

Annual Status and Options Report

Roads Infrastructure
November 2023

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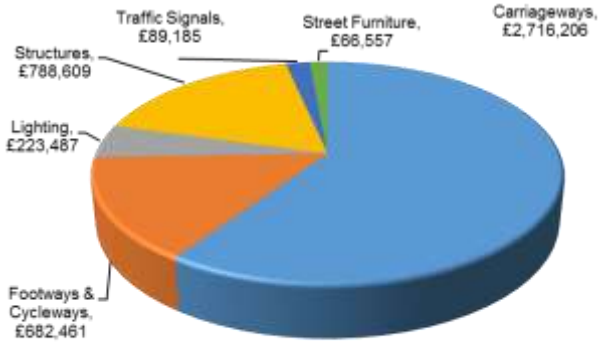
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1.0 Introduction

The Annual Status and Options Report is a product of our Road Asset Management Plan. It records the condition of our road assets and provides a means of identifying and prioritising the overall funding needs.

This report discusses the status of our road assets in terms of extent, value and condition and presents the projected outcome of a number of investment options. The options and scenarios presented aim to assist with the budget setting process and identify where investment should be prioritised.

Latest figures indicate that the cost of replacing all road infrastructure assets is estimated at £4.57bn. The pie chart below details the value of the assets broken down by asset type.



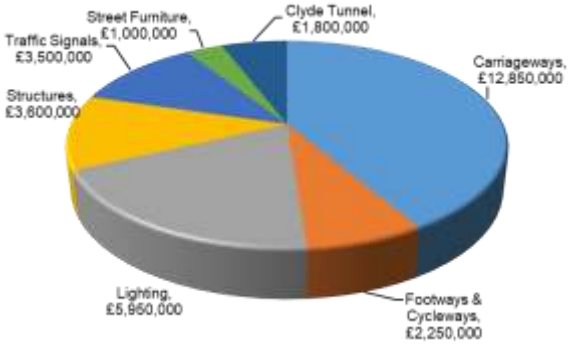
Gross Replacement Cost per Asset (£'000)

The level of investment required to maintain our roads infrastructure in its current condition (steady state) is estimated at £30.95m per year; this equates to an annual investment of 0.68% of the total asset value.

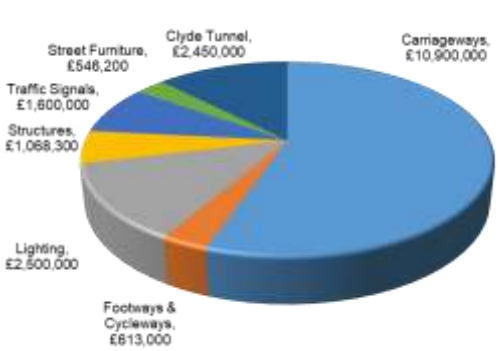
The Report contains a section for each road asset that outlines;

1. Asset Overview
2. Asset Condition
3. Investment Options

The pie charts below illustrate and compares the annual level of investment required to maintain the asset in its current condition against the current level of investment. It should be noted that the current investment only includes the additional budget allocation for the current year that can be attributed to works that will improve the condition of the asset and not cyclic or reactive maintenance budgets in recent years this funding has generally came from The Council's Capital allocation, however it should be noted that there will be a consequential impact on revenue and operational expenditure that is not considered in the figures below and will need to be factored into budget allocation. This risk is particularly prevalent when new active travel schemes are constructed.



Steady State Investment - £30.9m

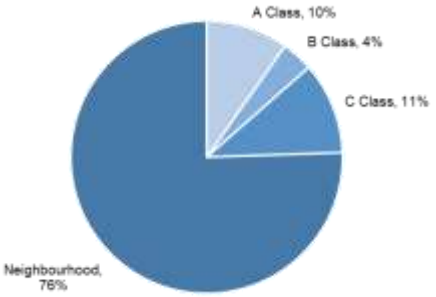


Current Investment - £19.7m

2.0 Carriageways

2.1 Asset Overview

Glasgow City Council is responsible for the management and maintenance of 1,922km of carriageways. Neighbourhood carriageways represent the majority of Glasgow's network (76%).



A Class	188km
B Class	72km
C Class	210km
Neighbourhood	1452km

Figure 1.0 – Carriageway Length

The latest data indicates that the condition of our carriageways remained at 71.7% of our carriageways in acceptable condition. This shows that Glasgow continues to be one of the best performing Road Authorities in the country when compared to the latest available Scottish average of 66.8% of carriageways in acceptable condition.

Customer Satisfaction

There is a direct correlation between customer satisfaction and public pothole reports. Extreme winter weather and more frequent summer rain events has a detrimental impact on the number of public pothole reports received and, therefore, customer satisfaction.

The latest data indicates that satisfaction with roads maintenance, which is measured by an annual household survey, has now fallen to the lowest level since 2011 (17%) whilst we saw a large increase in public pothole reports to over 20,000.

This can be attributed to the severe winter of 2020/21 and the sustained frost and freezing temperatures of winter 2022/23, which saw Glasgow have its coldest road surface temperatures since 2010 in addition to periods of heavy rainfall.

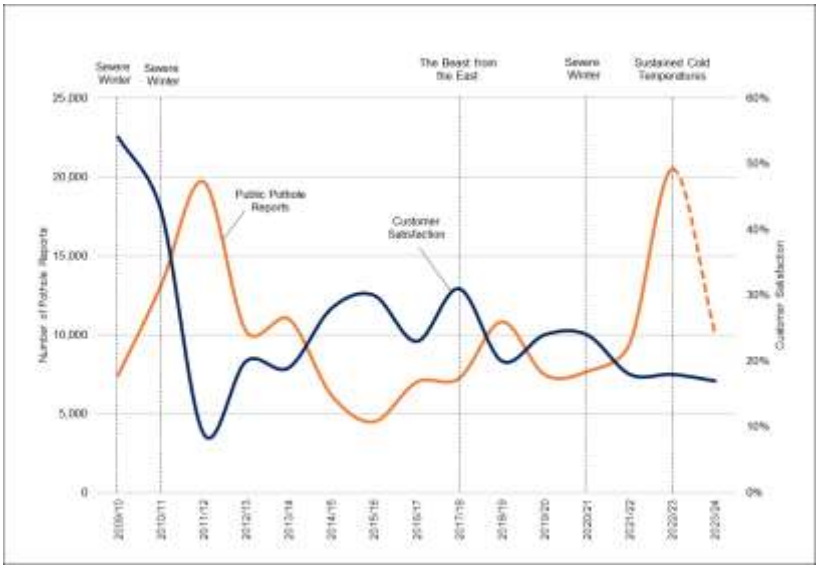


Figure 2.0 – Public Pothole Reports vs. Customer Satisfaction

Seasonal Risk

The impact of extreme winter and summer weather on the condition of our carriageways is clear. There remains a risk of structural deterioration and, in the event of subsequent bad winters, the number of potholes will increase significantly.

Targeted investment strategies after the severe winters of 2009/10 and 2010/11 helped to improve the level of customer satisfaction and reduce the number of public pothole reports, however, subsequent severe winters in 2017/18 and 2020/21 negatively impacted the carriageway network.

It should be noted that the impact of a severe winter, or sustained frost and freezing temperatures such as those experienced in winter 2022/23, is not realised immediately and an increase in public pothole reports should be expected approximately a year after the event. In recognition of the impact severe weather has on the number of potholes, an additional £6m was allocated to the carriageway budget this year with a view to improving condition and public satisfaction in the coming years.



Figure 3.0 – Public Potholes Reports vs. Investment

2.2 Asset Condition

Road structural condition is measured by the Scottish Road Maintenance Condition Survey (SRMCS). The survey assesses parameters including smoothness, rutting, surface texture and surface cracking. This provides an indication of the integrity of the unseen road structure and provides a measure of the percentage of carriageways that should be considered for future maintenance treatment. However, it does not indicate the condition of the road surface condition or potholes and, therefore, there is likely to be a discrepancy between public perception of carriageways and the road structural condition shown below.

Figure 4.0 shows that the overall structural condition of our carriageways had slowly improved over the last ten years due to continued investment in the asset. The latest data indicates that our carriageway condition remained constant.

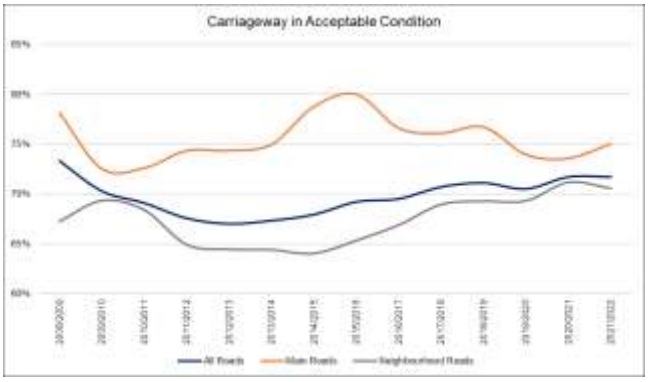
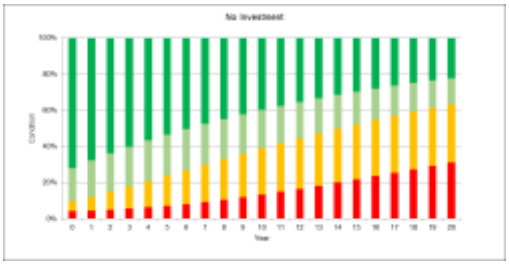


Figure 4.0 – Carriageway in Acceptable Condition

2.3 Carriageway Investment Options

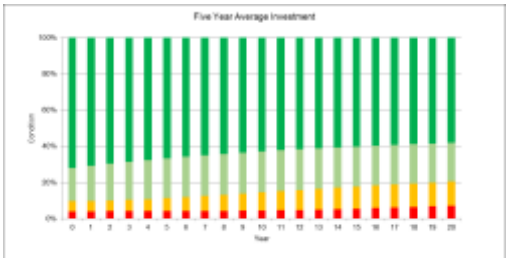
Road infrastructure deterioration is slow. It is affected by external factors and is often unseen, meaning that any impact of investment usually cannot be assessed in the short term. The investment options presented below consider the projected impact over a 20-year life cycle. This allows decisions to be taken with an understanding of medium and long-term implications.

It is significant to note that the overall cost of the two Improvement Plan's is less than the cost to preserve steady state. It is cheaper to intervene early in the material lifecycle than to wait until more extensive repairs are required and a fairly small increase in investment now, will save a substantial amount of money in the future.



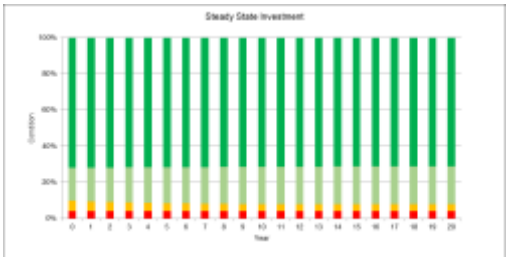
Option 1 – No Investment
No investment in the carriageway asset would lead to severe deterioration, with 78% of carriageways in poor condition after 20 years. This scenario would see a dramatic increase in the number of potholes reported, the cost of temporary repairs and cause severe reputational and economic damage to the city.

20 Year Investment: £0m



Option 2 – Five Year Average Investment
Continued investment at the previous five year average of £9.7m per annum would lead to a deterioration in the condition of the asset with approximately a further 13.9% or 267km of carriageways in poor condition after 20 years. It should be noted that this average investment is skewed somewhat by the additional £6m Capital investment in 2023/24.

20 Year Investment: £194m



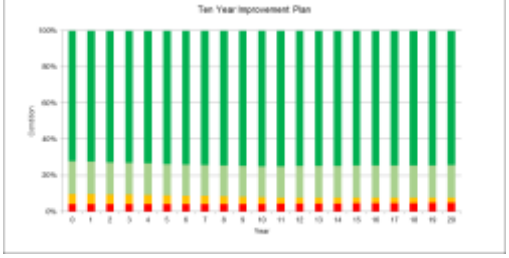
Option 3 – Steady State Investment
An annual investment of £12.85m is required to maintain the existing condition of our carriageways at 28% of carriageways requiring attention, with marginal improvement.

20 Year Investment: £257m



Option 4 – Five Year Improvement Plan
An annual investment of £13.95m over 5 years would reduce the percentage of carriageway requiring attention to 25% or less of the network. The condition could then be maintained at this level for £10.6m per annum. This investment scenario would result in Glasgow's road network being in its best condition for over a decade.

20 Year Investment: £229m



Option 5 – Ten Year Improvement Plan
An annual investment of £12.5m over 10 years would reduce the percentage of carriageway requiring attention to 25% or less of the network after 10 years. The condition could then be maintained at this level for £11m per annum. To achieve a condition under 25% would be unsustainable and require unrealistic continued investment.

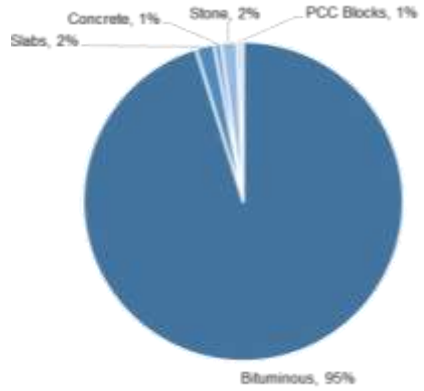
20 Year Investment: £235m

3.0 Active Travel Infrastructure

3.1 Asset Overview

3.11 Footways

Glasgow City Council is responsible for the maintenance of 3,124km of footways.



Bituminous	2974km
PCC Slabs	58km
Concrete	22km
Stone	51km
PCC Blocks	19km

Figure 5.0 – Footway Length

Impact of Recent Investment

Despite there being no specific allocated roads investment for footway works in 2022/23, there has continued to be a Capital investment in footways through City Deal projects and improvements made in conjunction with active travel schemes on key thoroughfares and transport links throughout the City.

The condition of footways is the most significant factor in the number of public injury claims and 2022/23 saw the first increase in the number of footway claims settled since 2017.

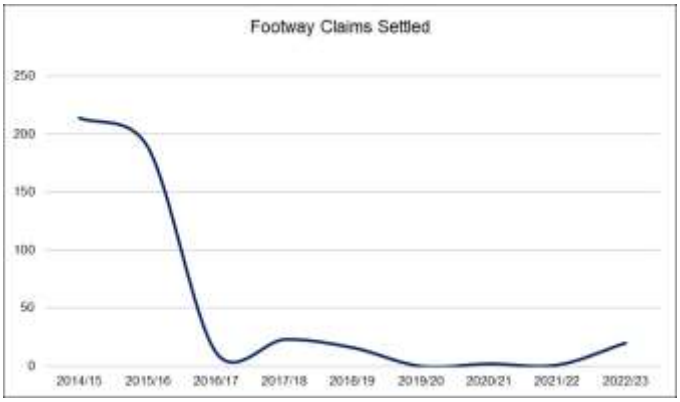


Figure 6.0 – Footway Claims Settled

Customer Satisfaction

Customer satisfaction with regards to the footway network, which is measured by an annual household survey, has fluctuated between 42% and 52% between 2012 and 2019. This is attributed to previously sustained investment to maintain the condition of our neighbourhood footways utilising value for money treatments to prolong the life of these footways by sealing the surface, whilst removing minor defects.

The 4% fall in satisfaction levels from the 2019 survey is attributed to weather conditions and the impact of the pandemic, which is now being realised. With an allocated Capital footway budget of £300k for 2023/24, in addition to a number of significant active travel and Avenues Project schemes, we anticipate that customer satisfaction will improve.

Dramatically increasing customer satisfaction of the footway network is difficult. For example, despite a major Capital investment of £5m completed in 2018, that focused on the improvement of highly pedestrianised neighbourhood thoroughfares, customer satisfaction levels did not increase.



Figure 7.0 – Customer Satisfaction

3.12 Cycleways

Glasgow's active travel network currently consists of 310km of cycle infrastructure, made up of primary and secondary routes in addition to permeable, residential zones.

As the cycle network continues to expand and be improved, we are still collecting data to assist and inform future maintenance requirements. An assessment of the primary cycle network has been completed. 61km of the primary cycle network is on the publicly adopted road network for which Glasgow City Council has a statutory duty to maintain.

Shared Path	22.9km
Segregated	22.4km
Designated	8.6km
Unmarked	3.6km
Bus Lane	2.2km
Quietway	0.7km
Remote	0.2km

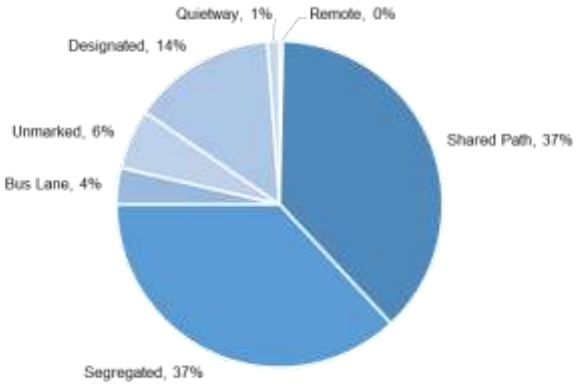


Figure 8.0 – Primary Cycle Network Length Maintained by GCC

Impact of Recent Investment

The recently adopted City Network Final Delivery Plan represents Glasgow's commitment to create a safe Citywide cycling network. Council Officers are progressing a range of projects to deliver on our City Network commitments. The previous year has largely been focussed on development, design and engagement of projects, however, phases of some key projects were delivered.

Connecting Woodside

Connecting Woodside is an area-wide active travel project, the first of its kind in Scotland and aiming to work with the community to improve streets and public spaces for walking and cycling and rebalancing streets to reduce the dominance of road traffic.

The first major phase of the project was completed in July 2021 and winning a Scottish Transport Award for Excellence in Active Travel. Further to this, the Raeberry Street phase of the project was completed in November 2023.

South City Way

Work on delivering the South City Way (SCW) continues. Site works on the penultimate phase on Gorbals Street connecting the route to Clyde Street were completed in early 2023, with a formal launch event with the funding partner and the Minister for Active Travel held in June 2023. The final stage of the SCW will deliver a link from Victoria Bridge to Trongate with works beginning in October 2023.

East City Way

The East City Way (ECW) will deliver a safer, more comfortable walking and cycling active travel route between the City Centre and Mount Vernon. The design and construction of the 7km route has been separated into 7 Phases. In advance of the UCI World Cycling Championships being held in Glasgow last August, the Project Team prioritised delivery of Phases 6 and 7 connecting the existing segregated infrastructure on the A74 London Road at Fielden Street to the existing Spaces for People segregated cycle lanes east of Canmore Street.

Secure On-Street Cycle Parking

The contract to deliver the Secure On-Street Cycle Parking project was awarded in March 2021. Phase 1 of the pilot provided 61 units across Glasgow in areas of high household density. These shelters proved to be hugely popular with residents, achieving 98% of capacity being utilised across the scheme.

Following the highly successful Phase 1, approval was granted to progress further installations. 201 units have now been successfully installed across the City giving 1206 spaces at an annual rental cost of £72 per space. The project is presently at 95% capacity and there are over 3000 residents on the waiting list for space.

Planning is currently underway for another phase of installations which will provide an additional 360 units, equating to 2160 spaces. It is anticipated that the new contract will be in place by spring 2024.

Active Travel Transformation Fund

The Scottish Government has committed to a generational shift in Active Travel over the course of this Parliament with almost £190m of funding has been allocated in 2023/24. To assist in this a national “Active Travel Transformation Project” was set up to assess delivery approaches and recommend a model to deliver this across Scotland. Against this backdrop, the Active Travel Transformation Fund was established.

The primary objective is to support the delivery of eligible construction-ready active travel schemes in 2023/24, with projects prioritised across a range of factors including the ambition and quality of the proposed scheme, delivery track record and the respective ‘readiness’ of the partner to deliver. For this first year of the fund, Glasgow City Council (GCC) successfully secured £4m for 2023/24 for the immediate delivery of three projects highlighted below.

Pitt Street Active Travel Link

This project is currently on site as part of the wider Holland Street Avenues project. The project design principles are derived from the Avenues objectives, which in turn are supported within the City Centre Transport Strategy’s priorities for creating places for people with quality public realm, green infrastructure and innovative technology. This project is now in the delivery phase and is currently scheduled for completion summer 2024.

Connecting Battlefield – Phase 1

Connecting Battlefield is an area-wide active travel project within the Langside area in the south of Glasgow. At the heart of the Connecting Battlefield project is an aim to work with the community to improve streets and public spaces for walking, wheeling and cycling, rebalancing streets to reduce the dominance of road traffic and to provide lasting improvements that are accessible and enjoyed by all.

The project will see the delivery of segregated cycling tracks on strategic routes as well as improvements to public space to make walking, wheeling and cycling more comfortable, attractive and safe for people living in, and travelling through, the area.

Phase 1 of the works will be from Victoria Road to Langside Road/Queens Park Street, north of the New Victoria Hospital. It is anticipated that works will begin on site in February 2024.

North Eat Active Travel Route (NEATR) – Phase 1

The NEATR will provide improved active travel routes in the form of segregated cycle routes and improved pedestrian facilities, connecting the North East of the City to the City Centre, via the Sighthill Transformational Regeneration Area (TRA) Pedestrian facilities include crossings, and improvements to footways and side roads, linking users between Stobhill Hospital, via the TRA and over the new Sighthill bridge and into the City Centre. It is anticipated that works will begin in late February 2024.

Customer Satisfaction

Sustrans Scotland's recent Walking and Cycling Index 2021, indicated that 42% of the public feel that their local area is a good place to cycle in. Additionally, 38% of the public stated that they feel safe cycling in their local area.

Whilst these figures may appear low, in 2020, 23.5million cycling trips were made across Glasgow totalling 103.1 million miles. The developing City Network is an essential component for Glasgow in reducing carbon and promoting health and wellbeing.

New Infrastructure and Maintenance

Public realm footways create high quality public spaces that, in addition to having a natural stone surface, include certain features, such as rain gardens and cycleways. These areas have a more aesthetically pleasing appearance as well as assisting with climate adaptation through the use of new drainage techniques.

The expansion of the cycle network at a significant rate and the installation of associated infrastructure also creates new challenges due to the specialised maintenance and labour required to maintain this network. Various materials have been utilised to provide a more aesthetically pleasing environment and enable a smoother ride which is more costly to maintain than a typical bituminous surface. This is also a public concern as a recent survey regarding the development of the South City Way indicated that 8% of respondents were worried about the future routine maintenance of the cycle network.

This new infrastructure requires increased inspection, maintenance and winter gritting as well as different plant and machinery to maintain it. The specialist routine and cyclic maintenance requirements of this infrastructure, such as increased sweeping, gritting and more expensive materials, therefore creates an increased burden on resources and existing revenue budgets.

An example of exploring different maintenance techniques was the joint funding by Glasgow City Council and Sustrans of a multipurpose vehicle that is being used to carry out winter maintenance on this new infrastructure. This vehicle is now operating at full capacity and the addition of any additional infrastructure requiring winter treatment could result in the required timescales for treatment not being met. Further options are now being explored to procure additional multipurpose vehicles due to the expansion of the cycle network. Currently with one multipurpose vehicle we are able to carry out winter maintenance of 25km of segregated cycleway Citywide. This currently costs £130k, but with additional vehicles, route optimisation and the expansion of the cycle network, it is anticipated that the unit costs will reduce to approximately £90k. With the continued expansion of the cycle network an increase to the annual revenue budget is required to maintain this level of service.

The continued expansion of the cycle network, the construction of the 17 schemes that make up the £115m Avenues Project and the expansion of public realm areas will require future revenue budgets to be increased as a result.

3.2 Asset Condition

3.21 Footways

The most recent footway condition data indicates that 81.2% of our footways are in either a good or fair condition. 2.9% (approximately 92km) of our footways exhibit major or structural deterioration and 15.9% (approximately 498km) exhibit minor deterioration such as cracking and oxidisation.

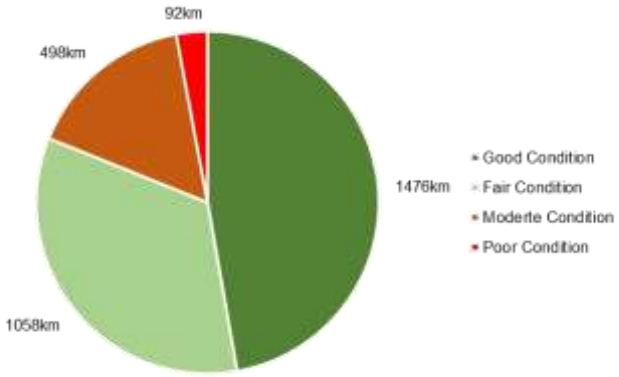


Figure 9.0 – Footway Condition

3.22 Cycleways

The condition data available at present for the cycle network only covers the 61km primary cycle network maintained by Glasgow City Council. This data indicates that 94% of the asset is in good or fair condition. This reflects the fact that much of this infrastructure is relatively new.

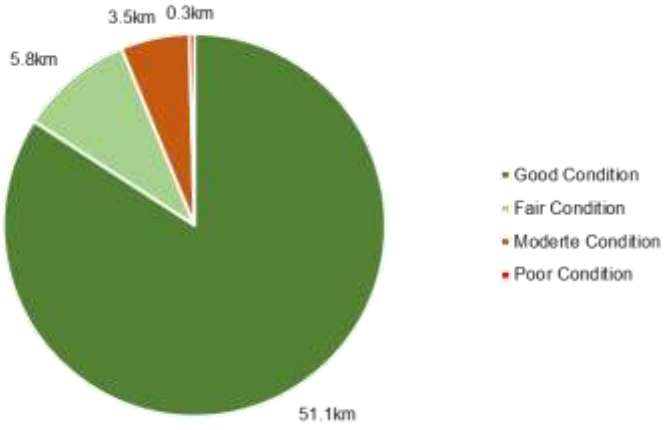
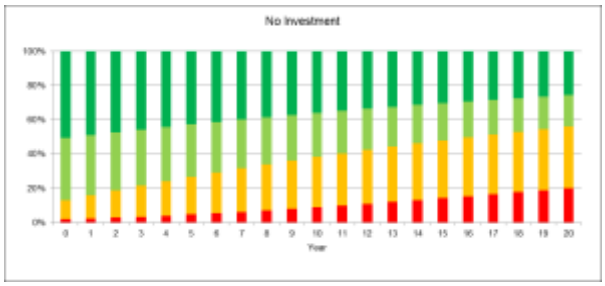


Figure 10.0 – Primary Cycle Network Condition

3.3 Active Travel Infrastructure Investment Options

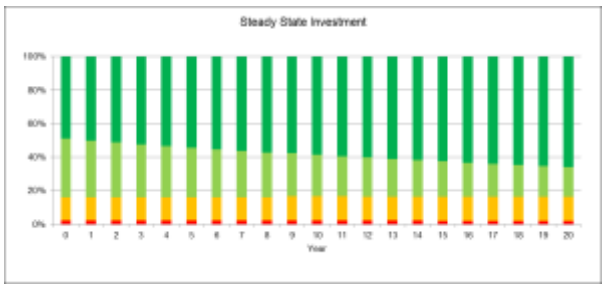
3.31 Footways

A sustained level of investment in the short term would deliver an improvement in the condition of our footways. The footway investment scenarios outlined below improve condition in the short and medium term whilst offering value in the longer term.



Option 1 – No Investment
No further investment in the asset would lead to severe deterioration, with over half of footways in poor condition after 20 years. This option would result in significant risk to public safety and dramatically increase the number of slips trips and falls and the cost of reactive repairs.

20 Year Investment: £0m



Option 2 – Steady State Investment
An annual investment of £2.25m is required to maintain the existing condition of our footway network.

20 Year Investment: £45m



Option 3 – 5 Year Improvement Plan
An annual investment of £3.78m for 5 years would remove all footways exhibiting major defects and structural deterioration (red condition footways). The steady state amount thereafter to maintain the condition level at approximately 15%, with the red condition footways remaining at 0%, would be £1.95m per annum.
20 Year Investment: £48.15m

3.32 Cycleways

Cycle Network Investment Option – New Infrastructure Maintenance Requirements

An annual revenue investment of £75k would enable the required levels of gritting, sweeping, rain garden maintenance and surface maintenance to be carried out. Investment under this level would lead to a reduction in the condition of the network and provide less scope for cost effective planned maintenance of the unique maintenance aspects of this asset.

4.0 Road Drainage

4.1 Asset Overview

Our road drainage systems comprise of approximately 74,000 gullies (stanks), 2,500km of road drains, manholes, pumps, kerb drains and a variety of Sustainable Urban Drainage Systems (SUDS). These assets form an integral part of the public road and failure to maintain them will compromise the integrity of the entire road structure and cause significant disruption to the network during storm events.

Impact of Recent Investment

Drainage improvement works are risk assessed based on Glasgow City Council's Road Safety Inspection and Repair policy and continue to be carried out to identify the causes of longstanding drainage problems at locations city wide and repairs are undertaken via revenue budgets and our Infrastructure Capital investment budget on this risk-based approach, as funds allow. However, increased investment is required to resolve a number of longstanding drainage issues.

The completion of the cyclic drainage review has also allowed the new risk-based approach to gully cleaning to commence in conjunction with neighbourhood 'weeks of action'. Specific neighbourhoods are targeted, with the programme based on numerous pieces of data, and all gullies within that area that require attention are cleaned. These 'weeks of action' also assist as since the proliferation of the car it has become very difficult to gain access to the gully asset to clean them. The system we have put in place is effective but more expensive. To date, 13 neighbourhoods have been completed with 62% showing a reduction in the number of blocked gully reports once the work has been completed, despite a 153% increase in rainfall between 2021/22 and 2022/23.



Climate Change Implications

It is recognised that flood risk and climate change continue to present a significant environmental risk to the City. Climate change has implications for the road drainage systems, with higher intensity storms predicted to become more frequent. For example, during August 2020 Glasgow experienced a 1 in 600-year storm event which saw the number of blocked gully reports increase to 608, compared to 489 in August 2019, which was the wettest on record, and 160 in August 2018.

It should also be noted that, in certain circumstances, floods are not always due to blocked gullies. Other contributing factors include; the underlying capacity of the sewer network which is insufficient to cope with periods of intense rainfall, heavy leaf fall in autumn which covers gullies preventing floodwater from draining, although this impact can be reduced with the assistance of residents clearing leaves in the vicinity of their property, and surface water management techniques that divert floodwater into 'green corridors', flood plains or storage areas until a storm passes.





Overall, the number of blocked gully reports has steadily increased to 3,100 reports in 2022/23. Reasons for this increase has been attributed to an increase in more frequent, intense storms, usually during the summer and autumn months, which results in an increase in gully cleaning requests.

We should ensure our roads infrastructure is resilient to increased risk of flooding, storms, heat stress etc. Increasing resilience to extreme weather and climate change should be part of our capital and maintenance programmes where this is cost effective.

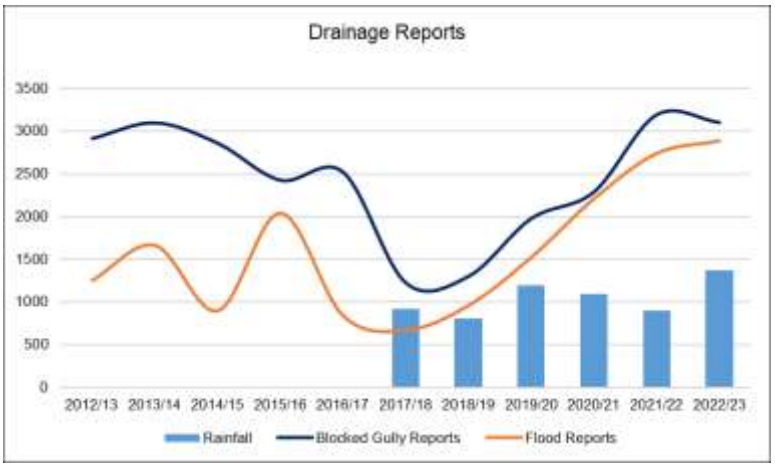


Figure 11.0 – Blocked Gully & Flood Reports

The Metropolitan Glasgow Strategic Drainage Partnership

The complexity of flooding events requires a partnership approach. The development of Surface Water Management Plans for urban areas to reduce the impact of flooding is underway in Glasgow and is being carried out through the Metropolitan Glasgow Strategic Drainage Plan (MGSDP). Glasgow City Council, Scottish Water, Scottish Government, SEPA and South Lanarkshire Council have been working together to tackle the issues of drainage and sewerage in the metropolitan Glasgow area since 2002, when the East End of the City suffered major flooding.

The objectives of the MGSDP are; supporting sustainable economic growth, flood risk reduction, water quality improvement and habitat enhancement. The work undertaken by the MGSDP has already led to informed and innovative decisions. This includes the installation of improved surface water management to prevent the wastewater systems from being overwhelmed by diverting into 'green corridors', flood plains or storage areas until a storm passes.

The MGSDP is currently developing a route map that will end uncontrolled flooding in the city for a 1 in 200 year/0.5% probability event by 2060. It is likely that this route map will identify the need for increased levels of investment in order to deliver a range of interventions similar to the City Deal inventions alongside a Property Level Protection initiative.

Sustainable Urban Drainage Systems

Sustainable solutions for the management of surface water form an integral component of the MGSDP strategy and, as such, GCC has prepared Surface Water Management Plans (SWMPs) for a number of key development areas within the City. The first stage being the development of an Integrated Water Plan (IWP) in the Clyde Gateway Initiative area in the East End. The development of IWPs, which include Sustainable Urban Drainage Systems (SUDS), allows development to proceed in areas where the combined sewerage and watercourse system is already at capacity, serving as a drainage 'blueprint'. This ultimately promotes sustainable economic growth in the City.

SUDS provide an environmentally friendly method to manage surface water and aim to control the flow, volume and frequency of surface water and prevent pollution by intercepting silt and runoff.



New SUDS infrastructure, such as; rain gardens, swales, basins, ponds or tree pits, that have been installed as part of the expansion of the cycle network, the continued construction of the schemes that make up the £115m Avenues Project and the expansion of public realm areas will require future revenue budgets to be increased as a result.

This new infrastructure requires increased inspection and maintenance as well as different plant and machinery to maintain it. The specialist routine and cyclic maintenance requirements of this infrastructure, such as increased sweeping, gritting and more expensive materials, therefore creates an increased burden on resources and existing revenue budgets.

Flood Alleviation

Glasgow City Council is working with key partners to reduce the impact of flooding. The responsibilities regarding flooding are varied, and at present a number of agencies have responsibility for dealing with its aspects in Glasgow. The Council is responsible for the drainage of local roads and public highways, provision of flood defences, maintenance of watercourses and dealing with flooding caused by extreme rainfall, tidal and river flooding.

4.2 Asset Condition

The condition of the existing road surface water drainage assets was not well developed due to a combination of factors including the lack of historical records and the expense of data collection which made it difficult to accurately predict future investment needs. To mitigate the impact of this we have completed a cyclic drainage review which has recommended a risk-based approach to drainage maintenance. Drainage inventory data being is now being collated, along with investigations into SMART gully technology, which will be used to inform future investment needs.

4.3 Road Drainage Investment Options

In addition to strategic initiatives, it is acknowledged that Glasgow's road drainage system is a historic system built up over a number of years and can be subject to blockages and failures. The cyclic drainage review, where we have digitally mapped blocked gully and flood report data, has allowed us to re-prioritise cyclic gully cleaning and drainage repair works towards a risk-based approach. This will ensure that resources are targeted to where they will achieve maximum benefit to communities in addition to freeing up resources to quickly attend to reports of flooding.

Using the data collected as part of the cyclic gully review has enabled problematic flood locations to continue to be identified Citywide. System failures can be attributed to blocked or damaged gullies, broken pipes and more complex issues relating to Scottish Water sewer capacity and topography.

In order to ensure the significant investment continues to function, as designed, for future years, it is vital that appropriate maintenance is funded and delivered for new assets alongside maintaining existing assets. Failure to do so will reduce performance and increase costs associated with reacting to incidents, both for the Council and communities.

Investment Option – No Additional Investment

Maintaining the current revenue investment of £750k would only allow for the existing level of cyclic maintenance to be maintained and would not allow for any repairs to known issues to be resolved or any additional maintenance aspects for new assets to be incorporated.

Investment Option – Minimum Maintenance and Repairs

An increase in revenue investment by £100k per annum would allow for increased cyclic gully cleaning and minor follow-up repairs to be carried out when issues arise.

Investment Option – Improvement Investment

Previous investment enabled us to investigate and repair many recurring flood locations to further reduce flood reports and minimise network disruption during periods of inclement weather.

Based on average scheme costs in the past few years, it is estimated that an additional revenue investment of £500k per annum would enable us to continue to maintain the road drainage asset and improve the level of customer satisfaction, through a programme of preventative measures rather than through reactive maintenance.

5.0 Lighting

5.1 Asset Overview

We have recently undertaken an exercise to validate our inventory and the Council's Street lighting network consists of over 74,000 lighting columns/supports and approximately 74,250 lanterns.

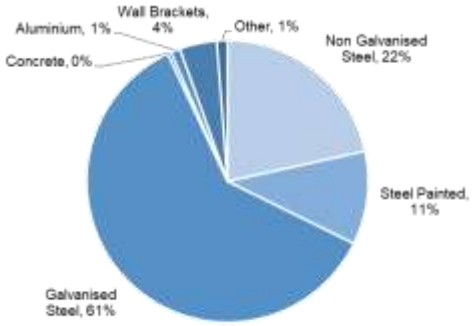


Figure 12.0 – Column/Support Type

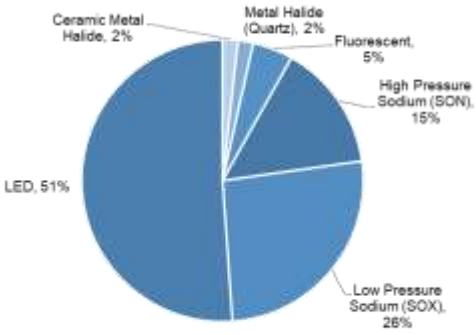


Figure 13.0 – Lantern Type

Impact of Recent Investment

Although the street lighting investment recently has been significant in comparison to the past, the level of investment is still below the £5.95m per annum steady state figure required to maintain the infrastructure in its current condition. There is a need for increased investment as the existing levels on infrastructure improvements do not address the ageing profile of the lighting assets.

Further investment of £7.5m was approved (£2.5m per annum over three years). This investment will replace approximately 2,500 columns over the next two years.

Energy Costs

The biggest factor currently influencing street lighting is the price of electricity. Over the last decade the cost of electricity has increased considerably, and it is predicted that these prices will rise in the coming years. If the recent trend is to continue, the additional cost to the street lighting service will be significant.

In Figure 14.0 below, growth rates, between 5% and 12%, have been used to measure potential increases in electricity costs (based on today's consumption) over the next 20 years. If the projected energy cost increases are realised, the energy bill could increase significantly, from £5.029m in 2022/23 up to £43.3m in 20 years.

The energy costs are already rising and compared to last year, it would not be unreasonable to forecast that the figure could rise to £8m for 2023/24.

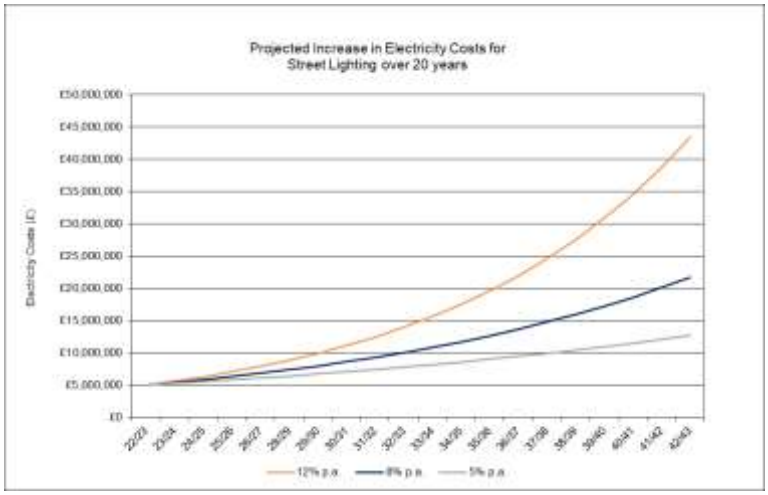


Figure 14.0 – Projected Increase in Electricity Costs for Street Lighting

Environmental Issues

The LED lanterns installed are using an average of 65% less energy. This is improving the efficiency of the lighting network and contributing towards the Council's corporate sustainability objectives by reducing carbon emissions and the aim of being one of the most sustainable cities in Europe.

Energy Efficiency

Over 80% of the remaining sodium lanterns (orange-coloured lamps) have exceeded their expected service life. As these lamp types are no longer produced our street lighting teams are now replacing any sodium lanterns that need changing with LED lanterns as standard.

It is important to explore options for reducing street lighting energy usage that will protect the Council against predicted energy cost rises noted above. Additional costs are also incurred as part of the Climate Change Levy.

5.2 Asset Condition

Structural Columns

Glasgow's lighting infrastructure consists of various column types and is in poor condition with approximately 30,800 lighting columns (41%) beyond their Expected Service Life (ESL). This is a significant issue as the deteriorating condition of the infrastructure poses an increasing risk to public safety. To mitigate this risk an increased inspection regime has been implemented to identify and pro-actively remove columns in the poorest condition.

In recent years, there has been a number of lighting column failures which are being addressed by an investment in our column replacement programme. This programme aligns with our Risk Management Strategy and has been implemented to ensure that ongoing maintenance (electrical and structural) is prioritised in accordance with the risk it poses and that those columns most at risk of failure are identified and replaced.

The number of high-risk condition Type 4 columns identified has increased by approximately 25% in the last year to over 8,000 with 5 column failures in 2023.

To date, over 4,580 columns have been replaced as part of this programme which includes the fitting of LED lanterns. Overall, there are approximately 40,000 LED units installed throughout Glasgow.

The photographs below are examples of Type 4, high risk condition columns (which have since been replaced).





Lighting Network Replacement

We have undertaken 10 complete lighting network replacement schemes. The benefit of these installations is that both structural and electrical risks are addressed at the same time. The picture below from Clarence Drive also shows the improvement in the overall lighting effect.



5.3 Lighting Investment Options

The investment scenarios below would address the highest risks associated with the ageing lighting assets following completion of the ongoing column renewal and LED projects. It should be noted that no allowance is made for inflation; forecasts are made at current market rates.

Due to the condition of the existing street lighting, options 4 or 5 will offer a realistic approach to address the continual deterioration of Glasgow's street lighting network.

Investment Option 1: No Investment

If the assets beyond their expected service life are not replaced, the risk of injury by column collapse or exposure to electrical wiring will increase. Over 73% of lighting columns will exceed their expected service life by 2033. In the absence of a sustained renewal programmes the reduction of condition of our lighting assets will accelerate and lead to an ever-increasing number of network failures and reactive repairs.

30 Year Investment: £0m

Investment Option 2: Current Level of Investment

If we continue at the current level of investment (£2.5m/year), the age profile of the columns will continue to deteriorate and the risk of injury by column collapse or exposure to electrical wiring will increase. Over 58% of lighting columns will exceed their expected service life by 2033.

30 Year Investment: £150m

Investment Option 3: Steady State Investment

At present, 41% of Glasgow's Street lighting assets are beyond their ESL. An annual investment of £5.95m is required to maintain the current condition of the asset.

30 Year Investment: £178.5m

Investment Option 4: Replacement of Columns with Condition Category Type 4

An average investment of £5.2m for 5 years would replace up to 8,000 'category Type 4' columns and associated cabling that are in poor condition, followed by a steady state of £5.19m per annum for the next 25 years. This investment will show an improvement in condition over 5 years, but if no further investment above steady state, then approximately 45% of columns will exceed their service by 2028.

This investment will show an improvement in condition over 5 years, but if no further investment above steady state, then approximately 45% of columns will exceed their service by 2028.

The benefit of this investment is that it will address and replace the Type 4 high risk columns already identified within the lighting asset.
30 Year Investment: £184m

Investment Option 5: Replacement of Columns Exceeding Service Life

An average investment of £6.67m for 15 years would replace up to 30,800 'at-risk' columns and associated cabling which will result in a substantial improvement in infrastructure condition followed by a steady state of £3.17m per annum for the next 15 years. This will significantly reduce the risk of structural column failure and improve our column age profile by addressing the columns that currently exceed their expected service life. This action will show an improvement in condition and approximately 36% of columns will exceed their service by 2038. The fitting of new LEDs for these columns would be included within the investment, providing the associated reductions in energy consumption and carbon emissions.

The benefit of this investment is an improvement and stabilisation of condition of the street lighting infrastructure, a significant reduction in the risk of structural column failure and electric shock, a reduction in reactive repairs and increased customer satisfaction.

30 Year Investment: £222m

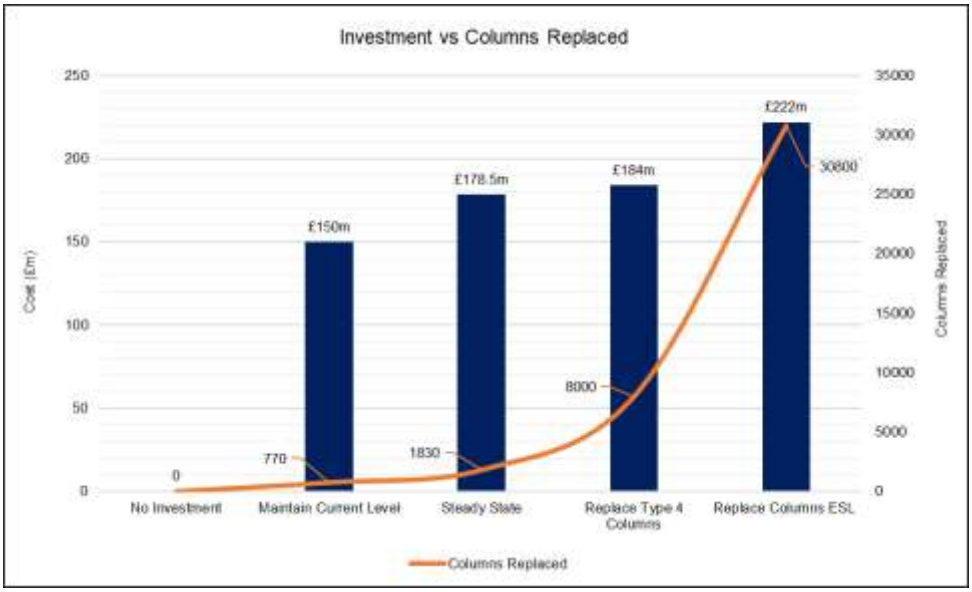


Figure 15.0 – Investment vs Columns Replaced

6.0 Traffic Signals

6.1 Asset Overview

Traffcom is the Council's traffic control centre that manages the intelligent transport systems within the City. This includes;

- 910 traffic signal-controlled junctions and crossings, comprised of; poles, cables, traffic signal lanterns, push buttons, detectors and controllers.
- A Urban Traffic Management Control (UTMC) system that includes; bus priority, which is installed at over 150 sites and can detect late buses and amend the traffic signal timings to get any late buses back on their original timetable, Split Cycle Offset Optimisation Technique (SCOOT), which is a real time adaptive traffic control system, and fault management.
- 5 strategic Variable Message Signs (VMS) on arterial routes into the City that can be configured to display key travel information to motorists regarding events and incidents on the road network.

Impact of Recent Investment

Projects completed in 2022/23 saw the upgrade of six junctions, six pedestrian crossings and the introduction of one new crossing from the Clyde Walking Safer Routes (CWSR) budget awarded by Transport Scotland. This allowed the sites to be upgraded to the current accessible standards which include tactile cones, tactile paving, smart cross and new technology to improve pedestrian and cyclist facilities, pedestrian safety at crossings and reduce traffic signal fault rates.





We have continued with the introduction of Smart Cross technology at sites where the cabling can support this. Smart Cross is a touchless push button for pedestrians to request the green man which helps to make active travel more accessible for disability groups and improve journeys for vulnerable users. Smart Cross is now installed as standard at all new and upgraded traffic signal installations.



Funding from Strathclyde Partnership for Transport (SPT) and the Roads Capital budget allowed us to continue to repair traffic carriageway loops or install above ground detection on over 200 sites to keep the network moving and get SCOOT/Bus Priority repaired quickly. We continue to see damaged loops on a frequent basis and are gradually moving sites to above ground detection to reduce system down times and increase efficiency of junctions.

Disability Discrimination

Traffcom are aware of the difficulties people with disabilities face when travelling around the City in particular the City Centre and key public transport locations. The Equality Act 2010 places a duty on the Council to make reasonable adjustments for people with disabilities to help them to overcome barriers they may face when using road infrastructure assets. Upgrading traffic signal junctions improves accessibility and safety to Glasgow's most vulnerable citizens through the installation of compliant tactile paving, tactile cones and improving the junction layout.

6.2 Asset Condition

Traffic signal condition monitoring is carried out as part of the maintenance inspection under the current maintenance contract. The main items of equipment (controller, poles, cabling and signal heads) are allocated a scoring from 1 to 5 based on condition, with 1 being good condition and 5 being old and in need of replacement.

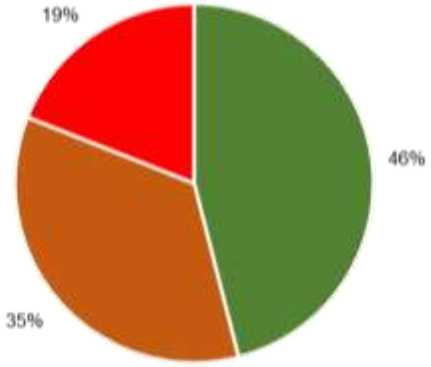


Figure 16.0 – Traffic Signal Condition

Whilst we have seen the number of faults decrease by approximately 300, there have been two occasions this year where there was a power surge from the national grid which impacted on over 100 sites. There is a specific older type of controller that does not reset after power issues and, therefore, these sites have to be reset manually. This also meant that there was approximately 100 extra faults recorded that month. We also recorded a higher number of Road Traffic Collisions involving traffic signal equipment this year, with 22 recorded in December 2022 alone.

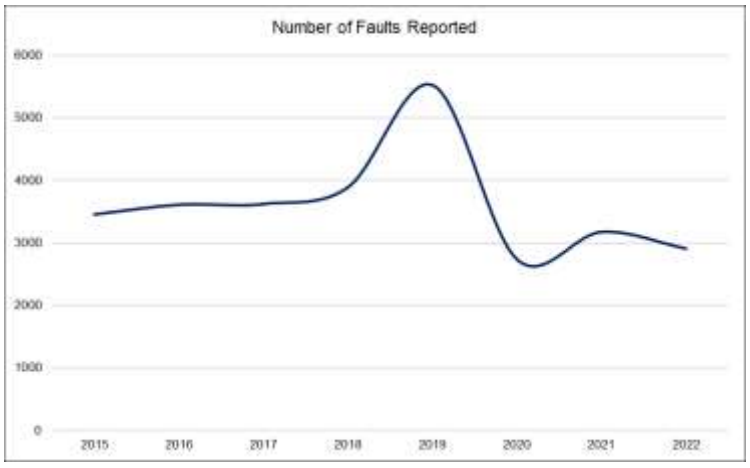


Figure 17.0 – Number of Traffic Signal Faults Reported

Procuring and Sustaining Non-LED Stock

The Traffcom team are still continuing to report on the incandescent lamp crisis and obsolete equipment. This is where the lamps that incur higher energy costs and are less environmentally friendly are becoming increasingly difficult to source. The ageing sites are still a concern as it is becoming increasingly expensive to maintain these and source components for the older equipment.

As reported last year, we still have a large number of sites that are in excess of 15 years old. Approximately 47% of our assets are incandescent lamps and obsolete.

Variable Message Signs (VMS)

Due to the age of the five VMS signs, we are continuing to see a decline in their operation as parts have been obsolete for some time. We made the decision to remove the VMS located on Maryhill Road last year as this had become faulty and parts could not be sourced. Parts from this were used to keep the remaining signs operational. Costs for replacement of the signs is approximately £220k and we continue to review the options for replacing the signs and funding sources.

6.3 Traffic Signal Investment Options

Sustained investment is required to address the poor condition of these assets, reduce cyclic maintenance costs and improve energy efficiencies.

The existing UTMC system has been in place since 2014 and will require an upgrade within approximately five years in order to keep up with changes within the industry. This includes updates to existing systems such as bus priority and SCOOT as well as the introduction of new technology, artificial intelligence and fault management.

It is worth noting that the Contract Price Adjustment on the contract in January 2023 was 7.8%, this along with material costs increase and industry shortage for component parts will have a major impact on the delivery of projects within the funding limitations.

Investment Option 1 – No Investment

No investment would see a significant deterioration in the condition of the traffic signal infrastructure. This would result in an immediate risk to road safety and increased network disruption, with the number of faults reported increasing considerably.

Investment Option 2 – Current Investment

Capital investment for the 2022/23 financial year was £1.6m. Our models indicate that with an investment of £1.6m per annum, it would require approximately 16 years to bring the traffic signal infrastructure up to the required standards. This level of investment would not address the potential risk of road safety or increased network disruption.

Investment Option 3 – Steady State Investment

An annual investment of £3.5m is required to maintain and/or replace assets which are assessed as poor condition, but still serviceable.

It should be noted that an increase in investment would also require an upscale of the resources within the team to cope with the increase design and management of projects.

Investment Option 4 – Upgrade all Remaining Sites to LED and Equality Act 2010 Compliance

An investment of £5.5m for 5 years is required to address the risk of traffic signal lamps becoming unavailable and bring all signalised junctions to the current standards in the Equality Act 2010.

Traffic signals, tactile cones and tactile paving are essential to allow visually impaired pedestrians to navigate the City and use the junctions and pedestrian crossings. There are currently 157 sites without tactile paving and 99 sites without tactile cones.

Improvements would also include the upgrade of all traffic signals to LED. It should be noted that there is significant costs savings to be made if the traffic signal network was upgraded to LED as this would further reduce the Council's energy use, reduce CO2 emissions, reduce maintenance costs, and significantly improve traffic signal operations with a reduction of incidents of traffic signals not working due to failure of components.

7.0 Traffic Signs, Lines & Street Furniture

7.1 Asset Overview

Glasgow City Council is responsible for the maintenance of;

- 24,000 traffic signs
- 20,000 bollards
- 110km of pedestrian barrier
- 5.3km of vehicle safety barrier
- 5,700km of road markings

All these assets improve the safety and usability of the road network. Additional street furniture such as seating, grit bins and bus shelters is also included within this asset group.

Impact of Recent Investment

Current investment of £546k per annum only allows for the reactive maintenance of these assets and repairs are carried out when assets are no longer fit for purpose or to mitigate the risk to public safety.

A £250k programme was completed that focussed on the repair of key, highly critical vehicle safety barrier on the Clydeside Expressway and Clyde Tunnel Expressway that will reduce the severity of accidents and save lives.

7.2 Asset Condition

The most recent condition surveys indicate that the majority of the street furniture asset is in a safe and serviceable condition with 98% of pedestrian barriers, 98% of bollards, 96% of traffic signs and 99% of vehicle safety barriers in good condition.

Road markings are a vital asset that improve road safety and facilitates enforcement. Assessments have shown that 80% of road markings in the City are in good condition.

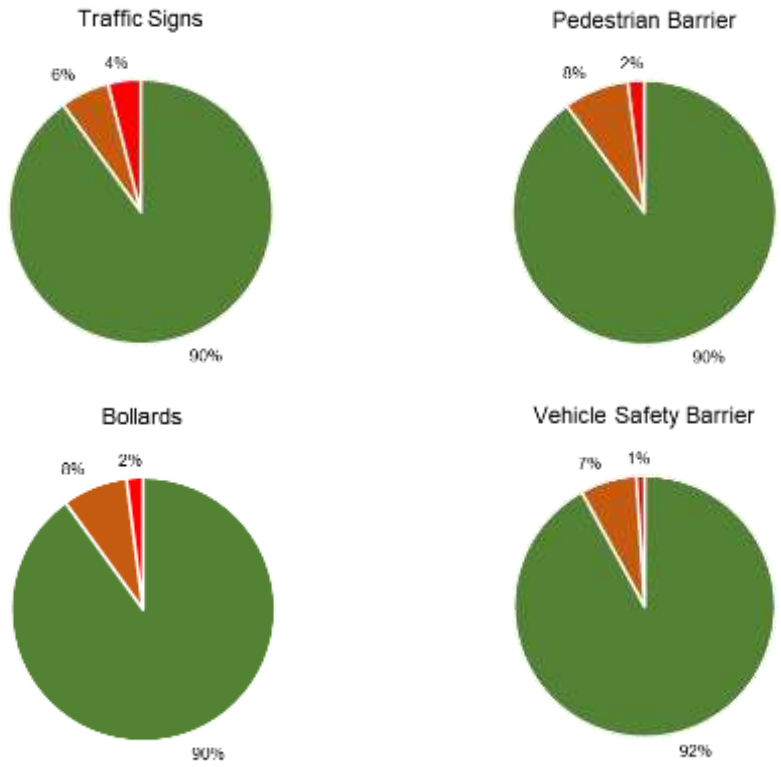


Figure 18.0 – Asset Condition

7.3 Traffic Signs, Lines & Street Furniture Investment Options

Increased and sustained investment would proactively target assets beyond or nearing the end of their useful life, improve asset condition and reduce ongoing maintenance costs.

Investment Option: Repair Assets in Need of Renewal

An additional revenue investment of £100k over a sustained period of 16 years would allow for the repair or replacement of all street furniture identified as being in poor condition, including 960 traffic signs, 2.2km of pedestrian barrier and 400 bollards. This investment will improve road safety and remove unsightly road furniture.

8.0 Structures

8.1 Asset Overview

Glasgow City Council is responsible for maintaining and managing 395 structures throughout the City.

These include listed structures, such as the Albert Bridge (built 1871), old masonry arch bridges such as Snuff Mill (built 1730) in Langside and modern iconic structures such as the Clyde Arc (built 2006). All have differing maintenance requirements dependent upon their structural type and condition.

Glasgow's structures connect communities and ensure commerce allowing citizens and business easy access across rivers, railways and roads ensuring efficient travel and transportation.

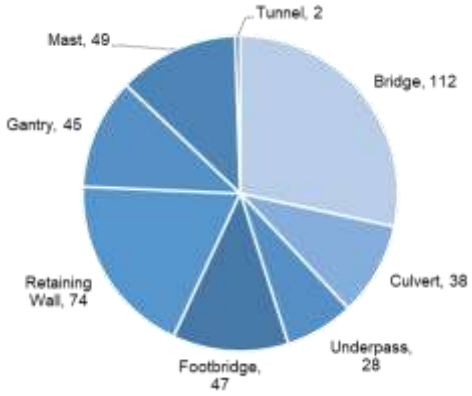


Figure 19.0 – Structures Asset

Impact of Recent Investment

Targeted concrete repairs were carried out on sixteen bridges last year. Repairs treated bridges where important concrete members were in a severe condition. This programmed preventative maintenance will prolong the service life of the bridges.

Drainage clearance, de-vegetation and minor works to structures were carried out as routine maintenance improving serviceability and safety. Numerous investigations and smaller repair and strengthening schemes are underway on the highest priority bridges to improve the condition of the asset, including the Partick Bridge Parapet Repair project which is underway.

Structural Assessments

A load assessment programme has been ongoing since the 1990's. 20 Council owned/maintained bridges failed the load assessment in addition to 63 privately owned bridges, mostly owned by Network Rail. These bridges either have weight restrictions or interim measures in place, such as vehicle containment barriers to keep traffic to stronger areas of the bridge. Nithsdale Road Bridge replacement in Strathbungo, was completed by Network Rail in January 2023 which removed Council liability to the understrength bridge.

Network Rail Structures – Shields Road Bridge

Legislation passed, as part of the 1968 Transport Act, limits Network Rail's load bearing obligation to 1968 loading standards. Due to this, Glasgow City Council has a liability to contribute to the cost of strengthening, or replacing, Network Rail owned bridges which form part of the public road network.

The Shields Road Bridge (owned by Network Rail) is located over the railway between Scotland Street and St Andrews Drive and has been identified by Network Rail as requiring replacement as the bridge is weak and in a very poor condition. Shields Road bridge replacement works are currently underway with the replacement cost currently estimated to be £12.6m, with the Council contributing £5m.

8.2 Asset Condition

There are two key Bridge Stock Condition Indicators (BSCI) used to measure and compare the condition of the Scottish Council Bridge stock. 'BSCI Average', is a measure of the overall condition of all the structures, and 'BSCI Critical' is a measure of the most deteriorated parts of the structures.

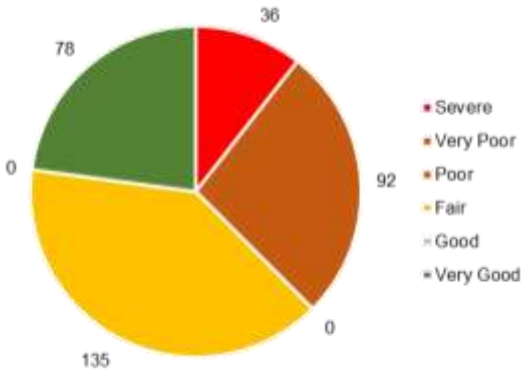


Figure 20.0 – Asset Condition

The Average Condition Indicator is 83 which equates to a condition rating of 'Fair'.

Glasgow's Critical Condition Indicator is 53. This value equates to a rating of 'Very Poor Condition'. Structures in very poor condition or lower have been investigated and remedial works prioritised. This condition factor does not indicate that the structures are unsafe; it indicates there is a potential for deterioration in condition of an element, or elements, of the structure if maintenance works are not carried out.

Maintenance priorities are targeted to ensure structures are safe. Many structures cannot be fully refurbished due to lack of funding and this is reflected in the condition indicator figures.

76 structures have been identified for future remedial programmes. The table below lists the top ten priorities.

1. Shieldhall Overpass Refurbishment	£4.5m
2. Edinburgh Rd Bridge o/rail Refurbishment	£455k
3. Edinburgh Rd o/dis Bridge Repairs	£240k
4. Partick Bridge Parapet Repair	£120k
5. Dumbarton Road o/dis Rail	£150k
6. Cathcart Road (E&W) Footbridge Refurbishment	£100k
7. Edmiston Drive Govan Bridge Repairs	£110k
8. Bellfield St Footbridge Replacement	£1.2m
9. Dumbarton Road Bridge o/tunnel Approaches Parapet Upgrade	£80k
10. Finnieston Overpass Refurbishment Phase 2	£2m

The top priority structure is Shieldhall Overpass. £4.5M of Capital funding has been secured for year 2024/25 when works will commence on site. The works tender process will commence at the end of 2023 with works commencing summer 2024.

8.3 Structures Investment Options

It is estimated that £52m is required to strengthen weak bridges, upgrade parapets to current standards and address all maintenance needs identified during the cyclic inspections.

Investment Option 1 – No Investment

In the absence of capital funding the condition of the structures stock will move towards very poor. The deterioration of these assets will accelerate until they become unsafe. In the short term there would be an increase in the number of weight restrictions and lane closures. In the longer-term bridges, and roads, would need to be closed.

Investment Option 2 – Steady State Investment

In order to halt deterioration it is estimated that an annual investment of £3.6m is required. With this level of funding the overall condition would not deteriorate. Existing measures including weight restrictions and lane closures would remain.

Investment Option 3 – Structure Repair Plan

In order to strengthen and repair the structures in the worst condition, an annual investment of £4.5m is required for the 20 year cycle. Medium and long term programmes would allow the removal of lane & weight restrictions throughout the city and improve the Bridge Stock Condition Indicators.

Investment Option 4 – Structures Improvement Plan

To improve the condition and performance of the structures stock, including upgrading, would require an average annual capital investment of £6.2m over a 20-year period. Committing this level of investment would minimise whole life maintenance costs while prioritising the required levels of performance, i.e. removal of traffic restrictions from bridges across the network and would shift the structures to a stable ‘fair’ condition.

9.0 The Clyde Tunnel

9.1 Asset Overview

Strategic Importance

Glasgow City Council is responsible for the maintenance of the only road tunnel in Scotland. The Clyde Tunnel is the busiest stretch of non-trunk road in Scotland with approximately 64,000 vehicles using the Tunnel each day. An independent study assessing the economic value of the Tunnel concluded that it has local, regional, and national importance. It also concluded that, if the Tunnel was closed to vehicles, there would be an unacceptable severe impact on the movement of goods and people in the Clyde Valley affecting the viability of commerce, industry, and tourism.



Grant Aided Expenditure

The operational funding for Clyde Tunnel funding is not properly accounted for in the Grant Aided Expenditure (GAE) formula. Glasgow City Council receives the same amount of funding as a similar length of local road. This funding takes no account of the need for the Tunnel to be staffed 24/7, the maintenance of the two tunnel bores and safety equipment, the maintenance of the two ventilation buildings, operational control room and the office block. The revenue funding shortfall is approximately £820k each year.

Traffic modelling confirmed that any unplanned closure of the Clyde Tunnel, due to lack of maintenance, would have an adverse socio-economic impact as well as a risk of reputational damage. The traffic modelling also confirmed the regional and national importance of this asset to the economy and its importance in serving the Queen Elizabeth University Hospital. Meetings were held with Transport Scotland (TS) to discuss the outputs of the traffic modelling and if any funding could be accessed. Although TS provided technical advice and information, they confirmed that they were unable to assist with any funding. GCC is preparing a Clyde Tunnel business case to support future funding bids.

Operational Requirements

There are strict regulations on the safety and management of road tunnels that require an operational workforce 24/7, 365 days a year. The workforce consists of one Tunnel Manager, one operations controller, one assistant operations controller, twelve network officers (three on shift at any one time) and one electrician/fitter. The appointment of a Tunnel Manager (Clyde Tunnel & Tidal Weir) was completed in November 2021 and provides professional oversight, compliance with the Road Tunnel Regulations 2007 and defends GCC's legislative position. Operation safety detail is included in Appendix 1 at the end of this report.

9.2 Asset Condition

Road Tunnel Structural Repairs, Cathodic Protection, Emergency Cross Passage & Approach Ramp Grouting

Structural repairs and the replacement of the Tunnel's cathodic protection system are required. There is a risk that localised repairs will be needed to the reinforced concrete road deck which would lead to traffic congestion. Partial funding of £1m has been provided within Capital Investment for 2024/25. However, costs received from bidders initial funding was insufficient and further funding of £3m is required to complete all planned works.

Structural modification to the existing cross passage is needed also it can become a compliant evacuation route. Approach ramp grouting repairs are required to improve condition and proper drainage.

Operational Buildings

The outcome of a building condition survey carried out in 2015 concluded that the two ventilation buildings, operational control room and the office block require upgrading; structural repairs and remedial works are required so that they are wind and watertight. The condition of these operational buildings increases the risk of system failures that may require the Tunnel to be closed.

Capital Investment funding has been provided in 2023/24 to carry out some works with further funding of £1m available in 2024/25 to complete required roof repairs to workshop roof and to the north and south ventilation buildings. During these roof works, the intake cowling and exhaust ventilation ducts on the north and south ventilation buildings were found to have lost protective galvanised coating allowing significant sections of rust to form, this is contributing to water penetration into the buildings and fans. Funding of around £500k is required to clean, repair and recoat the protective covering for these essential structural parts.

Cycle & Pedestrian Tunnels

The existing wall mounted fluorescent compact lamp fittings are beyond their design life and the associated cabling requires to be replaced. To promote active travel and safe use of the cycle and pedestrian ways, the existing lamps and cabling are be replaced with energy efficient LEDs, new cabling, CCTV & public address systems. This would greatly encourage active travel due to the more welcoming and safer environment. Our contractor is working on design plans and costs to include these works within the existing capital funded projects, this is expected to be published late-2023.

North & South Ventilation and Plant Rooms

The original ventilation installation from the 1960s requires to be overhauled.

9.3 Clyde Tunnel Investment Requirements

The Tunnel and its approaches require substantial capital investment. The table below summarises prioritised investment needs.

Clyde Tunnel (Priority = Red/Amber/Green)	**Estimate (£M)**
Cathodic Protection/Concrete Repairs Cycle & Pedestrian Tunnels	3.00
Intake Cowling & Exhaust Ventilation Repairs	0.50
SCADA Integration Cycle & Pedestrian Tunnel	0.30
Road Tunnel LV Power Supply and Distribution Upgrade	0.60
Shieldhall Overpass Strengthening*	*4.50
CCTV Cycle & Pedestrian Tunnels	0.10
Road Tunnel Replacement Drainage Pumps	0.20
LED & Cabling Cycle & Pedestrian Tunnels	0.60
Road Tunnel Emergency Cross Passage	2.00
Road Tunnel Ventilation Upgrade	0.50
Road Tunnel Fire Auto Fixed Fogging System, Gas Detection & Fire Ring Main	3.50
Clyde Tunnel Approach Ramps Grouting	0.20
Total	**16.00**

* This investment requirement is included within the Structures backlog figure (section 8).

10.0 Ex GCC Housing Infrastructure

10.1 Maintenance Obligations

The roads infrastructure associated with the 2003 housing stock transfer to Glasgow Housing Association are not adopted as public and the Council has no statutory obligation under the Roads Scotland Act with regards to maintenance and replacement of these assets and consequently are not included in any safety inspection regime or considered for inclusion in investment programmes.

A number of these housing estates have been subsequently subject of secondary transfers and are the responsibility of Local Housing Associations and due to a lack of investment, this infrastructure is generally in poor condition and requires extensive investment to bring it up to an acceptable standard.

A recent legal interpretation of the 2003 transfer agreement has determined that although not statutorily obliged to maintain these assets, the Council corporately does have contractual (under the terms of the agreement) and a wider duty of care (as landowner) obligations to ensure that these assets are safe and maintained to a reasonable standard. At present NRS undertake reactive repairs to ensure that these assets remain safe, however without planned investment these assets continue to deteriorate and the requirement to undertake these repairs has increased resulting in dissatisfaction of residents, an increasing number of complaints and puts additional pressure on already stretched maintenance resources. It will not be feasible to continue to undertake these types of repairs forever and investment will be required to upgrade and replace these assets.

10.2 Scale of the Assets & Upgrade Costs

The roads infrastructure that serves the ex GCC Housing Estates is significant and comprises of approximately 44km of road (2% of existing network length) and 265km of footway and footpaths (8% of existing network length) a visual survey undertaken in 2015 estimated the cost to bring these roads and footpaths to acceptable standard to be in the region of £7m this is now likely to have increased.

A substantial lighting asset, estimated to be approximately 8,800 columns (12% of existing total), is also associated with the 2003 housing stock transfer. No condition data is available however in the absence of any investment it is likely that the majority of this will either have exceeded or be near to exceeding it's 30-year service life and will be in need of replacement. The cost to completely replace the lighting asset associated with the Stock Transfer is estimated to be £24m.

10.3 Summary

In the absence of significant investment to repair and upgrade these assets The Council is exposed to an ever-increasing maintenance liability that is likely to increase year on year, the likelihood is that costs to undertake reactive repairs will increase, customer satisfaction will decrease and complaints, Member Enquiries and public liability claims will also increase. To try and mitigate these risks we are proposing to establish cross department working group to review how these assets are maintained and explore options and opportunities to attract additional funding.

11.0 Recommended Investment Options

Asset Group	Investment Option	Projected Outcome
Carriageways	£69.75m Over 5 Years	An annual investment of £13.95m for 5 years would lead to the Glasgow road network being in the best condition in over a decade.
Footways	£18.9m Over 5 Years	An annual investment of £3.78m would remove all footways exhibiting major defects and structural deterioration.
Street Lighting	£100m Over 15 Years	An annual investment of £6.67m for 15 years would replace up to 30,800 'at-risk' columns and associated cabling which would substantially improve the infrastructure condition.
Traffic Signals	£27.5m Over 5 Years	An annual investment of £5.5m for 5 years will convert all traffic signal junctions with old incandescent technology to LED's and the installation of tactile paving at all junctions and pedestrian crossings.
Structures	£90m Over 20 Years	An annual investment of £4.5m over a 20 year period would allow for the structures in the worst condition to be targeted for repair.
Clyde Tunnel	£16m	An investment of £16m would allow for the repair of operational infrastructure and structural issues.
Total Investment	£322m	

Asset Group	Additional Revenue Investment	Projected Outcome
Cycleways	£75k per annum	An additional investment of £75k would enable the required levels of gritting, sweeping, rain garden maintenance and surface maintenance to be carried out.
Road Drainage Systems	£500k per annum	An additional investment of £500k would enable us to maintain the road drainage asset and improve the level of customer satisfaction, through a programme of preventative measures rather than through reactive maintenance.
Traffic Signs, Lines and Street Furniture	£100k per annum	An additional investment of £100k over a sustained period would allow for the repair or replacement of all street furniture identified as being in poor condition
Total Additional Revenue Investment	£675k per annum	

Appendix 1 – Clyde Tunnel Operational Safety

SCADA

The existing Supervisory Control and Data Acquisition system (SCADA) was replaced In July 2022 due to obsolete technology and lack of available replacement parts. This SCADA replacement has been installed in a new environmentally controlled server room and provides a modern system for control of pumps, ventilation, lighting, telephones, fire control, and VAID. Further sub-systems can be added later to the fibre backbone provide extra integrated functionality at a lower cost than a standalone implementation.

LED Lighting

LED Lighting installation in both bores of the Tunnel was completed in June 2022 and has been fully integrated into SCADA. This major improvement work provides modern, controllable energy efficient lighting that is compliant with current safety and design standards. Our electricity supplier has indicated a 50% saving has been achieved on our typical 94,000 kWh monthly usage for lighting at the Clyde Tunnel after introduction of LED Lighting.

Telephone System

The aging analogue PABX internal & SOS telephone was updated in September 2022 to a modern IP internal telephony system with enhanced routing features, call recording, fault reporting and integration with SCADA systems.

VAID

The Clyde Tunnel has a variety of critical operational safety systems and equipment. A new Video Automated Incident Detection (VAID) system was installed in October 2021 and integrated with the SCADA improving traffic control and incident detection. The system was extended further in July 2022 to enhance ramp & portal visibility. This replaced the old proprietary analogue VAID system that was beyond its design life and provides additional safety functionality and enhanced digital camera coverage along with incident recording and limited archiving of video.

Road Tunnel Fire Detection

Funding has been sourced to upgrade the obsolete ADT Fire Control system which is required to provide compliance with Design & Refurbishment Code of Practice for Roads Tunnels (CD352). An independent Fire Risk Assessment was carried out in September 2022 and plans are progressing to have a new Fire Control system installed mid-2024. This fire control system will also be fully integrated within the new SCADA system.

Electric Vehicle Batteries

An emerging risk is that of potential for Electric Vehicle (EV) fires occurring within the tunnel. The risk of an EV fire within the tunnel is low however the impact is very high should it happen. A working group has been setup to investigate options to mitigate the risks to the public, staff and tunnel structures. We will look at engaging with specialist contractors to assist recovery of vehicles and procedures to deal with contaminated by-products from any fire. As the only road tunnel within Scotland, the working group will be taking the lead in developing new operational procedures and regular review as necessary.

Business Continuity Plan

The Glasgow Operations Centre (GOC) will be updated by mid-2024 to include backup facilities for operational control of Clyde Tunnel to ensure business continuity as and when required. This SCADA integration will be regularly tested to ensure easy transition between operational sites and will be utilised during live exercises to ensure multi-agency responses are co-ordinated.

Public Address, Radio Re-broadcast

The Clyde Tunnel has no public address, voice alarm, Emergency Services Airwave Radio or public radio re-broadcast systems. There is a risk that should there be a major incident within the Tunnel, the efficient and safe management of the emergency services and evacuees could be compromised.

Variable message signing (VMS) and improved traffic control is required to provide compliance with Design & Refurbishment Code of Practice for Roads Tunnels (CD352). Funding of £950k was provided from Capital Investment programme for 2023/24 & 2024/25 to proceed with installation via tender in mid-2024. Procurement of consultancy services to inform the tender process is proceeding in late-2023.

Road Tunnel Fire Protection

Comprehensive active fire protection installations are required to provide compliance with Design & Refurbishment Code of Practice for Roads Tunnels (CD352). Refer to the table in Section 10.3 below.

HV Power Supply

Scottish Power Energy Networks (SPEN) upgraded the dual power supplies (North & South) to the Clyde Tunnel from 6.6KV to 11KV High Voltage (HV) within their national programme in May 2022. The Clyde Tunnel's cabling, switch gear and sub stations were earlier upgraded to accept the 11KV SPEN HV supply. A designated HV Authorised Person has been appointed, the upgrade works and authorised person improves the resilience of the HV electrical supply to the Clyde Tunnel.

LV Power Supply

Further works are still required on the Low Voltage (LV) Power Supply and Distribution which requires to be upgraded as this is an original installation from the early 1960s. See table in Section 10.3 below

Pedestrian & Cycle Tunnel

To promote active, environmental needs and to be attractive and safe for users, several investment requirements are needed to improve the environment are included in the table in Section 10.3 below.

Replacement Drainage Pumps

The Clyde Tunnel drains any water reaching the road deck during heavy rainfall towards sumps below the pedestrian and cycleway tunnels. This is automatically pumped away, when necessary, by two sets of pumps which activate in sequence to keep levels under control. This is monitored and controlled by the integration into our SCADA system.

The existing surface mounted pumps are around twenty years old and failing. Several recent attempts to rebuild these pumps to the original design specification has failed as the pumps are still overheating under load. If these were to fail, the sumps could overflow into the pedestrian and cycleway tunnels and eventually into the road deck above. A costing exercise was carried out comparing costs of refurbishment against replacement with new pumps which was significantly cheaper and would prove more reliable. Revenue funding was used to replace three pumps in late 2023 and plans are ready to replace the other three pumps in 2024.