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16. Improving Public Health - Bristol Clean Air Zone Update

FBC 33 and 35

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**Bristol Clean Air Plan
Full Business Case**

Scheme costs

FBC-33

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Bristol City Council

Draft

Bristol Clean Air Plan

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Appendix A. Breakdown of CAZ Scheme Cost Estimates

Acronyms and Abbreviations

AED	Approved Enforcement Device
ANPR	Automatic Number Plate Recognition
AQM	Air Quality Monitoring
BCC	Bristol City Council
BOF2	Police Back Office Facility (data management system)
CAF	Clean Air Fund
CAZ	Clean Air Zone
CEO	Civil Enforcement Officer
DfT	Department for Transport
DVLA	Driver and Vehicle Licensing Agency
FBC	Final Business Case
HGV	Heavy Goods Vehicle
HR	Human Resources
JAQU	Joint Air Quality Unit
MEV	Mobile Enforcement Vehicle
NPS	(Penalty Charge) Notice Processing System
PCN	Penalty Charge Notice
QRA	Quantitative Risk Assessment
SAT	Site Acceptance Test
SCOOT	Split Cycle Offset Optimisation Technique for active traffic signal control
SRN	(Highways England) Strategic Road Network
TPT	Traffic Penalty Tribunal
UTMC	Urban Traffic Management and Control system
VMS	Variable Message Sign

1. Introduction

Poor air quality is the largest known environmental risk to public health in the UK¹. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill to ensure that certain standards of air quality continue to be met by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. In common with many EU member states, the EU Limit Value for annual mean nitrogen dioxide (NO₂) is breached in the UK and there are on-going breaches of the NO₂ limit value in Bristol. The UK government is taking steps to remedy this breach in as short a time as possible, with the aim of reducing the harmful impacts on public health. Within this objective, the Government has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

This note provides reference information and explanatory detail on how the capital and revenue costs have been derived for the proposed CAZ solution (small CAZ 'D'), which comprises:

- Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic; and
 - Holding back traffic to the city centre through the use of existing signals
 - Introduction of segregated cycling infrastructure at Old Market Gap.

The terms and abbreviations used in this document are set out prior to this introduction.

¹ Public Health England (2014) Estimating local mortality burdens associated with particulate air pollution.
<https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

A breakdown of the estimated costs for the identified CAZ solution is provided in the tables in Appendix A of this document. This divides the various elements of the system into the following sections:

- 1) Capital costs for the enforcement system, including:
 - Supply, installation, configuration and testing of a fully-equipped mobile enforcement vehicle (MEV);
 - Supply, installation, configuration and testing of fixed Approved Enforcement Devices (AED) with intelligent data processing;
 - Supply, installation, configuration and testing of a back-office system and associated servers and data storage;
 - Complete system test and site acceptance testing (SAT) including interfacing with external systems (e.g. central government payment portal, existing BCC permits and exemptions system, existing BCC Penalty Charge Notice processing system);
 - Design peer review and project management for systems interfacing and operational planning; and
 - Project management of the delivery phase.
- 2) Capital costs for highway works, including:
 - Supply, installation and testing of camera masts, mountings, cabinets, power supplies and associated local ducting;
 - Decommissioning of existing cameras where such locations are required for CAZ AED installation;
 - Extension of BCC's existing optical fibre cable network including all required ducting, cabling and network termination equipment;
 - Supply and installation of new signage for the CAZ on local authority highway networks at the CAZ boundary and in advance of the CAZ;
 - Supply and installation of new signage for the CAZ on the Highways England Strategic Road Network (SRN) in advance of the CAZ;
 - Changes to existing advanced direction signage to ensure that non-compliant vehicles are not directed into the CAZ;
 - Installation of all required kerb line alterations and carriageway realignment works to accommodate new and updated signage;
 - Traffic management on the local authority highway network and on the Highways England SRN for all signage and camera installations and for associated kerb line amendments;
 - Design review of each camera location checking for the presence of cellars, statutory utilities and other restrictions as well as foundation details; and
 - Design, project management and site supervision of all on-street works.
- 3) Capital costs for non-charging measures to reduce the disbenefit of the CAZ to vulnerable groups as well as increasing the impact of the CAZ.
 - Implementation fund measures, including:
 - Replacement of existing 12 Variable Message Signs (VMS) for provision of information to road users on CAZ operation;
 - Closure of Cumberland Road to inbound general traffic; and
 - FastTrack measures using traffic signals to control traffic flow around the CAZ boundary.
 - Introduction of segregated cycling infrastructure at Old Market Gap.
 - Clear Air Fund (CAF) measures, which are detailed in Appendix Ci to the FBC (FBC-17)

- 4) Quantified risk during the implementation stage, which is detailed in Appendix L to the FBC (FBC-35)
- 5) Back office operational (revenue) costs, including:
 - Civil enforcement officers, appeals officers and staff to operate the MEV;
 - CAZ operations and administration staff and staff to manage exemptions;
 - Network management officer to monitor and manage network issues affected by, or affecting, CAZ operation, e.g. suspension of the CAZ during a major incident.
 - Annual software licence and maintenance costs for the CAZ, notice processing and exemptions management systems; and
 - Revenue payment to Central Government to cover ongoing operation and development of central payment portal.
- 6) Ongoing (revenue) costs for routine and responsive maintenance and support, including that for:
 - Roadside and back-office CAZ equipment, including replacement of damaged AEDs;
 - Annual camera maintenance and calibration;
 - Camera mounting post, including street lighting columns;
 - The operations centre, i.e. the building and its associated facilities; and
 - Replacement and repair of signage and road markings.
- 7) Ongoing (revenue) costs for the operation of power and data communications networks, including:
 - Repair of BCC's "B-Net" optical fibre network and associated comms equipment;
 - Provision of 4G network data services used as a backup service for the fibre network; and
 - Electricity consumption of all on-street equipment including cameras, comms equipment and signage (where illuminated).
- 8) Management costs associated with delivery of the CAZ system, including:
 - Programme Director, Programme Manager and Project Manager for the CAZ systems;
 - Technical Project Manager, Technical Architect, Business Analyst, Subject Matter Expert, Test Manager and technical support services for the IT elements of the CAZ;
 - Staff to manage and advise on procurement, legal and HR issues;
 - Corporate communications officers; and
 - Project manager for CAF measures.
- 9) Provision of staff and equipment for ongoing monitoring and evaluation of:
 - Air quality monitoring systems;
 - Traffic volumes and movements;
 - Economic indicators;
 - Alternative travel modes (primarily walking and cycling); and
 - General scheme performance.
- 10) Ongoing (revenue) costs for other activities, including:
 - PCN issue;
 - CAZ publicity, advertising and telemarketing; and

- Decommissioning of all aspects of the CAZ system at the end of the scheme, including cameras, comms, back office systems and all signage.

The above items are described in more detail in this note in order to provide further explanation of the estimated costs for each element and how these costs were derived.

Note that an earlier version of the scheme costs was used in the financial modelling, and economic assessment. A summary of the differences is provided in the Financial Report, FBC-41.

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2. Assumptions and Exclusions

It is expected that BCC use a remotely hosted CAZ back office system managed and maintained by the selected CAZ system provider. This will include all system hardware and software, processing and data storage required to carry out all CAZ processes except for those external databases such as the DVLA database and the national taxi database which will be the responsibility of others (primarily JAQU). It is also assumed that the BCC system will use the central government payment portal for all CAZ payments.

With regard to camera locations, although camera locations have been identified, the method of data communications with these cameras has yet to be finalised. For the purposes of this report it was assumed that all locations will be connected to BCC's B-Net optical fibre network. At the majority of locations this will require additional civils works and cabling to extend the existing fibre network to achieve connectivity.

It is also anticipated that the majority of camera installations will involve mounting cameras onto street lighting columns. However, it is likely that the majority of lighting columns will not be of sufficient structural strength to accommodate the additional loading of this equipment so it was assumed for the costing purposes that all locations where cameras are to be mounted on street lighting columns will require replacement of the column with one that is suitable for mounting of a camera.

Procurement of each part of the CAZ system is outlined within the separate Procurement Strategy document in Appendix I of the FBC (FBC-32).

3. Determination of Costs

The scheme costs identified in this document were jointly developed by BCC and Jacobs staff based on the agreed design for the CAZ and using various sources for cost rates and values. This included existing BCC term service frameworks, BCC staff rates and tendering activities currently being carried out by BCC. Where such details were not directly available for some items that needed to be costed, suitable rates and costs were agreed between BCC and Jacobs based on information obtained from previous similar installations and services undertaken for BCC and other local authorities.

The costs identified herein have developed over time and have continued to change up to the date of publication. This has resulted in some variations from the costs used in the CAZ financial modelling activities and it was not feasible for the re-modelling of the financial case to be undertaken each time that a scheme cost was re-assessed and re-defined. The project costs presented in Section 1-6 of the Finance Report (FBC-41) are therefore based on an earlier iteration of the estimates identified herein. However, the costs shown here are incorporated into the 'core' scenario of the Finance Report along with an additional sensitivity test (Sensitivity Test 9) in Section 7 (Addendum) of the Finance Report. The updated costs presented in that Addendum reflect current cost assumptions and supersede those costs listed in Sections 1-6 of the finance Report.

The capital cost (CAPEX) discrepancies between these two reports are summarised in Table 1 below.

Table 1: CAPEX Differences in Finance Report

CAPEX Item	Cost (£) in Finance Report	Current Cost (£)	Difference (+/-£)	Explanation
Enforcement System	663,324	700,291	+36,967	[REDACTED]
Highway Works	3,233,840	3,603,044	+369,204	[REDACTED]
Non-Charging Measures – Implementation Fund	515,000	1,265,726	+750,726	[REDACTED]
Total difference (£)			+1,156,897	(when compared to the Finance Report)

The overall OPEX cost identified in the Finance Report is also less than is identified in this document. This is in part due to the year-on-year cost calculations used in the Finance Report compared to the average annual costs used here. This results in a difference (reduction) of £225,459 in the Finance Report for system operations and maintenance costs (primarily for staff costs) as well as a 25% difference (reduction of £296,271) in staff costs for project delivery and operational management. There is also a 25% difference (reduction of £42,500) in the costs for publicity and advertising and a reduction of £189,342 in the OPEX for production of PCNs. This gives a total of £753,572 less OPEX in the Finance Report than described herein.

4. Capital Cost Estimates

Capital cost estimates are based wherever possible on known base costs and schedules of rates for equipment, staff and services [REDACTED], and are therefore considered reasonably robust. Capital cost estimates identified in this document do not include a contingency element.

4.1 Enforcement System

The CAZ system supply and installation costs total **£700,291** which comprises **1.6%** of the total capital cost for the CAZ scheme. This includes the on-street camera equipment (camera and control devices) but excludes all housing, mounting and cabling infrastructure (e.g. lighting columns, posts, cabinets, ducts), which are included in section 4.2.1 as highway works activities. Also excluded in this calculation are costs for provision of the data communications network, which again is included in section 4.2.1 as part of highway works activities. An allowance has been included in the system costs for provision of one mobile enforcement vehicle (MEV).

Costs for the cameras and MEV are [REDACTED] established by BCC for the CAZ system. At the time of publication of this document the tender process is still underway [REDACTED].

BCC's preferred technical solution for the back office element of the CAZ system is for a hosted service whereby all software and data are located on remote server(s) owned and operated by the system provider and located at the system provider's premises, or owned and operated by a third-party hosting service used by the system provider. All data from and control of the roadside equipment (ANPR cameras) will be via this hosted system. BCC will use existing and new computer terminals at its existing operations centre to access the functions and data held on the hosted CAZ system.

The cost for the back office system therefore includes supply, setup and configuration of the hosted service [REDACTED] for checking of vehicle details and for CAZ entry payments, [REDACTED].

A cost is also included for work by BCC's existing enforcement Notice Processing System (NPS) provider, which processes Penalty Charge Notices (PCNs) for bus lane and parking contraventions. PCN production for CAZ contraventions will be an identical process so this system will be extended to cover CAZ operations.

It is also envisaged that BCC's existing permits and exemptions system ("MiPermit") will be used for the management of vehicle exemptions, to enable certain authorised vehicle to enter the CAZ without incurring a charge. An estimated cost is included for the existing permit system provider to develop this for CAZ. This estimate also includes provision of basic information points (touch-screen displays) at several public locations (e.g. general hospital) to enable the public to identify if their vehicle is compliant.

An estimated cost to Interface to BCC's existing UTMC system is also included to enable ANPR data to be used for journey time monitoring purposes. [REDACTED]

4.1.1 On-Street Camera Equipment

For the supply of ANPR cameras (AEDs) a cost [REDACTED] per camera was identified [REDACTED]. This includes supply-only of the camera hardware, i.e. camera and any associated on-street data/image processing hardware, and all required mounting and fixing hardware.

A total of 56 cameras at 54 locations was estimated to be needed for enforcement of the CAZ. At the unit price provided [REDACTED]. This includes cameras at every CAZ boundary entry point as well as a limited number of cameras located within the CAZ to capture vehicles moving solely

4.2.1 Camera and Communications Network Infrastructure

A cost estimate was made for camera posts and mountings, which was derived from known costs and rates for similar installations carried out in Bristol. This estimate was based on a site-by-site analysis of preferred mounting options for each individual camera, including mounting multiple cameras on a single post wherever possible.

The preferred mounting solution is to mount camera(s) on street lighting columns, which avoids needing to install additional mounting infrastructure and minimises street clutter, as well as making the camera installation more discrete. Street lighting columns were identified as the preferred method of camera mounting at 46 of the 56 camera locations. However, following consultation with BCC's street lighting team it was concluded that the identified street lighting columns are unlikely to be structurally capable of mounting the camera(s) and are likely to need to be replaced with more suitable columns. The cost for replacing the 46 columns was included in the estimate at a cost of £[REDACTED] per column, £[REDACTED].

Of the remaining 10 camera locations, five were identified where cameras can be installed on traffic signal columns, which will require replacement of these columns to provide additional height for camera mounting. The remaining five sites were identified for installation of new dedicated posts where mounting on existing infrastructure is not considered feasible. Both of these types of installation are included at an estimated cost of £[REDACTED] per site, £[REDACTED]. This includes provision of a mains electricity supply.

A further 10 sites were identified where existing ANPR cameras are operating as part of a dual system to provide BCC with network journey time information and to provide Avon & Somerset Police with data to support their activities. Installation of CAZ ANPR cameras at these sites will require removal and decommissioning of the existing ANPR cameras to allow for optimal placement of the CAZ ANPR cameras. A per-site cost of £[REDACTED] was estimated for these sites for this activity, £[REDACTED].

Consideration was given to the cost of installing the digital communications network, which is proposed to use BCC's existing optical fibre network. Provision of 4G mobile network communications is also included as a backup service to provide operational resilience.

Some of the proposed camera sites are at locations where B-Net is already present but others will require additional ducting and cabling to connect to the nearest existing B-Net network point. By comparing each proposed site with the location of the existing B-Net network in Bristol an estimate was made of the likely length of ducting required to each camera location. Three categories of cost were identified according to whether the likely length of duct for each location was below 50 metres (£[REDACTED]), between 50 and 100 metres (£[REDACTED]) or more than 100 metres (£[REDACTED]). The relevant cost was then assigned to that location according to the estimated length of connection required, including provision of duct access chambers at regular intervals. This produced a total cost for B-Net connection to all 56 cameras of £[REDACTED].

The installation of the backup 4G service is not expected to incur any capital cost as it will be a simple task of installing a network SIM card into the proposed hardware and thus requires no new on-street infrastructure.

Estimates were made for provision of civils works at each location during installation of the posts/columns and camera(s). This varied according to location but the total cost for this was calculated at £[REDACTED]. Estimates were also made for provision of traffic management for each location during installation of the posts/columns and camera(s). Again, this varied according to the type of work to be undertaken at each location, with the total cost calculated at £[REDACTED].

4.2.2 Road Signing and Minor Kerb Realignment

Estimates were made for civils works associated with the provision of CAZ road signing as well as minor realignment of kerb-lines. It is anticipated that no major carriageway or footway re-alignment work will be needed for any part of the proposed CAZ boundary.

A street-level analysis was undertaken of the signing requirement for each of the entry and exit points at the proposed CAZ boundary. Advanced warning signs were also considered essential to provide road users, and especially HGV drivers, with prior notice that they were heading towards the CAZ, providing the opportunity for them to take a suitable alternative route. A street-level analysis was also carried out to determine the exact locations for such advanced signing.

The following signage requirements were determined from this:

- Supply and installation of 117 non-illuminated signs at 53 locations on the CAZ boundary notifying road users of entry to and exit from the CAZ.
- Supply and installation of 131 non-illuminated advanced warning signs on BCC and neighbouring local authority roads upstream of the CAZ boundary advising road users of their approach to the CAZ.
- Supply and installation of 9 advanced warning signs on the Highways England SRN. It is expected that Highway England contractors will undertake this work. Proposals for installation of these signs and the costs for installation are subject to discussion with Highways England and thus may change depending upon the outcome of those discussions.
- Supply and installation of 50 'repeater' signs at 25 locations within the CAZ.
- Replacement of, or modification to, 56 existing advanced direction signs on the inbound approaches to the CAZ around Bristol to ensure that drivers of non-compliant vehicles are not directed into these restricted/banned areas and thus made liable for payment of a CAZ charge and/or PCN. The precise requirements for sign replacement are still subject to review.
- Kerb line alterations for an estimated 1 in 10 of all boundary and advanced signs described above (excluding those on the Highways England SRN) to allow for placement of the signs in accordance with design standards.
- Design review of each proposed sign installation accounting for local environment, ground conditions, presence of statutory services, etc.
- Design, project management and site supervision of all sign installations.

The total cost for supply and installation of all of the above signs was estimated at [REDACTED]. An additional [REDACTED] was estimated for design, contract administration, project management and site supervision. This gives a total cost of [REDACTED] for all signage and kerb alignment work.

4.3 Non-Charging Measures – Implementation Fund

Costs for other non-charging measures were estimated to total **£1,285,875** which comprises **2.9%** of the total capital cost for the CAZ scheme. This includes the replacement of out-of-date Variable Message Signs (VMS), traffic signal control measures to restrict vehicle movement into the CAZ and to provide bus priority, a segregated cycle facility and implementation of air quality monitoring.

4.3.1 Variable Message Signage

It is proposed to install 12 full LED VMS to replace existing route guidance VMS on key routes in Bristol. These VMS will display CAZ operational status as well as information on vehicle classes to which charges apply. They will also be used to notify road users of any changes to these conditions, for example if CAZ operation is suspended due to a major incident. It is also anticipated that other information such as air quality levels will be displayed. BCC shares the same VMS back office system and has installed similar signs previously so the cost of these is well-known and was estimated at [REDACTED] per sign. Thus, the total cost for all VMS was estimated at [REDACTED].

4.3.2 Other non-charging measures

The following non-charging measures to support the CAZ are proposed to be undertaken using funding from the Implementation Fund:

- Installation of air quality monitoring within the CAZ, comprising supply and installation of 93 diffusion tubes and one continuous NO_x analyser at Marlborough Street. Total estimated cost for these installations [REDACTED].
- Closure of Cumberland Road to inbound general traffic and introduction of a bus gate. Total cost for this work was estimated [REDACTED].
- FastTrack traffic signal control measures. This involves using BCC's existing SCOOT traffic signal control system to control the flow of traffic around the CAZ boundary. An estimated cost [REDACTED] was derived which largely comprises staff time to prepare and implement the plans in advance. This equates to approximately 3-4 weeks of full time work for one member of BCC engineering staff.
- An estimate of £20,000 was derived for BCC staff to develop queue relocation methods using traffic signal control, to encourage the use of sustainable travel modes and to identify transport messaging to the public to reduce queuing around disruptions.
- Legal onboarding – following discussion with JAQU on issues of onboarding, it was recommended that to follow current best practice there should be legal representative from BCC involved in all aspects of CAZ implementation. BCC's Legal Team estimated that this would require approximately 50 hours of staff time at a cost of £10,000.
- Installation of segregated cycle facilities at Old Market Gap. This involves connecting and upgrading a key strategic cycle network (NCN4) that links the eastern fringe to the city centre. The total cost of installing these works was estimated [REDACTED].

4.4 Non-Charging Measures – Clean Air Fund (CAF)

The Clear Air Fund (CAF) measures are detailed and costed in Appendix Ci to the FBC (FBC-17). The package of measures totals £35,878,344 which comprises 81% of the total CAZ scheme capital cost.

4.5 Quantified Risk Assessment

A quantified risk assessment (QRA) has been developed and is set out in Appendix L to the FBC (FBC-35). The QRA figure in line with DfT WebTAG (P(Mean)) is £2,801,000 during the project implementation stage. This comprises 6.3% of the total estimated capital cost for the CAZ scheme.

5. Revenue Cost Estimates

As for capital costs, revenue cost estimates are based wherever possible on known base costs and schedules of rates for equipment, staff and services as well as costs obtained from service providers, and are therefore considered reasonably robust. The revenue cost estimates identified in this document do not include a contingency element.

5.1 CAZ Back Office Operations and Maintenance

The estimated revenue cost for CAZ back office operations is **£4,592,837** over the three-year period during which the CAZ is expected to operate. This equates to an annual average back office operations and maintenance cost of [REDACTED] and represents **54.4%** of the total estimated operational expenditure over the three-year CAZ operating period. This cost primarily comprises the anticipated 10% annual payment to JAQU from revenue income for the use of the central payment portal, which totals £1,979,353 over the three-year CAZ operating period.

5.1.1 Enforcement Operations

A significant operational revenue cost is that of staff salaries for enforcement activities, which totals [REDACTED] over the three year CAZ operating period. Three roles were identified based on BCC's existing parking and bus lane enforcement activities:

- Civil Enforcement Officer (BCC grade 7)
- Appeals Officer (BCC grade 7)
- Senior Officer TPT (BCC grade 9)

It is anticipated that 50,000 CAZ-related PCNs will be issued each year. Based on known rates of PCN processing capability, it was estimated that 3 new Appeals Officers will be required to process these PCNs. Similarly, it was estimated that one Civil Enforcement Officer (CEO) will be required for every 30,000 PCNs issued, which equates to 2 additional CEOs. It was also estimated that one additional Senior TPT Officer will be required. This role provides liaison with the national Traffic Penalty Tribunal which handles cases from those who wish to appeal against the issue of a PCN.

The number of contraventions is expected to fall after the first year of CAZ operation with a corresponding reduction in the number of PCNs issued and thus a reduction in the requirement for enforcement staff. It is anticipated that BCC will employ the above staff from the outset and if the number of PCNs reduces then enforcement staff levels will be reduced accordingly.

The MEV is expected to be operated by a single member of staff, which will either be one of the additional staff identified above or an existing staff resource. Therefore no additional staff are likely to be needed specifically for MEV operation.

5.1.2 CAZ Operations and Exemptions Management

Additional staff resource will be required to manage day-to-day operations of the CAZ as well as for CAZ-related administration, including management of CAZ exemptions (MiPermit). The total estimated cost for this additional staff resource and for the operation of the exemptions management system was calculated at [REDACTED] over the three-year CAZ operating period.

Four CAZ enforcement roles were identified as follows:

- CAZ Operations Officer (BCC grade 10)
- CAZ administration - public facing (BCC grade 7)
- CAZ Exemptions Administrator (BCC grade 7)

- Senior CAZ Exemptions Administrator (BCC grade 8)

Further to the enforcement roles, one new CAZ Operations Officer will be required together with support from three new CAZ administration staff. Four further staff – three administrators and one senior administrator - will also be required to review, approve and manage CAZ exemptions. The total cost for these CAZ management staff was estimated at [REDACTED] over the three-year operating period.

The MiPermit system for management and processing of exemptions is also operated on an annual licensing arrangement based upon the required number of permits (exemptions in this case). It was estimated that up to 30,000 exemptions will be provided in the first year of CAZ operation, falling to 20,000 in year 2 and 10,000 in year 3. The licensing cost is [REDACTED] per permit per year, so the overall cost over the three-year operating period was estimated at [REDACTED].

The CAZ is likely to bring new challenges in managing the transport network in and around Bristol. Additional staff resource will be required to manage any disruptions that impact upon the CAZ, or to handle issues with CAZ operation that impact upon network operation, e.g. if a major incident in the city centre requires temporary suspension of CAZ operation or if major roadworks adjacent to the CAZ boundary require diversion into the CAZ. It was estimated that one additional Network Management Officer (BCC grade 9) will be needed at cost [REDACTED] over the three-year operating period.

5.1.3 CAZ Back Office Systems Operations and Maintenance

Operations and maintenance costs for the back office elements of the CAZ system are estimated to total [REDACTED] over the three-year CAZ operating period. This comprises operation and maintenance of the back office ANPR processing system and the NPS and the provision of electricity for the MEV.

As previously mentioned, the back office ANPR system will be remotely hosted by the system provider, for which there is an annual hosting fee of [REDACTED] and annual maintenance of this system is a further [REDACTED]. Annual support services for the back office system are an additional [REDACTED]. Thus the total cost for ANPR back office system maintenance is [REDACTED] over the three-year CAZ operating period. [REDACTED].

In addition to the above, an annual cost will be incurred for the operation and maintenance of the NPS. It is understood that the NPS provider will shortly be moving to a per-camera charging model, the details for which are not yet known. An annual cost for this was therefore estimated [REDACTED] per camera. For the proposed 56-camera [REDACTED].

Another ongoing 'back office' cost is that for the mains electricity supply for the MEV. This was estimated at [REDACTED] over the three year CAZ operating period, assuming a full charge every other day of the year at a cost of [REDACTED] per charge.

5.1.4 Payment Processing Fees and Revenue Payments to JAQU

Each card and direct debit payment will incur a processing fee from the relevant card/direct debit service provider. A general assumption of 18 pence per CAZ payment transaction was made based on current known rates for card payments. Using forecast data from the economics model for the number of payments to be made each year, an estimated cost of £301,626 was derived for fees to the various payment services.

Revenue generation data was taken from the economics model together with an assumption that 10% of revenue generated would be payable to JAQU for ongoing operation of the CAZ Central Service. From this, estimates of the payments were calculated at £228,870 in 2021, £750,912 in 2022, £601,705 in 2023 and £397,866 in 2024. This gives a total payment over the three-year CAZ operating period of £1,979,353.

5.2 Camera and Signage Maintenance and Support

Maintenance and support of roadside equipment and hardware includes ANPR cameras, communications networks and signage. The cost for this over a three-year CAZ operating period is **£994,559** which accounts for **11.8%** of the total revenue cost over the same period.

5.2.1 On-Street ANPR Camera Equipment

Costs for maintenance and support of the on-street ANPR camera equipment were calculated at [REDACTED] over the three-year CAZ operating period. These costs were [REDACTED]

- Replacement of camera due to irreparable damage or malfunction – [REDACTED] for each camera, based on known costs [REDACTED]. The number of cameras requiring replacement each year was estimated [REDACTED] of the total deployed. This means two cameras per year for the proposed 56-camera ANPR system. Thus, the revenue cost over the three-year CAZ operating period will be [REDACTED]. This is for supply only but the cost for installation of the replacement cameras is expected to be part of emergency maintenance as described below.
- Route (i.e. non-responsive/non-emergency) maintenance [REDACTED] per camera per year, equating to [REDACTED] over the three-year CAZ operating period.
- Emergency maintenance (e.g. camera failure, damage repair/replacement) - [REDACTED] per year for all 56 cameras, which equates to [REDACTED] over the three-year CAZ operating period.
- Camera ground-truthing – annual check to assess whether each camera is correctly aligned and configured to accurately capture and identify the maximum number of passing vehicles. The cost for this check is [REDACTED] per camera per year, which equates to [REDACTED] over the three-year CAZ operating period.
- Maintenance of camera communications and interfaces - [REDACTED] per year for all 56 cameras, which equates to [REDACTED] over the three-year CAZ operating period.
- Maintenance management, support and administration - [REDACTED] per year for all 56 cameras, which equates to [REDACTED] over the three-year CAZ operating period.

5.2.2 Power and Communications Networks

It is proposed that all 56 cameras are connected via the B-Net optical fibre network and that they also include a 4G mobile network connectivity to serve as a backup service in case of failure in the primary network. Both communications services will incur ongoing costs for maintenance and support and for data usage. Additionally, costs will apply for the ongoing supply of mains electricity to each camera. In total these costs are estimated at [REDACTED] over the three-year CAZ operating period. These estimates were derived as follows:

- B-Net optical fibre network – estimated [REDACTED] per camera per year, giving a total of [REDACTED] over the three-year CAZ operating period.
- 4G mobile communications – estimated at [REDACTED] per camera per month, giving a total of [REDACTED] over the three-year CAZ operating period.
- Mains electricity – estimated at [REDACTED] over the three-year CAZ operating period. This assumes each camera consumes 100W, i.e. 876 KWh per year, at a cost of [REDACTED] per KWh (the average price of electricity supply in 2019).

5.2.3 Replacement/Repair of CAZ Signage

An additional cost estimate has been included for replacement or repair of CAZ signage that is accidentally damaged or subjected to vandalism or theft. The estimate for this assumes that 5% (1 in 20) of the total signs installed, excluding those on the Highways England SRN, will require replacement each year. This equates to 14 signs per year at an estimated average cost of [REDACTED] per sign including installation, i.e. a total of [REDACTED] over the three-year CAZ operating period.

All signs proposed for installation on the Highways England SRN include a maintenance contribution (commuted sum) within the CAPEX cost. This will cover the limited period for which they would be in place. If maintenance is required then it is expected that provision will be made under the maintenance regime of the Highways England Area 2 term maintenance contractor.

5.3 Project Delivery and Ongoing Operational Management

This cost element relates to the additional staff considered essential for delivery of the CAZ prior to the commencement of operations. This includes:

- Roles such as programme leadership and programme / project management. **Total costs** £530,075;
- Staff required for delivery of the CAZ technical solution including Solutions Architect, Business Analyst, Project Manager and test manager. **Total costs** £258,565;
- Supporting staff roles, considered essential for delivery of the CAZ including Procurement, legal, HR and finance support. **Total costs** support roles: £396,444.

The total revenue cost for the staff roles for the CAZ delivery phase is therefore **£1,185,084** which equates to **14%** of all revenue costs over the three-year CAZ operating period.

5.4 Monitoring and Evaluation

Estimates for monitoring and evaluation are a combination of staff and service costs relating to the monitoring of CAZ operation in terms of air quality levels, traffic volumes, economic impact and the effect on other active travel modes (primarily cycling and walking). This comprises the following cost estimates over an eight-year monitoring period to 2030:

- Air quality monitoring (AQM) – this includes the operation of a continuous NO_x analyser on Marlborough Street and the monthly replacement of diffusion tubes at 53 locations as well as the monthly calibration of the Marlborough Street site; it also includes lab analysis and reporting. Total cost for all activities was estimated at [REDACTED].
- Traffic count surveys – temporary surveys in advance of and during CAZ operation at an estimated cost of [REDACTED].
- Ongoing monitoring of CAZ-related economic indicators – estimated at [REDACTED].
- Ongoing monitoring of active modes (cycling and walking) – including surveys, at an estimated cost of [REDACTED].
- Ongoing CAZ scheme monitoring by BCC's Sustainability Team - estimated to cost [REDACTED].

Thus the total monitoring and evaluation cost over an over an eight-year monitoring period was estimated at **£389,869** which comprises **4.6%** of the total estimated revenue cost. It should be noted that in addition to this Air Quality Monitoring (Installations) including infrastructure at Marlborough Street is included in the implementation proposal at a cost of [REDACTED] (see section 4.3.2).

5.5 Production of Penalty Charge Notices

The cost for processing and issue of PCNs and for activities relating to any subsequent appeals is directly related to the number of expected contraventions, i.e. a non-compliant non-exempt vehicle entering the CAZ for which there is no payment or for which insufficient payment has been made, leading to production of a PCN. It was estimated that 50,000 PCNs for CAZ-related contraventions will be issued in the first year of CAZ operation. This number may fall in subsequent years as road user compliance improves and as the proportion of non-compliant vehicles falls. However, for the purposes of the cost estimate it was assumed that 50,000 PCNs will be issued in every year of CAZ operation, i.e. 150,000 over the three-year CAZ operating period. A total revenue cost for PCN production of **£431,625** was estimated (comprising **5.1%** of overall revenue costs) based on the following calculations:

- PCN TPT fee – the production of each PCN incurs a fee of 30 pence payable to the independent TPT panel for its ongoing service in assessing and judging appeals against the issue of PCNs. For 50,000 PCNs per year this equates to a cost of £45,000 over the three-year CAZ operating period.
- Stationery and supplies – it is mandatory for all PCNs to be printed and posted to the recipients. The cost for paper and envelopes and the print consumables for PCN production was estimated at £1.43 per PCN. For 50,000 PCNs over the three-year CAZ operating period this equates to £214,500.

- Postage – it is also mandatory for all PCNs to be posted using the first-class mail service. At the time of publication of this document the cost of first-class postage is 85 pence, so for 50,000 PCNs per year the total cost of postage over the three-year CAZ operating period was estimated at £127,500. However, experience with the issue of PCNs for BCC's bus lane enforcement has shown that up to 35% of PCN recipients do not respond and thus require one or more follow-up notices. The unit cost for stationery and supplies already allows for this extra cost and so does not require adjustment but the same does apply to postage. Therefore, postage of an additional 17,500 notices (PCNs or other correspondence) per year is included, which totals £44,625 over the three-year CAZ operating period. Therefore the total postage cost was estimated at £172,125.

5.6 CAZ Publicity and Advertising

A cost estimate of £70,000 per year was also included for publicity and advertising prior to and during the three-year CAZ operating period. This is based on similar cost estimates for the Birmingham Clean Air Zone following discussions with representatives from that CAZ who are managing Birmingham's publicity and advertising activities.

During discussion with JAQU as to best practice for CAZ, it was agreed that a telemarketing team should be established to ensure that members of the public, industry, commerce and any others potentially impacted by the CAZ can easily access information and advice as to CAZ aims, objectives and details as how it operates and issues of compliance, non-compliance and exemption. This service is only expected to operate in advance of CAZ operation and not during its operation. This was estimated to cost [REDACTED].

Thus the total cost for publicity and advertising in advance of and during a three-year CAZ operating period was estimated at [REDACTED] which comprises [REDACTED] of overall revenue cost.

5.7 Decommissioning of Cameras and Signs at End of Scheme

An estimate was made for decommissioning the CAZ once air quality compliance levels have been achieved and the scheme is considered by BCC as no longer necessary. This will require the removal of all on-street camera and communications equipment, including cabinets, and the removal of all signage. It also includes removal of mounting posts for cameras and signage.

A cost of [REDACTED] was estimated for the decommissioning of cameras and related on-street equipment and a cost of [REDACTED] estimated for decommissioning of CAZ signage on BCC roads, with an additional [REDACTED] estimated for decommissioning of signage on the M32 motorway. A further [REDACTED] was estimated for BCC engineering design staff to design and manage the decommissioning process for all of the above elements. These estimates are based on BCC staff rates and known BCC framework rates for highway works.

The total decommissioning cost is therefore estimated at **£681,616** which comprises **8.1%** of the overall revenue cost for the CAZ scheme.

6. Price Contingency and Other Variations

It should be noted that all figures quoted in this document exclude any element of contingency. Furthermore, all capital and revenue price estimates provided in this document are assumed to be firm and fixed for the duration of CAZ installation and operation. No allowance has been made for index-linked or any other such potential variations in prices over time.

DRAFT

7. Summary of Capital and Revenue Costs

As can be seen in Appendix A of this document, allowing for the costs previously described - including risk but excluding uplift for contingency - the total base capital cost for the proposed CAZ was estimated at **£44,268,554**.

Of this, supply and installation of the enforcement system (cameras, enforcement vehicle, control room setup and back office hardware and software) along with various project management services is £720,291. Highway works activities, including supply and installation of cabinets, mounting posts, replacement street lighting columns, signage, road markings and minor kerb realignments makes up £3,603,044. This includes estimates for various project management and site supervision activities.

The total capital cost for non-charging measures relating to the Implementation Fund was estimated at £1,285,875 which includes installation of air quality monitoring equipment.

For the Clean Air Fund the total cost was estimated at £35,878,344.

Risk is also incorporated at an estimated value of £2,801,000.

The ongoing base revenue cost for the CAZ to operate along with all other associated measures was estimated at **£8,445,591** over the three-year period in which the CAZ is expected to operate before compliance is achieved. This includes an estimate of £681,686 to decommission cameras and signs at scheme end. It should also be noted that ongoing revenue costs for air quality, traffic and other monitoring activities (totalling £389,869) are for an eight-year monitoring period from the date of operation of the CAZ.

Table 2 below provides an overview these capital and revenue costs.

Table 2: Summary of CAZ Scheme Capital and Revenue Costs

Item	Cost (£)
CAPEX Requirements	
CAZ System (including roadside and back office systems and MEV)	700,291
Highway works	3,603,044
Air quality monitoring installations	20,149
Non-charging measures - Implementation Fund	1,265,726
Non-charging measures – Clean Air Fund	35,878,344
QRA	2,801,000
TOTAL CAPEX	44,268,554
OPEX Requirements (for 3-year CAZ operating period*)	
Back office systems operations and maintenance (excluding payment to JAQU – see below)	2,613,484
Revenue payment to JAQU for CAZ Central Service operations	1,979,353
Camera and signage operations and maintenance	994,559
Project Delivery and Operational Management	1,185,084
Monitoring and Evaluation*	389,869
Production of Penalty Charge Notices	431,625
Publicity, advertising and telemarketing	170,000
TOTAL OPEX (for 3-year CAZ operating period*)	7,763,974

The final cost element not included in the above table is for decommissioning the CAZ at the end of year 3, which was estimated to be **£681,616**.

* Monitoring and evaluation costs are for an eight-year period to 2030. All other OPEX costs are for an expected three-year CAZ operating period.

Appendix A. Breakdown of CAZ Scheme Cost Estimates

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[REDACTED]



Bristol City Council Clean Air Plan Final Business Case

Quantitative Risk Assessment

FBC-35| 2

February 2021

Bristol City Council

Draft

Bristol City Council Clean Air Plan Final Business Case

Project No: 673846CH
 Document Title: Quantitative Risk Assessment
 Document No.: FBC - 35
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 Document Status: N/A
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 Project Manager: HO
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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	22/1/2021	FBC ORA Draft	KW	JB	CB	HO
1	26/1/2021	FBC ORA Draft – updated	GD	HO	HO	HO
2	17/2/2021	FBC ORA Draft (V1 + V2)	GD	HO	HO	HO

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Draft

Acronyms and Abbreviations

BCC	Bristol City Council
CAP	Clean Air Plan
CAZ	Clean Air Zone
Defra	Department for Environment, Food & Rural Affairs
DfT	Department for Transport
EU	European Union
FBC	Full Business Case
JAQU	Joint Air Quality Unit
LA	Local Authority
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
QRA	Quantitative Risk Assessment

Draft

1. Introduction

Poor air quality is the largest known environmental risk to public health in the UK¹. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. In common with many EU member states, the EU Limit Value for annual mean nitrogen dioxide (NO₂) is breached in the UK and there are on-going breaches of the NO₂ limit value in Bristol. The UK government is taking steps to remedy this breach in as short a time as possible, with the aim of reducing the harmful impacts on public health. Within this objective, the Government has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

Jacobs has been commissioned to support BCC to produce a Full Business Case (FBC) for the delivery of the CAP; a package of measures which will bring about compliance with the Limit Value for annual mean NO₂ in the shortest time possible in central Bristol. This FBC forms a bid to central government for funding to implement the CAP.

1.1 Purpose of this Report

A Quantitative Risk Assessment (QRA) was undertaken for the BCC CAP. The project involves the implementation of the Small CAZ D Option, which includes the following measures:

- Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs)
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic; and

¹ Public Health England (2014) Estimating local mortality burdens associated with particular air pollution.

<https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

² Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

- Holding back traffic to the city centre through the use of existing signals.

The project is currently at the FBC stage and this QRA has been developed to support the FBC Submission.

A version of the QRA was submitted as part of the OBC, and it has been reviewed regularly since then. This technical memorandum outlines the risk identification (risk register) and the QRA process and presents the QRA outputs.

The main purpose of the QRA is to support the scheme costing as presented within the financial case by predicting the level of risk contribution, having a defined level of confidence, to cover the various stages of the scheme. QRA allows for uncertainty in unplanned additional cost items, including cost due to delay, that cannot be included in the project costs. The assessed risk value is to be used in the financial case for this package and incorporated in the economic appraisal.

The QRA process involves four steps.

- Step 1 is identification of all risks affecting the project through risk workshops and risk reviews. This step results in a risk register.
- Step 2 is analysis of the various risks by defining their distributions in terms of probabilities, impacts and knock-on effects. This information is also gathered through risk workshops and other interactions including stakeholders.
- Step 3 is undertaking the risk modelling using Monte Carlo simulation (in this project @Risk® software was used).
- Step 4 is analysing the results against required contingency needs for the project.

The risk model has been constructed by Jacobs using Microsoft Excel® and @Risk® software packages. The model used the Monte-Carlo simulation theory by replicating a large number of iterations of possible project risk scenarios. Confidence levels relating to the cost of the scheme are obtained from the distribution of the averaged results produced by the simulations.

2. Risk Model Inputs

2.1 Cost of Implementation and Operation

Monthly costs have been established for risks which occur during various stages of the project. These are split between costs which occur during FBC and those which occur during the implementation and delivery/operation of the scheme.

The following unit costs of delay (£ per month) have been considered for the various risks that could cause delay to the project:

- £2,000 to £20,000/month – for risks during the FBC stage that do not affect the critical path of project. This allows for project management costs and the potential for a limited amount of re-work.
- £75,000/month – for risks during the OBC/FBC that affect the critical path of project and include legal staff costs. This is based on the average spend per month of the project to date plus an allowance for a limited amount of legal assistance within a month.
- £110,000/month – for risks that occur during delivery/operation of the scheme. This is based on the approximate monthly cost of delay to contractors on site and the project management time that would be incurred.

2.2 Risk Identification, Categorisation and Ranking

A risk register was developed through group consensus via a risk workshop. The risk workshop consisted of staff from BCC and Jacobs that are involved in the project. This has been reviewed regularly with the technical specialists in each category, including the following:

- Project and programme managers
- Resource managers

- Network management staff
- Legal officers
- Public Engagement and Communications team
- Procurement team
- Finance officers
- Technical / Design team.

Each risk was categorised based on project objectives, then scored, which produced an Overall Risk Ranking in terms of high, medium, or low for each risk. The current Risk Register is included in Appendix B of this document.

A number of risk mitigatory/management actions have been taken by the project team. Following the QRA workshops, 113 risks were deemed potential risks that are pertinent to the scheme, which were quantified (financial risk and delay risk). Of these 113 risks, 40 have now been closed as the risks have been addressed and eliminated and 73 risks are still 'open'.

2.3 Risk Quantification

Individual risks were defined in terms of their distributions, likelihood/probabilities, impacts and knock on effects, etc., through the workshops. For each risk, the key inputs into the @RISK software to be assessed in the QRA model are: Financial/Delay Impact Estimate (best case, worst case, and most likely) and Probability / Likelihood.

The risk category and the Overall Risk Ranking (high, medium, low) were used as a guidance in quantifying risks. These values were then used in the model to determine a Mean Outcome and a Risk Exposure for each risk and for each iteration. The Monte Carlo simulation used 10,000 iterations using the @Risk software to develop a single probability distribution for all possible risk outcomes for the scheme. The results were then used to determine various risk percentile values for the scheme.

One potential very large risk not currently included in the QRA is for a shortfall of funding in the CAF bid. Other authorities have received in the region of 25% less CAF funding than originally bid for. Informal assurances have been given that this will not happen in the case of Bristol due to the early engagement that has taken place and therefore this risk is not included within the QRA estimates or financial model. However, it needs to be formally noted that the CAF bid has been designed to ensure we meet the legal direction. If the risk had been quantified in the QRA, it would be an additional £5.391m. If the risk becomes apparent from further discussions that the required CAF funding will not be available to Bristol, this risk value will need to be added to the QRA making the total value of the QRA £8.192m.

3. Risk Model Outputs

3.1 Risk Value

The QRA figure being included financial case is the 80th Percentile - P (80). In addition, the 50th Percentile (P (50)) and the P(Mean), the mean percentile value also provide further levels of confidence. QRA results are shown below in Table 3-1. The @Risk outputs for FBC stage are included in Appendix A of this document, which show the full range of percentile values calculated by @Risk.

Table 3-1: QRA 1 – FBC Stage

	P (50)	P (80)	P (Mean)
Grand Total Risk (Financial + Delay)	£2,256,000	£2,801,000	£2,277,000

The P (80) level of risk has been used to establish a quantified contingency budget, in line with discussion between BCC and JAQU.

3.2 Totals by Risk Categories

The totals of the risks by their categories in the FBC stage of the project are listed in Table 3-2.

Table 3-2: Totals by Risk Categories QRA 1 – FBC Stage

Risk Category	Risk Value P (80)
Brexit	£15,079
Communications / stakeholder challenge	£287,240
Construction	£90,367
Covid	£94,241
Financial	£232,174
Legal / process	£259,007
On-street effects	£73,724
Political	£871,104
Procurement	£603,014
Resources	£89,333
Technical / Design	£185,718
Total	£2,801,000

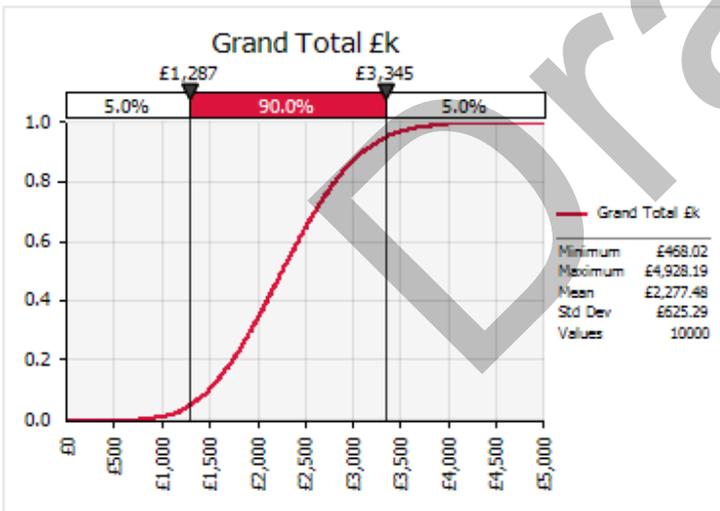
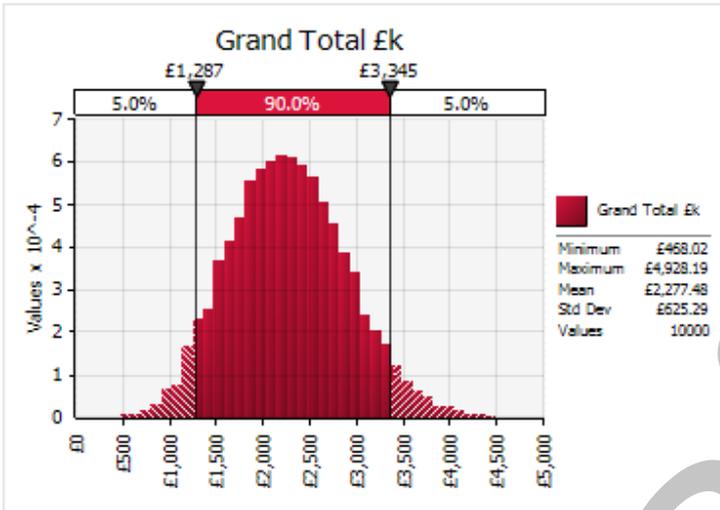
Appendix A - @Risk Output

QRA 1 – FBC Stage

@RISK Output Report for Grand Total £k X125

Performed By: Dean, Graham/BRS

Date: 20 January 2021 09:46:15



Simulation Summary Information

Workbook Name	BCC CAZ QRA RISK REGISTER
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	292
Number of Outputs	4
Sampling Type	Monte Carlo
Simulation Start Time	20/01/2021 09:45
Simulation Duration	00:00:26
Random # Generator	Mersenne Twister
Random Seed	628629362

Summary Statistics for Grand Total £k

Statistics	Percentile		
Minimum	£ 468	5%	£ 1,287
Maximum	£ 4,928	10%	£ 1,486
Mean	£ 2,277	15%	£ 1,616
Std Dev	£ 625	20%	£ 1,732
Variance	390984.6788	25%	£ 1,832
Skewness	0.236457465	30%	£ 1,923
Kurtosis	2.915817509	35%	£ 2,011
Median	£ 2,256	40%	£ 2,091
Mode	£ 2,263	45%	£ 2,174
Left X	£ 1,287	50%	£ 2,256
Left P	5%	55%	£ 2,335
Right X	£ 3,345	60%	£ 2,422
Right P	95%	65%	£ 2,504
Diff X	£ 2,058	70%	£ 2,596
Diff P	90%	75%	£ 2,694
#Errors	0	80%	£ 2,801
Filter Min	Off	85%	£ 2,929
Filter Max	Off	90%	£ 3,091
#Filtered	0	95%	£ 3,345

Appendix B - Risk Register

See separate Excel Spreadsheet below:

- 1) **QRA - FBC Stage**

Draft

BCC CAZ - Risk Register and QRA

Rev: v1.17 DRAFT - 20 Jan 2021

Scheme: Bristol Clean Air Zone

Milestone: Final Business Case

Works Cost: TBC

Cost of delay (k): Varied by risk

Resources
Business case
On-street effects
Legal / Process
Communications / stakeholder challenge
Procurement
Political
Financial
Technical / Design
Construction
Operation

likelihood		
	1 = Almost Certain	95.0%
Extreme Risk	2 = Likely	50.0%
High Risk	3 = Possible	25.0%
Medium Risk	4 = Unlikely	12.5%
Low Risk	5 = Rare	5.0%

No.	Risk Ref	Description	Category	Mitigation owner	Initial Risk					Approach Avoid, Accept, Reduce, Transfer	Mitigation Measures	Status	Residual Risk					Likelihood (%)
					Cost	Time	Perf	Prob. Rating	RAG				Impact			Prob. Rating	RAG	
													Cost	Time	Perf	Rating		
1	Risk 1	Staff / skills shortage in BCC projects	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
2	Risk 2	Staff / skills shortage in BCC BAU / back office staff for processing PCNs	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
3	Risk 3	Staff / skills shortage in BCC TRO team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	10.0%
4	Risk 4	Staff / skills shortage in BCC ICT team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	30.0%
5	Risk 5	Staff / skills shortage in BCC Operations Centre team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
6	Risk 6	Staff / skills shortage in BCC street-lighting team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
7	Risk 7	Staff / skills shortage in BCC Procurement team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	10.0%
8	Risk 8	Staff / skills shortage in BCC Legal team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	20.0%
9	Risk 9	Staff / skills shortage in BCC FOI team	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	30.0%
10	Risk 10	Staff / skills shortage in neighbouring authorities and HE (for signage etc).	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
11	Risk 11	Staff / skills shortage in Jacobs to deliver	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	5.0%
13	Risk 13	Staff / skills shortage in the Street Lighting framework contractor for power	Resources	BCC	M	M	M	M	4.00	Reduce	Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary.	Open	M	M	M	L	2.00	25.0%
15	Risk 15	Agreement on, and resources to take on the system operation, including hardware (BAU arrangements).	Resources	BCC	M	L	M	H	5.00	Reduce	Have early discussions within BCC with BAU teams to agree scope, specification and gain understanding and approvals.	Open	M	L	L	M	2.67	50.0%
20	Risk 20	Potential inaccuracy on the number of people driving uncompliant vehicles into the CAZ affects the expected revenue and therefore running costs	On-street effects	BCC	M	L	M	L	1.67	Accept	Monitoring to be put in place and contingency planning will be needed	Open	M	L	M	L	1.67	12.5%
21	Risk 21	CAZ scheme not implemented in time.	On-street effects	BCC	M	L	M	M	3.33	Reduce	Early identification of realistic and practical complimentary measures. Progress work on these with equal priority as other CAZ elements (AEDs / back office / signage etc) and not as a secondary priority	Open	L	L	L	L	1.00	25.0%
22	Risk 22	Impact on neighbouring authorities' road networks - increased traffic from displacement. Complaints, investigation of mitigating measures	On-street effects	BCC	L	L	M	L	1.33	Transfer	Work with partner authorities to understand any issue if they arise and work together to seek solutions.	Open	L	L	M	L	1.33	25.0%
23	Risk 23	Unforeseen impacts on local junctions at key points outside CAZ zones, e.g. outside schools.	On-street effects	BCC	L	L	M	M	2.67	Reduce	Ensure that modelling and assessment work takes into account likely impacts at these key locations outside the CAZ	Open	L	L	M	L	1.33	12.5%
27	Risk 27	Risk of challenge by Judicial Review to small CAZ D - at the point of Cabinet decision and/or JAQU approval	Legal / process	BCC	H	M	H	H	8.00	Reduce	Robust OBC and FBC, robust consultation, good liaison with JAQU, and a robust and timely public communications and stakeholder plan.	Open	H	M	M	M	4.67	50.0%
27A	Risk 27A	Risk of successful challenge by Judicial Review	Legal / process	BCC	H	M	H	H	8.00	Reduce	Robust OBC and FBC, robust and legally complaint process including consultation, good liaison with JAQU, and a robust and timely public communications and stakeholder plan.	Open	H	M	M	M	4.67	35.0%
28	Risk 28	Successful challenges (e.g. JR) to the process for making the Orders (e.g. charging order)	Legal / process	BCC	H	M	H	H	8.00	Reduce	Ensure a robust and legally complaint process.	Open	H	M	M	M	4.67	50.0%
32	Risk 32	Delays in approvals of FBC from JAQU from submission	Legal / process	BCC	M	M	M	M	4.00	Reduce	Ongoing and regular engagement with JAQU. Identify key issues and address early	Open	L	L	L	L	1.00	12.5%
36	Risk 36	Breach of personal data - data protection / GDPR issues - back office systems and databases of personal information for penalty notices. Also of loans and / grants. Additional office time to address	Legal / process	BCC	M	M	M	M	4.00	Reduce	Seek legal opinion early Undertake a Privacy Impact Assessment ASAP	Open	M	M	M	L	2.00	12.5%
40	Risk 40	Additional costs to explain to stakeholders what the scheme restrictions mean / changes to now not being a diesel ban / also the difference between a clean air zone and a congestion charge	Communications / stakeholder challenge	BCC	M	L	M	M	3.33	Reduce	Try to make sure the restrictions, charges and exemptions are easy to understand to the citizens of Bristol. Also a clear communications package workstream covering pre-publicity and sources of help.	Open	M	L	M	L	1.67	75.0%
41	Risk 41	Large number of FOI requests in excess of predictions result in extra costs and additional staff time	Communications / stakeholder challenge	BCC	M	M	L	M	3.33	Reduce	Ensure the project and procedures are open and transparent. Put information into the public domain proactively to prevent the feeling that 'they have something to hide'. Seek legal / FOI input early.	Open	L	L	L	L	1.00	12.5%

No.	Risk Ref	Description	Category	Mitigation owner	Cost	Time	Perf	Rating	RAG	Approach Avoid, Accept, Reduce, Transfer	Mitigation Measures	Status	Cost	Time	Perf	Rating	RAG	Likelihood (%)
43	Risk 43	A failure to adequately communicate and engage early enough with public and stakeholders leading to negative reaction during implementation - additional staff time needed to address negative reaction	Communications / stakeholder challenge	BCC	M	M	M	H	6.00	Reduce	Seek to design scheme with less chance of opposition. Consult early, setting out the reasons for the CAZ and mitigating measures. Seek support, and have robust communications and stakeholder plan.	Open	M	M	M	M	4.00	50.0%
44	Risk 44	Reliance on industry's understanding / ability to deliver retrofit solutions for older taxis / LGVs / HGVs / buses / coaches - additional staff time to liaise and explain	Communications / stakeholder challenge	BCC	M	M	L	M	3.33	Accept	Risk effects baseline rather than scheme impacts. Monitor success of other projects and update baseline assumptions if need be	Open	M	M	L	M	3.33	25.0%
46	Risk 46	Input from external conservation group / design groups on camera and/or signage design cause additional staff time and delay. Also cost to relocate signage and/or cameras	Communications / stakeholder challenge	BCC	M	M	M	M	4.00	Reduce	Seek to design scheme with less chance of opposition. Consult early. Seek support, and have robust communications and stakeholder plan.	Open	L	L	L	M	2.00	50.0%
48	Risk 48	Lack of clarity in scope of what is to be procured (e.g. back office systems / signs)	Procurement	BCC	H	H	M	H	8.00	Reduce	Be clear on the scheme, so the scope of the system can also be clear. Agree scope with all stakeholders, including the Highway Signage teams. Accept the CAZ can't upgrade all existing systems and signs.	Open	L	M	L	M	2.67	12.5%
49	Risk 49	Delays in BCC approvals for procurement of cameras, back office systems and/or signage, including equalities and sustainability elements	Procurement	BCC	M	H	M	H	7.00	Reduce	Start discussions on procurement process early. Get early agreement to progress procurement, agree route and timescales.	Open	L	M	L	M	2.67	12.5%
50	Risk 50	Delays in procuring approved ICT hardware, e.g. secure managed network switches.	Procurement	BCC	L	M	M	M	3.33	Reduce	Agree scope early with BCC ICT. Use existing approved hardware where possible. Try to avoid 'gold plating' the solution.	Open	L	L	L	L	1.00	25.0%
51	Risk 51	Unsuccessful contractors challenge procurement process	Procurement	BCC	M	M	M	H	6.00	Reduce	Follow a robust procurement process and be clear on what is being asked and how it will be marked. Seek early input from Procurement teams.	Open	L	L	L	H	3.00	75.0%
52	Risk 52	Initially no clear plan or budget for decommissioning on street equipment when not required anymore (5-year life / large signs?)	Procurement	BCC	M	L	L	M	2.67	Reduce	Plan for decommissioning, including a suitable budget with protections to ring-fence it.	Open	L	L	L	L	1.00	12.5%
53	Risk 53	Procurement of signs for neighbouring local authorities / HE – not covered by lot 7 of the BCC Framework. Will need a procurement route	Procurement	BCC	M	L	M	H	5.00	Reduce	Engage with HE and neighbouring LAs to agree procurement routes	Open	L	L	L	M	2.00	50.0%
54	Risk 54	The impact of the CAZ may be unacceptable requiring switch off or refinement, e.g. traffic congestion, impact on safety, diversionary routes	Political	BCC	H	H	H	M	6.00	Reduce	Ensure modelling is robust. Seek support. Comprehensive communications package to explain the scheme and mitigating measures.	Open	L	L	L	L	1.00	25.0%
55	Risk 55	Cabinet does not approve FBC, resulting in delay	Political	BCC	M	H	H	M	5.33	Reduce	Seek early understanding of project aims and objectives. Clear communication and engagement. Ensure the FBC is robust.	Open	L	M	M	L	1.67	7.5%
61	Risk 61	Change in political leadership may lead to delays, such as a review of the scheme.	Political	BCC	M	M	M	M	4.00	Accept	Would need to review and agree way forward with JAQU.	Open	M	M	M	M	4.00	50.0%
63	Risk 63	Exemptions may need to be changed to meet technical and/or political aspirations	Political	BCC	M	M	H	M	4.67	Reduce	Take into account in the modelling different exceptions so there is an evidence base. Try to keep exemptions realistic.	Open	L	L	M	L	1.33	12.5%
65	Risk 65	Differences in political opinions with neighbouring authorities affect joint working	Political	BCC	M	M	M	H	6.00	Reduce	Early engagement with neighbouring authorities at both political and officer levels.	Open	M	M	M	H	6.00	75.0%
66	Risk 66	Delay occurs as a result of impact on businesses	Political	BCC	H	H	H	H	9.00	Reduce	Seek and business community support. Have an effectively publicity and communications package to promote the positive benefits of the CAZ and complimentary measures.	Open	M	M	M	M	4.00	7.5%
67	Risk 67	Risk of delay and/or risk to reputation due to pressure from various interest groups (e.g. conservation areas, civic design, environmental groups)	Political	BCC	M	M	M	H	6.00	Reduce	Seek and interest group support. Have an effectively publicity and communications package to promote the positive benefits of the CAZ and complimentary measures. Design scheme and infrastructure to reduce anticipated impacts	Open	L	L	L	M	2.00	40.0%
68	Risk 68	Delays in funding / insufficient funding from JAQU	Financial	BCC	M	M	M	M	4.00	Reduce	Good liaison with JAQU and robust FBC	Open	L	L	L	L	1.00	12.5%
69	Risk 69	Insufficient funding from JAQU for Clean Air Fund results in non-compliance leads to partial delivery of scheme.	Financial	BCC	H	L	M	H	6.00	Reduce	Good liaison with JAQU and robust CAF is prepared	Open	H	L	M	H	6.00	95.0%
70	Risk 70	Budget is insufficient for installation of signage in other LAs or on HE network	Financial	BCC	M	M	H	M	4.67	Reduce	Early design and costing work on signage. Need to agree signage on HE and other LA network, and also agree procurement route(s).	Open	L	L	M	L	1.33	25.0%
71	Risk 71	Handling of financial payments GO CARDLESS to BCC etc / refunds etc – payment processors etc – cause delay and extra cost to BCC	Financial	BCC	M	M	H	H	7.00	Reduce	Work with JAQU re central portal. Agree with BCC finance how this will work and what monies gets paid to whom, when and how.	Open	L	L	M	M	2.67	25.0%
72	Risk 72	Vandalism of on-street equipment (signs and cameras) hits budgets and reduces income and effectiveness	Financial	BCC	M	M	M	M	4.00	Reduce	Design and specify on street equipment that is robust and out of reach of all expected vandalism.	Open	L	L	L	M	2.00	75.0%
75	Risk 75	Cost of utilities diversions for signs and camera gantries	Technical / Design	BCC	H	H	H	H	9.00	Reduce	Robust design work including searches. Plan and order new utility supplies early. Have a sufficient budget for utilities including diversions.	Open	M	M	M	M	4.00	75.0%
76	Risk 76	Risk of insolvency of suppliers	Financial	BCC	H	H	H	M	6.00	Reduce	Robust procurement process including supplier assessment including financials. Need to take into account suppliers over-stretching themselves on similar schemes elsewhere. Use of financial bonds where appropriate.	Open	M	M	M	L	2.00	10.0%
78	Risk 78	Lack of technical knowledge in all organisations (BCC, Jacobs, JAQU, DFT etc) on design and technical interfaces, or inability to respond in timely manner.	Technical / Design	BCC	M	M	M	M	4.00	Reduce	Engage with the right people / teams early, including enforcement, procurement, smart cities and ICT. Also with external organisations. Flag up early if there are concerns about lack of knowledge to address early.	Open	L	L	L	L	1.00	25.0%
79	Risk 79	Lack of feedback/guidance from JAQU (e.g. on signage / payment portal)	Technical / Design	BCC	M	M	H	H	7.00	Reduce	Work proactively with JAQU on obtaining the feedback / guidance needed. Be clear what is needed and by when. Escalate if there are concerns / delays. Work with other LAs with CAZs as likely to be common problems.	Open	M	M	M	L	2.00	25.0%
80	Risk 80	DVLA database not available when required (both public checker and for enforcement). Impact on BCC staff with queries and complaints	Technical / Design	BCC	M	H	H	H	8.00	Reduce	Work with JAQU and DVLA to understand availability of test environments and their test plans, as well as their implementation and roll-out plans	Open	M	M	M	L	2.00	25.0%
81	Risk 81	Inaccurate/incomplete euro emissions data in DVLA database is an issue. Users will need to appeal and update database. Risk that this causes local impacts in enforcement such as refunds.	Technical / Design	BCC	M	H	H	H	8.00	Transfer	Work with JAQU and DVLA	Open	M	M	M	L	2.00	25.0%
84	Risk 84	The JAQU provided Taxi and Private Hire database doesn't meet BCC's requirements. Will need timely access to the test systems	Technical / Design	BCC	M	M	H	H	7.00	Reduce	Continue working with JAQU	Open	M	M	M	L	2.00	25.0%

No.	Risk Ref	Description	Category	Mitigation owner	Cost	Time	Perf	Rating	RAG	Approach Avoid, Accept, Reduce, Transfer	Mitigation Measures	Status	Cost	Time	Perf	Rating	RAG	Likelihood (%)
85	Risk 85	The JAQU provided public service vehicle database doesn't meet BCC's requirements. Will need timely access to the test systems	Technical / Design	BCC	M	M	H	H	7.00	Reduce	Continue working with JAQU	Open	M	M	M	L	2.00	25.0%
86	Risk 86	The Approved Enforcement Device enforcement hardware and technology not available in time for 'go live' e.g. supply chain, manufacture, due to demands from other CAZ areas.	Technical / Design	BCC	M	M	H	H	7.00	Reduce	Early work on specification and procurement, as well as technical elements such as on-street infrastructure and power supplies	Open	M	M	H	L	2.33	10.0%
87	Risk 87	The Approved Enforcement Device detailed design with supplier takes longer, or costs more, than anticipated	Technical / Design	BCC	M	M	H	M	4.67	Reduce	Early work on specification and procurement of AEDs. Need realistic cost estimates. Ensure no scope creep.	Open	L	L	M	L	1.33	25.0%
88	Risk 88	The overall signage design takes longer than anticipated (City Design issues)	Technical / Design	BCC	M	M	H	M	4.67	Reduce	Early work on specification and procurement of signage. Need realistic cost estimates. Ensure no scope creep.	Open	L	L	M	M	2.67	50.0%
89	Risk 89	The signage is hard to design accurately for every site in terms of preliminaries	Technical / Design	BCC	M	M	M	H	6.00	Accept	Need a large allowance of time and budget for signage.	Open	M	M	M	H	6.00	70.0%
90	Risk 90	The on-street power supply design takes longer, or costs more, than anticipated (also metered / unmetered question?)	Technical / Design	BCC	H	H	H	H	9.00	Reduce	Early work on specification and procurement of on-street power. Need realistic cost estimates. Agree early and be clear on requirements for cabinets, earthing, circuit breakers, testing	Open	M	M	M	M	4.00	50.0%
91	Risk 91	Structural strength of lamp-columns not able to be ascertained – resulting in more new free-standing poles being required	Technical / Design	BCC	M	H	H	H	8.00	Reduce	Early engagement with street lighting teams on requirements to understand which can and cannot be used.	Open	L	M	M	M	3.33	30.0%
92	Risk 92	The links to BCC's other ICT systems (e.g. Roadflow, ABW, BCC internal comms / B-net) design takes longer, or costs more, than anticipated	Technical / Design	BCC	M	H	H	H	8.00	Reduce	Creation of Enabling Technology project with a BCC Solution Architect to be assigned to project team. Early engagement with ICT team and identification of suitable resource	Open	L	M	M	M	3.33	50.0%
93	Risk 93	The ICT system design requires more internal ICT approvals and sign-off and/or requirements e.g. ICT security (BCC ICT / BOpen) than anticipated.	Technical / Design	BCC	M	H	H	H	8.00	Reduce	Creation of Enabling Technology project with a BCC Solution Architect to be assigned to project team. Early engagement with ICT team on requirements including comms, networks, security.	Open	L	M	M	L	1.67	25.0%
95	Risk 95	Delays in the availability of the highway for CAZ street-works due to new network management arrangements and highway booking from April 2020. Other utilities may have made their reservations first.	Construction	BCC	M	H	H	H	8.00	Reduce	Need early programme of works and book in as soon as possible. Allow some time contingency in programme for delays	Open	L	M	M	L	1.67	10.0%
97	Risk 97	The Approved Enforcement Device supply and installation takes longer, or costs more, than anticipated due to competing priorities for contractors	Construction	BCC	M	M	M	H	6.00	Reduce	Early specification and procurement. Ensure project programme has sufficient time for the expected competing priorities. Seek procurement advice on use of non-performance rebates etc.	Open	L	L	L	M	2.00	30.0%
98	Risk 98	The communication system implementation takes longer, or costs more, than anticipated due to a new BCC contractor for fibre and cameras	Construction	BCC	M	M	M	M	4.00	Reduce	Early design and specification of fibre (if required) and cameras / camera mountings. Use mobile comms (4G etc) instead of fixed comms to reduce required infrastructure. Possibly use the framework Traffic Signals contractor if required.	Open	L	L	L	M	2.00	30.0%
99	Risk 99	The signage implementation takes longer than anticipated due to competing priorities for contractors	Construction	BCC	M	M	M	H	6.00	Reduce	Early specification and procurement. Ensure project programme has sufficient time for the expected competing priorities.	Open	L	L	L	M	2.00	30.0%
100	Risk 100	The on-street power supply implementation takes longer, or costs more, than anticipated due to competing priorities for contractors.	Construction	BCC	M	M	M	H	6.00	Reduce	Early specification and procurement. Ensure project programme has sufficient time for the expected competing priorities.	Open	L	L	L	M	2.00	30.0%
101	Risk 101	The ICT system implementation takes longer, or costs more, than anticipated due to competing priorities for contractors	Construction	BCC	M	M	M	H	6.00	Reduce	Early specification and procurement. Ensure project programme has sufficient time for the expected competing priorities.	Open	L	L	L	L	1.00	20.0%
102	Risk 102	Unknown geotechnical, environmental, unexpected utilities at the time of installation of columns for cameras and sign poles	Construction	BCC	L	L	M	H	4.00	Reduce	Possible staged implementation to reflect construction issues when identified	Open	L	L	L	H	3.00	70.0%
104	Risk 104	Integration with the existing BCC back office systems may be more complex than expected and currently this may not be adequately aligned with the new processes required or the JAQU back-office system requirements.	Technical / Design	BCC	M	L	L	M	2.67	Reduce	Creation of Enabling Technology project with a BCC Solution Architect to be assigned to project team. Detailed technical design discussions will be needed with our current supplier to ensure feasibility, assess impact and identify any additional development work that will be needed to meet these new and additional requirements.	Open	L	L	L	L	1.00	25.0%
105	Risk 105	Multiple LA tenders mean small number of suppliers too busy to submit, or take a commercial decision not to tender as small potential return, or a lack of resources.	Procurement	BCC	M	H	M	H	7.00	Reduce	Ensure market know the scale and scope of BCC project. Ensure contracts have robust penalty clauses for late delivery	Open	M	M	M	L	2.00	25.0%
106	Risk 106	Current contract for the BCC back-office system is only in place until the end of March 2021. The potential change in supplier may present risks to the project.	Procurement	BCC	M	M	M	M	4.00	Reduce	Further discussions are needed to identify the appropriate mitigation measures, as several options are possible. Commitment to combine Bus Lane Enforcement and CAZ procurement.	Open	L	L	L	M	2.00	50.0%
112	Risk 112	Effect of Covid on supply chain - hardware manufacture and supply and permitted construction works	Covid	BCC	H	H	H	M	6.00	Reduce	Work with contractors to ensure they can work in Covid-secure ways and in accordance with all current Covid legislation.	Open	L	L	L	M	2.00	30.0%
113	Risk 113	Effect of Brexit on supply chain - hardware manufacture and supply	Brexit	BCC	M	M	M	M	4.00	Reduce	Procurement process to ask questions about minimising the effect of Brexit on supply chains.	Open	L	L	L	M	2.00	30.0%