The Kent Highway Asset Maintenance Plan

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Kent Highways

Kent County Council

Foreword

The Highway Asset Maintenance Plan sets out the policies, standards, interventions and priorities necessary for delivering highway services in Kent. It takes an asset management approach in assessing the requirements for delivering a service that covers all parts of the highway asset. It is the outcome of a major review of highway maintenance activities.

The plan is for practitioners responsible for delivering the highway maintenance service. It is also an information document for county and district members and members of the public that have an interest in the service.

Public satisfaction with the service depends on the seamless delivery of a range of activities to not only maintain and improve the condition of the highway, but also to improve the highway environment for the benefit of users and residents. The plan encourages this and promotes close working between Kent County Council (KCC) and district councils.

To address the wider needs of the highway user, the plan includes improved prioritisation methods that take account of structural condition, national standards and inputs from safety inspections, service requests, defect records and new environmental assessments provided by the highway inspectors.

Meeting the needs of vehicular traffic is crucial but the highway network is maintained for the benefit of all users whether they have impaired mobility and irrespective of their preferred method of travel. The plan pays attention to the needs of partially sighted people and wheelchair users, as well as bus users, walkers, horseriders and cyclists. It also requires all works on the highway to be co-ordinated to maximise the availability of the network for its users. The plan recognises the need for heavy goods movement.

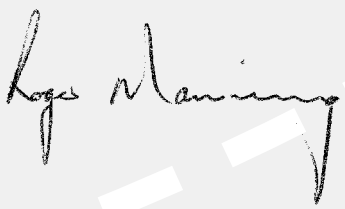
The asset management approach taken in this plan means the maintenance needs of all the highway assets are considered when assessing priorities for funding for different maintenance activities. Managers consider service levels for each maintenance activity and determine the funds necessary to achieve them – a process called zero-based budgeting. This allows managers to set the levels of service for a given budget.

Delivering a wide range of maintenance services requires detailed guidance. This is provided separately in the Highways Management Reference Book, an electronic library of guidance notes, policy documents and procedures necessary for the consistent delivery of services.

The Audit Commission measures the performance of KCC through a process of Comprehensive Performance Assessment (CPA) and will undergo its next CPA in 2006. The CPA uses a combination of measures in its assessment of performance, including Best Value Performance Indicators (BVPIs), results from public satisfaction surveys and the publication of various plans and policies.

The highway service relies on adequate and sustained funding and efficient delivery through the commitment of officers to implement the plan. However, our success will be judged on performance indicators and public satisfaction.

Finally, I must express my thanks to the officers; their urgency and enthusiam have been instrumental in the production of this plan.



Roger Manning
Chairman Informal Member Group

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1.1 Introduction

The Asset Maintenance Plan is the key document that sets standards, interventions and priorities for all highway maintenance services and seeks to optimise the contribution maintenance makes to the usability of the network for our customers.

In setting the standards, interventions and priorities for delivering the highway maintenance service in Kent, the plan considers all parts of the asset from roads and pavements through to drainage, vegetation, aids to movement and structures. The plan sets out an asset management approach that considers and prioritises between all parts of the asset in delivering the highway maintenance service.

The plan aims to take account of the needs of all our customers whether they are walkers or cyclists, car drivers or users of public transport. The plan also considers the needs of residents living adjacent to the highway and endeavours to maintain an inclusive network for the benefit of all users, including those with impaired mobility. The requirements of the Disability Discrimination Act 1995, which come into effect in October 2004, have been taken into account in this plan.

The maintenance service is delivered by the Kent Highways Partnership (KHP): a partnership of Kent County Council, district councils, consultants and contractors.

This plan aims to incorporate the principles of best value in setting its standards, intervention and policies.

The Highway Asset Maintenance Plan sets out how we will:

- Maintain the asset and safeguard users
- Respond to the needs of highway users and residents
- Prioritise work on the different parts of the asset
- Promote innovation in asset management
- Determine scheme priorities

1.2 Public Expectations

The county council tries to see the service through the eyes of those using it from bi-annual Highway Tracker Surveys for roads, pavements and streetlights, annual parish council surveys and the views of residents who have lived with roadworks.

We have concluded that there is a difference between what the highway service is trying to achieve in terms of repairing the road and pavement network, engineering or structural standards, and the expectations of the public.

Not surprisingly, the public view the condition of the whole of the street or lane in determining their satisfaction with the performance of the highway service. This whole-environment or streetscene view relies on a range of services coming together to maintain and improve the overall environment within which the user lives or travels. The highway authority and its other service providers must work together to achieve a good streetscene. Street sweeping is an example of a service provided by KCC and district councils for differing purposes.

The providers of all the maintenance services must consider the overall needs of the highway user and see the whole of the highway environment in the same way as the public. Managers, engineers and inspectors must be able to call on a range of services – whether they are district council or county council functions - to achieve improved public perception of the condition of the highway.

In November 2003, the county council's Highways Advisory Board recommended the Cabinet Member for Transport Operations adopts a series of commitments to the public to demonstrate the council's determination to improve the service for the benefit of all users.

1.2.1 Kent Highways Partnership (KHP) Commitments to the Public

The commitments, together with references to where the plan deals with them in terms of asset maintenance, are shown in table 1:

Table 1 – KHP Commitments to the Public

No	Description	Referred to in Chapter
1	We will make sure that hazardous faults on roads and pavements are put right within five working days of being reported to us; if we can't, we will let you know why.	2 & 3
2	We will routinely inspect the condition of roads, pavements and streetlights.	2,3 and 6
3	We will introduce safety measures to reduce the number of casualties on Kent's roads.	2
4	We will provide the public with reliable, timely and useful information about roadworks.	2
5	We will require utility companies to work swiftly and efficiently and to reinstate roads and pavements properly after carrying out work.	2
6	We will direct lorries to the main road network rather than local or minor roads.	2
7	We will seek to give pedestrians priority on arrival when designing new pedestrian crossings.	6
8	We will take into account the needs of people with mobility difficulties when building or altering roads and pavements.	2&3
9	We will introduce measures to make cycling in Kent easier and safer.	3
10	We will work to restrict the rate of traffic growth around major urban areas and will continue to lobby government to reduce congestion at the busiest points of major trunk roads and motorways in Kent.	N/A
11	We will continue to develop public transport services which meet regeneration, economic development and social needs	N/A
12	We will encourage and help employers in Kent to adopt "green" travel plans.	N/A

1.3 The Process of Review

In reviewing the new Highway Asset Maintenance Plan, a number of factors were taken into consideration:

- Public opinion
- Asset management and levels of service
- The budget model
- The national Code of Practice for Maintenance Management
- The best value review
- The 1999 Maintenance Plan

To guide the review of the new plan, an Informal Member Group (IMG) - a cross party group of elected members - was established. The IMG made an invaluable contribution to the development of this plan and approved both the August draft for consultation and the final December draft prior to it being submitted to the Highways Advisory Board in January 2004.

The IMG, in parallel with meetings of the highway managers and the senior management team, considered the needs of all parts of the asset in responding to feedback from public opinion surveys and the best value review.

One public opinion survey that the IMG paid particular attention to was "You're the Highway Inspector – You Decide", undertaken at the County Show in 2002. In this exercise members of the public were shown photographs of road surface and were asked to decide whether they needed maintenance and, if so, to rank them in priority order for repair. The public found that all the roads were in need of repair and ranked them accordingly. The road that attained the highest ranking was in fact structurally sound, but had a very poor appearance due to loss of surfacing, weed growth, many reinstatements and faded road markings.

This exercise reinforced the message that the public sees more than just structural deterioration but assess the whole street environment in forming an opinion on its priority for maintenance. This concept is endorsed in the national Code of Good Practice for Maintenance Management published in July 2001.

It was clear that the review of the Maintenance Plan had to take more notice of the needs of the public in maintaining the highway network. Members and officers had to consider the contribution maintenance of the whole of the asset has on improving public satisfaction with the condition of the highway.

In order to understand the contribution each part of the asset has, it was necessary to consider the asset in terms of its groupings or components to enable the needs of each to be properly compared. The highway asset was broken down into six main elements:

1. Roads
2. Pavements and cycle tracks
3. Drainage
4. Vegetation
5. Aids to movement
6. Structures

The IMG sought to understand the relative needs of each asset group, their relative priorities for maintenance and funding. In order to compare the needs for funding on an equitable basis, the relative needs of each part of the asset were determined. This was achieved by developing the concept of service levels whereby Members and officers could consider alternative levels, and using the budget model, determine the funding requirements.

Using the budget model, the IMG determined both an increased annual funding requirement to improve levels of service across the asset, and a regime of intervention levels that are affordable with current budgets. In order to continue funding road repairs, as supported by the public, it was not possible to improve service levels for other parts of the asset such as grass cutting, gully emptying or tree pruning without substantial increases in budget. The standards for such routine work will largely remain the same as in the 1999 Maintenance Plan.

The IMG recognised the need for maintenance to improve the network for all users, including those with impaired mobility, and to consider new methods of prioritising schemes that take into account the whole street environment, not just structural condition.

As a result the new Asset Maintenance Plan proposes improved prioritisation methods as well as programming repairs to respond to the needs of all users. The proposals in this plan were included in the latest public consultation exercise, carried out in September 2003. The proposals were endorsed by the public with the exception that increased funding for improving service levels to improve the appearance of a street should not be at the expense of road and pavement repairs.

1.3.1 Consultation for the Asset Maintenance Plan

A consultation exercise was carried out in September 2003 to find out public opinion on three proposals included in the new plan. All respondents were asked if they agreed with the three proposals, which covered the balance of spending between certain aspects of infrastructure maintenance, the target population for whom repairs are to be implemented, and finally, response arrangements for hazards and emergencies. The results of this consultation exercise are shown in table 2:

Table 2 – Results of Public Consultation on Proposals in the Plan

1. Balancing the Spend	Agree	Disagree
The new Asset Maintenance Plan is proposing to increase the frequency with which certain items of street furniture are cleaned and maintained. For example, drains may be emptied more frequently, signs and bollards may be cleaned regularly, road markings and cats eyes may be replaced at regular intervals, trees may be pruned regularly, and grass verges may be cut more often. The additional costs of these activities could result in less money being available for road and pavement repairs.	42%	48%
The new Asset Maintenance Plan is proposing to maintain the whole network to meet the needs of all types of users, whether they are car drivers, walkers or cyclists, bus users or lorry drivers. The network will not be maintained for the exclusive benefit of any of these. Particular attention will be paid to those that suffer from impaired mobility, such as wheelchair users and partially-sighted people.	82%	11%
Highway inspectors carry out inspections of roads and pavements at different frequencies depending on the importance given to a road or pavement. Busy roads and pavements are inspected more frequently than less busy ones. If the Highway inspector finds a defect that could be hazardous, for example a pothole in the road or a trip on the pavement, he can ask the council contractor to repair the defect within three days. If an emergency occurs on the road or pavement and needs immediate attention, the inspector can ask the contractor to attend site within two hours.	77%	12%
2. The Allocation of Maintenance Funds		
The district council highways units carry out the highway maintenance service locally, on behalf of KCC. KCC calculates how much of the total highway maintenance budget is given to each highway unit by taking account of the size and condition of the infrastructure within each district area. Therefore, those highway units with the biggest infrastructure in the worst condition receive a greater share of the budget.	63%	17%
3. The Selection of Roads for Repair		
The government measures local authorities' performance indicators that measure whether the road network is structurally sound. This forces KCC to prioritise its major road repairs strictly on the basis of structural condition only. By its nature, structural condition of roads of roads is not necessarily visible to the public. What they see are surface problems, such as potholes, unclear markings on the roads, broken pavements, blocked gullies, and signs hidden by vegetation. This means that although we aim to keep roads structurally sound, the public uses a different measure and are often dissatisfied with our performance based purely on a judgement of how the road network looks. We want to ensure that the road network is structurally sound, and also increase public satisfaction by improving the way the network looks.	75%	10%
KCC measures the condition of the roads across the county every year. The Highway Units then use the survey results to allow them to plan and prioritise road repairs. This means that all roads of a similar nature are compared equally across the county, irrespective of where they are, in determining programmes of repair. The Asset Maintenance Plan proposes a new method of determining priorities for major works programmes by taking more account of other factors. These include: requests from parish and town councils; the number of requests for repairs logged for a particular street; the number of times potholes and other repairs have been made in a particular street; and a highway inspector's assessment of the state of the street in general.	76%	10%
Paving slabs that rock, that are not level with each other, or that are cracked and broken can cause trips on pavements. These problems often result from streetworks or parking on the pavement. The Asset Maintenance Plan proposes to replace cracked, broken, rocking and non-level paving slabs with blacktop surfacing over the whole area of the pavement to provide a much smoother walking surface and one which doesn't cause so many trips.	75%	18%

1.4 Objectives

The Asset Maintenance Plan strives to achieve two clear objectives:

Safeguard the user	Works carried out to safeguard the user include reactive works such as filling potholes and repairing trips. In addition, a range of other activities such as repairing streetlights, improving skid resistance and cleaning signs are carried out to maintain the network in a safe and convenient condition for users.
Maintain the asset	Works carried out to maintain the structural integrity of the roads, pavements and structures of the highway network so that it continues to cope with the demands of traffic and users.

These two objectives identify the purpose of Kent Highways' maintenance services across the Highway Asset.

1.5 Best Value

Best Value is one component of the government's modernising agenda for local government. The white paper Modernising Government in March 1999 set out a vision for all public services into the 21st century. It has five themes, all relevant to Best Value:

- ensuring that public services are responsive to the needs of citizens, not the convenience of service providers
- ensuring that public services are efficient and of high quality
- ensuring that policy-making is more joined-up, strategic, forward-looking and not reactive to short term pressures
- using information technology to tailor services to the needs of users
- valuing public services and the tackling of under-representation of minority groups

The specific vision for local government was set out in a further white paper Modern Local Government – In Touch with People in July 1999. It introduced the Best Value duty, and set out the principles that form the context of Best Value – that modern local authorities should be in touch with the people, provide high quality services, and give vision and leadership for local communities.

The progress local authorities make in pursuing their Best Value duty is measured through a series of Best Value Performance Indicators (BVPIs).

1.6 Best Value Performance Indicators

The BVPIs relevant to highway asset maintenance are included in table 3:

Table 3 – Best Value Performance Indicators

BVPI Number	Description	Referred to in Chapter
96	Condition of principal roads – percentage of the network in need of major repair	2
97a	Condition of non-principal classified roads (B&C) - percentage of the network in need of major repair	2
97b	Condition of unclassified roads - percentage of the network in need of major repair	2
99K & S (a-e)	The total number of road accident casualties (of various types) per 100,000 population	2
100	Number of days of temporary traffic controls or road closure per kilometre of traffic sensitive roads caused by local authority roadworks	2
186a	Efficiency indicator for repair works on principal roads (condition indicator divided by expenditure)	2
186b	Efficiency indicator for repair works on non-principal roads (condition indicator divided by expenditure)	2
187	Percentage of high-use pedestrian footways that are in need of repair	3
165	The percentage of signalised pedestrian crossings with facilities for disabled people	6
180b	Average lamp circuit wattage used by street lights compared with average consumption/wattage for local authorities in the UK	6

1.7 The Highway Asset

The highway infrastructure in Kent consists of 8,400 kilometres of road, 6,000 kilometres of pavements, 2,700 structures, two tunnels and hundreds of thousands of individual items of infrastructure such as gullies, signs and streetlights. It is the combination of all parts of the infrastructure that is collectively described as the Highway Asset and is valued at £6.5bn.

The Highway Asset consists of six main elements:

Roads	The surface and underlying structure of carriageway built for the purpose of carrying vehicular traffic
Pavements and cycle tracks	The surface and underlying structure of the pavement and cycle tracks built for the purpose of carrying pedestrians and cyclists
Drainage	Gullies, pipes, soakaways, outfalls, catchpits, lagoons, ditches and grips.
Vegetation	Grass verges, street trees, low growth shrubs, amenity areas.
Aids to Movement	Safety and highway fences, pedestrian guardrails, signs and bollards, streetlights, traffic signals, road markings and road studs, bus shelters and flag posts.
Structures	Bridges, gantries, culverts, retaining walls, tunnels and embankments.

The plan is written around these six main elements of the asset with a chapter dedicated to each one. The size of the asset is described by the Highway Inventory, which quantifies 17 separate items of infrastructure ranging from areas of road, pavement and grass to numbers of gullies, signs and streetlights and the structures database.
Public Rights of Way (PROW) such as byways, bridleways and footpaths are not dealt with in this plan but are referred to in the PROW Best Practice Manual.

1.8 The Highway Inventory

The highway asset in Kent is growing continually and the inventory is regularly updated to keep track of those changes. Inventory surveys are routinely carried out on new sections of road that are added to the network each year through the adoption of new housing estates and developments, major highway improvements and de-trunking of roads previously managed by the Highways Agency.

In addition, the inventory is affected by ongoing maintenance of the asset and the quantities of certain important inventory items are re-measured periodically. For efficiency, inventory collection is carried out while the site is already being visited for maintenance purposes, for example:

- Using the gully-cleansing contractor to check the number and location of gullies being cleansed using Global Positioning Systems (GPS).
- Using sign cleansing contractors to photograph and check the location of signs using GPS.
- Using condition surveys to identify and measure lengths of safety fence on A and B roads.
- Using the street lighting contractor to check the number and location of street lights using GPS.
- Using condition surveys to identify not only high-risk sites where high friction surfacing is required, but to identify where such surfacing already exists.

Further important items of inventory such as low growth shrub areas and numbers and location of soakaways are held locally by the highway unit. Local records are made available to update the central inventory to give the best possible record of the size of the highway asset.

The quality of inventory data held locally varies considerably between highway units who must develop local records to common standards of quality of electronic collection and storage for the benefit of updating the countywide inventory.

1.9 Asset Management Tools

We manage our asset using two major computer systems that hold a wide range of data and operate systems that help to control works on the highway. The two systems operated in Kent are the Highway Information Management System (Kent HIMS) and Mayrise. Both systems use a common road network referencing system so that all data is cross-referenced. The data is displayed on maps using Geographical Information Systems (GIS). Each system contains a number of modules that provide the full range of information about the asset.

Kent HIMS is a comprehensive series of linked databases and includes:

- National Street Gazetteer (NSG)
- The Maintenance Hierarchy
- Associated Street Data (ASD)
- Road Condition Database
- Crash Database
- Traffic Database
- Structures Database

Mayrise includes:

- National Street Gazetteer (NSG)
- Electronic Management of Orders (ELMO) including licences
- Electronic Safety Inspection System

- Street Light Management System
- Roads and Street Works Act (RASWA) System

Kent HIMS is updated, operated and maintained through Kent's partnership contract with KCC's consultant, while the Mayrise systems are operated in-house by the Contract Management and Network Operations teams in partnership with the company Mayrise.

Kent HIMS is a vital tool used in the measurement of highway condition to identify and prioritise maintenance programmes and provide Best Value Performance Indicators (BVPIs). It monitors and analyses crashes to identify and prioritise crash remedial measures and safety schemes and also holds data on traffic flows to help with forward planning. The structures database holds data on the condition of every structure in the county and is used to identify and prioritise maintenance programmes.

The Mayrise Electronic Management of Orders system (ELMO) enables all safety inspection schedules to be managed and recorded for all 12 highway units across the county. Safety inspections are carried out using hand-held data capture devices (DCDs) that download results from inspections directly into ELMO. This, in turn, enables defects to be recorded against individual streets and for works orders to be produced to effect repairs. The ELMO system will therefore hold a complete history of all works carried out in a street from identification to completion.

The street lighting module works in a similar way in that it records the results of audit patrols, logs identified, defects and issues works orders directly to the street lighting contractor.

The Mayrise RASWA system enables officers to control and manage all utilities' streetworks carried out throughout the county. The system logs opening notices, records results of trench inspections and issues defect notices as necessary.

All modules within both systems use the National Street Gazetteer, a common network referencing system that allows information from all modules from both systems to be cross-referenced. An example is the ability to compare crash data with skidding resistance to enable works programmes to be targeted to reduce crashes and improve the road surface.

Geographical Information Systems (GIS) allow all data to be shown on a range of electronic layers that are overlaid onto a map background to enable engineers to consider all relevant information before finalising maintenance proposals.

The highway asset cannot be maintained without a maintenance budget and this is also managed in relation to the six elements of the asset and the means of service delivery.

1.10 Financial Management

Proper management of budgets is necessary to achieve cost-effective asset management. Maintenance works on the highway asset fall into three categories: operations, repairs and reconditioning.

1.10.1 Operations

The first category is work that has to be done to ensure the safety of the highway user and is referred to as operations. Operations includes reactive hazard response, cyclic maintenance such as gully emptying and grass cutting, and maintenance of aids to movement such as cleaning signs, replacing road markings and paying the energy bill.

1.10.2 Repairs

The second category of work is maintenance programmed to repair all parts of the asset and includes road and pavement surfacing to repair defects and improve skid resistance, improving drainage to prevent flooding and replacing

street light columns. Repairing the asset both protects the current value of the asset by preventing it deteriorating further, and enhances it to improve the condition of the asset for the benefit of users.

A complete breakdown of all maintenance works that fall into the operations and repairs categories is included in table 5.

Financial management reflects the asset management approach to maintaining the network, the need for both operations and repairs, and the sources of funding for maintenance.

The budget is reported as shown in table 4:

Table 4 – Budget Report

Asset	**Operations**	**Repairs**	
Component	Revenue	Revenue	Capital
Roads (Ch 2)			
Pavements (Ch 3)			
Drainage (Ch 4)			
Vegetation (Ch 5)			
Aids to Movement (Ch 6)			
Structures (Ch 7)			

In setting the budget each year, managers consider the needs of each component of the asset by taking a zero-based budget approach. The budget report describes the year's priorities by indicating a budget breakdown in accordance with table 4. By adjusting intervention standards to determine priorities, the report also informs Members what can be achieved for a particular level of expenditure in the forthcoming year. This process enables priorities to be reviewed annually.

1.10.3 Reconditioning

The third category of maintenance is A road reconditioning. The budget for reconditioning is not included in table 4 because it is not distributed to the highway units. It is managed centrally by the area offices.

Reconditioning is road maintenance designed specifically to strengthen the A road network so that it can continue to support the high demands of commercial traffic. The government considers that A roads require higher levels of maintenance owing to their impact on economic prosperity and sanction specific capital loans that are bid for through the Local Transport Plan to fund major repairs. Reconditioning has the greatest impact on BVPI 96, the percentage of principal roads in need of major repair.

These major repairs are designed to increase the future life of the road and so improve its ability to support heavy goods vehicles into the future. A design life of 20 years is the normal design standard for reconditioning.

The reconditioning programme is identified through a detailed analysis of a range of survey results and a structural appraisal report is commissioned for each scheme to determine the precise maintenance necessary to achieve a 20-year design life. Detailed design is then commissioned to ensure the recommendations in the appraisal report are implemented.

The reconditioning schemes are carefully programmed across the county to minimise traffic congestion and co-ordinate works.

1.11 Budget Management

Kent County Council operates a highway maintenance budget model to ensure a needs-based targeting of money.

The budget nodel is a computer system that has been developed in-house. The model provides a method of prioritising between a range of maintenance services to determine funding for all parts of the highway asset, and calculates allocations for our partners who help us deliver those maintenance services. The model uses a comprehensive set of inventory and condition data in determining needs-led priorities and allocations in three stages:

- Stage 1 – Topslicing
- Stage 2 – Prioritising between elements of the asset
- Stage 3 – Distribution to the highway units

1.11.1 Stage 1 - Topslicing

Once the total maintenance budget has been established, the first stage allows managers to set aside (topslice) funds necessary to cover unavoidable costs such as the energy bill, term contract fixed charges and annual tunnel maintenance. These commitments are managed centrally and so are deducted from the overall maintenance budget. Having topsliced these commitments from the maintenance budget, the remainder results in the 'works budget' - monies that fund maintenance in the form of operations and repairs.

1.11.2 Stage 2 - Prioritising between Elements of the Asset

The second stage (of the budget model) is the asset management module. The size of each asset component can be determined from the highway inventory which is continually updated to reflect the growth in the network resulting from capital schemes and section 38 and 278 agreements. Seventeen items of inventory are combined to quantify the six components of the asset.

The asset management module helps determine the relative priority for investment between the components of the asset. For example, it helps determine what percentage of the budget should be allocated to roads compared with, say, drainage. The difficulty is, however, that there cannot be a like-with-like comparison. How do you prioritise gully emptying against the need to repair pavements? How can a measure of condition be included when you only have condition data for certain parts of the asset and not others?

The solution is to consider intervention levels for every single part of the asset and use these to build up budget needs that can be converted to relative priorities. By considering intervention levels, the need for funding for each part of the asset can be compared equally. For example, the desired frequency for resurfacing roads and pavements can be considered alongside the desired frequency for cleaning gullies and street signs. So, in its ability to compare 'chalk and cheese' through the use of intervention levels, the model allows officers and Members to compare the service needs for all parts of the asset.

Applying unit rates to inventory quantities and intervention frequencies gives an annual budget need for each service. Grouping services means that relative annual need, and therefore priorities for each component of the asset, can be calculated. Funding for reactive works is included in the calculations. Here, historic expenditure is used to assess budget need. A similar approach is taken for services where the inventory quantity is unknown, such as for cleaning soakaways.

The output from the asset management module of the budget model is six percentages that divide the annual budget to fund each part of the asset.

The advantage of this approach is that value judgements can be made in assessing relative need for funding. For example, if it was decided to increase the frequency of gully emptying, either the additional budget requirement can be calculated or decisions on which other services are reduced to compensate can be made. The asset management

module has become an essential tool in the determination of budget need. This has been particularly important in assessing the funding, or a change in priorities, necessary to support the recommendations in the new plan.

The asset management module actually quantifies the funds necessary to provide an acceptable service for users. Therefore, for a given budget, officers will be able to report to elected members what levels of service can be provided for a given annual budget. Exercises in which members can state their own desired service levels to be evaluated have been arranged. These have been instrumental in helping members understand maintenance budget pressures.

Once the asset component percentages have been calculated, the budget is divided up accordingly for roads, pavements, drainage, street lighting, vegetation and aids to movement.

1.11.3 Stage 3 - Distribution to the Highway Units

The third stage of the budget model is the distribution module that calculates allocations for the 12 highway units.

The distribution module takes a needs-based approach in calculating highway unit allocations. This module considers the size (attributes) and the condition (factors) of the infrastructure within each highway unit. Each attribute and factor is weighted in accordance with its relative importance in determining the need for funding a particular service. These weightings can be changed as necessary to better reflect relative need.

The distribution module uses some 40 attributes and factors; each is updated on an annual basis in time for the next budget round. Road condition indices are updated each year from condition surveys carried out on the network. In addition, inventory quantities are updated annually along with other factors such as numbers of insurance claims received separated between roads and pavements.

The 40 factors and attributes are combined, with their weightings, to calculate percentage budget allocations for each of the five components of the asset for each highway unit. Applying the annual budget to these percentages gives a total of 60 allocations for the highway units for both operations and repairs.

The great benefit of the distribution model is that it applies factual data to determine highway unit budgets. The highway unit managers see their budgets calculated in a fair and equitable way using attributes and factors that are published each year. The managers can therefore compare the size and condition of their networks with their neighbours making the whole budget allocation process transparent.

Stage three of the budget model determines the proportion of the works budget allocated to the highway units in delivering the service. It does this by considering the size and condition of the infrastructure within each district area. The budget model is designed therefore to give a greater share of the budget to those highway units with the largest network in the worst condition. The budget model achieves a fair, needs-based distribution of the budget to the highway units.

The budget model is a key tool in managing our highway asset because it promotes a way of prioritising 'chalk with cheese' through intervention levels, is needs-led, and enables intervention levels to be adjusted to meet annual budgets. The budget model has become an essential tool for the management of maintenance budgets and the effective targeting of resources in Kent.

1.12 Level of Investment

Good asset management must use life cycle costing which calculates the total funding necessary to sustain the network over the complete life of the asset.

This plan is not about life cycle costing because the level of funds necessary to achieve this is not currently available. Its approach is, therefore, how best to use the money that is available.
The frequency of interventions, ascribed at stage two of the budget model, determine the level of investment necessary

to achieve a desired performance from the asset. Unfortunately, current investment in the asset is insufficient for the desired frequency of interventions to be met and so these frequencies have to be adjusted to manage the asset within the available budget.

In addition, it has been determined that current funding will not eradicate the backlog of works necessary to bring the asset up to national standards. A zero-based budget approach has been taken to consider an affordable performance from the asset given current funding levels.

1.13 Zero-based budgeting

Zero-based budgeting requires budget managers to re-evaluate all their activities completely in order to decide whether any should be eliminated, or funded at a different level. Appropriate funding levels, from zero to a significant increase, are determined by the priorities established by members and the overall availability of funds. Zero-based budgeting tries to achieve an optimal allocation of resources that incremental or historic budget systems do not allow.

A zero-based approach has been used in this plan and intervention frequencies for a range of services have been set. Setting intervention frequencies for all our highway maintenance services allows members to prioritise funding for different parts of the asset for a given annual budget. Increasing interventions for a particular service, for example gullyemptying, means another service will have to be reduced to compensate. A zero-based budgeting approach, incorporated in stage two of the budget model, allows the priorities between services and parts of the asset to be reviewed and reported annually once the annual maintenance budget is known.

Although the budget model enables frequencies of interventions to be revised each year depending on the annual maintenance budget, once frequencies for cleaning, repair and replacement have been set, the impact of significant change from year to year on the resources of our partners must be taken into account.

Once the highway units receive their allocations, the budget is managed in detail through Midas (the Highway Authority's accounting system) using job-specific codes shown in table 5 and combined in the budget report (table 4).

Table 5 – Activities Receiving Budget Allocations

ASSET	OPERATIONS (Revenue funding only)	REPAIRS (bold shows potential for Capital funding)
Roads	Hazard repairs	Patching and joint sealing Patch prior to surface dressing Surface dressing Anti-skid surfaces (HFST) **Category A Surfacing** **Category B Surfacing** **Category C Surfacing** **Retread** **Haunching and reconstruction**
Pavements & cycle tracks	Weed treatment Hazard repairs	Patching, sealing & re-setting **Surfacing** **Reconstruction**
Drainage	Gully emptying Grip cutting/ditch clearing Soakaway/lagoon/outfall cleansing Jetting Maintain & repair pumps inc. renewal	**Localised repair inc. culverts** **Improvements**
Vegetation	Verge filling & regrading Grass cutting Weed treatment Tree inspection Tree/hedge cutting/replanting Low growth shrub maintenance	
Aids to movement:		
Safety & highway fencing	Repair/renew vandal/impact damage	Paint/local renewal/repair posts/panels
Traffic signs	Repair/renew vandal/impact damage	Repair, replace, reset markers
Traffic signals	General maintenance for safety	**Improvements**
Road markings	Renew markings/studs, replace inserts	
Street lighting & lit signs	Schedule A - PrelimsBulk lamp change Schedule B - Fixed costs Schedule B - Gen. maint: Columns, beacons & subways Schedule B - Gen. maint: Lit signs, bollards & sch. xings Schedule C - Electrical testing Schedule D - Special maintenance Orders to electricity company Audit patrols Repair/renew vandal/impact damage	**Schedule E – Strengthening (Misc)** **Column replacement**

NB: The financial management of structures is dealt with in chapter 7.

1.14 Sustainability

Kent County Council takes a sustainable approach to the delivery of highway services, in particular maintaining the authority's highway heritage and in the source of materials used in maintaining the infrastructure.

The highway asset contains features that have existed for many years and these reflect a sense of locality and heritage. Examples include milestones and village direction signs. These are maintained wherever possible rather than replaced as a matter of course.

In sourcing materials to be used in maintaining the asset, materials are reduced, reused or recycled. The aim of this approach is to minimise the use of virgin aggregates used in the maintenance service in Kent and there are many examples where this is put into practice. Specifications for materials allow for bound and unbound materials to contain recycled aggregates with the aim of maximising the amount of materials we reuse. Further information is contained in the Highway Sustainability Guide in the Highway Management Reference Book.

1.15 Highway Management Reference Book

The Highway Management Reference Book (HMRB) is a library of all the highway authority's guidance notes and policy documents, and is available through the HMRB website. The HMRB has been the primary reference document for operational issues since it was first established in the 1980s. It is the definitive 'document' that Kent County Council uses to guide processes and procedures to provide a broadly consistent approach to service delivery across the county.

The plan continues to describe the maintenance service for each of the six elements of the asset and includes the relevant standards and interventions that promote the usability of the network for all its users.

2 Roads

The 8,400km of roads in Kent require varying levels of maintenance appropriate to the importance of the road in the network.

The Kent Highways Partnership aims to improve its services through road maintenance by publishing its commitments to the public.

2.1 KHP Commitments to the Public

The commitments relating to roads are shown in table 6:

Table 6 – KHP Commitments Relating to Roads

No	Description	Referred to in Section
1	We will make sure that hazardous faults on roads and pavements are put right within five working days of being reported to us; if we can't, we will let you know why.	2.6
2	We will routinely inspect the condition of roads, pavements and streetlights	2.4
3	We will introduce safety measures to reduce the number of casualties on Kent's roads.	2.9.4
4	We will provide the public with reliable, timely and useful information about roadworks.	2.10
5	We will require that utility companies work swiftly and efficiently and properly reinstate roads and pavements after carrying out works	2.10
6	We will direct lorries to the main road network rather than local or minor roads.	2.3
8	We will take into account the needs of people with mobility difficulties when building or altering roads and pavements.	2.5

The government measures the condition of the nation's road network through Best Value Performance Indicators (BVPIs).

2.2 Best Value Performance Indicators

The BVPIs that represent the performance of roads are shown in table 7:

Table 7 – BVPIs Relating to Roads

BVPI Number	Description	Referred to in Section
96	Condition of principal roads – percentage of the network in need of major repair	2.8.1, 2.8.2 & 2.9.2
97a	Condition of non-principal classified roads (B&C) - percentage of the network in need of major repair	2.8.1, 2.8.2 & 2.9.2
97b	Condition of unclassified roads - percentage of the network in need of major repair	2.8.1, 2.8.2 & 2.9.2
99K & S (a-e)	The total number of road accident casualties (of various types) per 100,000 population	2.9.4
100	Number of days of temporary traffic controls or road closure per kilometre of traffic-sensitive roads caused by local authority roadworks	2.10
186a	Efficiency indicator for repair works on principal roads (condition indicatordivided by expenditure)	2.9.2
186b	Efficiency indicator for repair works on non-principal roads (condition indicator divided by expenditure)	2.9.2

Kent strives to be in the top quartile nationally, and work programmes are targeted to improve the BVPIs.

However, road classifications alone do not define the varying needs for maintenance across the road network. To do this we have developed a maintenance hierarchy.

2.3 Maintenance Hierarchy

It is necessary to ensure that the right maintenance is carried out in the right places by targeting resources at those locations demonstrating the greatest need. The maintenance hierarchy categorises roads according to their importance in the overall network and guides the decision-making process for determining priorities for maintenance activities.

BVPIs, in measuring the condition of road classifications, fail to account for the damaging effect of the traffic that uses the roads. The maintenance hierarchy is determined by heavy goods vehicle flows that have the most damaging effect on the structural condition of the carriageway. This traffic loading is expressed in terms of million standard axles (msa), a uniform measure of the damaging power of all types of heavy goods vehicles.

The maintenance hierarchy established in the 1999 Maintenance Plan, based on New Roads and Street Works Act (NRSWA) traffic bands, is retained and is described in table 8:

Table 8 – Maintenance Hierarchy

Hierarchy Category	Description
Major Strategic (hgv loading >10msa)	Routes, or parts of routes, linking major urban centres where these are not linked by trunk roads.
Other Strategic (hgv loading >2.5 - <10msa)	Routes, or parts of routes, between other urban centres or centres of industry/commerce.
Locally-important (hgv loading >0.5 - <2.5msa)	Routes, or parts of routes, of local importance in the distribution of goods or people.
Minor Roads (hgv loading <0.5msa)	All other routes, including estate roads and rural lanes.

In addition to NRSWA traffic bands used to define the hierarchy, and to ensure maintenance is targeted towards those parts of the network requiring a higher level of maintenance, the following networks have been incorporated in the top three categories of the hierarchy:

- The A road network owing to its importance in carrying the largest flows of traffic
- The adequate network of roads where bridges provide suitable routes for heavy goods vehicles and abnormal loads
- Precautionary salting routes identified as important to prevent the formation of ice or frost during the winter months.

The 'lorry map' – available to all lorry drivers in Kent to guide them in using the most appropriate routes to reach their destination – takes into account the maintenance hierarchy.
It is the combination of the maintenance hierarchy and the lorry map which contributes to our commitment to the public to "direct lorries to the main road network rather than local or minor roads."

The road network broken down by classification and maintenance hierarchy is shown in table 9:

Table 9 – Road Network by Classification and Hierarchy – November 2003

	Major Strategic (km)	Other Strategic (km)	Locally Important (km)	Minor Roads (km)	Totals (km)
A Roads (km)	405	541	7	0	953
B Roads (km)	3	161	290	0	454
C Roads (km)	0	78	607	1205	1890
Unc. Roads (km)	0	1	270	4795	5066
Totals (km)	408	781	1174	6000	8363

The categorisation of roads into the hierarchy is assessed periodically to allow for changes in usage along the routes.

2.4 Safety Inspections

To meet the first objective of "safeguarding the user" a system of safety inspections is used to identify and repair defects in the highway to prevent crashes occurring.

The frequency of safety inspections takes account of the risk to safety of the road user. The assumption is that this risk is greater on heavily-trafficked roads simply because of their higher use.

2.4.1 Inspection Frequencies

To address variations in risk to the road user, inspections are as follows:

- Major and Other Strategic roads every month
- Locally-important and Minor Roads once every six months.
- High speed dual carriageways such as the A249 between the M2 and M20, the A299 Thanet Way, A256 Whitfield and A229 Blue Bell Hill are inspected weekly.

Inspection frequency is increased if a road is deteriorating rapidly with potholes occurring frequently, where the road is deforming or suffering from repeated flooding.

The Code of Practice for Maintenance Management recommends the following safety inspection frequencies and are shown with Kent's frequencies in table 10:

Table 10 – Comparison of Safety Inspection Frequencies

National Code of Practice		Kent's Maintenance Plan	
Category	Frequency	Category	Frequency
Strategic Route	1 month	Major Strategic	1 month
Main Distributor	1 month	Other Strategic	1 month
Secondary Distributor	1 month	Locally-Important	6 months
Link Road	3 months	Minor Roads	6 months
Local Access	1 year		

Kent's maintenance hierarchy does not match that suggested by the code since the code's is based on all traffic flows whereas Kent's is based on heavy goods vehicle flows to better represent the needs for maintenance and to match the NRSWA road categories. It is likely that the code's strategic routes and main distributors match both Kent's strategic categories and therefore the frequency. Some secondary distributors and link roads equate to Kent's locally-important roads that are inspected to a lesser frequency. However, Kent's minor roads are inspected at twice the frequency recommended by the Code for Local Access roads.

Kent's regime of safety inspections strikes the correct balance of sufficient frequency of inspection across the whole network albeit at the expense of a lesser frequency for some roads equivalent to the code's Secondary Distributors and Link Roads.

It is Kent's regime of safety inspections that contributes to our commitment to the public to "routinely inspect the condition of roads".

2.5 Inspecting For All Users

The list of items to be checked during a safety inspection is included in the Highway Inspectors' Manual. Inspectors also consider the usability of the road for all road users including cyclists, bus users and disabled drivers during their regular safety inspections, contributing to Kent's commitment to the public to "take into account the needs of people with mobility difficulties when building or altering roads and pavements".

2.5.1 Cyclists

The condition and cleanliness of the surface of cycle lanes marked on the road, road markings and direction signs are particularly important to cyclists. Cycle lanes must be free from obstructions and roadworks planned so as to minimise the impact on cyclists. Where appropriate alternative safe cycle lanes should be provided.

2.5.2 Bus Users

The condition of the bus lanes and the condition and cleanliness of direction signs, road markings and shelters are particularly important to bus drivers and their passengers. Bus routes must be free from obstructions, including overhanging trees. Roadworks are planned and organised to try to maintain the reliability of bus services.

2.5.3 Disabled Drivers

Maintaining access is important for disabled drivers and particular attention is given to the condition and cleanliness of disabled parking bays, their road markings and signage.

2.6 Response Times

If an inspector identifies a defect that, owing to its severity and location could result in an accident, repairs will be organised quickly. If the defect is so dangerous that it could result in serious injury or fatality at any moment, 'emergency' repairs are started, or the hazard made safe, within two hours of notifying the contractor. With such a defect, the inspector would be expected to remain at the location to warn highway users until the contractor arrived. Such a defect could be a large manhole cover missing in a busy thoroughfare, an area of collapsed carriageway or a road blocked by a fallen tree.

Hazardous defects that could lead to an accident occurring such as a pothole in the road or a damaged and leaning sign post will be repaired 'urgently', within three days of notifying the contractor.

All other non-hazardous defects identified on the safety inspection record that would not be expected to lead to an accident are programmed for repair, normally before the next safety inspection unless the road in question is to be included in a major works programme.

Defect Category	Emergency	Urgent	Non-Urgent
Response Time	2 Hours	3 Days	Programmed

The response times outlined above contribute to Kent's commitment to the public to "put right hazardous faults on roads and pavements within five days of being reported and if we can't we'll let you know why."

2.7 Improving the Highway Environment

The public is concerned about a number of factors affecting the highway environment and there are a number of ways the inspector can help improve it.

The inspector considers the whole of the highway environment while carrying out a safety inspection and take steps to make improvements or request services wherever necessary. Things that adversely affect the road environment are obstructions, such as poorly positioned skips, litter and rubbish, graffiti, and dirty signs and bollards. The inspector can call on a range of services, whether they are provided by the county council or the district council, to rectify problems encountered during an inspection.

2.7.1 Assessing the Streetscene

Once a year, at the end of the safety inspection, a streetscene assessment is completed for every road in the county. The streetscene assessment allows the inspector to record an 'impression' of the street taking into account a range of attributes that contribute to the liveability and usability of the street. This assessment is not intended to record hazards that have already been identified in the safety inspection. An assessment form is shown in table 11.

Table 11 – Streetscene Assessment

Place a Tick in the Appropriate Box	Very Poor	Poor	Satisfactory	Comments
Highway Condition				
Road trips and potholes?	4	3	0	
Pavement trips and potholes?	4	3	0	
Grass verge/markers?	3	2	0	
Street light columns?	4	3	0	
Dayburners?	3	2	0	
Safety fences?	3	3	0	
Pedestrian guardrails?	4	3	0	
Gullies/ditches/grips blocked?	3	2	0	
Ironwork level/broken?	4	3	0	
Markings?	3	2	0	
Structures?	4	3	0	
Tree roots?	3	2	0	
Total Rating				
Highway Environment				
Dog mess?	2	1	0	
Roads & pavements well-swept?	2	1	0	
Weeds?	3	2	0	
Daytime pavement parking?	3	2	0	
Litter and rubbish?	2	1	0	
Puddles/ponding?	3	2	0	
Signs/SNPs/posts dirty/damaged?	2	1	0	
Overhanging trees/vegetation	3	2	0	
Obstructions, skips, wheeliebins etc	2	1	0	
Graffiti	2	1	0	
Mud/debris	3	2	0	
Other (please state)	2	1	0	
Total Rating				
Combined Total				

The streetscene survey has two purposes:

- It is used to enhance priorities for highway maintenance determined from formal condition surveys and to identify additional works the engineer considers in preparing road or pavement surfacing schemes. This enables all the maintenance requirements to be organised in one visit to the site.

- It can be used to identify the need for other services such as cleansing or parking enforcement and contributes to enhancing work programme priorities derived from condition survey results.

The streetscene assessment shown in table 11 includes ratings that are triggered when a box is ticked. The form is incorporated into the hand-held data capture devices used by the inspectors. This enables the streetscene assessments to be recorded into Mayrise automatically against individual streets that are compared with condition data to determine scheme priorities. This approach could be extended to other district council officers working in the street to promote and share streetscene issues.

2.8 Highway Condition Surveys

To meet the second objective of 'maintaining the asset', the condition of the road network is monitored using a range of regular condition surveys carried out at certain frequencies depending on the road classification and hierarchy category.

2.8.1 TRACS

Traffic-speed condition surveys (TRACS) are used to measure a range of defects including cracking, rutting, ride quality and surface texture.

TRACS are machined-based computerised surveys that are carried out rapidly without disrupting traffic. TRACS are carried out on the county's A, B and C roads once a year to provide data for BVPI 96 (A roads) and BVPI 97a (B&C roads).

2.8.2 Driven Visual Inspections

Driven Visual Inspections (DVI) are manual visual inspections carried out by a surveyor from a slow moving vehicle. The survey identifies and records a range of defects apparent at the road surface. These surveys are carried out on the unclassified network once every two years to provide BVPI 97b.

2.8.3 SCRIM

Sideways-force Coefficient Routine Investigation Machine (SCRIM) surveys measure the skidding resistance of the A and B road network and the two strategic hierarchy categories every year.

2.8.4 Deflectograph

Deflectograph surveys measure the structural strength of a road to predict its ability to support heavy goods vehicle traffic in the future. These surveys are only carried out on specific A road sites identified by the TRACS survey to assist in designing repairs for major maintenance schemes. Deflectograph surveys are not, therefore, carried out at regular intervals.

2.8.5 Summary of Inspections and Survey Frequencies

The frequencies of safety inspections and condition surveys are summarised in table 12:

Table 12 – Regime of Road Inspections and Surveys

Regime of Safety Inspections and Condition Surveys by Classification and Hierarchy		Major Strategic	Other Strategic	Locally Important	Minor Roads
A Roads	Safety Inspections	Monthly	Monthly	6 Monthly	6 Monthly
	TRACS Type Surveys	Annually	Annually	Annually	Annually
	SCRIM Surveys	Annually	Annually	Annually	Annually
B Roads	Safety Inspections	Monthly	Monthly	6 Monthly	6 Monthly
	TRACS Type Surveys	Annually	Annually	Annually	Annually
	SCRIM Surveys	Annually	Annually	Annually	Annually
C Roads	Safety Inspections	Monthly	Monthly	6 Monthly	6 Monthly
	TRACS Type Surveys	Annually	Annually	Annually	Annually
	SCRIM Surveys	Annually	Annually	N/A	N/A
Unc. Roads	Safety Inspections	Monthly	Monthly	6 Monthly	6 Monthly
	TRACS Type Surveys	N/A	N/A	N/A	N/A
	SCRIM Surveys	N/A	N/A	N/A	N/A
	DVI Surveys	Every 2 Years	Every 2 Years	Every 2 Years	Every 2 Years

High speed dual carriageways such as the A249 between the M2 and M20, the A299 Thanet Way, A256 Whitfield and A229 Blue Bell Hill are inspected weekly.

2.9 Standards and Priorities

A set of standards has been determined for each of the road classifications. These standards are the intervention levels that a road must meet before maintenance is considered and prioritised. The structural condition of the road is measured through BVPIs.

2.9.1 Intervention Standards

Using Kent's computerised highways information management system (Kent HIMS), the condition of each road classifications is expressed through a range of defects: structural, surface, edge, rutting, riding quality, skidding resistance and surface texture.

A range of national standards for each defect type has been set against road classification through the United Kingdom Pavement Management System (UKPMS). Kent adopts these national intervention standards to ensure that lengths of road identified for repair will improve the BVPI once remedial works have been completed. Once an intervention standard has been exceeded for any type of defect, then that section of road is prioritised for repair.

2.9.2 Prioritising Works Programmes

The priority ranking for that section of road takes account of the likely treatment, its cost and life expectancy. The highest priority is given to treatments that correct the most defects at the lowest cost, and that last the longest. This is the economic prioritisation that ranks schemes in the works programmes and ensures cost-effective treatments are used.

Survey results are used to develop countywide programmes of both full-width (surfacing) treatments and edge repairs (haunching and patching). It is necessary to develop both programmes in order to improve the results of BVPIs 96, 97a and 97b.

Prioritising works to ensure cost-effective treatments are used will improve Kent efficiency indicators BVPIs 186a and 186b for principal and non-principal roads respectively. These indicators compare the condition of the roads with the expenditure incurred in maintaining them.

2.9.3 Prioritising by Hierarchy Category

Setting priorities in compiling works programmes must assess maintenance needs over the whole network, taking account of overall condition of roads within the hierarchy categories. Thus the need for maintenance on major strategic roads is compared with the need for repairs on minor roads. In the past works have automatically been prioritised towards maintaining the strategic parts of the network, since these carry the highest levels of traffic and have the greatest need for maintenance.

However, regard must be given to the needs of the locally-important and minor networks. Assessing their needs using BVPI results broken down by hierarchy category allows backlogs of work to be determined for each of the hierarchy categories for comparison purposes. This approach enables the need for maintenance to be assessed over the whole network with the overall aim to improve Kent's BVPIs for road condition for all classes of roads.

Therefore, setting priorities for works takes account of the road classification and its place in the maintenance hierarchy, individual scheme rankings and the backlogs of different work types.

A comprehensive set of results and analysis from Kent HiMS is provided to the highway units in a computerised map-based system at the beginning of each financial year. The system is used to identify and compile works programmes and a hence a bid for funding for the following financial year. It is the use of the outputs from Kent HiMs that ensures proper targeting of funds to reduce the BVPIs that measure the condition of the road network and the efficiency of our expenditure.

2.9.4 Improving Skidding Resistance to Reduce Crashes

Values for skidding resistance are necessary since crashes occurring on a wet or damp road surface can be reduced if the surface has appropriate skid resistance and texture values. These values are set according to the risk at particular sites and are not dependent on the maintenance hierarchy. The values are given in the Kent Skid Resistance policy document.

To keep the cost of routine monitoring to a minimum, testing for skid resistance and texture is targeted at the high-risk part of the network. SCRIM surveys are therefore carried out to cover the A and B road networks as well as the two strategic categories of the maintenance hierarchy.

An initial sieve of the results is achieved by reference to a national 'investigatory' level of skid resistance. Those sites below this level are highlighted in order to investigate whether any remedial treatment is necessary.

Almost all road surfaces in the county have a skid resistance which is adequate for the frictional demands arising from routine braking, accelerating and manoeuvring of vehicles which are driven with normal care. Drivers are aware that roads are more slippery when wet but tend to expect a certain level of friction provision and drive accordingly. A site with lower-than-expected skid resistance may need treatment.

It is important that the lowest skid resistance sites are tackled first and so the concept of deficient sites has been developed. With the availability of integrated management systems (including GIS) it is practicable to include personal injury, wet-road crash data into the decision model. This enables priority to be given to those sites that achieve the greatest reduction in wet crashes, thus reducing the numbers of fatalities and injuries.

The highest priority is given to those sites that are categorised as deficient. A site is deemed to be deficient when:

- The skidding resistance is more than 0.20 units below the investigatory level, regardless of the past crash record.
- The skidding resistance is more than 0.10 units below the investigatory level AND one wet-road crash has occurred at the location during the preceding three years.
- The skidding resistance is at or below the investigatory level AND two or more reported personal injury wet-road crashes have occurred at the location during the preceding three years.

Skid resistance improvements can be implemented at relatively low cost and can produce very substantial benefits to the community in terms of savings in crash costs and in the reduction of crashes resulting in personal injury.

All crash clusters are investigated to try to determine common factors in the crashes occurring. Improving the skidding resistance is only one of a number of remedial treatments that can be considered in reducing crashes at a particular location. Remedial treatments are designed to tackle the common factor and may include improving sight lines or signs.

Targeting improvements to skid resistance specifically at sites suffering from crashes that occur in wet weather will have a beneficial effect on BVPI 99 K & S (a-e), the total number of road accident casualties, of various types, per 100,000 population, by reducing the number of crashes caused by wet-surface skidding.

In addition, targeting improvements to skid resistance specifically at sites suffering from crashes that occur in wet weather contributes to Kent's commitment to the public to "introduce safety measures to reduce the number of casualties on Kent's roads."

2.9.5 Providing a Customer Focus

Priorities for work programmes developed from condition surveys are enhanced to meet the varying needs of our customers and the range of users of the road network, by using other information that relates to their needs. For example:

- Records of defects identified in safety inspections. These are assessed to indicate whether a certain road requires repeated localised repairs to keep it in a safe condition. In such cases the priority for that scheme, whether it be for whole surface or edge works, is increased. This approach also aids the economic approach to prioritisation.

- Results of the highway inspectors' streetscene assessments. If they indicate a road is in poor condition visually, then the priority for that scheme, whether it is for whole surface or edge repairs, is increased depending on the nature of the defects recorded. In addition, maintenance is designed to improve the whole street environment taking account of the problems being recorded on the streetscene assessment.

- Records of service requests from the public. These offer a good indication of the condition of a road and are used to enhance its priority identified through condition surveys, defect records and streetscene assessments.

- Requests for parish priorities. Parish councils are invited each year to identify their priorities for major road repairs and these are compared with sites identified by condition surveys, defect records, service request records and streetscene assessments.

2.9.6 Summary of Prioritisation Process

The steps to prioritising works for the benefit of all users of the network are summarised as follows:

- Adopt national standards for the road classifications

- Measure condition and compare against the standards for each classification

- Compile works programmes for whole surface and edge repairs

- Compare priorities based on relative backlogs for each type of works

- Determine scheme priorities within each type of works

- Amend scheme priorities taking account of records of service requests and records of defects identified in safety inspections

- Amend scheme priorities taking account of results of streetscene assessments

- Compare works programmes with priorities identified by parish councils and elected members

Having developed and prioritised works programmes following the above steps, it is necessary to co-ordinate them with other authorities.

2.10 Co-ordinating Works Programmes

Maintenance programmes, including those for structures, are co-ordinated with other programmes of work, such as small improvements and utilities' streetworks, to minimise disruption to the public and to maximise the value of the works. The New Roads and Street Works Act allows highway authorities to classify busy roads as traffic-sensitive which enables greater control over the timing of roadworks to minimise disruption to road users. The entire network has been assessed to produce a schedule of traffic-sensitive streets that demand additional control over the timing of works.

The performance of the network in minimising disruption to users is measured through BVPI 100 which counts the number of days temporary traffic controls or road closures per kilometre of traffic-sensitive roads are caused by local authority roadworks. The timing of works programmes is carefully controlled on traffic-sensitive routes to minimise the indicator and hence the disruption to road users.

Bus companies must be informed in advance of programmes of work that are carefully co-ordinated to help them maintain timetables and punctuality of service for their customers. Of particular importance is the reliability and punctuality of the school bus service that operates during the morning peak flows.

In particular, advance notice of road closures and use of temporary traffic signals on bus routes is essential for bus operators so that alternative routes can be planned and advertised well in advance. All bus routes are shown on the Kent website and advice must be sought from the Passenger Transport Unit (PTU) that looks after local bus planning and school transport routes.

The use of stop/go boards in place of temporary traffic signals also minimises the delays to bus services during peak times. All temporary traffic signals are licensed by the local highway unit.

It is also necessary to inform the PTU if temporary bus stops are to be used. The existing bus stop must be reinstated after the works have finished and the temporary stop removed.
In compiling works programmes for the A road network, care is taken to avoid clashes or duplication of works included in the A Road Reconditioning programme, which is published each year in the Local Transport Plan and the Asset Management system.

All substantial works programmes affecting the highway are co-ordinated through the quarterly NRSWA meetings.

Finally, co-ordinating works programmes also takes account of local needs and demands that are site-specific to the local community, such as school fetes, parades and other local events.

The New Roads and Street Works Act (1980) gives highway authorities the powers to approve the time period for proposed utilities' works to aid co-ordination. Powers also extend to allow authorities to test a 30% sample of utilities' reinstatements to check workmanship and compliance with specifications.

A series of codes of practice are published that describe how these powers can be implemented and are available throughout the Kent Highways Partnership. Officers therefore have the tools and powers to control both the timeliness and quality of works carried out by utilities. These are all set out in the KCC procedures for the control of utilities works and are included in both the Highway Inspectors' Manual and the HMRB.

In addition, there are provisions in the new Traffic Management Bill that will enable highway authorities to strengthen their control over utilities, especially in the co-ordination of works.

With sufficient resources and training, the New Roads and Street Works Act and the Traffic Management Bill enable KCC to control, co-ordinate and therefore enhance the accountability of utilities in carrying out works on the highway.

The co-ordination of both our own and utilities' road works contributes to Kent's commitments to the public to "provide the public with reliable, timely and useful information about roadworks" and to "require that utility companies work swiftly and efficiently and reinstate roads and pavements properly after carrying out work"

3 Pavements and Cycle Tracks

As with roads, the importance of a pavement or cycle track is considered in meeting the two objectives of safeguarding the user and maintaining the asset. However, the further objective of promoting walking and cycling as valued alternative modes of transport is also considered. These objectives are achieved by developing a maintenance hierarchy for pavements and cycle tracks.

The Kent Highways Partnership aims to improve its services through pavement and cycle track maintenance by publishing its commitments to the public.

3.1 KHP Commitments to the Public

The KHP commitments to the public relating to pavements and cycle tracks are shown in table 13:

Table 13 – KHP Commitments Relating to Pavements and Cycle Tracks

No	Description	Referred to in Section
1	We will make sure that hazardous faults on roads and pavements are put right within five working days of being reported to us; if we can't, we will let you know why.	3.7
2	We will routinely inspect the condition of roads, pavements and streetlights.	3.4
8	We will take into account the needs of people with mobility difficulties when building or altering roads and pavements.	3.5.1
9	We will introduce measures to make cycling in Kent easier and safer	3.5.2

3.2 Best Value Performance Indicators

The BVPI that represents the performance of pavements is shown in table 14:

Table 14 – BVPI Relating to Pavements

BVPI Number	Description	Referred to in Section
187	Percentage of high-use pedestrian footways that are in need of repair.	3.8

3.3 Pavement and Cycle Track Hierarchy

A hierarchy is necessary to ensure that the right maintenance is carried out in the right places by targeting resources at those locations demonstrating the greatest need. A simple two-part hierarchy is applied to the pavement network: 'heavy-use' and 'other' pavements.

Heavy-use pavements are those that attract large numbers of pedestrians and represent the greatest need for maintenance. Examples of heavy-use pavements are shopping streets, shopping parades, prime seafront areas, routes to schools where walking buses operate, pedestrian routes to hospitals and residential homes for the elderly.

Maintenance is targeted at heavy-use pavements to maximise the benefits of maintenance to the majority of people.

It is not practical to create a strategic countywide pavement hierarchy because they do not form cross-county transportation corridors. Their importance is at a local level and therefore the local highway unit develops the pavement hierarchy. Definitions of cycle routes, lanes and tracks are as follows:

Cycle routes are not necessarily delineated on the ground but are usually accompanied by direction signing and/or marked on a map or leaflet. Routes can be made up of many types of cycle facility. Facilities include quiet roads, a cycle lane marked on the road surface, a cycle track alongside the road either shared with or segregated from the pavement and a cycle track away from the highway such as an alley or through a park.

Cycle lanes are situated on the road surface and marked by a white line with signing. A red surface and a continuous white line means that the lane is mandatory and vehicles cannot enter to park or unload. An advisory lane is not coloured and is marked by a broken line except where there is a side road junction and the broken white line marking the lane is discontinued. Vehicles can enter advisory cycle lanes.

A cycle track can be located next to the road or away from the highway. The track can be segregated from the pavement by a raised white line and is surfaced red or it can be shared with pedestrians where there is no segregation and the use of signing indicates that the road is shared.

The cycle route network can be located on road, as part of the pavement or built remote from the highway. The cycle track network includes a national network of cycle tracks promoted by the charity Sustrans to link urban areas with the countryside for leisure and utility journeys.

3.4 Safety Inspections

To meet the first objective of "safeguarding the user" a system of safety inspections is needed to identify and repair defects in the highway to prevent accidents occurring.

In setting the frequency of safety inspections, reference is made to the risk to safety of the user. It is reasonable to assume that the risk is greater on heavily-used pavements and cycle tracks.

3.4.1 Inspection Frequencies

To address the variation in risk to the user, heavy-use pavements receive monthly safety inspections, while all other pavements are inspected once every year.

	Pavements	
Hierarchy	Heavy-use	Other
Safety inspections	Monthly	Yearly

The frequency of safety inspections is increased if a pavement is deteriorating rapidly with trips occurring frequently, where the pavement is breaking up or suffering from repeated pavement parking.

It is Kent's regime of safety inspection that contributes to our commitment to the public to "routinely inspect the condition of pavements."

Cycle tracks within the highway are inspected at the same frequency as the road or pavement. Otherwise off highway cycle tracks are inspected annually.

	Cycle Tracks		
Hierarchy	On road	On pavement	Off highway
Safety inspections	As for roads	As for pavements	Yearly

3.5 Inspecting For All Users

The list of attributes to be checked during a safety inspection is included in the Highway Inspectors' Manual. In carrying out regular safety inspections the inspector also considers the usability of the pavement for all users including those with impaired mobility.

3.5.1 Inspecting Pavements

Of particular importance to users with impaired mobility are obstructions that could either lead to insufficient available width for wheelchair users or that could interfere with the progress of walkers with impaired vision. Also, careful checking is needed of potential obstructions that are off the ground such as low branches, overhanging hedges and signs with insufficient headroom. A minimum clear width of 1m is required to allow a wheelchair to pass between obstructions.

Pavement crossfalls are important to wheelchair users. Crossfalls exceeding 10% even over the shortest of distances will prevent a wheelchair user getting onto the pavement having crossed the road.

Care must be taken during road and pavement repairs to ensure dropped kerbs do not exceed 6mm in height so those wheelchair users may negotiate them. Covers and gratings must be flush with the pavement surface and the width of openings in gratings should not exceed 13mm.

In overseeing roadworks, care is taken to ensure an alternative pavement is provided that is properly signed and guarded with kick boards or tap rails for 'white stick' users and kerbs are ramped appropriately if temporary pavements are provided in the road.

It is the inspectors' appreciation of the needs of users of the network with impaired mobility, which contribute Kent's commitment to the public to "take into account the needs of people with mobility difficulties when building or altering roads and pavements."

3.5.2 Inspecting Cycle Tracks and Cycle Lanes

When inspecting cycle tracks and cycle lanes, inspectors should consider the particular needs of cyclists. Cyclists need clear signing and lining. Clear markings on shared non-segregated cycle tracks are particularly important to avoid confusion and possible conflict between users. Direction signs must be legible and pointing in the right direction. To do this, inspectors should be familiar with the cycle route and its destinations. The minimum height for signing on cycle routes is 2.7m.

When inspecting cycle lanes, emphasis should be placed on pothole repairs and the sweeping of grit and debris from channels, especially on roundabouts and islands.

Cycling can be promoted on the Public Rights of Way (PROW) network. However, if cycling is to be promoted along a byway or bridleway, it should not be considered without prior consultation with the PROW Unit. The promoter should make provision for an improved standard of maintenance to maintain widths, sightlines and the suitability of the surface of the byway or bridleway that cycling is promoted along. PROW footpaths that are converted to cycle tracks under the Cycle Tracks Act 1995 become the responsibility of the highway units to maintain and again, provision of an improved standard of maintenance should be made. Guidance on maintenance can be obtained from the PROW Best Practice Manual.

It is the inspectors' appreciation of the needs of users of the network that contributes to Kent's commitment to the public to "introduce measures to make cycling in Kent easier and safer."

3.6 Improving the Highway Environment

The public is concerned about a number of factors affecting the highway environment and the condition of pavements makes a major contribution to the environment.

In carrying out the streetscene assessment described in Chapter 2, the inspector considers the needs of all users including the mobility-impaired and takes steps to make improvements or request services wherever necessary. The inspector can call on a range of services (whether they are provided by the highway unit or the district council) to rectify problems encountered during an inspection. This information is shared to promote the wider streetscene approach. Detailed guidance on safety inspections is included in the HMRB and the Highway Inspectors' Manual.

3.7 Response Times

If an inspector identifies a defect that, owing to its severity and location, could result in an accident, repairs will be organised. If the defect is so dangerous that it could result in serious injury or fatality at any moment, 'emergency' repairs should commence or be made safe within two hours of notifying the contractor. With such a defect, the inspector would be expected to remain at the location to prevent an accident occurring until the contractor arrived. Such a defect could be a large manhole cover missing, an area of collapsed pavement or a fallen tree.

Hazardous defects that could lead to an accident occurring, such as a trip in the pavement or a damaged and leaning sign post, are repaired 'urgently', within three days of notifying the contractor.

All other non-hazardous defects identified on the safety inspection record are programmed for repair, normally before the next safety inspection unless the pavement or cycle track in question is to be included in a major works programme. Appropriate response times for non-urgent works are agreed with the contractor at regular progress meetings.

Defect Category	Emergency	Urgent	Non-urgent
Response Time	2 Hours	3 days	Programmed

The response times outlined above contribute to Kent's commitment to the public to "make sure hazardous faults on roads and pavements are put right within 5 days of being reported to us; if we can't, we will let you know why."

3.8 Prioritising Works Programmes

The condition of high-use pavements is measured through BVPI 187. Condition surveys necessary to produce BVPI 187 identify high-use pavements for repair. BVPI 187 will eventually include the entire pavement network, but in the meantime highway inspectors will identify maintenance schemes for all 'other' pavements. Pavement maintenance is identified and targeted to reduce BVPI 187.

When inspectors have identified a pavement or cycle track in need of major repair, such as resurfacing or relaying, an engineering assessment is completed to develop a priority ranking. A sample engineering assessment form is included in the HMRB.

Setting priorities in compiling works programmes takes account of the maintenance hierarchy and individual scheme rankings.

3.9 Providing a Customer Focus

Priorities for work programmes developed from condition surveys are also enhanced to meet the varying needs of our customers and the range of users of pavements and cycle tracks, by using other information that relates to their needs. For example:

- Records of defects identified in safety inspections. These are assessed to indicate whether a certain pavement or cycle track requires repeated localised repairs to keep it in a safe condition. In such cases the priority for that scheme is increased. This approach also aids the economic approach to prioritisation.

- Results of the highway inspectors' streetscene assessments. If they indicate a pavement or cycle track is in poor condition visually, then the priority for that scheme is increased depending on the nature of the defects recorded. In addition, maintenance is designed to improve the whole street environment taking account of the problems being recorded on the streetscene assessment.

- Records of service requests from the public. These offer a good indication on the condition of a pavement or cycle track and are used to enhance its priority identified through engineering assessments, defect records and streetscene assessments.

- Requests for parish priorities. Parish councils are invited each year to identify their priorities for major pavement and cycle track repairs and these are compared with sites identified by engineering assessments, defect records, service request records and streetscene assessments.

3.10 Co-ordinating Works Programmes

Maintenance programmes are co-ordinated with other programmes of work, such as small improvements and utilities' streetworks, to minimise disruption to the public and to maximise the value of the works.

Finally, co-ordinating works programmes takes account of local needs and demands that are site-specific to the local community, such as school fetes, parades and other local events.

4 Drainage

The drainage system forms a major element of the highway asset and is provided for three main purposes:

- To ensure public safety is not compromised by the presence of hazardous surface water
- To prevent highway surface water flooding adjacent property
- To prevent accelerated deterioration to the highway due to the presence of standing water.

The highway drainage system or drainage asset consists of gullies, pipes, soakaways, head and tail walls, manholes, catchpits and manholes, ditches, grips and lagoons. Currently, the drainage inventory only includes gullies. Only gullies receive cleaning at prescribed frequencies.

There is a need to establish a comprehensive drainage inventory in order to plan full and timely maintenance to prevent serious collapses and road closures caused by poorly maintained drainage systems leading to instability of underlying soils. This would be an extremely costly exercise owing to the size of the drainage infrastructure that is mostly buried underground and because of the level of detail necessary to complete the inventory.

The lack of a comprehensive inventory leads to the absence of an adequate maintenance strategy that has caused the Environment Agency to be very restrictive in their approval of remedial works for flooded highways. Compiling a comprehensive inventory would reveal a catalogue of necessary remedial works that would further pressurise the drainage budget. In the absence of funds necessary to compile a comprehensive drainage inventory and a maintenance strategy, an incremental approach to building the inventory is adopted. This incremental approach is described under the relevant inventory item.

4.1 Gullies

Through the asset management approach to budget prioritisation, sufficient funds are available to clean every gully in the county on average once a year. However, some gullies such as in low-lying locations and beneath trees are at a greater risk of frequent flooding, and these are emptied more frequently. The highway manager has the flexibility to clean some gullies more frequently than once a year, and some less, as long as the need for gully-emptying is met from funds based on cleaning gullies once a year.

The gully inventory is regularly updated to ensure sufficient funds are allocated to gully cleansing. An efficient way of updating the gully inventory is for the gully cleansing contractor to record the location of each gully using GPS while they are being cleaned. This doubling-up of work avoids the additional costs of a second party visiting the same location at a different time.

4.2 Soakaways

Soakaways should be cleaned at regular intervals. However, without a soakaway inventory it is not possible to quantify the size of the budget necessary to clean soakaways at a prescribed frequency.

Soakaways are therefore cleaned on a needs-basis, but their location is recorded using GPS at the time of cleaning. With this approach, a soakaway inventory will be compiled over time to be used in the future to quantify budget need depending on the set cleaning frequency.

4.3 Pipes

Pipes are cleaned on a needs-basis and locations of pipe runs are recorded on plans to compile a pipework inventory. Electronic records of these plans are made for ease of retrieval at a later date, and to enable funds to be quantified on the basis of the known asset.

4.4 Head and Tail Walls

Head and tail walls require periodic repair determined on a needs-basis. Damage to such walls can occur through tree roots or becoming blocked from silting up of the outfall.

4.5 Ditches and Grips

Ditches and grips require periodic cleaning or re-digging determined on a needs basis. Ditches form an integral part of the drainage system, particularly in rural areas and are not filled in or allowed to silt up.

4.6 Catchpits and Manholes

Catchpits and manholes require periodic repair determined on a needs basis. Particular attention is paid to the condition and level of catchpit and manholes covers, which are repaired to maintain the structural integrity of the access to the chamber, and to prevent them becoming a safety hazard.

Many manholes are owned by the utilities that are responsible for their maintenance. However, if a highway inspector sees a utility manhole in need of repair, the relevant utility should be informed. If the utility does not respond within an appropriate time period and the defect becomes hazardous, the inspector can inform the utility that repairs will be arranged and the utility recharged.

4.7 Lagoons

Lagoons can silt up over time and therefore require cleaning at intervals. Owing to the varying size and locations of lagoons, the intervention for cleaning is determined on a needs basis. The recommendations for maintaining lagoons outlined in a scheme's health and safety file, produced when a scheme is first built, must be considered in planning the maintenance works.

4.8 Summary of Interventions for Drainage

A summary of inspection and cleaning frequencies is shown in table 15.

Table 15 – Drainage Inspection and Cleaning Frequencies

Drainage	Inspection Frequency	Cleaning Frequency
Gullies	As for roads	Once a year (on average)
Soakaways	Needs-basis	Needs-basis
Pipework	Needs-basis	Needs-basis
Ditches	Needs-basis	Needs-basis
Grips	Needs-basis	Needs-basis
Catchpits/Manholes	Needs-basis	Needs-basis
Lagoons	Needs-basis	Needs-basis

The interventions for drainage recommended in the Code of Practice for Maintenance Management are shown in table 16:

Table 16 – Code of Practice Interventions for Drainage

Drainage	Inspection Frequency	Cleaning Frequency
Gullies	Yearly	Yearly with increased frequency for high risk gullies
Soakaways	Every 10 years or more frequently in high risk areas	Every 10 years or more regularly in high risk areas
Pipework	Every 10 years or more frequently in high risk areas	Every 10 years or more regularly in high risk areas
Ditches	When required	When required
Grips	Yearly	Yearly after last grass cut
Catchpits/manholes/culverts	Every 5 years	As required
Lagoons	Every 10 years or more frequently in high risk areas	Every 10 years or more regularly in high risk areas

4.9 Drainage Schemes

Where drainage systems prove to be inadequate, the highway unit can propose drainage schemes that either enhance an existing system, or provide new drainage in an area vulnerable to flooding. All proposed drainage schemes are held on a database and are prioritised according to the severity of the following risk factors:

- effect of flooding on the safety of the highway
- effect of highway water on adjacent property
- obstruction of the highway by flooding

4.10 Drainage Scheme Priorities

In determining scheme priorities, the following risks are considered and prioritised:

- Threat to life or personal injury
- Property damage
- Affect on the route
  - Route obstruction
  - Route safety
  - Route inconvenience

4.10.1 Method of Analysis

The remedial schemes are assessed according to the above basic categories/sub-categories and rated in accordance with the following. Detailed information on ratings is given in the HMRB.

4.10.2 Drainage Risk Categories

Threat to life or personal injury: All flooding poses a potential risk of death or injury. However, the significant risks in this category are from major flooding which is the responsibility of the Environment Agency and not the highway authority. Certain aspects of this such as accidents caused by icing/flooding and obstruction of routes to

hospitals, fire stations etc are dealt with under the other three categories. For these reasons, this category will not be considered further.

Property damage: The two considerations are potential value of damage and frequency of occurrence. High value properties include all domestic properties, offices and commercial premises where floodwater is likely to cause damage in excess of £10k. Low value properties include private garages, farm outbuildings etc where damage from floodwater is likely to be less than £10k.

Affect on the route: This category is broken down into three sub-categories as follows and the ratings that are allocated are factorised depending on the classification of the route.

Route obstruction: This category is divided into classes of vehicles that cannot pass through flooding and the estimated frequency of occurrence.

Route safety: Flooding that extends into the vehicle running lane has the potential to cause an accident due to either vehicles swerving to avoid the flooding or loss of control on hitting flooded areas. This is especially true for high-speed roads with no street lighting. Because these are generally areas of localised flooding, they are likely to occur several times per year after any high-intensity storm. Therefore, all flooding on unlit roads with an estimated 85%ile speed in excess of 50 mph is included as a single category. The probability of floods on other categories of roads causing fatal/injury accidents increases in proportion to the traffic volumes, frequency of occurrence and average length of time that the roads are flooded. These are the same criteria that are used in the route obstruction category and the rating allows for this. Permanently wet areas are likely to be a safety hazard during freezing temperatures.

Route inconvenience: This category includes all minor flooding which does not close roads to vehicular traffic but which may cause inconvenience to the travelling and general public due to delays, closed footpaths, possibility of spray from passing vehicles etc.

5 Vegetation – The Soft Estate

5.1 General

The highway infrastructure in Kent is enhanced by the inclusion of 'soft' landscape areas to mitigate the harshness of the built environment. These landscaped areas form an integral part of the highway infrastructure and are maintained to provide the visual amenity to be enjoyed by all users of the highway and its neighbours. The soft areas include grass verges, trees, low-growth shrubs and roadside nature reserves. The highway verge encompasses all parts of the soft areas of the highway corridor, including trees, grass areas, planting plots, embankments, cutting faces, ditches and lagoons. These areas perform a number of functions, including structural support for the road, landscape enhancement, visual mitigation, nature conservation and safety. Often all these functions are interlinked to a greater or lesser extent.

5.2 Roadside Verges

Grass verges occur alongside rural lanes and are also present in urban environments often located between roads and pavements. The grass on these verges has to be cut regularly to ensure sight lines are maintained wherever present (including visibility splays for signs) and ensure available road, cycle track and pavement widths are maintained. To achieve these objectives, funding is available to cut all roadside verges to a metre width, once a year.

The national code's suggested practice for grass cutting is that frequency of mowing will depend on the rate of growth but will normally be twice a year. Other areas of grass should be cut every three years unless a positive decision is taken to allow it to vegetate. In urban areas, grass cutting practice needs to involve a different balance of safety, serviceability and sustainability which suggests there is a need for a higher frequency of cutting in urban areas.

In Kent, it is normal practice for the district councils to fund the additional urban cuts to meet the objectives outlined above.

5.3 Visibility Splays

Visibility splays are located at junctions and around bends to provide visibility for motorists negotiating a junction or bend. Visibility splays are essential for safety purposes and are to be maintained sufficiently to prevent grass or other vegetation obstructing visibility. Visibility areas are therefore cut twice a year, with further cuts made on a needs basis depending upon the rate of growth and severity of location. Some visibility splays include areas of private land, specifically gardens where the height of walls and hedges/shrubs needs to be checked periodically to maintain a clear view for drivers. The maximum height for vegetation on visibility splays is 600mm.

5.4 Roadside Nature Reserves

Roadside Nature Reserves (RNRs) have been established to promote wildlife and other types of fauna and flora on verges of particular ecological interest. There are approximately 130 RNRs across Kent and they are managed in partnership between Kent Highways and the Kent Wildlife Trust (KWT). KCC funds a roadside verge officer who is responsible for providing management plans for each RNR, to work alongside KWT. These are then passed to the highway unit who adjusts the grass-cutting programme to meet the particular requirements of the RNR identified in the management plan.

Every RNR is marked by recognised designation posts which must be maintained by the highway unit to indicate to the grass cutting contractor the location and length of the RNR. The highway unit is also responsible for consulting the roadside verge officer before liasing with contractors and utility companies working in the vicinity of the RNRs. RNRs are also protected from overrunning, storage and tipping at all times during road or streetworks adjacent to the designated verges.

5.5 Amenity Areas

Amenity areas are areas of grass that are part of the highway but are not located adjacent to roads or pavements in the same way as grass verges. These are provided for visual amenity to soften the effects of the hard landscape of roads and pavements. These areas are also to be cut to maintain sight lines and maintain widths of roads and pavements. Through budget planning, sufficient funds are available to enable these amenity areas to be cut once a year, although district councils often enhance the cutting regime through additional (non-highway) funding.

5.6 Low-growth Shrub Areas

Low-growth Shrub Areas have been provided mainly through the adoption of new housing estate roads, particularly over the past ten years. These have been provided as visual amenities to mitigate the effects of the built environment and also to provide cover to utilities' plant in service strips. These low-growth shrub areas must be maintained to maintain sight lines, widths of roads, pavements and cycle tracks and to maintain access to utilities' plant.

The need to maintain widths of pavements is particularly important for users with impaired mobility and vision. Care is taken in maintaining the full width of the available pavement, particularly for wheelchair users. Vegetation encroaching onto the pavement can also impede partially-sighted users and is maintained to provide the maximum available pavement width.

There can be no fixed regime for maintaining low-growth shrub areas because the growth (and the need for maintenance) is dependent upon the species of shrub present and the weather conditions during the year. Highway inspectors pay particular attention to encroaching vegetation while carrying out their regular safety inspections and organise remedial works on a needs basis. The need to maintain visual amenity will require these areas to be cleared of litter on a regular basis. It may also be necessary to replant if gaps appear in the vegetation cover; otherwise unwanted weed growth will become a problem.

5.7 Hedges

Hedges are normally located to the rear of the pavement and are generally privately owned. Poorly maintained hedges that overhang the pavement can have serious consequences for users with impaired mobility, particularly the partially-sighted. Hedges that overhang rural lanes can have an adverse impact on cyclists and horseriders. Highway inspectors, in carrying out their regular safety inspections, ensure hedges are maintained by their owners to provide the maximum available width of the pavement and cycle track, and to ensure signs, signals and street lights are not obscured to maintain the safety of the highway user.

5.8 Trees

Highway trees are also provided to soften the effects of the built environment and so provide visual amenity for the highway user and its neighbour. Trees are subject to regular inspection and maintenance to prevent them becoming a danger to users of the highway and its neighbours. Trees receive formal inspections by tree specialists at a frequency appropriate to the usage of the road. Therefore, roads in the top three categories of the maintenance hierarchy receive specialist tree inspections once every two years. Tree specialists inspect the remaining minor network once every five years.

In addition to the regime of specialist tree inspections, Highway Inspectors look out for any trees during their regular safety inspections that may give rise to a hazard. The inspector records details of trees:

- considered to be dangerous
- with roots likely to cause a trip hazard
- with roots causing damage to paved areas
- obstructing the highway
- obstructing sight lines
- obscuring road signs

Particular attention is paid to overhanging branches on bus routes, especially those used by double-decker buses and on routes used frequently by horseriders. Where overhanging branches are lower than 5.2m, action to have them cut back is considered, depending on an assessment of the location and risk. The identification of overhanging trees on bus routes should be done in conjunction with the bus companies and the Passenger Transport unit, so that funds can be targeted where they have the most benefit.

Overhanging branches on pavements and cycle tracks could obstruct pedestrians and cyclists but are particularly dangerous to the partially-sighted and receive particular attention during the safety inspection. Highway inspectors must also ensure signs, signals and streetlights are not obscured.

To prevent trees becoming a safety problem, reactive tree maintenance is organised. The reactive tree-pruning programme targets the high-risk areas and in prioritising works, account is taken of reports from the specialist tree inspectors and the maintenance hierarchy. The Passenger Transport Unit can highlight priority areas to help establish the tree-pruning programme.

The response times for reactive tree works are within 24 hours for trees that pose a danger to the highway user. Programmed work for trees that may become a danger to the highway user will be arranged in either a six or 12 month timescale, depending on the recommendation of the specialist tree inspector.

Non-highway or private trees are included in the specialist tree inspections and the regular safety inspections, but reactive tree pruning is restricted to highway trees only. The owners of dangerous private trees are identified where possible and forced to take action to render the tree safe for the benefit of the highway user. Where private trees are identified as an imminent danger to highway users, the highway authority has the power to take urgent action.

The Code of Practice for Maintenance Management suggests that tree-cutting should be carried out when required. In rural areas work on highway trees will be reactive and limited, other than for safety reasons. In urban areas a proactive management programme including regular inspections by qualified arboricultural officers, thinning and crown reduction should be put in place to mitigate the negative impact of trees while retaining their environmental benefits.

5.9 Landscape Management Plans

Landscape Management Plans (LMPs) will be developed as a reference document to help highway managers maintain the areas of landscape provided alongside major highway improvements. The LMPs identify the purpose of the landscaping and ecological mitigation features, the nature of the species used and the maintenance practices most appropriate for achieving the function for which the areas were provided. Such areas are normally maintained under agreement for five years after the scheme has opened, at which time they become the responsibility of the highway unit to maintain, following the guidance of the LMP. Highway managers should be aware of the planning requirements under which landscaped areas were provided for new schemes, before taking action to alter them.

5.10 Weed Control

Intrusive weeds must be controlled to prevent hazards and accelerated deterioration of the highway. This maintenance primarily relates to weed growth in hard surfacing but can include treatment to soft verge areas subject to limited or no mowing.

Weed spray is applied to hard surfaces, e.g. pavements, kerbs, channels, island and roundabouts etc twice a year. The initial application is a total weed killer followed by a non-residual weed killer at the second application. In pursuing a streetscene approach, dead weeds are then removed by district councils through their environmental services.

Central reserves receive a single application of selective weed killer and spot treatments are carried out with a single treatment with a specified weed killer.

Particular weed problems such as ragwort, Japanese knotweed and giant hogweed, require tailored treatments and may be subject to controls under specific acts of parliament. Further information on ragwort can be found in the HMRB and specialist advice may be required.

The Code of Practice for Maintenance Management refers to Staffordshire County Council's weed control regime for guidance. The only herbicide available for use on the highway is Glyphosate, which has no residual qualities, and will only affect plants where there is direct contact. New weed growth occurs in spring and autumn, so for effective weed control, there needs to be at least two applications with the possibility of a third application in mid summer.

In dealing with noxious weeds such as ragwort, the code suggests cutting is used by many authorities for control to prevent the plant flowering and seeding and two full cuts of the verge by June every year for five years will inhibit seeding and spreading.

5.11 Summary of Inspection and Cutting/Pruning Frequencies

A summary of inspection and cutting/pruning frequencies is shown in table 17:

Table 17 – Inspection and Cutting/Pruning Frequencies and CoP Comparison

Vegetation	Inspection Frequency	Cutting/Pruning Frequency	Code of Practice Comparison
Verges	As for roads	Once yearly	Twice yearly
Visibilty/amenity	As for roads	Twice yearly	Twice yearly
Low-growth shrubs	As for pavements	Needs-basis	When required
Trees	Major strategic, other strategic and locally-important roads: once every 2 years	Needs-basis	When required
Trees	Minor roads: once every 5 years	Needs-basis	When required

6 Aids to Movement

Aids to movement are so called because collectively they provide information and protection to assist with the safe movement of all users of the highway. Aids to movement comprise:

- Safety fences and guardrails
- Signs and bollards
- Road markings and studs
- Traffic signals
- Interactive and variable message signs
- Street lights

Each of the components has a specific role to play in aiding movement through the highway network and must be adequately maintained in order to enable safe passage for the highway user.

The Kent Highways Partnership aims to improve its services through street lighting maintenance by publishing its commitments to the public.

6.1 KHP Commitments to the Public

The KHP commitments to the public relating to aids to movement are shown in table 18:

Table 18 – KHP Commitments Relating to Aids to Movement

No	Description	Referred to in Section
2	We will routinely inspect the condition of roads, pavements and streetlights	6.7
7	We will seek to give pedestrians priority on arrival when designing new pedestrian crossings	6.6.1

6.2 Best Value Performance Indicators

The BVPIs that represent the performance of aids to movement are shown in Table 19:

Table 19 – BVPIs Relating to Aids to Movement

BVPI Number	Description	Referred to in Section
165	The percentage of signalised pedestrian crossings with facilities for disabled people	6.6.1
180b	Average lamp circuit wattage used by street lights compared with average consumption/wattage for local authorities in the UK	6.7

6.3 Safety Fences and Guardrails

Safety fences are designed and provided to divert vehicles back onto the carriageway in the direction they were travelling if they stray off the running lane. Safety fences are designed to redirect vehicles back onto the running lane and their effectiveness relies on their structural integrity. It is important therefore that they are properly maintained.

Safety fences are particularly important on high-speed dual carriageways particularly when positioned in the central

reserve to separate opposing traffic flows, around bridge abutments and at the top of embankments. High-speed dual carriageways receive weekly safety inspections and the inspector pays particular attention to damage or faults affecting the safety fences. Repairs are prioritised locally taking account of risk, severity of defect and location.

Pedestrian guardrails are positioned to prevent pedestrians accessing the carriageway at particularly dangerous locations and to encourage pedestrians to use crossing facilities provided for them. They are more likely to be provided on heavy-use pavements that receive monthly safety inspections, and the highway inspector pays particular attention to their condition in carrying out the inspection. Highway users that are partially-sighted rely on colour contrast to help them negotiate the highway. Guardrails provided with some form of colour contrast can be used as a waymarking tool to help the partially-sighted access shops and services.

6.4 Signs and Bollards

Traffic signs are a primary source of driver information and their types, specifications and requirements for illumination by lighting and reflectorisation are detailed in the Traffic Sign Regulations and General Directions, a Statutory Instrument. Signs are required to be visible at all times and their reflective or illuminated performance is as essential as daytime visibility for legal purposes where they indicate mandatory or regulatory requirements. Where they warn of hazards or provide directional information, poor night-time performance is detrimental to road safety. Damage and faults relating to traffic signs are prioritised in accordance with table 20:

Table 20 – Sign Repair Response Times

Sign Type	Description	Response Time
Illuminated	Unsafe electrical apparatus	Temporary repair within two hours. Permanent repairs at appropriate response times
	Unlit regulatory, mandatory, warning signs, belisha and school flashing units	Attend within two days of identification and repair within nine days
	Unserviceable regulatory, mandatory or warning signs	Attend within two days of identification and repair within nine days
	Obstruction to regulatory, mandatory or belisha beacons (e.g. foliage)	Remove within seven days of identification
Non-illuminated	Damage which causes an obstruction to traffic or pedestrians	Emergency two hour or urgent three day response depending on severity and location
	Unserviceable regulatory, mandatory or warning signs	Attend within two days of identification and repair within nine days
	Reflectorised type regulatory, mandatory or warning sign with poor reflective performance nine days	Attend within two days of identification and repair within
	Obstructions to all non-illuminated signs	Remove as and when identified

General maintenance of traffic signs consists of the following activities:

- Identification/rectification of outages.
- Bulk lamp change.
- Inspection/rectification of electrical components.
- Electrical safety tests and inspections.
- Check for continued need for illumination based on regulations, prior to special maintenance.

Maintenance of sign faces is necessary if they are suffering from:

- Poor cleanliness.
- Peeling reflective material, loss of legend or vandalism.
- Ineffective reflectorisation.

Posts/fastenings are to be checked to:

- Identify/rectify deterioration of painted/galvanised surfaces and plastic coatings.
- Identify/rectify security of posts/fittings and sign faces.
- Inspect for structural integrity of large signs (area of signface over 10 square metres).

Sign renewal programmes are identified based on the following factors:

- Signs identified with ineffective reflectorisation.
- Signs no longer required to be illuminated.
- Sign face legends that no longer comply with the Traffic Signs Regulations and General Directions.
- Sign face legends that no longer comply with local or national policies.
- Missing signs requiring replacement

Damage and faults to illuminated road signs are identified through night scouting. Additionally, signs are visually inspected to identify ineffective reflectorisation. Sign faces are checked for compliance with regulations and national/local policies before replacement. Further information can be found in the KCC Signs Policy included in the HMRB.

6.4.1 Maintaining Signs and Bollards for the Mobility Impaired

Bollards, if used to protect an area of pavement from pavement parking, can cause difficulties for wheelchair users and the partially-sighted if they are positioned poorly. Bollards must be placed in line, and preferably in line with other street furniture such as streetlights, signposts and litterbins. Partially-sighted users of the highway rely on the continuity of street furniture to act as a guide in accessing shops and services.

Users that are partially-sighted also rely on colour contrast to help them negotiate the highway. Bollards, posts and streetlight columns, if provided with a colour-contrasting band or top, are used as waymarking tools to help access shops and services. Handrails, especially on steep sections of pavement, can also aid access to amenities.

Bollards must have a minimum height of one metre and litterbins must be placed at least 1.3m high and be continuous to the ground, i.e. do not protrude from street light columns. All pedestrians should enjoy an unobstructed height of 2.3m and all overhanging or protruding signs are positioned at or above 2.3m above ground level.

6.4.2 Variable Message and Interactive Signs

One of the unique features of the Kent Urban Traffic Control (UTC) system, currently operating in Maidstone, is the ability to take information from detectors, identify congested routes and activate the operation of Variable Message Signs (VMS) on the approaches to the town centre. Maidstone is also the site of a trial of the use of VMS to advise motorists about potential hazards in winter conditions. The signs are operated when temperatures are falling and warn drivers leaving the built up area that they may encounter icy road conditions.

Variable message signs are being used on the A20 London Road in Maidstone to promote the use of park & ride. Two VMS are in operation; one gives drivers general information about the park & ride service and the other displays current journey times to the town centre for buses and cars.

VMS are increasingly being used to display car-parking information to assist drivers to find a space. This reduces the amount of traffic circulating and queuing on the network. Car park management systems are installed in Maidstone and Canterbury, with others planned.

VMS are included in the traffic signals maintenance contract that includes provision for annual inspections.

Interactive signs are used to alert drivers who have entered a new speed limit that they have not reduced their speed

to the new limit. The signs work using a radar beam, which triggers the sign if a vehicle is travelling above the posted speed limit. When this occurs an illuminated sign appears showing the current speed limit, combined with flashing amber lights, for four seconds. Interactive signs are also available to warn of school safety zones.

Interactive signs are included in the highway inspectors' safety inspections. Faults of an electrical nature are reported to the street lighting contractor while other faults such as inoperative bulbs, knockdowns or damaged signs are reported to a specialist contractor.

6.5 Road Markings and Studs

Road markings provide a primary source of driver information and require installation and maintenance in accordance with the Traffic Signs Regulations and General Directions, a statutory instrument.

Highway inspectors take particular care in carrying out safety inspections to note the condition of road markings. Replacement of road markings are arranged when:

- Approximately 30% of the material is missing through wear
- The size of the marking has reduced by more than 10%

In addition, all road markings are to be inspected once a year during the hours of darkness to check reflectivity.

Particular care is taken of enforceable, mandatory double white line systems, including those under low bridges. These receive regular checks depending on the inspection frequency.

6.5.1 Maintaining Markings to Aid Users with Impaired Mobility

Users that are partially-sighted rely on colour contrast to help them negotiate the highway. Road markings often provide that colour contrast and are to be well-maintained. Yellow lines are particularly helpful in defining the boundary between road and pavement that create parking restrictions. Highway inspectors, in carrying out their safety inspections on pavements, take particular note of the condition of yellow and other road edge markings and take steps to keep them well-maintained so that they an be used as waymarking tools by the partially-sighted.

Drivers with impaired mobility rely on disabled parking bays to enable them to access town centres, shopping and other facilities. Road markings that delineate disabled parking bays are well-maintained to help prevent abuse from able-bodied car users.

6.5.2 Maintaining Markings on Bus Routes

Road markings along bus routes are well-maintained to promote the free flow of bus services. Particular attention is paid to yellow hatched 'keep clear' areas at junctions as well as markings that delineate bus lanes to prevent abuse by motorists.

6.6 Traffic Signals

Traffic signals that control traffic at major junctions can also incorporate controlled crossings for pedestrians and cyclists. Controlled crossings can also be located where there are no traffic signals to provide safe crossing points.

Controlled crossings can be pelican, puffin or toucan type crossings. Pelicans provide controlled crossings for pedestrians only and offer the pedestrian a certain time period to cross the road. Toucans provide similar facilities but include provision for cyclists as well. Puffin crossings are for pedestrians only and these include detectors that keep traffic on a red light all the while the pedestrian is using the crossing.

6.6.1 Facilities for the Mobility Impaired

Currently 95% of the controlled crossings in Kent include facilities for users with impaired mobility. These facilities include red tactile paving arranged in an 'L' shape to direct the partially-sighted to the control point, and tactile indicators for those that cannot hear when an audible tone indicates it is safe to cross. Controlled crossings are also provided with flush dropped kerbs over the full width of the crossing to aid access by wheelchair users. The design of new pedestrian signals incorporates technology that detects pedestrians approaching and automatically activates the signal in favour of the pedestrian.

The performance of signalised pedestrian crossings in helping users with impaired mobility is measured through BVPI 165 which counts the number of controlled crossings with facilities for disabled people.

In addition, the use of new technology in new crossings contributes to Kent's commitment "to give pedestrians priority on arrival when designing new pedestrian crossings."

6.6.2 Inspections

Inspection frequencies are based on Department of Transport advice for trunk roads and motorways. This requires monthly checks on all traffic signal approaches to sites with speed measuring equipment (i.e. sites where the 85 percentile approach speed is in excess of 35mph) and at all sites where there are regulatory box signs. Approximately half of all traffic signal sites are included in this category. Urban locations (within 30mph speed restrictions) require a minimum three monthly inspection regime but monthly where there are regulatory box signs.

The current monthly inspection regime meets the needs for insurance claims and evidence for court hearings has proved to be adequate for legal purposes. In view of the high proportion of sites requiring monthly inspections, there is considerable benefit in maintaining only one inspection frequency rather than attempting to carry out two regimes with resultant high travelling costs.

6.7 Street Lights

The two clear objectives of safeguarding the user and maintaining the asset apply equally to street lighting maintenance. In the case of street lighting, the objective of safeguarding the user has the additional aspect of safeguarding against crime and the perception of being safe from crime.

The objective of safeguarding the user has the additional benefit of community safety and is partly achieved through street lighting maintenance that includes:

- routine inspections every 14 days
- electrical testing
- replacement of failed components
- cleaning and servicing

It is Kent's regime of inspections that contributes to our commitment to the public to "routinely inspect the condition of streetlights."

Maintenance also includes the cost of the electricity consumed by the lamps and control gear, and works necessary to repair third party accident damage and vandalism.

Street lighting maintenance is carried out in Kent through a performance contract. Performance contracts allow the contractor to maintain as long as the performance criteria specified in the contract are met.

In order to achieve target standards of performance and completion times, the contractor initiates, maintains and reviews an approved system of scouting to detect faults and to plan maintenance activities and will, as a minimum,

involve inspecting 100% of the illuminated street furniture every fortnight. KCC audits this system through the highway units.

General maintenance includes the identification of outages, routine repairs or replacements, bulk lamp changes, cleaning, servicing, and testing. Repairs or replacements required following vandalism or accident damage are categorised as special maintenance.

A summary of intervention and response standards and bulk lamp change frequencies is shown in table 21:

Table 21 – Street Light Intervention and Response Standards

Description	Intervention	Response
Dual carriageway roads with lamps in the central reserve subject to a speed limit above 40mph	When 10% of lamps in any one kilometre length of road, or three adjacent lamps, are out of lighting	Repairs are assessed within 10 days from notification to the contractor and repaired within 24 days.
All other roads	Any lamp out of lighting	Repairs are assessed within 7 days from notification to the contractor and repaired within 21 days.
Bulk lamp change	Every three years	

At the time of bulk lamp change, lamps are replaced with the latest energy-efficient unit appropriate for the location. This in turn reduces the overall wattage of the street light infrastructure necessary to minimise the energy bill. The countywide lamp circuit wattage is measured through performance indicator 180b that compares our average lamp circuit wattage with the average consumption/wattage for local authorities in the UK.

Street lighting lanterns, illuminated signs and gazetteer references on all street furniture are cleaned at the times of the bulk lamp change.

Illuminated bollards are cleaned internally and externally at the time of the annual bulk lamp change. Additional external cleaning is carried upon an engineers' instruction.

Streetlights, illuminated signs and bollards are serviced at the time of bulk lamp change. Electrical safety tests are carried out at six yearly intervals. In addition, informal visual inspections are carried out at every column visit.

6.8 Bus Shelters and Flag Posts

There are approximately 2,000 bus shelters and 8,000 flags either on posts or lamp columns across the county, although the exact number, location and condition are not known. Table 22 summarises the current position.

Table 22 – Bus Shelters – Types and Current Activities

Type of Shelter	Current Maintenance Activity
Urban advertising shelters	Maintained by Adshell as part of the advertising contract with the district council. These are primarily urban shelters.
Parish shelters	Installed in partnership with parish councils and owned by the parish who retains maintenance liability
KCC bus shelters	Primarily in rural areas the maintenance is undertaken on a very ad-hoc basis
District bus shelters	Bus shelters owned and maintained by district councils
Flags and Posts	Both in urban and rural locations repairs are funded via the public transport manager

It is recognised that the use of public transport will be encouraged through the provision of well-maintained shelters and flag posts. Bus shelters and flag posts are therefore included in the regime of safety inspections so that emergency or urgent repairs are completed by the term maintenance contractor in accordance with all other hazard repairs.

In addition, highway units identify and include a discrete item for shelter replacement/improvement as part of their annual maintenance bid. In addition, where highway improvements take place, consideration is given to improve/enhance the bus infrastructure (including the shelter) as part of the scheme. Maintenance would be funded from the capital allocation.

6.9 Summary of Interventions

A summary of inspection, cleaning and replacement frequencies is shown in table 23:

Table 23 – Aids to Movement Inspection, Cleaning and Replacement Frequencies

Aids to Movement	Inspection Frequency	Cleaning Frequency	Replacement Frequency
Safety fencing	As for roads	N/A	N/A
Pedestrian guardrails	As for pavements	N/A	N/A
Road studs	As for roads	N/A	Needs basis
Road markings	As for roads	N/A	Needs basis
Non-illuminated signs & bollards	As for roads	Every three years	Needs basis
Illuminated signs & bollards	Fortnightly patrol	Every three years	Needs basis
Street lights	Fortnightly patrol	N/A	Needs basis
Bulk lamp change	N/A	N/A	Every three years
Traffic signals and controlled crossings	Monthly	N/A	Needs basis

The interventions recommended in the Code of Practice for Maintenance Management for aids to movement are summarised in Table 24:

Table 24 – Code of Practice Interventions for Aids to Movement

Aids to Movement	Inspection Frequency	Cleaning Frequency	Replacement Frequency
Safety fencing	Every five years for mounting height and integrity, every two years for tensioning bolts.	N/A	N/A
Pedestrian guardrails	As for pavements	Cleaned and painted when necessary	N/A
Road studs	As for roads	N/A	Performance standard
Road markings	As for roads	N/A	Performance standard
Non-illuminated signs & bollards	As for roads	When required	Painting of supports and frames when required or every 10 years plus review of signing regime every three-five years
Illuminated signs & bollards	Fortnightly patrol	Every year plus optical inspection and cleaning with inspection of sign supports every two years	Painting of supports and frames when required or every 10 years plus review of signing regime every three-five years
Street lights	The code refers to the Code of Good Practice for Road Lighting and Maintenance for standards for condition of street lighting.		
Bulk lamp change	N/A	N/A	In accordance with the Road Lighting Code
Traffic signals and controlled crossings	Monthly	Signal lenses should be cleaned once per year	Reactive

7 Structures

7.1 Objectives and Standards

The county council seeks to ensure that all new or replacement structures affecting the county highways in Kent are built to relevant standards, that its own structures are kept in a good serviceable condition and that other structures affecting the county's highways are similarly maintained. This is necessary to meet the statutory obligation to maintain the public highway and is all in the best interests of public safety, structural integrity and availability to all traffic with the aim of 'keeping Kent moving'. In doing this work care must be taken to protect our rich heritage of structures and be sensitive to the environment in which they are situated.

The Bridge Management Team is accountable for delivering these objectives on those structures within its stewardship and this is achieved by:

- Inspecting every structure on a predetermined cycle to assess and report on its condition and the nature and extent of remedial work required. The return cycle is commensurate with the form and condition of each structure
- Undertaking routines of special underwater and boat inspections and flood and post flood inspections on pre-selected bridges
- Repairing hazardous defects quickly
- Carrying out special investigations and structural assessments where identified to complement routine inspections
- Prioritising remedial works by taking into account the nature and extent of the defect and the importance of the bridge and route it carries
- Upgrading structures where appropriate to meet changing demands and/or standards
- Procuring and managing engineering consultants and contractors to prepare and carry out the works
- Implementing programmes of work and managing related budgets
- Setting and monitoring standards for design and construction of both new structures and maintenance works
- Recording the design, construction, inspection and maintenance of all highway structures and maintaining the related records system
- Assessing, through technical approval and maintenance audit, the acceptability of any proposed works by any party on existing or new structures, above, below or abutting the county highway
- Seeking to ensure that other bridge owners meet their obligations to the travelling public
- Reviewing achievements against aims and comparing with other authorities in the south to assess performance and invoke change where necessary

In carrying out these activities the aim is always to seek to minimise disruption to the travelling public and to conform to corporate economic and environmental policies and strategies as appropriate.

Inspection, consultation and design processes are Quality Assured activities operated by our engineering consultant.

There are as yet no national performance indicators (PIs) for bridgeworks although there is much work being done through the CSS (formally known as County Surveyors Society) Bridges Group and the national Bridges Board and Bridge Owners Forum to do this and Kent has played/is playing its part in this work. A code of good practice is also being developed. Meanwhile a number of local PIs are used to review performance covering:

- The bridge inspection programme.
- Delivery of schemes within agreed works windows.
- Cost outturns in relation to estimates.
- Progress on the strengthening programme; and
- Progress with dealing with the backlog of structural maintenance.

The structures management system operated in Kent also provides for a quantitative comparison of the condition of the structure stock with time to assist in directing funding. This is in its infancy and we are still learning how best to use it. It is also about to be overtaken by a national inspecting/reporting/condition index system, which CSS are developing and which is modelled on the KCC system.

Finally, there is a benchmarking group, chaired by KCC, comprising several shire counties in the south of England which meets thrice a year and from which useful feedback to aid comparison of intent and performance is being amassed. As a result, we have implemented a change in our inspection regime.

7.2 General

A highway structure is any bridge, subway, culvert, pipe, tunnel, manhole, chamber, wall, reinforced soil embankment, piece of street furniture, building or other structure built in, over, under or adjacent to any part of a county highway, and which materially affects the support of that highway and/or the safety of the travelling public. A county highway is one for which Kent County Council is the local highway authority. KCC is responsible for two tunnels, one in Ramsgate and the second in Chestfield.

The responsibility for highway structures is split between bridge management and the highway units and this is detailed in guidance included in the HMRB. However, a simple rule of thumb is the highway units deal with culverts with a span of 900mm or less and walls with a retaining height of less than 1.4m. The PROW Unit manages structures on Public Rights of Way that don't impinge on county roads.

There are as a result approximately 2,700 KCC structures (with a replacement value estimated at £480million) within the remit of Bridge Management (BM) and a further 1,200 owned by others with which the team is routinely involved in the interests of public safety. For the purpose of managing this large stock of structures they have been categorised as follows:

01 Retaining wall
02 Culvert <= 0.9m span
03 Minor bridge 0.9 – 3m (to be replaced by categories 11 & 12)
04 Pedestrian subway
05 Footbridge (not PROW)
06 Main bridge > 3m
07 Viaduct/tunnel
08 PROW structure
09 Miscellaneous structure
10 Non conforming structure
11 Culvert 0.90 – 1.49m
12 Minor bridge 1.50 – 3m

The general priority for investing in inspection and maintenance works is as in table 25:

Table 25 – Priorities for Inspecting and Maintaining Structures

Category	Type of Work	Priority	Examples
1. Inspections	Routines of inspections to monitor condition and identify remedial action	Work is to pre-established routines depending upon condition and form	• General • Principal • Special
2. Operations	Routines of maintenance essential for the safe use of the structure irrespective of structural condition.	Work is on an annual or shorter cycle.	• De silting culverts • Provision and maintenance of height and weight restriction signs (by highway units) • Clearing drainage systems • Opening and closing moving bridges • Maintaining pumps and lighting in subways (by highway units)
3. Protection	Routines of maintenance arising out of normal wear and tear andessential to keep the structure in good condition at all times. Good housekeeping combined with a 'stitch in time saves nine' philosophy.	Work is on a longer return period generally based on a predicted service life amended only if inspections show an earlier intervention to be necessary. (including resurfacing of carriageways). To this are added minor works where early intervention would prevent progressive deterioration.	• Repainting • Repointing • Re-waterproofing • Minor concrete repairs • Resurfacing • Anti-scour works • Replacing bearings • Localised brickwork repairs • Parapet Repairs
4. Strengthening And structural maintenance	These works generally arise out of a failure to do 2 and/or 3, shortfall in design or construction, old age, change in use or change in standards. Generally these form a backlog of work which is prioritised and programmed but occasionally more urgent action is needed which necessitates a change in planned programmes.	Work is prioritised scheme by scheme based on a quantitative method which takes account of the nature and seriousness of the defect, route importance (both strategic and local) assessed strengths and any other external influences which may affect the timing and/or nature of the scheme.	• Extensive concrete or masonry repairs • Underpinning • Redecking • Partial reconstruction • Strengthening • Upgrading elements to current standards • Widening structure • Replacement/full reconstruction • Flood relief measures

In prioritising expenditure against the various activities, the costs of inspections, operations and protection must be met, while strengthening and structural maintenance should be met.

Problems arise when the cost of (4) prevents a proper programme of (3) being carried out which generally results in some local improvements being achieved but at the expense of an overall deteriorating network.

Obviously in many cases the extent of deterioration in (4) becomes a safety issue and the work becomes unavoidable. However, notwithstanding this, investment in (3) is critical to reducing any maintenance backlog as it prevents progressive deterioration.

We must therefore establish an annual adequate budget for this protection work to be maintained in real terms year-on-year. Such work includes waterproofing, repainting, repointing and normal routines of resurfacing. This allows the strengthening programme to be funded on a needs-basis, with strict criteria being identified, for inclusion in any one year. That must be carefully followed, the county council must fund it and the operations and protection budgets must be protected.

A recent document by the CSS on 'Funding for Bridge Maintenance' identified an annual investment of 1% of the replacement cost of the structure stock as being a sensible level of budget for bridge inspection and maintenance once the backlog of structural maintenance is cleared.

7.3 Inspections

A regular routine of inspection is essential to maintaining structures and protecting public safety to identify early any defect requiring attention. For those under the remit of bridge management trained artisans, technicians or qualified engineers, as appropriate, employed by KCC's engineering consultant, manage and carry out these inspection programmes. There are three main levels of inspection namely:

General Inspections, which are undertaken on all structures owned by KCC on a maximum two-year cycle. This has been changed from the original 15 month cycle following benchmarking with other south east councils and evidence from past inspections and has freed inspectors to undertake other special exercises and essential training. This cycle is varied in certain cases where more frequent inspections are required, such as:

- Cast iron or weight restricted bridges which are inspected on a six month cycle
- Bridges where condition or assessment rating require more frequent visits

Principal Inspections, which are undertaken to all main structures (categories 4, 5, 6, 7 and some miscellaneous types) on a 10 - 15 year cycle. A principal inspection is one that requires close inspection of all parts of a structure, generally by a chartered engineer, which often requires lane closures and the use of special access equipment.

Special Inspections, which are carried out as necessary and which arise from a number of sources including:

- Boat inspections of river bridges as part of the routine of general inspections
- Annual underwater inspections of all main river bridges and other bridges where there is concern about potential scour
- Following accidents
- As a result of significant or uncertainty about defects found during the normal routines of inspection
- During and following floods

Additionally, general structural inspections are carried out of the accessible parts of structures owned by Network Rail and other 'Private' owners where there is reason to have some doubt about the veracity of inspection in relation to the users of the county road. This does not extend to structures owned by the Highways Agency and London & Continental (L&C) (who own subsidiaries Union Rail South (URS) and Union Rail North (URN) who maintain the new Channel Tunnel Rail Link), who are accepted as having robust inspection procedures in place including the interface with the county highway.

However, because of the County Council's responsibility for surfacing on bridges owned by others and for general public safety on county roads, ALL sites, whether KCC owned or private, including HA and L&C, are included in the safety inspections carried out by the Inspectors in the highway units on county roads in their districts.

Other structure owners are informed when significant defects are noted and action taken in default when necessary. The essential approach is safety first.

7.4 Scheme Development

KCC's engineering consultant undertakes all scheme preparation, approvals and supervision under the overall management of the KCC Bridge Management team. This work includes:

- Prioritisation using the in-house system which embraces existing strength deficiencies, nature and extent of fault and importance of the route involved

- Consultations with affected and interested parties and statutory bodies
- Complying with national standards and recommending local departures/enhancements where appropriate
- Seeking to introduce innovation and provide sustainable solutions
- Deliver best value
- Maximise flexibility of use of resources to the term contractor

All this is covered by a generic brief supplemented by specific briefs for each job from the client.

7.5 Programming

Bridge Management's consultant has Area Bridge Engineers (one each for West Kent, Mid Kent and North East Kent). They meet the highway unit manager at least twice a year (prior to the bids being made, and again once budgets are confirmed) to rationalise the planned work of both parties and also attend the NRSWA co-ordination meetings.

7.6 Technical Approval and Development Control

Technical approval from KCC is required for the design, detailing and construction of any defined highway structure. This applies without exception and regardless of promoter whether it be KCC, the strategic highway authority, Network Rail, district council, parish council, a private individual, or private company (including Statutory Undertakers under the NRSWA) etc. There are two sources for technical approval of structures - Bridge Management and the local highway unit - and a detailed breakdown is given in guidance included in the HMRB. KCC determines the level of technical approval required.

For structures within the remit of Bridge Management, the bridge management team of KCC's engineering consultant carries out the procedure.

This process ensures that the resulting structure is:

- Designed to the latest codes of practice
- Independently checked
- Maintainable

For structures built as part of a development and which are to be adopted into the highway maintainable at the public expense, a commuted sum for future inspection, maintenance and eventual replacement is sought from the developer.

7.7 Performance Review

Performance can only be measured by:

- Being clear what the aims are both during the works and upon completion of them
- Measuring outcome upon completion and performance during its life
- Seeking feedback from all concerned

Clarifying the Aims

- Advising the public
- Controlling the traffic
- Purpose of doing the work
- Life expectation of the work
- Time for completion

Measuring Outcome

- Quality of finished product inc. workmanship, suitability for function and visual appeal
- Performance after one year (first principal bridge inspection)
- Performance after four years (second principal bridge inspection)
- Life to first intervention
- Life to replacement

Feedback

- From designer on performance/demands of client
- From engineer on adequacy of contract documents (coverage and buildability)
- From contractor – ditto
- From engineer on performance of contractor
- From contractor on performance of engineer
- From locals on advance and continuing publicity by post-job questionnaire
- From highway unit audits/police feedback on traffic delay/disruption
- From complaints received
- Contract completion achieved

There is a formal scheme debrief/feedback process to bring all these issues together for works in excess of £100k and other selected schemes.

7.8 Special Points for Highway Units to Note

Safety inspections by highway inspectors must include inspecting and reporting on defects on those visible elements of structures on the road they are inspecting which pose a threat to public safety such as parapets, approach safety fencing, surfacing and expansion joints.

Highway units are responsible for maintaining the surfacing on all bridges owned by others and must be the first line of defence on those under the remit of Bridge Management. They are also responsible for the maintenance and replacement of lighting and drainage systems, including pumps, in subways owned by KCC. A more detailed breakdown of the demarcation of responsibilities at the interface with structures owned by others is given in separate guidance included in the HMRB.

There must be a presumption against the ability to overlay surfacing either under or over any bridge. Such a request has serious implications for clearance and strength respectively which must be considered fully before any such approval is given and then that will only be in a small minority of cases. Where such an approach is sought early consultation with the area bridge engineer as to its viability is essential.

No work to the surfacing on or under a bridge, whether resurfacing or surface dressing, can be undertaken without prior consultation with and approval by the area bridge engineer except in an emergency. Equally, in any resurfacing job, it is wrong to omit the bridge from the programme. It is essential in such cases that early consultation takes place with the area bridge engineer so that any preparatory work at the bridge can be included or undertaken in advance.

The maintenance of headroom and weight limit signs, as with all other road signs, is first and foremost the responsibility of the highway units.

Banners on bridges over or alongside the highway are not permitted in any circumstances as they present a real and avoidable hazard to and distraction for motorists. As such, they must and will be removed if found.

7.9 Tunnels

Kent County Council is responsible for two tunnels, Chestfield tunnel on the A299 Thanet Way at Whitstable and Ramsgate tunnel on the A299 on the approach to Ramsgate harbour.

Tunnel maintenance consists of two clear objectives: safe operation and the maintenance of the asset.

Both tunnels have fully automated systems, which feed into the control building at Ramsgate. An external contractor monitors these systems together with the CCTV cameras on a 12-hour shift basis, 24 hours a day over 365 days a year. These operatives are trained in the use of the equipment and play a vital role in supporting the emergency services in the event of an accident. In the event of any problems they report direct to the nominated tunnel manager, who has day to day operational responsibility for the tunnels.

The maintenance and operation of the tunnels generally follows the recommendations in the Highways Agency documents:

BD 78/99 Design of Road Tunnels
BD 53/95 Inspection and Record for Road Tunnels
BA 72/03 Maintenance of Tunnels.

The tunnels contain extensive interactive systems of electrical, mechanical and computer equipment which has to be maintained at regular intervals to ensure its efficient and continued operation for the safe use of the tunnel by the public.

Planned maintenance will generally be carried out at three, six or 12 monthly intervals and different tasks will be carried out at those times:

- THREE-MONTHLY MAINTENANCE generally consists of cleaning, checking the operation of the plant and calibration of tunnel sensors

- SIX-MONTHLY MAINTENANCE consists of specific requirements needed for certain items of plant such as checks on air conditioning plant and valve operation on pumps

- 12 MONTHLY MAINTENANCE consists of replacing components, earth integrity checks, electrical terminal checks, gully cleansing, enhancement of road markings and checks required by electrical regulations.

Each of the tunnels has slightly different requirements due to differences in equipment and the actual structure itself. The actual regime is based upon the requirements of the equipment suppliers as set out in the operation and maintenance manuals provided by the original tunnel designers and contractors. These recommendations are reviewed and amended based upon experience of the performance of the plant and the manufacturers' recommendations.

Failures of equipment can happen at any time between planned maintenance checks. In responding to alarms a fault diagnosis is carried out and a risk analysis is carried out to determine if the fault can be carried out during normal planned maintenance. Specialist contractors carry out all repairs and maintenance.

All planned maintenance is carried out during tunnel closures for safety reasons. These closures are pre-arranged for each year. Additional closures can be arranged for emergency purposes.