ITEM No …4……..

REPORT TO: **FAIR WORK, ECONOMIC GROWTH AND INFRASTRUCTURE COMMITTEE – 20 NOVEMBER 2023**

REPORT ON: **ROADS ASSET MANAGEMENT PLAN**

REPORT BY: **EXECUTIVE DIRECTOR OF CITY DEVELOPMENT**

REPORT NO: **320-2023**

1 PURPOSE OF REPORT

1.1 This report seeks approval of the Road Asset Management Plan for 2023-2028.

2 RECOMMENDATION

2.1 It is recommended that the Committee approve the Roads Asset Management Plan.

3 FINANCIAL IMPLICATIONS

3.1 There are no direct financial implications arising from this report.

4 BACKGROUND

4.1 With reference to Article IV of the Minute of the Meeting of the Policy and Resources Committee of 26 June 2023 (Report 177-2023 refers), the Committee approved the Council's Corporate Asset Management Plan for the period of 2023-2028.

4.2 The Road Asset Management Plan is an asset category plan structured to be read in conjunction with the overarching Corporate Asset Management Plan which provides the strategic context for the management of Council assets.

5 POLICY IMPLICATIONS

5.1 This report has been subject to the Pre-IIA Screening Tool and does not make any recommendations for change to strategy, policy, procedures, services or funding and so has not been subject to an Integrated Impact Assessment. An appropriate senior manager has reviewed and agreed with this assessment.

6 CONSULTATIONS

6.1 The Council Leadership Team were consulted in the preparation of this report.

7 BACKGROUND PAPERS

7.1 None.

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17 October 2023

ROADS ASSET MANAGEMENT PLAN 2023-2028

STRATEGIC OBJECTIVES

The Roads Asset Management Plan (RAMP) sets out the Council's plans for the management of the Council's roads asset up to 2028. It has been produced in accordance with national guidance contained in the Department for Transport UK Roads Liaison Group 2016 code of practice "Well-managed highway infrastructure", and recommended good practice developed through the Society of Chief Officers of Transportation in Scotland (SCOTS) Roads Asset Management Project.

The RAMP provides a strategic plan to deliver the best allocation of resources for the management, operation, and enhancement of our road infrastructure. It details the standards applied to the management of each asset group and informs the Council's investment decisions that affect the provision and maintenance of the network.

For Dundee City Council it is vitally important that the road infrastructure is maintained efficiently and that the best value possible is obtained from budgets. The Plan adds support to existing knowledge and provides a comprehensive inventory of the size and condition of our assets.

The asset management plan will be used to inform the budget setting process, target spending, and help forecast the impact that funding levels may have on the ongoing condition of the asset.

The Council utilises a number of electronic asset management systems which record inventory details, inspection records, treatment, and maintenance intervention history. The Council regularly updates asset records and continuously builds upon the level of data maturity held digitally. The Council reviews advancements in asset management technology and in conjunction with the SCOTS Roads Group seeks to modernise systems to benefit from technology advancement. In the previous 5 years this has included advancement in gully cleansing management, automation of winter maintenance treatments, and upgrading to web-based asset management platforms to enable live digital entry and information conveyance on site.

The Council is committed to transparency of planning and shares annual programmes of work with stakeholders and publish programmes on the Council's publicly accessible website. The Council also publishes an annual performance report each year detailing key performance indicator results benchmarked against the other Scottish City authorities and the national average performance results.

The asset management plan correlates with the Council's Road Safety & Defect Categorisation Policy which details the Council's policy for maintaining road condition standards. The Road Safety & Defect Categorisation Policy is available to view online at the following link;

www.dundeecity.gov.uk/service-area/city-development/roads-maintenance

DOCUMENT CONTROL

Date	**Version**
20 November 2023	Version 1 – Issued to the Fair Work, Economic Growth & Infrastructure Committee
Next Update Due	November 2028

RESPONSIBILITY FOR THE PLAN

The responsibility for the delivery of and updating of this plan are shown below:

Council Officer	**Responsible for**
Road Maintenance Partnership Depute Manager	Preparation and revision drafting of the plan
Road Maintenance Partnership Manager	Review and checking of the draft plan
Head of Sustainable Transport & Roads	Approval of draft plan presented to committee for consideration of approval

1 INTRODUCTION

A Corporate Asset Management Plan for the period of 2023 to 2028 (Report No 177-2023) was approved to the Policy and Resources Committee on 26 June 2023.

This plan provides further detail of the Council's management of its road infrastructure assets and a basis for implementing the overall Council Objectives.

2 CORPORATE CONTEXT

The Council's ownership of assets is categorised into six key areas:

- buildings and property;
- roads infrastructure;
- housing;
- open space;
- vehicle fleet;
- information and communications technology.

The overarching management of these assets is guided by the Corporate Asset Management Plan approved in June 2023. This ensures that all assets are optimally structured and financed to provide best value and efficient service delivery. Asset Management Plans have been prepared for each of the above assets areas which detail how the Council will achieve its overall objectives, improve the performance of its assets and yield the required efficiencies. This plan deals with the Council's Road Infrastructure Assets.

Strategic Asset Management seeks, through a better planned alignment of assets and service demand, to achieve the best possible function of assets with the Council's service delivery strategies. This is best ensured by the systematic management of all decision-making processes taken throughout the useful life of assets. This strategy will guide the maintenance and replacement of assets to make the most of their service delivery potential and manage the related risks and costs over their entire life.

The main benefits of a Corporate Asset Management Plan are that it:

- aligns asset plans with organisational objectives.
- ensures overall efficient and effective use of assets.
- provides a platform for structured forward planning and a basis for future decision making.
- gives an explicit description of the direction that the Council wishes to take with its assets.
- brings clarity to the way assets are managed in the Council.
- identifies future levels of funding required to provide services.

3 OBJECTIVES OF THE PLAN

This Asset Management Plan sets out the Councils approach to the strategic management of its road infrastructure and contributes to the Council Plan 2022-2027. The key priorities relating to road infrastructure are:

- reduce waste, and reuse or recycle more;
- reduce energy consumption from Council assets; and
- ensure the Council remains financially sustainable and continues to provide quality and efficient services.

Some of the key elements of the Asset Management Plan are:

- formalise strategies for investment in road asset groups;
- define service standards;
- prescribe how road assets are managed; and
- enable best value in services delivered.

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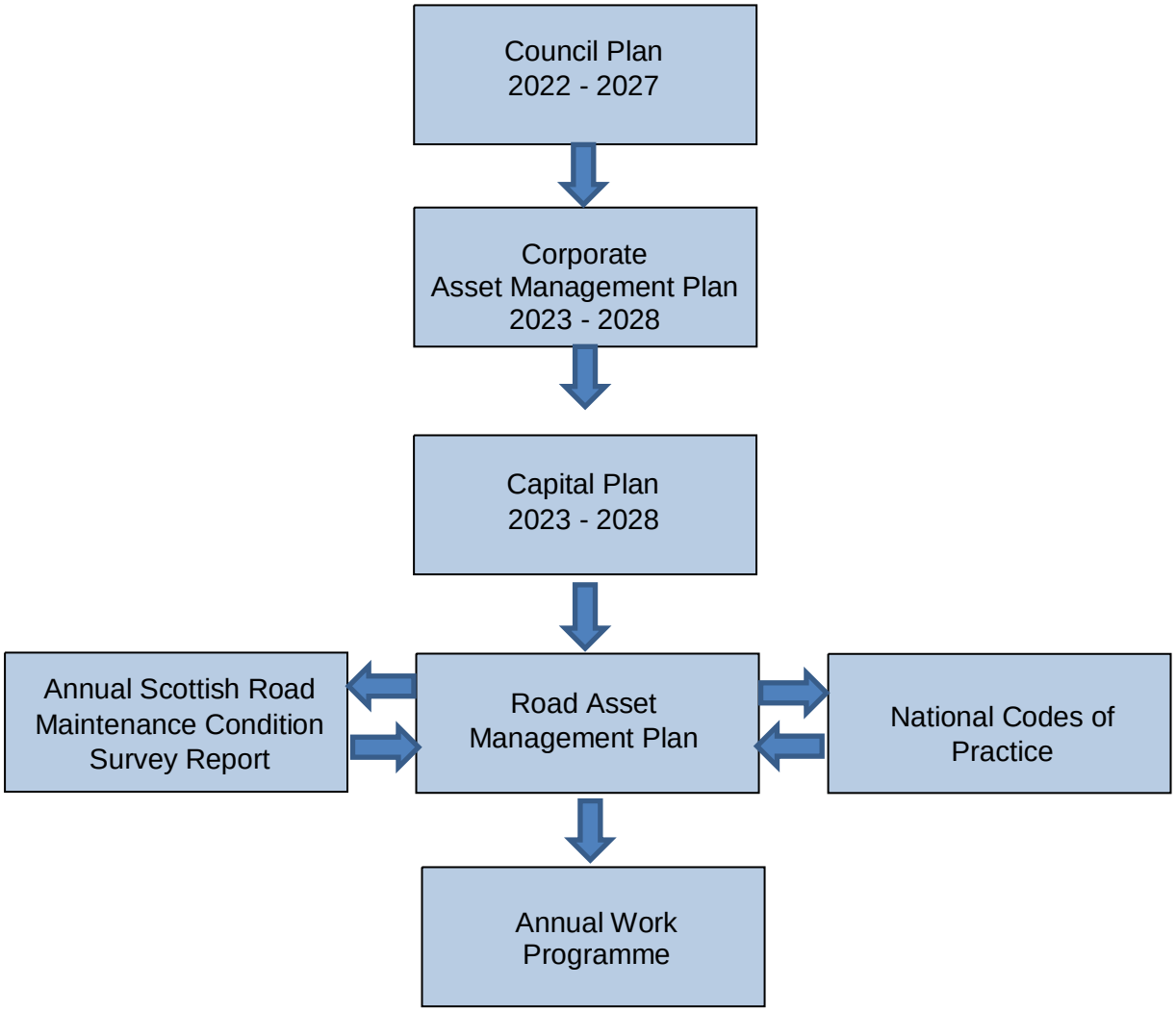
4 ROAD ASSET MANAGEMENT PLAN INTERFACE WITH OTHER PLANS

The Road Asset Management Plan relates to other plans as illustrated below:



Targets and strategies contained in the Road Asset Management Plan are used to develop annual works programmes once the Council's annual budget for road assets has been agreed.

The Road Asset Management Plan links to the Dundee City Council Plan 2022-2027 and the Capital Plan 2023-2028. These all align with the overarching objectives set out in the City Plan for Dundee 2022-2032. Targets and strategies contained in the Road Asset Management Plan are used to develop annual works programmes based upon Dundee City Council's Road Infrastructure budget allocations.

5 ASSETS

The Council's Road Infrastructure assets covered by this plan are:

Dundee City Council Asset	Quantity
Carriageways	580 kilometres
Bridges and Structures	71 Structures 11km of coastal sea wall
Footways, Footpaths, Cycle Paths	1,100 kilometres
Street Lighting	25,026 Lighting Columns 2,356 Illuminated signs and bollards
Traffic signals	49 Signalised Junctions 98 Signalised Crossings
Bus Shelters	348 Bus Shelters

Note: road drainage infrastructure and associated street furniture such as traffic signs, bollards and grit bins not individually catalogued. The coastal sea wall has a secondary function as highway retaining structures but is managed by the Council under different statutory provisions, such as the Coast Protection Act (1949).

6 INVENTORY DATA

The Road Asset Management Plan is based upon currently available inventory data for Road assets. All inventory data is recorded and stored electronically in the Council's Road Management System (RMS) and corporate GIS system. For some minor road assets inventory data is not currently held, and local estimates and sample surveys are utilised where available. An action to improve asset data forms part of the Council's road asset data management plan.

7 FUTURE DEMAND AND GROWTH

The asset grows each year due to the construction and adoption of new roads, usually with the construction of new housing but also attributed to infrastructure improvements such as new cycleways.

Over the last 10 years the network length has increased on average by 0.7% per annum.

New assets create the need for maintenance, management and associated funding in future years as these additional assets age.

Traffic growth over previous years has placed pressure on the road network due to the year on year increase in the volume of traffic, particularly large commercial vehicles. Many of the Council's roads were not designed to accommodate the level of traffic growth experienced since construction and accordingly have deteriorated more rapidly than expected creating a growing need for investment in maintenance.

The historic trend of year on year growth in traffic levels is anticipated to change with the Scottish Governments National Transport Strategy aiming for a 20% reduction in car kilometres by 2030. To achieve this level of traffic reduction, which would revert traffic volumes back to levels last experienced in the 1990s, will require both travel behavioural change and greater use of more sustainable transport methods by the public.

Pressure is also being placed upon the asset as a result of environmental conditions including:

Harsh winters: unseasonably harsh winters cause significant damage to road surfaces in the form of increased defects resulting from freeze/thaw action.
Flooding: Dundee has experiences of intense periods of rain and associated flooding both pluvial and fluvial.
Climate change: Current projections indicate, on average, warmer, wetter winters and warmer, drier summers with what are currently considered to be exceptional heat and precipitation events becoming more common and severe events becoming more extreme. This has the potential to cause more rapid deterioration in the road assets than planned.

These pressures have previously created a need for additional funding to both deal with the reactive element of the event (snow clearance and flooding response) and the longer-term impact on the road assets to repair carriageway damage and drainage challenges. If the frequency or severity of such events increases during the life of the plan it may be necessary to revise the standards that are affordable, or revise the funding requirement projections identified.

Recent world events have highlighted the volatility in energy markets demonstrating the need to reduce energy consumption in road assets, not only in an effort to achieve net zero, but also to reduce the impact of future inflation costs to the Council.

8 SERVICE STANDARDS

This plan is based upon delivering the service standards detailed below. The standards reflect the funding levels noted in this plan and are the standards that Service users can expect from the Council's Road assets during the plan period.

Road Maintenance

Service	Measured By	Target Standard
Safety	Percentage of category 1 defects made safe within response times	90%
	Percentage of category 2 defects made safe within response times	85%
	Percentage of category 3 defects made safe within response times	80%
	Percentage of safety inspections completed on time	90%
Condition	Percentage of Road network to be considered for maintenance treatment (Scottish Road Maintenance Condition Survey – Road Condition Indicator)	27.7%

Street Lighting

Service	Measured By	Target Standard
Safety	Electrical testing undertaken at a frequency of 8 years	100%
	Emergency faults made safe or repaired within 4 hours of notification	95%
Condition	A non-emergency fault rectified within 7 working days (Single Outage)	90%
	A non-emergency fault rectified within 7 working days (Section Fault 3 lights or more)	95%

Urban Traffic Control

Service	Measured By	Target Standard
Safety	Attendance at priority sites within 1 hour	90%
	Attendance at normal priority faults within 4 hours	85%
	Attendance at non-priority faults within the 24 hours	80%
Condition	Initial repair of priority faults within 24 hours	90%
	Initial repair of non-priority faults within 48 hours	90%

Bridges and Structures

Service	Measured By	Target Standard
Safety	General inspections will be completed every two years	100%
	Principal Inspections will be completed every six years	100%
Condition	Bridge Stock Indicator Average BSCIave (condition of all elements of the bridge)	>80
	Bridge Stock Indicator BSCIcrit (condition of all elements affecting structural safety)	>70

Bus Shelters

Service	Measured By	Target Standard
Safety	Electrical testing undertaken at a frequency of 8 years	100%
	Emergency faults made safe or repaired within 24 hours of notification	90%
Condition	Bus Shelter cleansing 6 times per annum	100%
	A non-emergency fault rectified within 30 working days	80%

9 ASSET VALUATION

As at November 2023 the road asset is valued as follows;

Asset	Gross Replacement Cost (GRC)	Expected Service Life (ESL)
Carriageways	£868m	40 years
Footways and Cycleways	£220m	40 years
Bridges and Structures	£65m	120 years
Street Lighting	£70m	25 years
Urban Traffic Control (Traffic signal apparatus)	£13m	20 years
Bus Shelters	£6m	20 years
Total	**£1,242bn**	

The valuation figures above illustrate how much it would cost to replace the existing asset. The values presented represent the renewal cost of assets as of 2023 and do not include for asset depreciation or land value.

The expected services life corresponds to the asset design life and correlates with design standards contained in the Design Manual for Roads & Bridges and Specification for Highway Works and an assumption that the requirements of these standards remain relatively consistent across the service life. In order to achieve the expected service life, routine maintenance of assets is required at intervening frequencies. All assets are subject to routine condition inspections and in some circumstances the assets structural integrity may allow for maintenance interventions to extend the serviceable life of the asset.

10 HISTORIC EXPENDITURE

Expenditure invested in works on the road infrastructure asset over the last five years is shown below:

Budget	Asset	Historical Expenditure £ 000				
		2018/19	2019/20	2020/21	2021/22	2022/23
Road Maintenance						
Capital	Carriageway	2500	3000	2500	2500	2500
	Footway / Cycleway	500	500	500	500	440
	Non-Adopted (CoNNA)	650	650	650	650	550
Revenue	Routine & Cyclic	707	707	657	657	657
	Street Name Plates	15	15	14	14	14
Total		**4372**	**4872**	**4321**	**4321**	**4161**
Street Lighting						
Capital	Street Lighting Renewal	1053	1096	725	1209	1467
	LED Lantern Conversions	1941	1298	130	112	72
Revenue	Routine & Cyclic	358	358	358	333	379
Total		**3352**	**2752**	**1213**	**1654**	**1918**
Bridges and Structures						
Capital	Structural Improvements	630	400	400	400	400
Revenue	Inspection	30	30	30	30	30
Total		**660**	**430**	**430**	**430**	**430**
Urban Traffic Control						
Capital	Traffic Signal Renewal	100	100	120	100	90
Revenue	Routine & Cyclic	145	131	131	131	131
Total		**245**	**231**	**251**	**231**	**221**
Bus Shelters						
Capital	Shelter Renewal	0	0	0	0	0
Revenue	Routine & Cyclic	54	54	54	54	45
Total		**54**	**54**	**54**	**54**	**45**
Combined Total		**8,683**	**8,339**	**6,269**	**6,690**	**6,775**

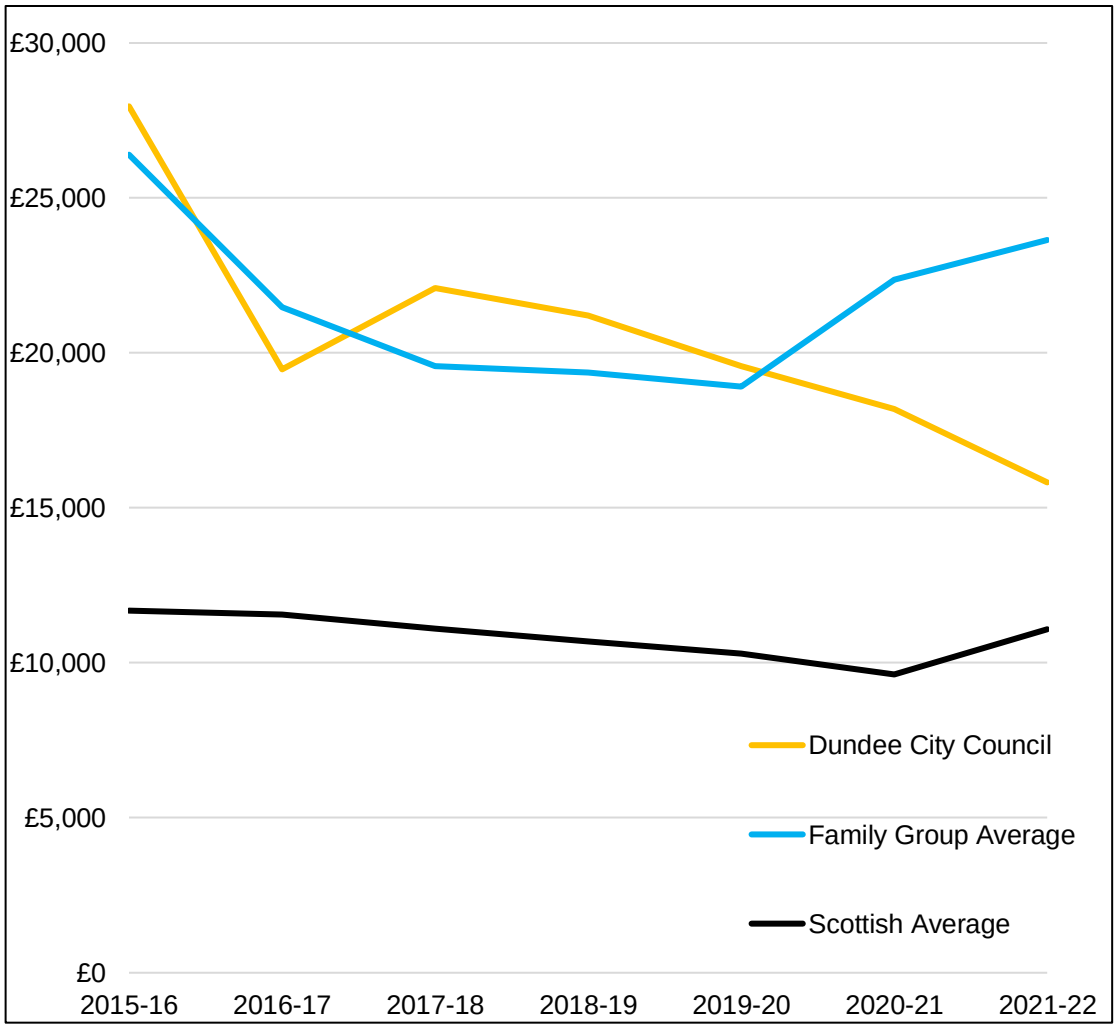
11 EXPENDITURE BENCHMARKING

The Local Government Benchmarking Framework (LGBF) includes a key performance indicator (ENV04A) for the cost of roads per kilometre which records the Council's overall capital and revenue expenditure on the road infrastructure asset.

The values used in the LGBF indicator include all revenue costs incurred, including staff costs and reactive works such as winter maintenance and pothole repairs. The values also include capital improvement works such as the LED street lighting conversion programme.

The graph below details the Council's expenditure on roads per kilometre between 2015-2016 and 2021-2022 benchmarked against the national average and the cities group average. Of note the national average includes rural authorities which feature a lower expenditure per km due to reduced infrastructure such as street lighting, traffic signals, footways, and drainage systems.

Source: www.improvementservice.org.uk/benchmarking/explore-the-data



Graph 1 – Local Government Benchmarking Framework KPI ENV04A

12 PLANNED EXPENDITURE

Noted below is the planned infrastructure maintenance investment set out in the Dundee City Council Capital Plan 2023-28. Revenue budgets are set on an annual basis however for the purpose of funding forecasting are projected to remain static at 2023/24 values.

Budget	Asset	Planned Funding £ 000				
		2023/24	2024/25	2025/26	2026/27	2026/27
Road Maintenance						
Capital	Carriageway	2500	2500	2500	2500	2500
	Footway / Cycleway	560	560	560	400	400
	Non-Adopted (CoNAA)	400	400	400	300	300
Revenue	Routine & Cyclic	690	690	690	690	690
	Street Name Plates	14	14	14	14	14
Total		**4164**	**4164**	**4164**	**3904**	**3904**
Street Lighting						
Capital	Street Lighting Renewal	1000	1000	1000	1000	1000
Revenue	Routine & Cyclic	398	398	398	398	398
Total		**1398**	**1398**	**1398**	**1398**	**1398**
Bridges and Structures						
Capital	Structural Improvements	630	400	400	400	400
Revenue	Routine & Cyclic	30	30	30	30	30
Total		**660**	**430**	**430**	**430**	**430**
Urban Traffic Control						
Capital	Traffic Signal Renewal	67	67	60	50	50
Revenue	Routine & Cyclic	131	131	131	131	131
Total		**198**	**198**	**191**	**181**	**181**
Bus Shelters						
Capital	Shelter Renewal	0	0	0	0	0
Revenue	Routine & Cyclic	45	45	45	45	45
Total		**45**	**45**	**45**	**45**	**45**
Combined Total		**6,465**	**6,235**	**6,228**	**5,958**	**5,958**

13 ASSET MANAGEMENT STRATEGY

The strategy in this plan has been determined using forecasts of future condition over a 20-year period. The forecasts enable the strategy to consider the whole life cost of maintaining the asset. Using long term predictions enables decisions about funding levels to be taken with due consideration of the future maintenance funding liabilities that are being created.

All assets are subject to routine condition inspections at frequencies attributed to their function. Programmes of work and funding considerations are reviewed annually to accommodate variances in asset deterioration over the period of the asset management plan.

The maintenance strategy for the road infrastructure assets is summarised below.

Category	Description	Basis of Strategy
Routine and Reactive Repair	Repair of defects to current intervention standards and response times.	The strategy requires the deployment of various work gangs on routine and reactive repairs (via customer interfaces and supervisor inspections).
Planned Maintenance Preventative	A programme of preventative treatment to prolong the assets serviceable life.	The strategy requires mid-life interventions such as structural repairs or resurfacing of bituminous assets, and periodic refurbishment work to electrical assets such as LED driver replacements and planned component replacements.
Planned Maintenance Corrective	Programme of asset renewal where a preventative treatment cannot be applied	The strategy requires reconstruction of paved assets at the end of their serviceable life, and replacement of street furniture and electrical assets when structural integrity of columns is nearing life expiry or service reliability is below acceptable levels.

The optimum asset management strategy is to maintain assets in a steady condition state, or improve the overall condition of the asset stock. Where funding is insufficient to maintain the current condition of the asset groups, a process of managed decline requires to be implemented.

Managing the decline of assets involves prioritisation of funding to ensure the assets are safe and serviceable. As asset condition declines, defects become more prevalent and the scale of remedial interventions increase. This requires a greater proportion of available funding to be allocated to reactive maintenance as opposed to preventative maintenance. As the extent of remedial work increases (as an example, roads will require deeper resurfacing if undertaken at a reduced interval frequency), the cost of interventions increases resulting in a lesser proportion of the asset group being renewed annually, and growth in the backlog value.

It is noted that maintaining a deteriorating asset presents a greater whole life cost compared to maintaining the asset in a robust condition. This is due to the cost differential of reactive repairs against planned maintenance, and the lesser opportunity to extend the life of the asset through preventive maintenance interventions.

The projected gap in asset maintenance funding is between £2.2M and £3.5M per annum depending on factors including the rate of asset deterioration and continuation of external funding contributions.

New powers enabled by the Transport (Scotland) Act 2019 present potential additional revenue streams, and surplus revenue generated, which has ringfenced expenditure uses, will be utilised to support road infrastructure improvements. The revenue generated from Transport (Scotland) Act powers is attributed to penalty charge notices from enforcement of the Low Emission Zone and Pavement Parking Prohibition. These funding streams may contribute to infrastructure maintenance requirements however are insufficient in isolation to bridge the funding gap. The key funding vehicle for infrastructure investment is the Council's Capital Plan and Officers will explore every opportunity to enable increased investment as part of the wider review of all competing Council priorities in future years. In the interim, deployment of funding and resources will follow a risk-based approach to asset management to prioritise available funding.

The funding considerations of each asset group are as follows.

Carriageways

The design life of a pavement is 40 years, however with interim resurfacing interventions the asset life can be extended indefinitely. In situations where interim maintenance interventions are not undertaken, or the asset construction is substandard, the pavement is liable to fail and require full reconstruction. The latter scenario is particularly prevalent in historically evolved local roads which can feature nominal depths of bituminous surfacing directly above a substandard road base material such as clay or sand. Natural stone road and footway construction also present limited treatment options for prolongation of the asset's residual life.

The local road network length in Dundee is derived of A, B, C, and U class roads. 25% of roads length is A, B, or C class with the remaining 75% unclassified roads (U class). Unclassified roads typical feature lower traffic volumes and where the road construction is robust, can often not require significant maintenance interventions within the first 40 years. This scenario is typically limited to roads of a more modern construction standard.

The Council currently resurfaces carriageways at a frequency of once in 100 years (i.e. 1% of the network length is resurfaced each year), and renew footways / cycleways at a frequency of once in 200 years (0.5% of the network length).

In addition to resurfacing and reconstruction the Council undertakes surface dressing to some roads where suitable, and slurry sealing of footways which can extend the life of the asset by up to 7 years. Of note, not all roads and footways are suitable for these forms of treatment due to either condition or geometry and these treatments can usually only be undertaken once or twice before the road or footway surface requires replacement.

To maintain the road network at its current state (road condition index of 27.7% as measured by the annual Scottish Road Maintenance Condition Survey) utilising a combination of preventative and corrective interventions would require an annual capital investment value of £5,000,000 (derived of £3.5M carriageway allocation, £0.75M footway allocation, and £0.75M non-adopted Council owned asset allocation).

The current capital investment level is £3,460,000 per annum (reducing to £3,200,000 per annum by 2026/27).

With reference to historical spend, the Council's peak capital budget allocation on road maintenance in 2016/17 was £4,375,000 (derived of £3.095M carriageway allocation, £0.63M footway allocation, and £0.65M non-adopted Council owned asset allocation).

At the current capital allocation level profiled, over the period of this plan the road condition is projected to decline to 35% RCI. The road condition index value (RCI) represents the percentage of the road network requiring maintenance.

Street Lighting

In Dundee, streetlighting columns are predominantly either steel or aluminium. The design life of steel street lighting columns is 25 years, and for aluminium columns is 50 years.

The Council currently has a £20,000,000 backlog associated with 10,867 life expired steel lighting columns which are over 30 years old. This represents 43% of the asset requiring replaced.

The Council currently renews street lighting assets at a frequency of once in 50 years (i.e. 2% of the asset group is renewed each year).

99% of street lights are now LED and the lighting luminaires have an expected service life of 20 years, however the driver components of these require replacement between 8 and 10 years. The Council's streetlighting asset also associates 500km of underground cable network with cables having an expected service life of 60 years.

Street lighting assets are subject to an electrical inspection regime and in situations where an electrical safety fault has been identified which cannot be immediately repaired, lighting assets are made safe by disconnection where required due minimise risk to public safety.

The current capital investment level is £1,000,000 per annum and the annual depreciation cost of all street lighting assets is £1,978,000 per annum.

The funding allocation incorporated in the capital plan is sufficient to accommodate the maintenance regime of aluminium lighting columns on a 1 in 50-year replacement cycle, which correlates with these assets expected service life. The 10,867 steel columns will be replaced with aluminium columns over the next twenty years and in the interim will be inspected on a risk-based approach for condition deterioration, with annual readjustment of the programme priority to replace columns showing greatest signs of structural failure earlier in the replacement programme.

Bridges and Structures

The design life of bridges and structures is 120 years, although the service life of bridge components such as corrosion protection, expansion joints, waterproofing, bearings and parapets range from 15-40 years. Like other assets, appropriate maintenance strategies can extend functional lifespan beyond the intended design life. However, highway structures are particularly vulnerable to the combined consequences of increased traffic flow and the introduction of vehicles of weights beyond their original intended capacities. For many types of structure, strengthening has not been feasible to bring structures up to full highway loading capacity. As a result, there are 7 weight limited bridges in Dundee, of which 4 are Council owned structures, the remainder being Network Rail owned structures that carry the adopted road network.

The Council's stock comprises 25 road bridges, 31 pedestrian bridges/underpasses and 15 highway retaining walls. The average age of the bridge stock is 50 years and 19 of the Council's bridges are Listed Structures.

National standards promote a risk-based approach to the inspection of highway structures both in type and frequency. For Dundee, this has been determined as 6 monthly inspections for weight limited structures with 2 yearly general inspections and 6 yearly principal inspections for other Council stock. These inspections identify work requirements to ensure the continuing safe operation of the asset. Due to specialist access needs, particularly for bridge over rail structures, principal inspections can be particularly expensive to undertake.

The bridge stock condition is measured as a weighted average of all individual bridge condition scores. The average score includes the condition of all elements of a bridge (BCIav), currently DCC BCIav is 90.00. The critical score only includes those elements that directly affect

structural safety (BCIcrit), currently DCC BCIcrit 81.55. The bridge condition indicator shows a negative trend in bridge condition year on year.

The overarching strategy for structures is to invest where possible in improvements to reduce the rate of deterioration of the asset. The bridge condition information indicates that the bridges are generally in a good condition. The focus of works is on those structures that are considered to be a high priority. The main capital budgets remain the same each year for the bridge maintenance. Additional funding is sought for the high priority replacement schemes.

The current capital investment level in the bridge stock is £400,000 per annum. Based on the condition of the asset stock, trajectory of condition score, and gross replacement cost of assets, the average annual spend requirement over the period of this plan is projected to be £800k. This excludes the costs associated with the potential replacement of 3 of the 4 Council owned, weight limited structures, estimated to be £6m each. The fourth Council owned structure has been previously stopped up to through traffic so the weight limit is considered to be acceptable, and the bridge would not be considered for strengthening.

Traffic Signals

The Council's traffic signal assets have an expected service life of 20 years and a gross replacement cost of £13,000,000. Currently ad-hoc Scottish Government grant awards have been utilised to enable refurbishment of traffic signal apparatus as part of improvements to pedestrian and cyclist crossing facilities.

The longevity of securing external grant funding for asset management purposes is unknown, and there are currently no multi-year award settlements available. Bidding for external funding is also becoming more prevalent with funders competitively allocating grants to projects presenting the greatest impact to the funding programme's objectives.

The optimum annual capital funding required to maintain the traffic signal asset group is £650,000 per annum.

The current capital investment level is £67,000 per annum (reducing to £50,000 per annum by 2026/2027).

Bus Shelters

The vast majority of the Council's 348 bus shelters were installed in 2005/06. The asset group comprises of 330 small type shelters and 18 large type shelters in the city centre.

The design life of the smaller shelters is 20 years and the design life of the larger shelters is 25 to 30 years. The estimated capital replacement cost of the asset is £6,000,000.

The Council are currently reviewing proposals to rationalise the number of bus stops in Dundee, and the outcome of the Scottish Government Bus Partnership Fund appraisal may provide partial funding for renewal of shelters as part of wider bus priority corridor improvements.

Pending outcome of these potential changes to the inventory, the assets will be maintained and there are no proposals to replace the assets in the five year period of this asset management plan.

14 ASSET MANAGEMENT CARBON EMISSIONS

Operation and maintenance of road infrastructure produces carbon emissions predominantly through the energising of electrical assets, and the delivery of maintenance interventions.

Carbon emissions generated through the operation of the infrastructure have been significantly reduced through the introduction of LED lighting in street lighting and traffic signal apparatus. Since 2012 the Council has reduced energy consumption by 48%, and CO2 by 78%. The LED

replacement programme has resulted in an annual CO2 reduction of 4,773kg compared to 2012 levels.

The winter maintenance operation has also featured carbon savings following the installation of a new salt shed at the Marchbanks Depot which has enabled the Council to change from imported sea salt to indigenous rock salt which is a by-product of potash fertiliser mining. This has both reduced the cost of material procurement and lowered the carbon footprint associated with shipping salt from North Africa.

The fleet is transitioning to zero emission where viable, with all cars and small vans now EV and some operational vehicles such as the NCN1/77 cycle route gritter being EV. The majority of plant and vehicles associated with road maintenance operations remain fossil fuelled due to heavy load carrying requirements, towing, and operational fixtures, however the service continues to consider emission reduction opportunities in the fleet replacement plan.

Emissions from maintenance works are defined by two predominant factors. Firstly, the materials utilised, and secondly the intervention regime. 100% of waste material is recycled and reused in construction materials and waste products from other industries incorporated in material manufactured and used on Dundee's road network.

Asphalt material production has moved to warm mix manufacture reducing the emissions in the production process and cold mix base layer materials are utilised where feasible. The asphalt material also incorporates up to 30% waste product material from cement processing, reducing virgin aggregate consumption.

The remaining key area for carbon emission reduction is in reducing the intervention rate of maintenance. The Council attends and repairs approximately 13,000 road defects per year. This figure has increased in the last five years from an average of 10,000. Repeated visits to repair reactive defects is less efficient both in terms of cost, longevity, and carbon emitted than planned renewal work which features a greater residual life.

Investment in road maintenance supports community wealth building due to the nature of the work benefiting from local supply chains, with materials and contractors employed in road infrastructure maintenance being predominantly from with the region.

15 RISKS TO THE ROAD ASSET MANAGEMENT PLAN

The risks that could prevent achievement of the asset management plans strategic objectives are:

Plan Assumption	Risk	Risk Rating	Risk Management Action
The plan is based upon continuing weather patterns.	Climate change may present extremes of adverse weather with higher levels of detects and deterioration than have been allowed for.	Medium	Budgets and/or forecasts will be revised, and this plan updated if abnormally harsh winters, high wind speed events, flooding, or extreme temperatures become more frequent occurrences.
Variations to planned budgets.	External pressures mean that asset maintenance funding is reduced.	Medium	Condition forecasts will be revised and programmes adjusted to balance requirements of preventative and corrective maintenance interventions.

Plan Assumption	Risk	Risk Rating	Risk Management Action
Construction inflation will reduce to level similar to the last 5 years.	Construction inflation will increase the cost of works.	Medium	Condition forecasts will be revised and programmes adjusted to balance requirements of preventative and corrective maintenance interventions.
Asset condition is based on visual inspections for some asset groups.	Assets deteriorate more rapidly than predicted and the investment required to maintain is insufficient.	Low	Adopt new technology innovations to benefit asset management planning from digital condition assessments where attainable.
Continuation of external grant awards in relation to traffic signal upgrades	Refurbishment of traffic signal apparatus no longer secures external grant awards, or external funding streams are diminished or discontinued.	Medium	Continue to monitor all external funding opportunities and build in asset management to funding bids where permissible.
Resources are available to deliver the improvement actions	Pressures on supply chain resources disrupt programme delivery and delay the undertaking of maintenance interventions	Low	Review supply chain resilience annually to mitigate service failure and maintain supplier framework contracts for all service requirements

The risk has been evaluated in accordance with the Council's corporate risk management strategy. In addition to the risks identified above a departmental risk register is maintained recording the risks associated with the Sustainable Transport and Roads service. A review of this register is used when programmes of works are developed.