset Renewal Contract.
- We have re-procured the Road Asset Renewal Contract through a robust commissioning process to achieve value for money, low whole life costs and excellent performance from our contractor. The new contract started in January 2021.
- We have explored the effect of various road treatment strategies on whole life costs.
- We have implemented scheme identification for both renewal and preservation schemes which is directly linked to the forecast models.
- We have commissioned a new condition survey contract to achieve excellent value for money and implemented Horizons as our pavement management system.
- We have commissioned a Kent Pavement Construction and Maintenance Manual to improve lifecycle performance and work to develop this is well underway.
- We have improved our knowledge of relevant legislation in order to assert our rights and hold utility companies to account when their assets fail. This includes recovering losses we incur when damage their asset failure causes highway damage. In recent years, we recovered around £1.3m in relation to a serious road collapse in Leeds, and we have commenced action to recover around £1.5m of losses resulting from a similar collapse on the A26 Tonbridge Road in Maidstone. Recovering these losses maximises our investment in highway maintenance, improving overall network condition.

Footways and Cycle Tracks

- Funding for the period of 19/20 was increased to £3.5 million, a significant improvement from the previous year, which has enabled us to successfully complete our largest footway preservation and renewal programme in recent years.

- We have carried out a thorough review of national best practice for footway condition survey data collection which will help to guide and inform decisions when designing our future survey regime.

- We have started work on commissioning a survey of cycle routes in Kent which will help determine those sections which are publicly maintainable so that they may be reflected in our Forward Works Programme.

Drainage

- We have implemented a system that allows us to view information on the location and status of our gullies, updated directly by the cleansing teams, through our Map16 software. In addition to gully location, information is collected about the gully condition and silt level. Recording of silt levels in highway gullies provides statistics to help focus, support and inform a new risk-based cyclical maintenance approach in the future, providing relevant information so we can make informed decisions.

- We have introduced a new process of pre-inspecting gullies on the annual scheduled cleansing programme prior to work being undertaken. This has identified a large backlog of repairs, including defective covers and completely blocked gullies. These are being programmed for repair throughout the year. Once repairs have been completed, on average each district only requires 30% of the gullies to be cleansed each year.

- Following the allocation of additional capital funding for drainage repairs and improvements, the size of the drainage planned works team has doubled. This is supported by a Drainage Capital Works Framework Contract running from April 2020 for eighteen months, which will provide us with greater resources for capital funded repairs and improvements.

- We have collated and mapped our records of flooding data from the previous five years using a geographic information system (GIS). This data has enabled the development of a two-year programme of drainage improvement schemes based upon identified hotspots of highway flooding or properties damaged by surface water flooding.

- We have been building relationships with our Flood Risk Management Team and have been assisting them in their review of Surface Water Management Action Plans. Furthermore, we have been and will be working closely with them in delivering actions identified within the Local Flood Risk Management Strategy. Together we are developing an analysis of the impacts of climate change upon highway flooding and local flood risks using GIS analysis of existing data. This will inform more proactive, targeted inspections and capital funded repairs or improvements in Years 3 to 5 of the Forward Works Programme.

- We have enhanced our asset management approach in responding to drainage defects identified from routine cleansing or asset surveys. Where these were considered to present a low risk, repairs were not previously actioned, with action only being taken where defects presented a high risk to highway safety or appeared likely to cause internal property flooding. By addressing drainage defects once identified, we expect to reduce urgent or emergency works and future longer-term deterioration of the highway asset.

- We have increased our awareness of the importance of land drainage and are undertaking necessary enforcement where maintenance responsibility lies with third parties.

- We have achieved increased collaboration between asset groups including, for example, drainage remedial works being prioritised ahead of machine resurfacing work. This avoids the need to excavate in relatively new road surfaces, maximising their lifespan.

- We have been opening dialogue and working with developers to improve/upgrade the existing highway drainage network, resulting in an overall betterment of the highway asset and reduction in flood risk to the area.

- We have focused on collaborative working with Environment Agency, Southern Water, local flood forums and community groups, particularly where a co-ordinated response to flooding emergencies is possible.

- We have engaged with the Environment Agency and Southern Water to address water management issues and share information/data to achieve shared objectives. Working closely with internal and external stakeholders has enabled us to identify opportunities for external funding for drainage improvements and asset replacement, for example of main river culverts.

Structures

- We have implemented a new structures management system and migrated the data.

- We have commenced software development in conjunction with the supplier to follow the new management processes we are creating, so we can fully take advantage of the enhancements available over our old, outdated database.

- We have initiated a programme of structural reviews and assessments initiated to make sure sub-standard structures can be identified and managed to ensure their continue safety for road users.

Crash Barriers

- We have introduced a data asset management system (Map16) with a Geographic Information System (GIS) interface.
- We have developed a risk assessment process to determine the appropriate response time following a crash barrier impact.

Tunnels

- We have used asset data to demonstrate a need for additional investment in the infrastructure at Ramsgate Tunnel to prepare for Brexit using DfT funding.
- We have procured a new structures database, which will maintain a record of our tunnels and underpass and their structural condition, and thus give future benefits in the asset management of our structures.
- We have used asset data to demonstrate an economic and lifecycle need to replacing aged Chestfield tunnel lighting with LED lighting, and have secured DfT Challenge Fund resource to deliver this in 2021/22.

Street Lighting

- We have upgraded our street lights to LED with a central management system.
- We have started using the results of the structural testing programme and asset condition, rather than asset age, to forecast future budget needs.
- We have implemented the use of the lighting column index and have included this in our asset inventory.
- The range of assets included in the forecasting has been extended to include illuminated signs.
- We have completed the upgrade of pole mounted equipment (excluding lanterns) where defective equipment was identified as part of the LED conversion programme.
- We have completed a programme to replace all of our concrete columns alongside the LED conversion programme. This has not only improved the asset, but has increased safety for operatives working on assets where structural integrity was previously in question.

Intelligent Traffic Systems

- We have removed legacy analogue communications equipment and upgraded to IP-addressable systems for traffic signals.

- We have replaced road detector loops with above ground detection systems where practicable.
- We have converted legacy Pelican crossings to the latest Puffin design standards with Extra Low Voltage (ELV) equipment.
- We have replaced some obsolete traffic signal controllers with new systems to ease the maintenance burden.
- We have reviewed our prioritisation process for ITS asset renewals to optimise our budget at the most critical sites, including giving consideration to adjacent third-party schemes which can offset our liability or supersede any planned works.

Soft Landscaping

- We have developed an understanding of the environmental benefits that our Tree Asset provides through the implementation of iTree reports.
- We have introduced the CAVAT (Capital Asset Value for Amenity Trees) method of valuing our tree asset. At the strategic level this helps us to put a value on the countywide tree stock. It also enables us to calculate an evidenced value to assess claims for trees that are removed or damaged.
- We have enhanced our risk-based approach to highway tree surveying, incorporating industry best practice to deliver efficiencies in tree safety inspections and a greater focus on the network hierarchy.
- We have implemented the iTree software model which calculates the benefits and ecosystem services that trees provide and values them in monetary terms. This provides an evidence-based approach in the development of informed urban forestry programmes, management plans and projects.
- We have developed our canopy coverage data for the tree asset by implementing the National Tree Map to provide benchmark information on the county's canopy coverage, and are using this to influence tree planting programmes and to set targets for canopy coverage in the future.
- We have conducted trials of alternative weed control methods, particularly hot foam, and determined the scalability and feasibility of this method.
- We are working with Kent Wildlife Trust for a habitat audit of all Roadside Nature Reserves to assess their current condition and the opportunities for improvements to biodiversity.

Signs, Lines, Cats' Eyes and Pedestrian Guard Rail

- We have refined our estimate of the quantity of these assets, and started exploring ways to make predictions of condition outcomes and budget requirements.
- We have started developing processes for assessing the condition of road markings and cats' eyes which will:
    - improve our knowledge of these assets, and
    - inform a more robust, evidence-based forward works programme.

Part 6: Our Future Approach and Action Plan

Our Five-Year Vision

To deliver a fully integrated, dynamic, efficient and effective highways asset management service to provide a safer, more sustainable and more resilient highway network that supports Kent's recovery from the COVID-19 pandemic and delivers on Kent's longer-term strategic objectives including environmental, active travel and road safety priorities.

Our future strategy

We shall deliver on this vision by:

- having certainty of approach and broad levels of funding over the next five-years to enable greater efficiency and planning
- treating highways asset management as a multi-year activity rather than an annual one
- implementing further measures to maximise the lifespan of new or improved highway assets, reduce their lifecycle cost and make them easier to maintain.
- further improving our knowledge of our highway assets and their lifecycle cost and performance, including improving data capture and analysis
- regularly reviewing our highway maintenance service levels and associated risks
- regularly updating our five-year forward works programme

Action Plan

Whilst we have made good progress in respect of Asset Management (AM) and *Well-managed Highway Infrastructure* (WMHI) workstreams, as outlined in Part 5 of this document, we recognise that we need to continue exploring new ways of improving the lifespan of our highway assets, reducing their whole-life costs and improving their future maintainability.

This principle applies both to renewed/life-extended assets and to new assets, whether adopted as part of new developments or constructed/installed as part of our own highway improvement schemes or public realm projects. These new highway assets are to be welcomed in that they bring significant benefits to Kent's residents and businesses; however, we need to strike the right balance between those benefits and our ability to maintain these assets over their lifecycle, not least so that these improvement fulfil their purpose for longer.

To address this we have developed a number of inter-related actions. The overarching aim of these is to further improve the ways in which we deliver highway maintenance and improvements, making our highways safer, more sustainable and more resilient so that our highway network continues to contribute to the delivery of

our strategic outcomes (including environmental, active travel and road safety priorities) as a key enabler of services.

Specific future actions are outlined below.

General actions

General

1.1 Further improving our knowledge of our highway assets and their lifecycle cost and performance, including improved data capture and analysis.

1.2 Optimising our risk-based approach in highways with the aim of re-focussing finite resource towards higher risks. This work will look at the full range of highways asset management services and also consider the scope for introducing risk-based investigatory levels based on our new maintenance hierarchies.

1.3 Developing and expanding our rolling five-year Forward Works Programme and Investment Strategy based on informed outcomes.

1.4 Reviewing our Technical Approvals Process for new and renewed highway assets to ensure that lifespans are maximised, whole-life costs are minimised and future maintainability is optimised, so that overall network condition is improved. Extending this process to include district/borough schemes which include new or enhanced highway assets.

1.5 Using our improved knowledge of our highway assets to influence procurement of the next Highway Term Maintenance Contract, enabling our strategies and priorities to be implemented throughout the county.

1.6 Ensuring that our investment decisions are evidence based, including continuing to identify unfunded schemes to enable us to bid for additional capital funding and meet the requirements for DfT funding. This will include the identification of future risks such as the risks to the resilient and strategic road networks arising from climate change.

1.7 Carrying out work to model the economic benefits of investing in our asset management approach to highway maintenance.

1.8 Analysing a cross section of highway improvement schemes and new developments delivered over the last five years to identify any lessons learned in terms of design, lifecycle performance and maintenance.

1.9 Reviewing our approach to all areas of highways asset management business to create an action plan for contributing to council environmental objectives such to Net Zero and Kent's Plan Bee.

1.10 Considering how the adoptions process may be developed to influence design choices towards increasing asset lifespans, reducing lifecycle costs and improving future maintainability.

1.11 Analysing data concerning spend on mechanical and electrical components across asset groups to identify how this may be delivered more efficiently going forward.

1.12 Continuing to explore ways in which we can improve how we gather, use and share asset and other data.

1.13 Continuing with our work on innovations such as the Live Labs programme and our internal trials, and ensuring that decisions to adopt any are evidence-based.

1.14 Reviewing maintenance regimes across asset groups to reflect known accident cluster sites.

1.15 Establish processes to incorporate road safety and active travel measures into maintenance schemes at low cost.

1.16 Exploring how as-built records and other technical information should be stored and made available across highway teams.

1.17 Completing work with district conservation teams to refine and finalise the Kent Highways Heritage Protocol, to ensure that we strike the right balance between conservation, affordability, lifecycle cost and future maintainability considerations in highway maintenance.

Asset-specific actions

Roads, Footways and Cycle Tracks

2.1 Finalising a new Kent Pavement (road, footway and cycle track) Construction and Maintenance Manual, in conjunction with the Kent Design Guide updates, with the aim of maximising lifespans, reducing lifecycle costs and improving future maintainability.

2.2 Implementing our new maintenance hierarchies for pavement (road, footway and cycle track) assets based on WMHI recommendations.

2.3 Commissioning specialist pavement (road, footway and cycle track) asset renewal and preservation services based on maximising asset performance and reducing potholes.

Roads

3.1 Continuing to improve our understanding of the effects of various treatment strategies on whole life costs.

3.2 Investigating the possibility of a correlation between overall road condition and accident rates.

3.3 Comparing past condition predictions against actual results to verify accuracy and robustness of modelling methodology.

3.4 Continuing to develop lifecycle modelling to improve confidence in forecasting.

3.5 Developing our use of modelling to forecast future pothole quantities and cost, based on different investment scenarios.

3.6 Exploring the use of low temperature asphalts and other innovative materials to reduce our carbon footprint.

Footways and Cycle Tracks:

4.1 Investigating and developing, through lifecycle planning, different treatment strategies for our footways and cycle tracks.

4.2 Designing and completing footway and cycle track condition survey trials, and verifying results to ensure that our surveys will deliver the required outcomes.

4.3 Plotting age and disability data so that this can be used to improve scheme prioritisation.

4.4 Prioritising active travel routes in our forward works programme.

4.5 Plotting our cycle tracks/routes/paths and ascertaining ownership and the size of the network.

4.6 Assessing our segregated cycle track network to develop a condition survey regime.

4.7 Developing an asset management approach for our cycle tracks.

Drainage

5.1 Improving our knowledge of our highway drainage assets, their location and condition to improve our maintenance of them.

5.2 Prioritising our capital investment using a risk-based approach.

5.3 Improving network resilience through designing, constructing and managing drainage assets to meet both current and future needs in a changing environment whilst making effective and efficient use of limited budgets.

5.4 Promoting stakeholder engagement and communication to work more closely with other risk management authorities.

5.5 Implementing computer-based modelling techniques to assess a variety of cleansing and maintenance strategies.

5.6 Ensuring reports of flooding are correctly logged and mapped to support where future spending is targetted on.

5.7 Developing a mapping system to record key or critical highway drainage asset details following the completion of our own improvement schemes, as well as new adoptable highway drainage assets from development.

5.8 Continuing to work with partners to introduce more sustainable urban drainage features, such as swales, on new developments.

Structures

6.1 Fully implementing the new structures management system to enable more robust lifecycle modelling, particularly for different treatment strategies.

6.2 Completing overdue structural reviews and assessments.

6.3 Reviewing the management of post-tensioned and other high-risk structures.

Crash Barriers

7.1 Developing the use of the data management system to improve asset condition forecasting.

7.2 Commissioning a survey regime to establish deterioration rate of assets to enable full implementation of asset management.

7.3 Undertaking risk assessments on very poor and poor graded barriers on the non-strategic roads, to determine if they need replacement or if they can be removed due to the hazard no longer being present.

Tunnels

8.1 Investigating the use of the structures database or other system to help with recording the maintenance and condition of individual components such as jet fans and drainage and to help in forecasting future asset management requirements.

Street Lighting

9.1 Refining the structural testing dashboards in our asset management system so that the records can be used for lifecycle planning including predicting the number of assets that will require replacing.

9.2 Refining the deterioration rates used in the forecasting based on previous results of the structural programme.

9.3 Extending our forecasting further to include Belisha and refuge beacons.

9.4 Exploring how street lighting assets can act as the platform for digital and telecommunication technologies which enable other assets and services to be monitored.

9.5 Exploring the potential use of street lights as electric vehicle charging points.

Intelligent Traffic Systems

10.1 Continuing to move to more flexible and modular signal design, as technology allows, which will further enable partial site refurbishments and individual component changes to be made to extend asset life, i.e. above ground detection systems.

10.2 Developing deterioration modelling and our understanding of faults rates and patterns, to enable us to model and deliver a wider range of asset treatments, as an alternative to full asset renewal.

10.3 Analysing the impact of developments and other schemes on adjacent sites, to enable us to seek ITS asset improvements.

10.4 Investigating new products and innovations which may be of benefit to maintaining the asset and reducing the impact on other asset groups, such as detection systems.

Soft Landscaping

11.1 Developing the use of Capital Asset Valuation of Amenity Trees (CAVAT) by making other highway teams and partners aware of the value of tree stock and the importance of protecting this asset.

11.2 Developing a rationale for implementing tree improvement schemes following CAVAT recovery of tree losses, including defining the benefit of replacement trees and being explicit about time taken for mitigation measures to meet the benefits of the original tree(s).

11.3 Continuing to explore ways of quantifying the effect this asset has on other asset groups.

11.4 Developing current data held on this asset to facilitate the use of asset management methodology, enabling us to introduce a more tailored approach to each work type dependant on requirement, location and cost.

11.5 Using an improved detailed knowledge of the asset to influence the procurement of subsequent tenders enabling our environmental strategies to be implemented throughout the county.

Signs, Lines, Cat's Eyes and Pedestrian Guard Rail

12.1 Developing a fully evidenced five-year cyclic maintenance programme for the high speed and strategic routes.

12.2 Introducing a condition survey process for the entire network, to understand the condition of these assets and make informed decisions about future maintenance regimes.

12.3 Developing technical guidance for these assets and embedding this within the Kent Design Guide.

12.4 Identifying how these assets can support the emerging environmental policy particularly in terms of sustainable transport.

12.5 Exploring the use of smart materials, and emerging asset collection technology to collect asset information.

12.6 Exploring using our lines and signs assets to support Driverless Vehicles and SMART City aspirations.