



# Commuted Sums Levied For Traffic Signals

September 2014



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# Issue and revision record

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# 1 Introduction

In November 2009 a guidance document was produced by Shropshire County Council on behalf of the County Surveyors Society (CSS) (now ADEPT) entitled “Commuted Sums for Maintaining Infrastructure Assets”. This document outlined advice, procedures and principles for Local Authorities and their Highway Authorities to follow, the aim of the CSS guidance document was to establish good practice and to offer a transparent and consistent approach to commuted sums. It believed the clarity of approach should help remove the uncertainty and risk for developers at an early stage in the process. The majority of Local Authorities agreed that the CSS guidance document should become best practice and it was widely adopted, usually through Cabinet approval. The document has been widely adopted by authorities, and has been broadly welcomed and deemed a success at setting the procedures and principles required for clarity in the assessment and collection of commuted sums.

In the following years the guidance has been implemented across the country although some issues have been raised regarding the calculation method and levels of commuted sums levied. The Traffic Systems Group is one such group which has raised concerns. Mott MacDonald was therefore commissioned by the Traffic Systems Group to produce a short paper, mainly focusing on issues arising from the development of commuted sums on traffic signal schemes; however, these issues may be common across other disciplines.

## 1.1 Background

S278 of the Highways Act 1980 provides for a developer to enter into an agreement to secure the carrying out of works to the public highway, provided that the highway authority is satisfied that the works will be of benefit to the public, and for the developer to pay all or part of the cost of those works. Sub-section (3) provides

“The agreement may also provide for the making to the highway authority of payments in respect of the maintenance of the works to which the agreement relates and may contain such incidental and consequential provisions as appear to the highway authority to be necessary or expedient for the purposes of the agreement.”

## 1.2 General

Commuted sums support the maintenance and replacement of highway infrastructure assets in respect of additional infrastructure which are only being provided as a result of new development. Without commuted sums the local highway authority will need to fund the maintenance and future replacement of these assets. Developer funds are not intended to fully cover the whole life cycle costs but to contribute towards these costs. Whatever process is used to determine the commuted sums, the process must be robust, auditable and transparent.



## 2 Review of Approaches to Commuted Sum Development on Traffic Signals

Warwickshire County Council (WCC) initially contacted over hundred Authorities on their approach to commuted sum development on Traffic Signals and the response rate was excellent. A high percentage said that they would welcome a guidance note on this issue. A review of the various Authorities' methodologies and existing CSS guidance was then undertaken by Mott MacDonald and WCC. It was noted that the majority of Authorities have adopted and followed the CSS guidance. However some have either diverged from the principles or, due to lack of specific detail in the guidance, have developed their own processes and procedures.

These Authorities were then either approached by the Traffic Systems Group for information, which they then provided, or the information was openly available on the internet. The following sections discuss the findings of the review.

The main focus of this guidance note will be around the application of commuted sums resulting from developments. The CSS guidance document notes there is specific provision in S278 (3) of the Highways Act 1980 for payments for the maintenance of the works, and this may be applied by the highway authority if it chooses to. The CSS guidance document also states that commuted sums are therefore considered lawful and should be used for the associated capital and revenue costs for the ongoing maintenance and replacement of the assets, in this case traffic signal junctions and pedestrian crossings. Further detail regarding legality and background is provided in the CSS guidance document.

### 2.1 Discounting and Ring Fencing

One of the key principles outlined in the CSS document is the 'discounting' of a commuted sum. Commuted sums are paid upfront and therefore need to be discounted to allow for the fact that they will be earning interest which will make up part of the maintenance payment when it is required. Some of the benefit provided by gaining interest is offset by inflation of maintenance costs. The CSS guidance includes, for the purpose of calculation of commuted sums, a recommendation for inflationary values and interest rates. These rates, 2.25% inflation and 4.5% interest, in the current economic climate do not appear in the short term to be realistic, therefore the inflation and interest rate should be reviewed on a regular basis, perhaps annually or bi annually. Each Authority therefore needs to review their individual circumstances and define what assumptions should be made. This depends on Authority accounting assumptions on ring fencing the commuted sum funds and interest that can be gained. It also depends on the consequence of over optimistic values for interest and inflation and the effect on the Authorities' budgets.

Following a review of accounting procedures and financial exposure to risk, one Authority adopted an initial set of prudent assumptions, then as the calculation period progresses, has made more optimistic assumptions. The inflationary rate was set at the government's long term aim of 2% and started the interest rate at the Bank of England Base Rate of 0.5%. The inflationary rate is then kept constant and the interest rate is stepped up over the assessment period. This was implemented in order to accommodate the current economic climate, whilst balancing exposure to financial risk.

As the commuted sum calculation is very sensitive to small changes in discounting assumptions, it is critical to ensure the most appropriate values are chosen. The CSS guidance should be reviewed to address this issue in order to ensure the most robust methodology for commuted sums is adopted. In the interim, local guidance should be produced by Local Authorities to ensure a transparent approach is demonstrated.

During the reviews of Local Authority current practices, it became apparent that Authorities that were charging commuted sums were managing the funds effectively; in the long term this will lead to better asset management. The whole commuted sum process encourages and facilitates the whole life cost process. It is essential that an accounting mechanism are put in place (ring fencing) in order to safe guard the funds for the future maintenance of the assets.

## **2.2 Commuted Sum Period**

The CSS guidance recommends a 60 year period for calculating commuted sums for highways schemes (excluding structures which have a 120 year period). A number of Authorities have been concerned about the potential burden put on developers by this requirement and have reduced this to 25 years. This appears to be a good compromise which safeguards the maintenance of the highway without overburdening and putting off developers from investing in their areas. Others have gone further and reduced this to 15 years in line with the expected life of some assets such as elements of traffic signal infrastructure. This decision needs to be made by the Local Authority based upon their individual circumstances relating to budgets and their appetite for encouraging development.

The following are options for commuted sum periods for the Local Authorities to consider;

- 15 years maintenance plus an option for one refurbishment/renewal
- 20 years maintenance plus an option for one refurbishment/renewal
- 60 years maintenance plus an option for three refurbishments/renewals

The CSS guidance should be reviewed to address this issue in order to ensure the most robust methodology for commuted sums is adopted. In the interim, local guidance should be produced by the Local Authorities to ensure a transparent approach is demonstrated.

## **2.3 Maintenance and Cost Assumptions**

Commuted sums are based on projected future maintenance costs; however, the way that maintenance is managed and procured varies from Authority to Authority. Therefore the CSS guidance document does not include any information on cost. The cost information should come from the Local Authorities' current maintenance contract rates. The review of Authority approaches confirmed there was a large variance in commuted sums levied for signal schemes varying from £0 to over £100,000. It was also noted that the methods of calculation did not always take account of the size of the signalised junction or pedestrian crossing. This can considerably affect the maintenance costs from both operational and programme replacement aspects and therefore the commuted sum should reflect this. Using the 'average commuted sum' approach on smaller signal sites may unnecessarily burden the developer, but on larger sites be

advantageous to the developer. This does not reflect the clarity intended by the CSS guidance document.

The different types of contract arrangements clearly affect how commuted sums are calculated and consequently a variety of methods of calculation were noted in the review. The variance in contract types and access to information regarding maintenance costs varies and this means that a standard approach to calculating commuted sums could not be applied across all Authorities. On long term contracts where the change control mechanisms within the contract are well defined, the maintenance costs can be broken down into individual elements e.g. pole, controller, etc. An example of this is given in Appendix A. This type of information may not be available for the majority of Authorities; therefore they will have to develop a unique methodology. This should be included in the local guidance produced by Local Authorities to ensure a transparent approach is demonstrated.

The cost of maintenance and the associated effect on commuted sums needs to be reviewed on a regular basis to ensure that the calculation reflects realistic costs. This review should be done on an annual basis and take into account any change of maintenance contract arrangements, including indexation of maintenance contracts.

A number of Authorities have produced a catalogue of commuted sums in order to provide clarity to developers, an example is shown in Table 2.1 below. However for traffic signals, these Authorities simply note that a scheme specific calculation needs to be made. This is due to the site specific nature of traffic signals schemes. However Local Authorities should consider producing a catalogue of commuted sums for different types, sizes and complexity of traffic signals as shown in Table 2.2.

**Table 2.1: Typical Catalogue of Commuted Sums format (commuted sum shown for illustrative purposes only)**

Bollards	Measure	Commuted Sum
Steel Bollard	Per Item	£300
Concrete Bollard	Per Item	£200
Wooden Bollard	Per Item	£400

**Table 2.2: Suggestion for Catalogue of Commuted Sums for Traffic Signals and Pedestrian Crossings**

Traffic Signals	Measure	Commuted Sum
Small Signalised Junction (up to 8 phases)	Per Item	£x
Medium Signalised Junction (up to 8 to 16 phases)	Per Item	£x
Large Signalised Junction (greater than 16 phases)	Per Item	£x
Puffin Crossing	Per Item	£x
Toucan Crossing	Per Item	£x

### 2.3.1 Outline for Commuted Sum

The Authority should be as transparent as possible in its approach to commuted sums. To this end, it should adopt its own policy setting out how it will calculate commuted sums, what items of costs will be included, e.g. is it just maintenance or does it include replacement at the end of the life –cycle, the period over which the commuted sum has been calculated, the assumptions which will be made about interest

which will be earned on the sums and how inflation will affect the cost of the maintenance, and how the commuted sums will be ring-fenced and used.

For traffic signal junctions and pedestrian crossings, which have a shorter life than most other infrastructure, it will be important to make clear the number of planned replacements included. Each developer should then be provided with a (provisional) figure for the commuted sum for the particular works which are subject to the S278 agreement before development commences (noting that this may vary during development if there are amendments to the scope of the works).

The commuted sum calculation includes allowances for;

- Operation maintenance;
- Programmed maintenance;

Appendix B reproduces an example form for calculating commuted sums. This form is currently used by one local authority.

### 2.3.1.1 Operation Maintenance

Operation maintenance is an annualised value and includes items such as inspections, cleaning, and reactive repairs, where it has not been possible to identify debtors.

### 2.3.1.2 Programmed Maintenance

The programmed maintenance element is made up of various planned maintenance interventions/replacements, for example signal head replacement. The type of intervention, the timing of the intervention and the cost of intervention will be required to calculate the commuted sum.

For example if the whole signal installation was assumed to require replacement after 15 years and the replacement cost was £50,000 then a calculation could be made on this basis using the methodology outlined in Appendix 6 of the CSS guidance document.

### 2.3.1.3 Cost of Communications

Traffic signal installations that are linked to the Authority's Urban Traffic Control System (UTC) or Remote Monitoring System (RMS) have a direct impact on the revenue costs which are outside the general maintenance costs. It is therefore essential that during the design stage the impact of any proposed scheme on the revenue costs needs to consider issues such as how the signals infrastructure is being connected to the Authority's UTC / RMS system, this evaluation is likely to drive down whole life costs and facilitate the use of better long term value for money solutions. One approach is to use Wi-Fi / Mesh and/or an annual SIM card subscription, which is cheaper compared to the annual cost of telecom line rental and more suited to less strategic sites. The alternate strategic approach is to provide a single telephone / ADSL link to a signal infrastructure node with Wi-Fi capability to adjacent infrastructure. The Authority could seek an agreement from the developer for funding the annual cost associated with communications to be included within the commuted sums.

### 2.3.1.4 Cost of Electricity

On-going electricity costs are another burden to the Authority's revenue budget. It is essential that during the design stage the impact of any proposed scheme on the revenue costs needs to consider issues such as the use of LED type equipment and implement extra low voltage equipment options. The Authority could also seek an agreement from the developer for funding the annual cost associated with electricity to be included within the commuted sums.

### 2.3.1.5 Section 278 Agreement

The S278 agreement itself should include details of the calculation of the commuted sum and a brief description of the purposes for which it is to be used. It will be for each Authority to determine, in consultation with its legal advisers, how to do this for its own agreements.

## 2.4 Need for guidance documents

It was observed that some Authorities have developed excellent local standards and guidance for commuted sums, whereas others have limited documentation. It is recommended that each Authority ensure that a transparent approach to commuted sums can be demonstrated to developers

## 3 Conclusions

### 3.1 Proposed Best Practice Approach

The review of various Local Authorities' methodologies and implementation of commuted sums has confirmed that the CSS guidance document is an excellent basis for calculation of commuted sums. When Authorities have followed the process and principles outlined in the CSS document and added local supplementary guidance, a robust, auditable methodology has been demonstrated. There are however some small areas for improvements, mainly due to a change in economic conditions. The following are recommendations that Local Authorities should seek to take action:

- Authorities should implement the guidance in the CSS "Commuted Sums for Maintaining Infrastructure Assets" guidance document.
- Ensure there is an auditable process developed for implementation of commuted sums.
- Authorities should consider a supplementary local guidance document outlining policy and/or procedures for implementation of commuted sums including the following:
  - Definition of how the commuted sums will be calculated.
  - Assumptions on inflationary and interest rates.
  - Define assessment period for commuted sum calculation and reasoning from divergence from CSS guidance document.
  - Definition of which elements of schemes will and will not be subject to a commuted sum.
  - Establish baseline of maintenance costs which feed into the commuted sum calculation.

### 3.2 Suggestions for Further Work

This paper is intended to raise issues for further discussion and gather current practice of implementation of commuted sums from a variety of Local Authorities.

The recommendations for further work include:

- Provide update to CSS Commuted Sums for Maintaining Infrastructure Assets guidance document and revisit specific sections including considerations of:
  - Period of commuted sum assessment.
  - Inflationary and interest rate assumptions.
- Gathering maintenance data for traffic signals to establish benchmarks similar to those produced by Mott MacDonald, which are contained in **Appendix C**.

### 3.3 Summary of Issues and Actions

Table 3.1: Summary of Issues and Actions

Issue	Action	Owner
Inconsistent methods of calculation with regard to maintenance assumptions	1. Produce local guidance	1. Local Authority
Inconsistent length of calculation period	1. Review CSS guidance document assumptions	1. ADEPT & TSG
	2. Produce local guidance	2. Local Authority
Items for which commuted sums are levied	1. Produce local guidance	1. Local Authority
Discounting assumptions and accounting mechanisms	1. Review CSS guidance document assumptions	1. ADEPT & TSG
	2. Produce local guidance	2. Local Authority
Inconsistent approach to calculation periods	1. Review CSS guidance document assumptions	1. ADEPT & TSG
	2. Produce local guidance	2. Local Authority
Concern on lack of ring fenced approach	1. Review CSS guidance document	1. ADEPT & TSG
	2. Produce local guidance	2. Local Authority
Some Authorities do not levy commuted sums	1. Produce local guidance	1. Local Authority

# Appendices



# Appendix A. Example Maintenance Costs Breakdown

## Commuted Sums Levied For Traffic Signals



Table A.1: Example Maintenance Cost Breakdown

Asset	Description	Unit	Operational Maintenance Cost (£/annum)	Number of Years Until Programme Intervention	Programme Cost of Intervention (£)
Traffic Signal Controller - up to 8 phase	Includes all components of Microprocessor Junction Controller – up to 8 phase, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Controller - 8 to 12 phase	Includes all components of Microprocessor Junction Controller - 8 to 12 phase, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Controller - 12 to 16 phase	Includes all components of Microprocessor Junction Controller - 12 to 16 phase, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Controller - 16 to 20 phase	Includes all components of Microprocessor Junction Controller – 16 to 20 phase, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Controller - 20 to 24 phase	Includes all components of Microprocessor Junction Controller - 20 to 24 phase, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Controller - 24 to 28 phase	Includes all components of Microprocessor Junction Controller - 24 to 28 phase, complete with Electricity Supply Pillar	Per Item			
Pelican Controller	Includes all components of Microprocessor Pelican Controller, complete with Electricity Supply Pillar	Per Item			
Pelican Controller - Dual	Includes all components of Microprocessor Pelican Controller - Dual, complete with Electricity Supply Pillar	Per Item			
UTC Outstation	Includes all components of Outstation Monitoring Unit / Remote Monitoring Unit, complete with Electricity Supply Pillar	Per Item			
Traffic Signal Pole – Straight Galvanised	Includes Galvanised Traffic Signal Pole shop painted	Per Item			
Traffic Signal Pole – Cranked Galvanised	Includes Cranked Galvanised Traffic Signal Pole shop painted	Per Item			
Traffic Signal Pole – Wide Base Galvanised	Includes Wide Base Galvanised Traffic Signal Pole shop painted	Per Item			
Traffic Signal Pole – Totem Galvanised	Includes 6.25m Totem Galvanised Traffic Signal Pole shop painted	Per Item			
Traffic Signal Pole - Swan Necked	Includes Swan Necked Galvanised Traffic Signal Pole shop	Per			

## Commuted Sums Levied For Traffic Signals

Asset	Description	Unit	Operational Maintenance Cost (£/annum)	Number of Years Until Programme Intervention	Programme Cost of Intervention (£)
Galvanised		Item			
Traffic Signal Head - 3 Aspect (RAG)	Includes 3 Aspect Traffic Signal Head (RAG), complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards painted.	Per Item			
Traffic Signal Head - 3 Aspect LED (RAG)	Includes 3 Aspect LED Traffic Signal Head (RAG), complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Traffic Signal Head - 4 In-Line (RAG+Box Sign)	Includes 4 In-Line Traffic Signal Head (RAG+Box Sign), complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Traffic Signal Head - 3 Aspect (RAG/RTIGA))	Includes 3 Aspect Traffic Signal Head (RAG/RTIGA) with side mounted Green Arrow complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Traffic Signal Head - 3 Aspect LED (RAG/RTIGA))	Includes 3 Aspect LED Traffic Signal Head (RAG/RTIGA) with side mounted Green Arrow complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Traffic Signal Head - 4 In-Line (RAG/RTIGA)	Includes 4 In-line Traffic Signal Head (RAG/RTIGA) complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Traffic Signal Head - 4 In-Line LED (RAG/RTIGA)	Includes 4 In-line LED (RAG/RTIGA) Traffic Signal Head complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets, Backing Boards	Per Item			
Pedestrian Traffic Signal Head - 2 Aspect	Includes 2 Aspect Pedestrian Traffic Signal Head complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets	Per Item			
Pedestrian Traffic Signal Head - 2 Aspect LED	Includes 2 Aspect LED Pedestrian Traffic Signal Head complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets	Per Item			
TOUCAN Traffic Signal Head	Includes TOUCAN Traffic Signal Head, complete with Aspects, Anti-vandal lens, Electrical gear and cabling, Hoods, Louvres, Brackets	Per Item			
PUFFIN / TOUCAN nearside Pedestrian Display and Demand unit (Combined)	Includes PUFFIN / TOUCAN nearside Pedestrian Display and Demand unit (Combined display and demand unit) complete with Anti-vandal wait panel, Electrical gear and cabling, Brackets	Per Item			

## Commuted Sums Levied For Traffic Signals

Asset	Description	Unit	Operational Maintenance Cost (£/annum)	Number of Years Until Programme Intervention	Programme Cost of Intervention (£)
PUFFIN / TOUCAN nearside Pedestrian Display and Demand unit (Separate)	Includes PUFFIN / TOUCAN nearside Pedestrian Display and Demand unit (Separate display and demand units) complete with Anti-vandal wait panel, Electrical gear and cabling, Brackets	Per Item			
PUFFIN / TOUCAN nearside high level head repeater unit	Includes PUFFIN/TOUCAN nearside display unit mounted at high level, complete with 'antivandal panel, electrical gear/cabling/brackets.	Per Item			
PUFFIN / TOUCAN ped demand unit	Includes PUFFIN/TOUCAN nearside demand unit with antivandal ABU/panel, electrical gear, cabling gear, and brackets and tactile unit.	Per Item			
PUFFIN / TOUCAN combined ped/display/demand unit with tactile and audible unit	Includes PUFFIN/TOUCAN ped display demand unit with tactile unit, but with audible unit complete with electrical gear/cabling/brackets.	Per Item			
Photo Electric Dimming Cell	Photo Electric Dimming Cell for above items complete with Electrical cabling, Brackets	Per Item			
Pedestrian Push Button Unit	Includes Pedestrian Push Button Unit complete with Anti Vandal Push Button Operator, Anti-vandal Pedestrian / Cycle Wait Panel, Electrical gear and cabling, Brackets	Per Item			
Pedestrian Push Button Audible Indicator	Includes item Pedestrian Push Button but with Audible Indicator complete with Electrical cabling, Brackets	Per Item			
Pedestrian Push Button but with Rotating Tactile Unit	Includes item Pedestrian Push Button but with Rotating Tactile Unit complete with Electrical cabling, Brackets	Per Item			
Pedestrian Push Button but with Audible Indicator and Rotating Tactile Unit	Includes item Pedestrian Push Button but with Audible Indicator and Rotating Tactile Unit complete with Electrical Cabling, Brackets	Per Item			
Above Ground Vehicle Detector	Includes Above Ground Vehicle Detector complete with all connectors and mounting bracket	Per Item			
On-crossing Above Ground Detector	Includes On-crossing Above Ground Detector complete with all connectors and mounting brackets	Per Item			
Kerbside Above Ground Detector	Includes Kerbside Above Ground Detector complete with all connectors and mounting brackets	Per Item			
Inductive vehicle loops	Includes slot cutting, supply and lay loop cable, connect to loop feeder, Test and Commission	Per metre			
Traffic Signal 16 Core Coloured Armoured Cable	Includes Cable - 16 Core Coloured Armoured Cable	Per metre			
Traffic Signal 16 Core White	Includes Cable - 16 Core White Numbered Armoured Cable	Per			

## Commuted Sums Levied For Traffic Signals



Asset	Description	Unit	Operational Maintenance Cost (£/annum)	Number of Years Until Programme Intervention	Programme Cost of Intervention (£)
Numbered Armoured Cable		metre			
Traffic Signal 8 Core Coloured Armoured Cable	Includes Cable - 8 Core Coloured Armoured Cable	Per metre			
Traffic Signal 4 Core Coloured Armoured Cable	Includes Cable - 4 Core Coloured Armoured Cable	Per metre			
Traffic Signal 2 Core Armoured Loop / Above Ground Detection Feeder Cable	Includes Cable - 2 Core Armoured Loop / Above Ground Detection Feeder Cable	Per metre			
Traffic Signal 3 Core Red Sheathed Armoured Cable	Includes Cable - 3 Core Red Sheathed Armoured Cable	Per m			
Traffic Signal Feeder Pillar 1	Includes Electricity Supply Pillar complete with Electrical gear and cabling	Per Item			
Traffic Signal Communication Supply Pillar	Includes Communication Supply Pillar	Per Item			
Miscellaneous Equipment Case (MEC)	Includes full installation of Miscellaneous Equipment Case (MEC), complete with Electricity Supply Pillar and provision of supply, Pole, Housing	Per Item			
I MESH router (housed within controller cabinet)	Includes IDT I Mesh route unit, cabling, suitable rack/mounts/brackets.	Per Item			
PEEK I-OUT (Chameleon) outstation communications unit housed within controller cabinet	Includes PEEK I-OUT rack mounted unit, interface leads/cables/brackets.	Per Item			
I MESH coax cable	Includes coax aerial cable including connectors.	Per metre			
I MESH pole mounted aerial (single or bi-directional)	Includes I MESH aerial, (single or bi-directional) brackets, fixings, mounted on to pole/lighting column (covered elsewhere)	Per Item			
Zebra Crossing (Non LED Solution)	Zebra crossing including road markings and amber beacons	Per Item			
Zebra Crossing (LED Solution)	Zebra crossing including road markings and amber beacons	Per Item			

# Appendix B. Example form for Calculating Commuted Sums

Figure B.1: Commuted Sum Calculation Example

COMMUTED SUM EXAMPLE CALCULATION					
<b>DATA</b>			<b>CALCULATIONS</b>		
Commuted Sum Period	Years	60	Asset Replacement @ 20 Years	Year	NPV
Life of Asset if New	Years	20	Asset Replacement @ 40 Years	40	£22,615
			Asset Replacement @ 60 Years	60	£13,795
Present day Asset Valuation		£45,000			£7,638
					<b>£44,049</b>
Call Outs & Repairs	£ per Annum	£1,100	Discounted Annual Maintenance Cost up to Year 30	1	£2,174
Inspections & Lamp Change	£ per Annum	£600		2	£2,100
Comms & energy	£ per Annum	£550		3	£2,029
<b>Total Annual Maintenance</b>	<b>£ per Annum</b>	<b>£2,250</b>		4	£1,961
Discount Rate (1 to 30 years)	%	3.50		5	£1,894
Discount Rate (30 to 60 years)	%	3.00		6	£1,830
				7	£1,768
				8	£1,709
				9	£1,651
				10	£1,595
				11	£1,541
				12	£1,489
				13	£1,439
				14	£1,390
				15	£1,343
				16	£1,298
				17	£1,254
				18	£1,211
				19	£1,170
				20	£1,131
				21	£1,093
				22	£1,056
				23	£1,020
				24	£985
				25	£952
				26	£920
				27	£889
				28	£859
				29	£830
				30	£802
					<b>£41,382</b>
			Discounted Annual Maintenance Cost Year 31 to 60	31	£900
				32	£874
				33	£848
				34	£824
				35	£800
				36	£776
				37	£754
				38	£732
				39	£710
				40	£690
				41	£670
				42	£650
				43	£631
				44	£613
				45	£595
				46	£578
				47	£561
				48	£544
				49	£529
				50	£513
				51	£498
				52	£484
				53	£470
				54	£456
				55	£443
				56	£430
				57	£417
				58	£405
				59	£393
				60	£382
					<b>£18,169</b>
			<b>Total Discounted Commuted Sum</b>		<b>£103,600</b>

# Appendix C. Example Maintenance Benchmark Data

Figure C.1: Example Benchmark Data-Road Markings

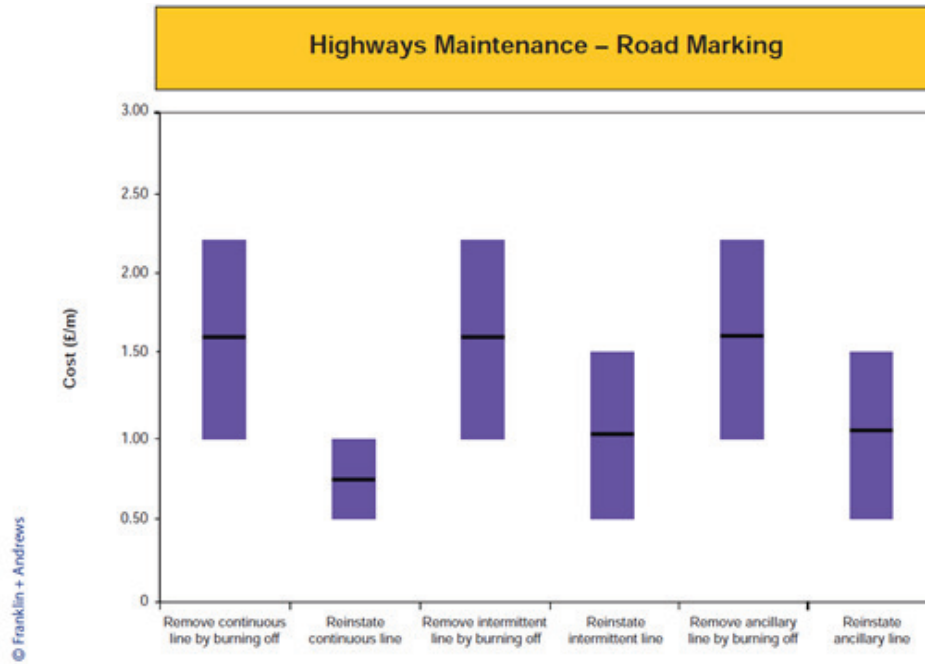
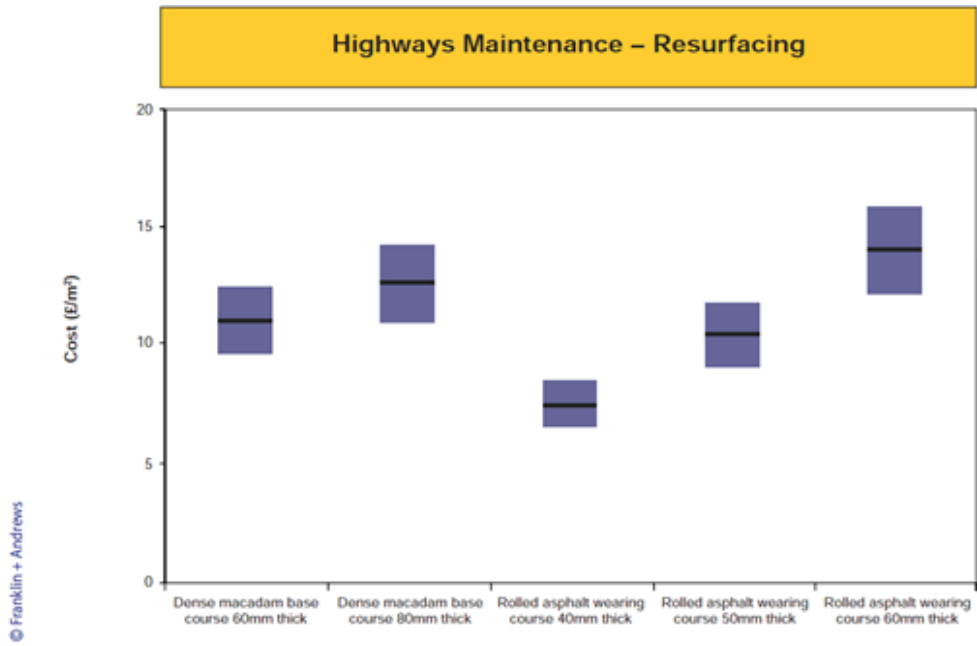


Figure C.2: Example Benchmark Data-Resurfacing



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Figure C.3: Example Benchmark Data-Resurfacing

