Basildon Air Quality Management Plan

Full Business Case (FBC)

ISSUED FOR ESSEX COUNTY COUNCIL/BASILDON BOROUGH COUNCIL APPROVAL

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1 Executive Summary

This Full Business Case (FBC) restates and reinforces the conclusions of the Outline Business Case (OBC) which demonstrated that the Engineering Option 3b provides the best overall solution to reducing the harmful impact of poor air quality at East Mayne junction in line with requirements.

The Engineering Option 3b is shown in Figure 1-1. The solution meets the primary Critical Success Factors (CSF) for the project of delivering compliance with NO_2 air quality Limit Values in the shortest possible timescales. It also performs well against the secondary CSFs as outlined in Section 3.4.

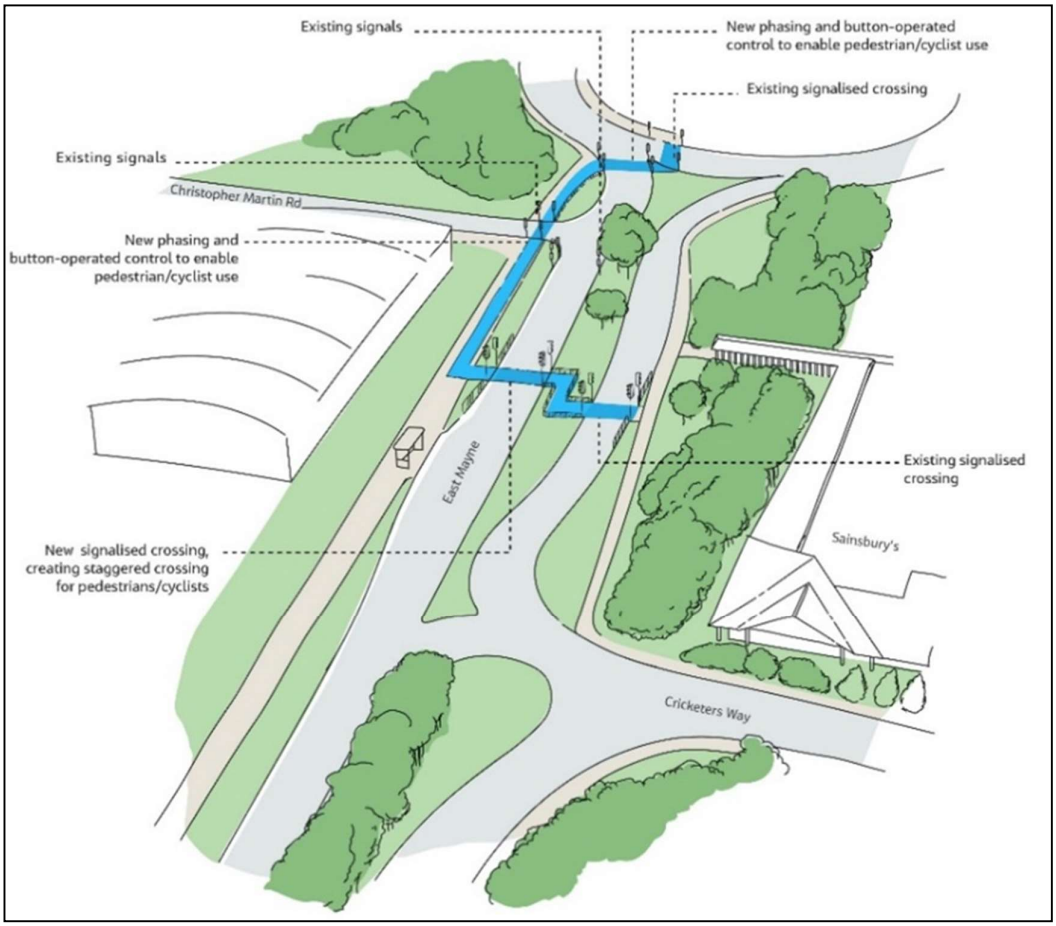


Figure 1-1: Engineering Option 3b - Revised pedestrian and cyclist route

The Engineering Option 3b was compared against a category 'C' Clean Air Zone (CAZ) in the OBC and this comparison has been updated here. The CAZ C has been used as a benchmark for comparison only as it was identified through early options analysis that it would only provide compliance with air quality levels in the same year it became active[1] which is the same year as the modelled year of natural compliance. In the CAZ C

1 See Appendix S - Options Appraisal Report

benchmark option, non-compliant goods vehicles, passenger vehicles, buses and coaches would be charged to enter a zone encompassing the Basildon Enterprise Corridor and adjacent sections of East Mayne and Upper Mayne roads.

In the Economic case the Net Present Value (NPV) for the Engineering Option 3b is estimated as -£7.00m. This negative NPV is primarily driven by disbenefits arising from longer journey times. The benchmark CAZ C is estimated to have an NPV of -£11.63m. The largest disbenefits arising from welfare impacts of cancelling trips and a worsening of CO_2 emissions. The Engineering Option 3b performs better than the benchmark CAZ C both in terms of environmental impacts and costs of implementation and is the option that can be delivered in the shortest possible time to provide compliance in 2022 ahead of the modelled Year of Natural Compliance (2024). The delivery of the works is to be undertaken by Ringway Jacobs, operating as Essex Highways. Essex Highways is an approved supplier of highways maintenance and design works for ECC.

Communication and engagement with road users, local residents and other stakeholders regarding the new crossing layout has already begun. A stakeholder engagement plan has been established including a brochure providing information about the scheme for residents. A Monitoring and Evaluation Plan (MEP) has also been established and this is detailed in Appendix F. The MEP is designed to consider the performance of the scheme by monitoring behavioural changes and air quality impacts.

This business case has been developed in accordance with guidance provided by the Joint Air Quality Unit (JAQU), itself based on the HM Treasury Green Book. It sets out the process by which a preferred option has been identified to bring about compliance with air quality limits in the shortest possible time. It provides the rationale and justification for the funding secured under the Implementation Fund and the Monitoring and Evaluation Fund to allow delivery and ongoing evaluation of the plan.

2 Background

The aim of the Basildon Air Quality Management Plan (AQMP) is to reduce exceedances of nitrogen dioxide (NO_2) to below the limit values within the shortest possible time, at those locations within Basildon that have been identified both on the national Pollution Climate Map (PCM) and at additional locations that were identified following local modelling. Thus, the primary objective being to bring NO_2 levels at exceedances points to comply with the UK Air Quality Standards Regulations 2010 requiring annual mean levels below 40 µg/m^3.

The development of Basildon AQMP commenced in 2017 with an OBC submitted to JAQU in April 2019. This set out options for reducing emissions on the A127 through the introduction of a 50-mph speed limit and to resolve the remaining exceedances through a package of measures supporting the development of a non-charging Clean Air Zone (CAZ) around the Basildon enterprise corridor. During this stage an options appraisal was undertaken for the original package of measures at the time.

However, the OBC and the package of measures were not approved by JAQU at the time. Instead Basildon and Essex received a directive to implement a speed limit measure and to develop a CAZ benchmark and/or engineering or traffic management options to address the remaining exceedances on East Mayne. An FBC for a speed limit on the A127 to address the original exceedances was approved in 23 Mar 2020 and the scheme installed by end March 2020.

An OBC was submitted in December 2020 which addressed the requirement to develop the CAZ benchmark and alternative options for addressing the remaining exceedances. The preferred option from that OBC was the Engineering Option 3b and this has been further developed and is presented here in the FBC as the final proposal.

3 Strategic Case

3.1 Introduction

The Strategic Case sets out the case for change and the strategic rationale for the investment. It closely examines the current problem and the need for intervention. It considers how well the proposed options address the problem and delivers the strategic objectives.

This Strategic Case considers the suitability of the Engineering Option to reduce public exposure to illegal levels of NO_2 that have been identified at exceedance locations on East Mayne in Basildon. It also includes a comparison with a proposed CAZ benchmark scheme. Now at the Full Business Case (FBC) stage the engineering options has already been established as preferred to the CAZ benchmark in the Outline Business Case (OBC) but is included here for reference.

The Strategic Case is part of the Full Business Case (FBC) and will cover the following key points:

- **The Need for Change** – Outlines the issues around air quality and public health and highlights the relevant policy and strategy.
- **Problem Identification** – Demonstrates the specific issues on the A127 and on East Mayne.
- **Strategic Objectives** – Outlines JAQU's Critical Success Factors as the Strategic Objectives of the scheme.
- **Identification of the Shortlisted Options** – Describes how options were considered to address the exceedances and how two options were identified for further consideration.
- **Performance of Options for Air Quality Compliance** – Describes the performance of those two options at achieving the strategic aims**.**
- **Stakeholder Engagement** – Describes how stakeholders will be engaged.
- **Benefits Management, Risks, Constraints and Dependencies** – Outlines some of the key factors that affect the strategy for the scheme.

3.2 Problem Identification

The UK Plan[2] for tackling roadside NO_2 concentrations states there is increasing evidence that air quality has an important effect on public health, the economy, and the environment. The risks to public health associated with elevated levels of NO_2 and other pollutants from vehicles emissions (as highlighted in the previous section) provide clear evidence that appropriate actions should be taken in the shortest possible time to reduce adverse health consequences.

[2] Defra: UK plan for tackling roadside nitrogen dioxide concentrations, An overview, July 2017

3.2.1 National and Local Air Quality Modelling

Modelling undertaken at the national level to inform the UK Plan, assessed compliance with the annual mean NO_2 EU Limit Value at reportable receptors[3]. Defra reported the outputs of its Pollution Climate Mapping (PCM) model in July 2017. This identified road links[4], that are the responsibility of Local Highway Authorities, which are projected to be in exceedance of the NO_2 annual mean EU Limit Value of 40 µg/m^3 beyond 2020.

The results of the 2017 PCM model for the A127 within Basildon Borough and Rochford District are shown in Table 3-1. This table indicated that with no intervention in place, there would be exceedances adjacent to three identified PCM Census IDs within Basildon and Rochford beyond 2020.

The locations of these PCM Census IDs are shown in Figure 3-1. The Basildon links are on the western side and the Rochford District links are to the east.

Table 3-1: Annual Mean NO_2 Concentrations at PCM Census ID locations (modelled by the PCM tool)

Local Authority	Road	PCM Census ID	2018 (µg/m^3)	2020 (µg/m^3)
Basildon Council	A127	16646	50	45
Basildon Council	A127	75041	51	46
Rochford District Council	A127	46683	49	45

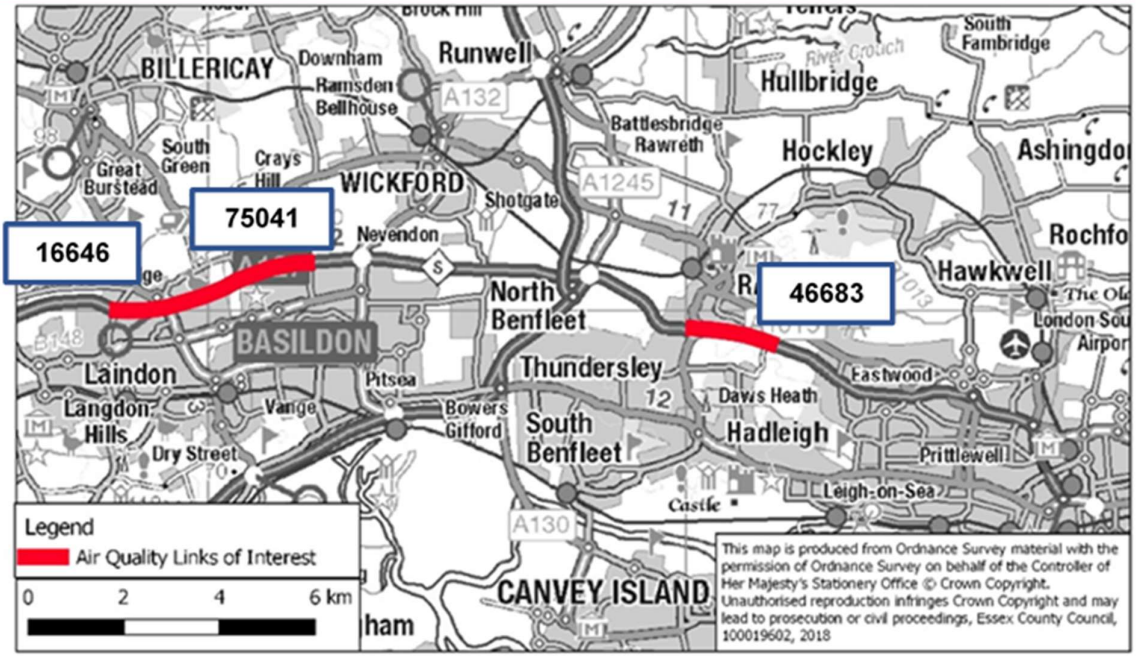


Figure 3-1: Locations of PCM Census IDs of interest for the October 2019 FBC submission

[3] Reportable receptors are locations where public exposure to pollution is likely.
[4] Also referred to as Census IDs.

With respect to exceedances identified for the PCM links above, speed reduction on the A127 was found to be a suitable measure for deliver compliance. In June 2019 Essex County Council (ECC) and Basildon Borough Council (BBC) received a Ministerial Directive that required the Councils to implement a speed limit reduction scheme with the objective of meeting the annual mean NO_2 EU Limit Value along the A127 at the non-compliant Census IDs by 2020 (i.e. 2021 providing a full year of compliance).

Following the target determination modelling reported in 2019[5], the exceedance identified by the PCM tool for the Census ID in Rochford was found to be compliant. This was further confirmed by the JAQU via its own Target Determination process. As a result, Census ID46683 was omitted from any further assessment.

The target determination modelling also confirmed locations of other likely exceedances at PCM Census IDs to the south of the A127 on East Mayne in 2020 (Table 3-2-2) Further exceedances at PCM Census IDs were also identified near to Upper Mayne but these were predicted to be compliant in 2021 with speed management in place on the A127. At East Mayne, seven roadside reportable receptors indicated exceedance of the Ambient Air Quality Directive (AAQD), Table 3-2 reports the maximum concertation value for PCM Census ID's. In addition, a single reportable receptor in the central reservation also indicated exceedance. The location of exceedances of NO_2 over 40 µg/m3 on East Mayne are shown in Figure 2-2, these require addressing in line with JAQU guidance.

Table 3-2: Annual Mean NO_2 Concentrations at PCM Census ID locations for 2020 (modelled by the ECC)

Local Authority	Road	PCM Census ID	2020 (µg/m^3)
Basildon Council	Upper Mayne	75039	43.8
Basildon Council	East Mayne	47950	46.7
Basildon Council	East Mayne*	47950	48.4

*Central reservation

[5] Revision 3 files were compiled and uploaded onto Huddle on the 11th January 2019. The submission included TD1_08012019-Revision 3 DM2020 Results and various figures showing the magnitude of NO_2 concentration and location of receptors.

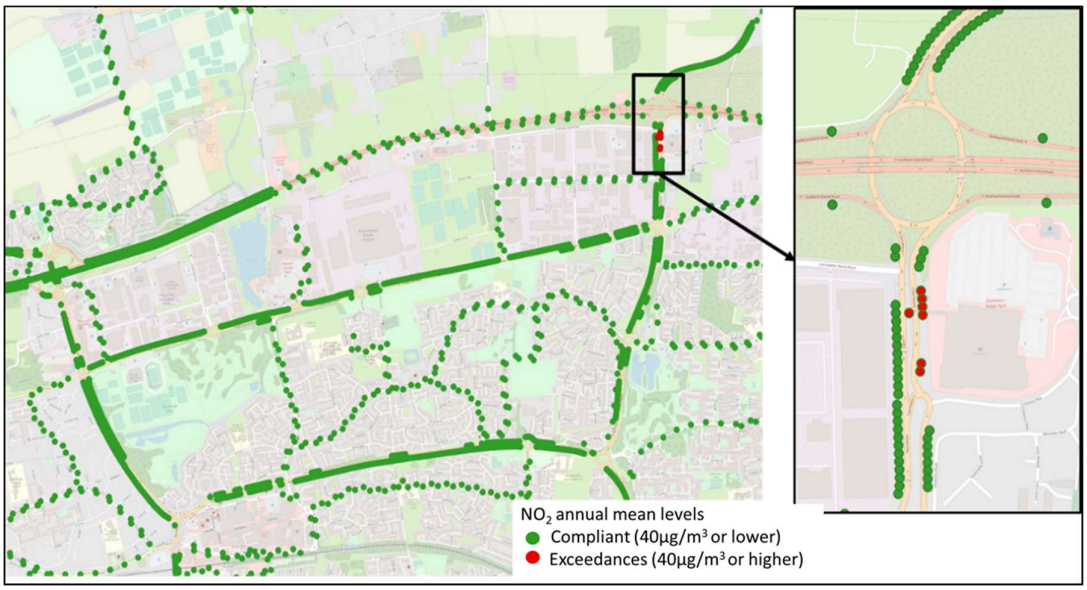


Figure 3-2: Exceeding Reportable Receptors Basildon Study Area - Do Minimum 2020

The remaining exceedances on East Mayne were along the footway within the central reservation as shown in Figure 2-3. The rest of this FBC sets out the preferred approach to addressing the East Mayne exceedances whilst comparing these against a Benchmark CAZ C as requested by JAQU.

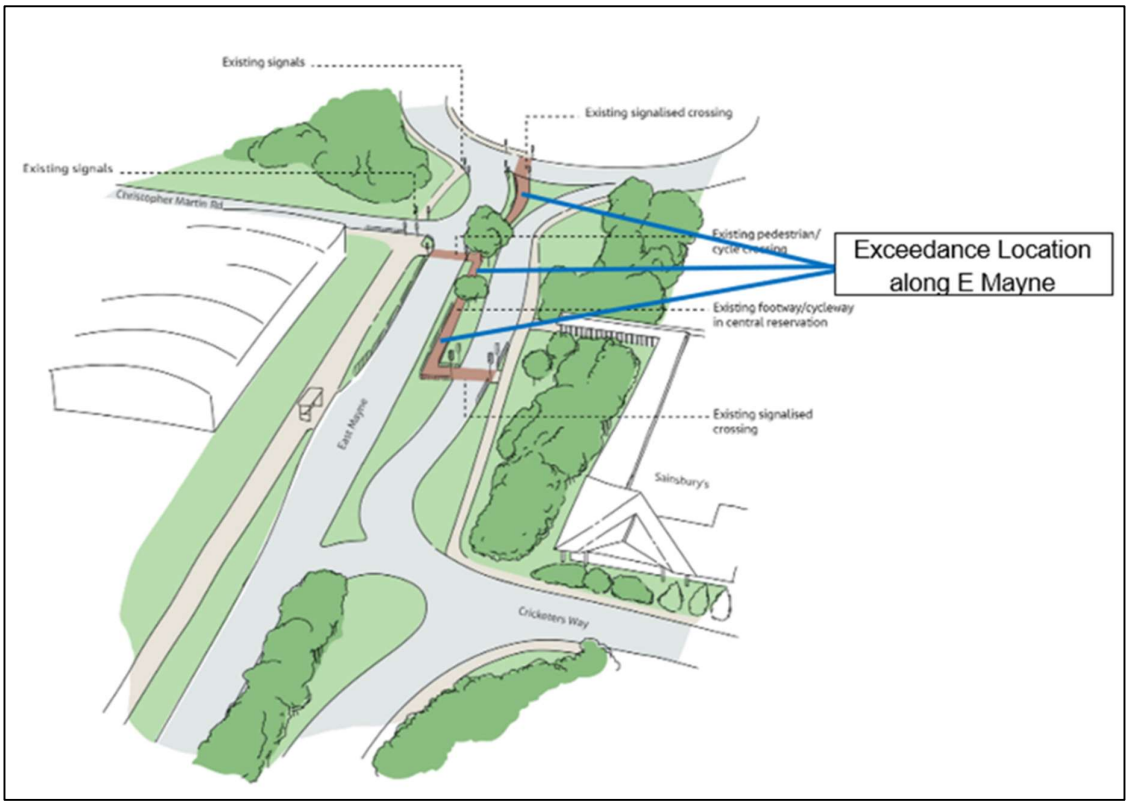


Figure 3-3: Locations of exceedances on East Mayne approximate areas of exceedances

3.2.2 Source Apportionment

Source apportionment was undertaken at several stages of the assessment including the Target Determination stage. The analysis reported here was undertaken as part of the Readiness Test stage. The aim of the source apportionment was to better understand road emission sources contributing to reportable exceedances of the annual mean EU Limit Value for NO_2. The approach applied for the source apportionment is described in Appendix J - AQ2.

Receptor P9849 is located in the central reservation of East Mayne. The predicted contribution to the NO_2 annual mean was 66% from the immediate road sources and 34% from background sources. Table 3-3 shows the source apportioned road NO_2 contributions to receptor P9849 from the five highest contributing road links. As highlighted rigid HGV's contribute the most to the annual mean NO_2 followed by diesel cars and diesel LGVs. These three road sources contribute over 75% of the road source contribution. Table 5-2 in AQ3 (FBC Appendix K) provides supporting information relating to the flows of each vehicle type and overall link speed.

Table 3-3: Road NO_2 contribution at receptor P9849 from the five most influencing road links

Link ID	Proportions as a concentration (µg/m^3 of Road NO_2)							
	Petrol Cars	Diesel Cars	Petrol LGVs	Diesel LGVs	Rigid HGVs	Artic HGVs	Buses / Coaches	Other
955281059b_C1_Q	0.7	4.6	0.0	3.9	7.3	0.4	3.3	0.1
955276789b_C1_Q	0.2	1.5	0.0	1.2	2.5	0.1	0.9	0.0
955276789d_C2_Q	0.0	0.1	0.0	0.1	0.2	0.0	0.1	0.0
1070207094_569563_Q	0.0	0.1	0.0	0.1	0.2	0.0	0.1	0.0
955281059c_C2_Q	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Sum	0.9	6.5	0.0	5.3	10.3	0.6	4.4	0.2

3.3 The Need for Change

3.3.1 Air Quality and Public Health

According to Public Health England, poor air quality is the largest environmental risk to public health in the UK[6]. There is now a convincing body of evidence that two main airborne pollutants affecting personal health and the environment, namely Fine Particulate Matter ($PM_{2.5}$) and Nitrous Oxide (NO_X).

In Europe, air pollution is the biggest environmental risk factor for premature death[7]. While other components of air pollution damage health, particularly at high levels of exposure, the strongest evidence for harm caused by lower levels is the effect of long-term population wide exposure to $PM_{2.5}$ and NO_2.

Evidence collated by Defra, Public Health England and the Local Government Association[8] shows that short-term exposure to high levels of air pollution can cause a wide range of

[6] Public Health England, '*Estimating local mortality burdens associated with particulate air pollution*', 2014, www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution
[7] The Lancet, 'The Lancet Commission on pollution and health' (October 2017)
[8] www.local.gov.uk/sites/default/files/documents/6.3091_DEFRA_AirQualityGuide_9web_0.pdf

adverse health effects including exacerbation of asthma, effects on lung function, increases in hospital admissions and mortality. A review by the World Health Organization (WHO) concludes that long-term exposure to air pollution reduces life expectancy by increasing deaths from lung, heart and circulatory conditions. There is emerging evidence from the Royal College of Physicians (amongst others) of possible links with a range of other adverse health effects including diabetes, cognitive decline and dementia, and effects on the unborn child.[9]

In the UK, $PM_{2.5}$ is responsible for 29,000 premature deaths annually and NO_2 is associated with 23,500 deaths, based on current outdoor air pollution.[6] Analysis shows that a 10 µg/m^3 reduction in pollution alone would have a larger impact on increasing life expectancy in England and Wales than eliminating all road traffic collisions or passive smoking[8].

The Public Health Outcome Framework[10] (PHOF) recognises the need to reduce the health burden from air pollution. Indicator 3.01 reports the fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution measured as fine particulate matter, $PM_{2.5}$. According to this indicator in 2017, 5.7% of deaths in Basildon, 5.5% in Rochford and 5.5% in Southend-on-Sea were attributable to particulate air pollution. These are above the average in England, reported by this indicator as 5.1% in 2017.

In addition, air pollution also brings associated increases in social costs[11] and threatens economic growth. It also impacts upon people of working age which can have economic effects, for instance if they have to take days off work. It is estimated that in 2012, poor air quality cost the UK up to £2.7 billion through its impact on productivity[12].

Air pollution is also responsible for significant damage to the natural environment. NO_2 contributes to acidification and eutrophication of soil and watercourses, which impacts on animal and plant life and biodiversity. It also contributes to local ozone production, which has public health impacts and damages agricultural crops, woodland and plant habitats.

3.3.2 Policy Context

A review of the national and international policy around air quality and emissions was undertaken to consider the strategic alignment of the scheme objectives and the options under considerations. The full review is presented in Appendix A and B and is summarised here.

European Policy

Air pollution has been one of Europe's main political concerns since the late 1970s. Ambient Air Quality Directive (2008/50/EC) provides the current framework for the control of ambient concentrations of air pollution in the EU.

The European Union standards for vehicle emissions have been evolving since 1990 through 6 standard levels (from EURO 1 to EURO 6) having reduced the limit standards of some pollutants up to 96% from the release of EURO 1, thanks to technology advancements. European emission limits are associated to Carbon Monoxide, Hydrocarbons, Particulate Matter, and lately more focused on Oxides of Nitrogen

[9] Royal College of Physicians 'Every breath we take. The lifelong impact of air pollution' (2016).
[10] Public Health England, *'Public Health Outcomes Framework'*. Available at: https://fingertips.phe.org.uk/profile/public-health-outcomes-framework [Accessed 17 April 2019]
[11] Defra, *'Air quality damage cost guidance' (January 2019)*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf [Accessed 17 April 2019]
[12] Department for Environment, Food and Rural Affairs, 'Valuing the impacts of air quality on productivity', https://ukair.defra.gov.uk/assets/documents/reports/cat19/1511251135_140610_Valuing_the_impacts_of_air_quality_on_productivity_Final_Report_3_0.pdf (2015)

concentrations. The EU limit value for Nitrogen dioxide is 40 µg/m^3 per year and 200 µg/m^3 per hour (and cannot be exceeded more than 18 times per calendar year).

Table 3-4: Key European policies and objectives

Policy	Summary
International and European standards of air quality	Defra reports national emission totals each year for the main pollutants to the European Commission and the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Transboundary Air Pollution. The UK is compliant with its 2010 national emission ceilings for air pollutants. The UNECE subsequently agreed a number of protocols including the Gothenburg Protocol (amended in May 2012), which sets national emission reduction targets, including for fine particulate matter, to be achieved by 2020. Like most other European countries, the UK is facing difficulties in meeting the air quality standards for concentrations of NO_2 alongside some of our busiest roads. Defra's air quality plans set out all the measures being taken to achieve the air quality standards in the shortest time possible.

National Policy

Air quality legislation was first introduced in the late 1990s as part of the **Environment Act (1995),** in which it defined the concept of local air quality management. In 2007, Defra published the **Air Quality Strategy** which sets the national objectives for further improving air quality and how they would be achieved. Related to the Air Quality Strategy, the UK sets its own **Air Quality Standards Regulations in 2010** which limit the concentrations of NO_2 for being harmful for the environment and having serious health implications.

Table 3-5: National policies and objectives

Policy	Summary
National air quality standards	The Air Quality Standards Regulations 2010 set the limit values for concentrations of NO_2 in ambient air. These limit values reflect World Health Organization (WHO) air quality guidelines: • Hourly mean limit value – 200µg/m^3 not to be exceeded more than 18 times a calendar year. • Annual mean limit value – 40µg/m^3.
National strategy on air quality	Defra published the Air Quality Strategy in 2007 in two volumes: volume 1 contains the strategy, and volume 2 provides information about the evidence underpinning the strategy. This strategy set out national objectives for further improving air quality, and how the country would achieve them. The Committee on the Medical Effects of Air Pollutants (COMEAP) was established as an expert committee of the Department of Health. COMEAP advises government on the health effects of air pollution. The Department of Health has also published an indicator for air pollution as part of its Public Health Outcomes Framework. The Government published a wider Clean Air Strategy in January 2019 setting out how we will meet our international commitments to significantly

Policy	Summary
	reduce emissions of various air pollutants by 2020, and 2030 across transport, industry and energy generation. This builds on the Defra UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations published in 2017 and the National Institute of Health and Care Excellence air quality and health guidelines. Local Authorities are responsible for reviewing and assessing air quality, to check they meet national air quality objectives.
UK Plan for tackling roadside nitrogen dioxide concentrations	The focus of Defra's UK Plan for tackling roadside NO_2 concentrations published in July 2017 is on the most immediate air quality challenges: to reduce concentrations of NO_2 around roads – the only statutory air quality limit that the UK is currently failing to meet; bringing NO_2 air pollution within statutory limits in the shortest possible time. The plan identifies a range of contemporary initiatives to tackling roadside NO_2 concentrations including: • Creation of Low Emission Zones; • Investment in bus services to accelerate the uptake of low or ultra-low emission buses, including new buses and retrofitting older buses supported by a new accreditation scheme; • Investment in the national and local road network to relieve road congestion, including pinch points on the Strategic Road Network and to improve safety, increase provision for cyclists on and near its network, and enhance access for a variety of users, including pedestrians, horse riders and the disabled, and to help local authorities improve air quality; • Retrofit technology schemes aimed at the oldest vehicles (mainly buses); • Promoting fuel efficient driving style; • Encouraging use of alternative fuels; and • Promoting uptake of Low emission vehicles (ULEVs) including: - Conventional car and van sales to end by 2040, and for almost every car and van on the road to be a zero-emission vehicle by 2050. - investment in UK's charging infrastructure at home, on-street residential, workplaces and motorway service stations - grants towards purchase of new ultra-low electric vehicles - company car tax incentives for ULEVs. The Plan identifies 56 local authorities in England with persistent exceedances. These authorities are required to undertake local action to consider the best option to achieve statutory NO_2 limit values within the shortest possible time through a local authority led action plan. Defra is looking for local plans that are effective, fair, good value, and deliver the necessary air quality likely compliance. Local authorities are to consider a wide range of innovative options, exploring new technologies and seeking to support the government's industrial strategy so that they can deliver reduced emissions in a way that best meets the needs of their communities and local businesses. If these measures are not sufficient, local plans could include access restrictions on vehicles, such as charging zones or measures to prevent certain vehicles using particular roads at particular times.

Policy	Summary
	This document identifies Basildon as an area with persistent exceedances and this has led directly to the development of this business case and supporting research and analysis.
	Any local authority can already implement a Clean Air Zone (CAZ) to address a local air quality issue. Following a consultation in 2016, the UK government has published a CAZ Framework in England setting out the principles for the operation of CAZ in any cities which decide, or are required, to do so. The Framework is designed to provide a consistent approach to the introduction of a CAZ by local authorities in order to help businesses and individuals and support cities to grow and transition to a low emission economy. The Framework sets out the outcomes that a CAZ is expected to deliver, and ways in which local authorities can support and encourage public transport.

Local Policy and Strategic Context
The following sub-regional and local documents and policies are currently pertinent and have been reviewed below.

- Basildon Borough Council – Air Quality Topic Paper
- Basildon Borough Draft Local Plan January 2016
- Essex Transport Strategy: The Local Transport Plan for Essex
- Essex County Council's Environmental Statement
- Essex County Council's Sustainable Modes of Travel Strategy (SMoTS)
- Essex Cycling Strategy
- SEAT (South Essex Active Travel) Programme
- A127 Corridor for Growth Strategy.
- Rochford District Council – New Local Plan – Issues and Options
- Havering Air Quality Action Plan 2018-2023 (AQAP) (Draft)
- Southend-on-Sea Borough Council: Low Carbon Energy & Sustainability Strategy 2015-2020

The proposed scheme aims to align with various sub-regional and local policy objectives, in particular, in relation to Local Authority plans for sustainable future growth, whilst also considering Basildon, Rochford and Southend local policy objectives regarding air quality, carbon emissions and environmental protection. These goals are stated in the Essex Transport Strategy.

3.4 Spending Objectives

The strategic objectives for this initiative are defined by JAQU's Critical Success Factors (CSF). JAQU require that local authorities appraise their options against one primary (pass/fail) CSF and any options which do not meet this CSF should be rejected. The primary CSF is:

- Deliver compliance with NO_2 air quality Limit Values in the shortest possible timescales

JAQU's Options Appraisal Package guidance highlights that there is a need to define secondary CSFs to further differentiate amongst options. Options that meet the primary CSF are required to be considered against the secondary CSFs. Several secondary CSFs were defined against which options have been assessed. These are:

- **VfM**: Does the measure deliver good Value for Money (VfM)?
- **Distributional Impacts:** Does the measure significantly affect one or a number of particular groups of stakeholders?
- **Strategic and wider air quality fit:** Does this measure fit and/or complement other existing and planned policies?
- **Supply side capacity/capability:** Is there a sufficiently well-developed market to support the efficient delivery of the measure?
- **Affordability:** Is the measure likely to be affordable in both the short and long run in comparison to other measures considered?
- **Achievability:** Given market conditions, are adequate resources available to manage and implement such measure successfully?
- **Robustness of evidence:** Can the impacts of this intervention be quantified in a robust way?

3.5 Identification of the Preferred Solution

The Options Appraisal Report (OAR) presented alongside this FBC (Appendix S) provides a detailed explanation of the option refinement and selection process. Option identification is summarised here for the purposes of the Strategic Case.

The following options in Table 3-6 were considered to address the East Mayne exceedances. Of these only Engineering Option 3b achieves an overall 'pass' against the primary Critical Success Factor.

Table 3-6: Full list of non-CAZ options considered in OAR

No.	Route Option Description	Primary CSF
1	Engineering Option 1 – Retains the pedestrian/cycle route along the central reservation up to the existing crossing on the northbound carriageway to the south of Christopher Martin Rd. A new staggered crossing route is provided in the vicinity of Sainsbury's to link with the existing crossing on the southbound carriageway..	No
2	Engineering Option 2 – Retains the pedestrian/cycle route along the central reservation up to the existing crossing on the northbound carriageway to the south of Christopher Martin Rd. Provides a new crossing over the southbound carriageway at that location.	No
3	Engineering Option 3 – Provides a new crossing from the beginning of the central reservation route over to the west of East Mayne and continues the route south to a point opposite the existing crossing in the vicinity of Sainsbury's. A	Yes

No.	Route Option Description	Primary CSF
	new crossing point is provided over the northbound carriageway. Option provides partial compliance with LTN 1/20.	
4	Engineering Option 4 – Provides a new crossing from the beginning of the central reservation route over to the west of East Mayne then crosses back over to the east of East Mayne via the existing crossing on the northbound carriageway and then onto a new crossing point on the southbound carriageway.	No
5	Engineering Option 5 - Upgrade A127 eastbound on slip & westbound off slip signals to Toucan crossings and widen shared route eastern side of roundabout.	No
6	Engineering Option 6 - East Mayne Crossing location south bound closer to roundabout.	No
7	Engineering Option 7 - Provide a route to the existing cycleway on the western side of roundabout. Using the existing signals on the A127 westbound off slip and the existing signals to the centre of Nevendon roundabout.	No
8	Engineering Option 8 - Provide a route to the existing cycleway on the western side of roundabout by introducing a Toucan crossing over the west bound A127 on slip and removing the existing route on the roundabout.	No
9	Structure Option - Cycle Footway across East Mayne.	No
10	Structure Option - Covered Walkway along Central Reserve.	No
11	Structure Option - Barrier either side of Central Reserve.	No
12	Road Realignment of Southbound Carriageway.	No

3.5.1 Shortlisted Option Selection

In line with JAQU guidance Critical Success Factors (CSF), detailed in Section 3.4, were used to conduct a high-level comparative assessment of the options. The primary and secondary CSF were used with primary CSF requiring to be passed for an option to be considered further. This produced the shortlisted options below however the CAZ C was only progressed as a benchmark:

1 **CAZ C (benchmark)** - Around the Basildon Enterprise Corridor

2 **Engineering Option 3b** - Replace existing crossing layout with staggered crossing Remove existing crossing location and remove access to area of exceedance along East Mayne Central reservation. Includes signal timing changes to ensure East Mayne queues are minimised. In addition, active air quality and traffic monitoring is included with this option. Option 3b provides partial compliance with LTN 1/20.

Monitoring and evaluation plan is included for both options (Appendix F). The detailed appraisal of the shortlisted option is also in the OAR (Appendix S) and is summarised here for convenience.

Clean Air Zone (CAZ) C (Benchmark Option)

The CAZ C option was developed to cover the area outlined in Figure 2-4. The full implementation timescale for the CAZ C was also established. For the Basildon AQMP and the exceedances on East Mayne, the timeline for the development and earliest possible introduction of the CAZ C was assessed to be within the same year as the modelled natural year of compliance in 2024. The engineering option modelling showed it could result in

removing exposure to NO_2 by 2022. As a result of this modelling, JAQU confirmed that the CAZ C Benchmark was to only be developed for benchmark purposes and was not required to be investigated in full.

It should be noted for the entire economic appraisal it has been assumed that a Benchmark CAZ C is implemented and operational in 2022 as a direct comparison with the engineering option. This is because we have been requested not to undertake any further transport and air quality modelling for the CAZ. However, from a programme perspective we have estimated that a CAZ could not be implemented and operational until mid-to-late 2024 (Options Appraisal Report for the potential timescale for implementing a CAZ).

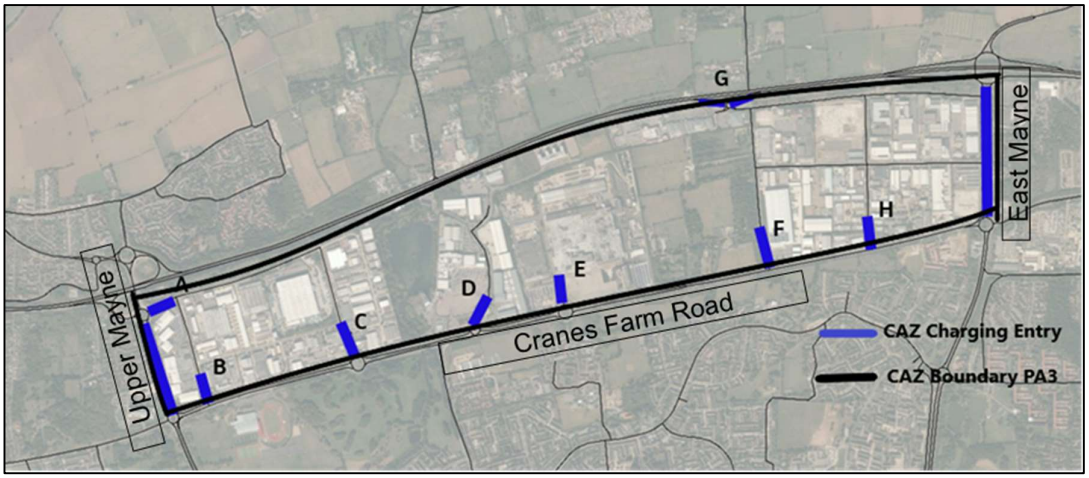


Figure 3-4: CAZ C boundary and entry points

Engineering Option (Preferred Option)
Several engineering options were considered as part of the option refinement process.

Engineering option 3, which is shown in Figure 2-5 was identified as the preferred engineering option. This option includes monitoring air quality through active air quality sensors, a continuous analyser and diffusion tubes, as well as optical sensors to monitor traffic flows, composition and queueing, and an ANPR survey (see Appendix F for more detail). This will ensure that sufficient evidence is made available, to support adjustments to the signal timings on East Mayne, in the event that air quality does not improve in line with modelling expectations (Appendix K - AQ3 Modelling Report). Monitoring equipment will be situated along East Mayne.

The engineering option will remove the central reservation exceedance location and provide an alternative route for pedestrians and cyclists along the west side of East Mayne. The signals along East Mayne and at the Nevendon roundabout at the A127 junction operate on a SCOOT system which, in conjunction with the proposed monitoring equipment, will provide the ability to adjust the local traffic signals and maximise traffic flows to deliver air quality improvements.

The timeline for delivery of the engineering package including submission and approval of OBC and FBC is shown in Appendix X. This shows delivery of the engineering package of measures by end 2021 which provides a minimum of two years compliance ahead of the modelled year of natural compliance in 2024.

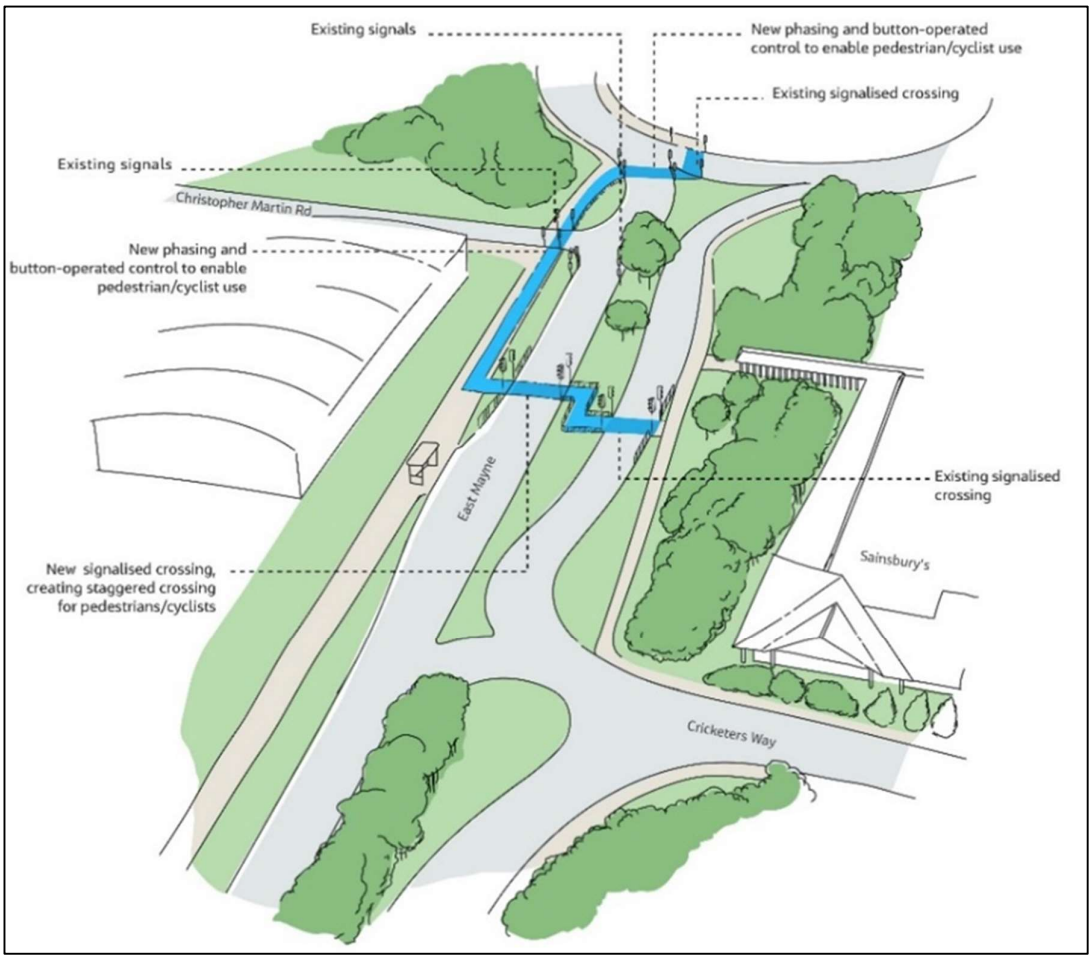


Figure 3-5: Engineering Option 3b - Revised pedestrian and cyclist route

All engineering options were reviewed against the DfT's Local Transport Note (LTN) 20/1 which advices on design principles for cycle routes. This review highlighted the following design considerations and risks for Engineering Option 3.

- Will remove a central reservation receptor;
- Creates a multiple stop scenario northbound that could easily present flow issues and potentially worsen AQ however the proposal for continuous AQ monitoring would manage this risk;
- The southern crossing could also impinge flows around the Cricketers Way junction;
- Pedestrians could abuse the crossing regimes – look to cross direct over the Southbound carriageway or attempt to use the current arrangement 'down' the central reserve. Would require barriers and complete removal of existing route to deter use;
- Will introduce a pedestrian phase to the crossing (N/S) over Christopher Martin Rd;
- Traffic Signal phase will still remain for Northbound at Christopher Martin Rd;

- Similar emissions profile to Option 1 although would slightly improve air quality at receptors on the SB East Mayne link; and
- Creates a significant number of extra crossing points for cyclists travelling N/S.

Engineering Option 3b is designed with active air quality sensors. Figure 3-6 shows where the monitoring equipment will be located to carefully assess emissions and enable the signal timings to be optimised to support the delivery of the air quality objective.

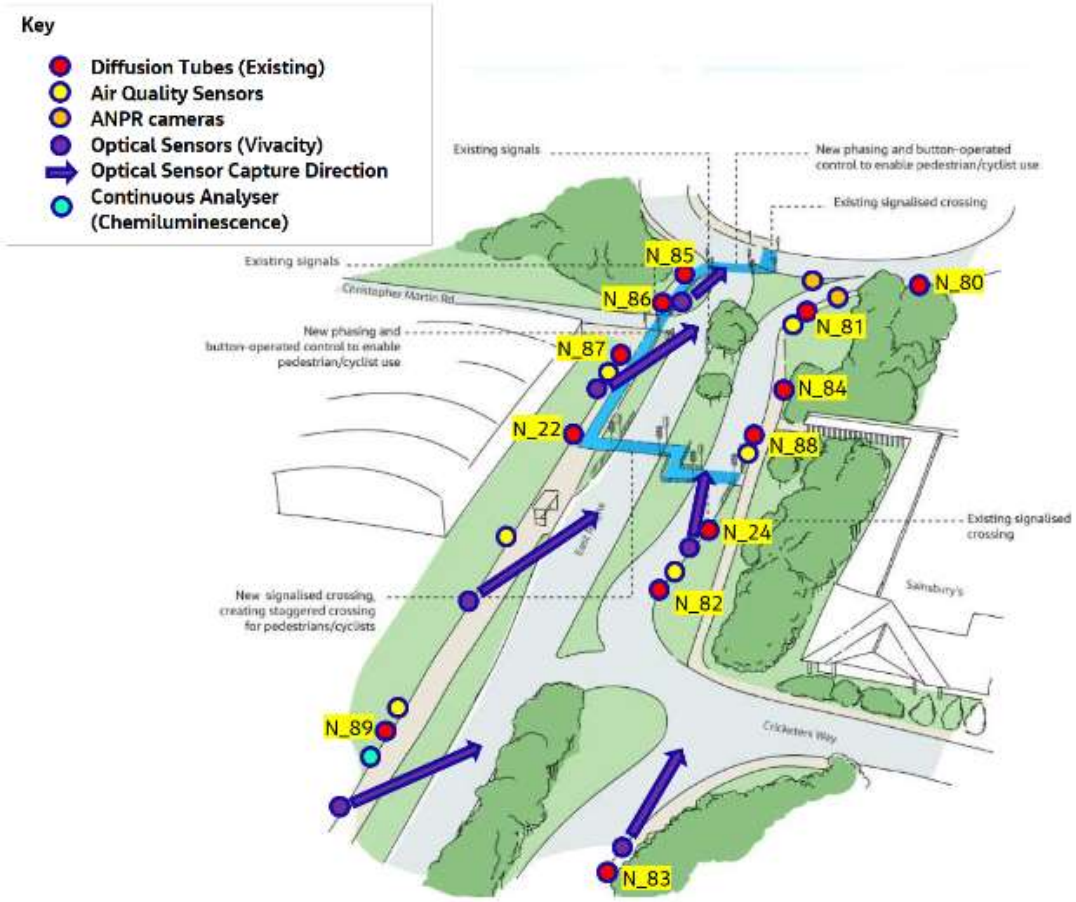


Figure 3-6: Plan of sensor locations along East Mayne

3.6 Performance of preferred option for air quality compliance

As outlined in Section 3.4, the options appraisal process resulted in the proposal to take forward Engineering Option 3b with active air quality sensors and compare this against a benchmark CAZ C. Both these options have been appraised as per JAQU guidance.

After extensive discussions with JAQU a process for modelling the local exceedances was agreed. This was submitted to T-IRP in August 2020 who confirmed their approval of the modelling methodology. Targeted transport modelling has then been undertaken at East Mayne.

3.6.1 Results – 2022 Preferred Option Scenarios

2022 Do-Minimum

The 2022 DM VISSIM results predict just one remaining non-compliance with the EU Limit Values, located on the central reservation on East Mayne. The modelled concentration using traffic data produced by VISSIM, was 40.9 µg/m^3. All other reportable receptors indicated compliance with EU limit values. The results for East Mayne are presented in Figure 3-7.

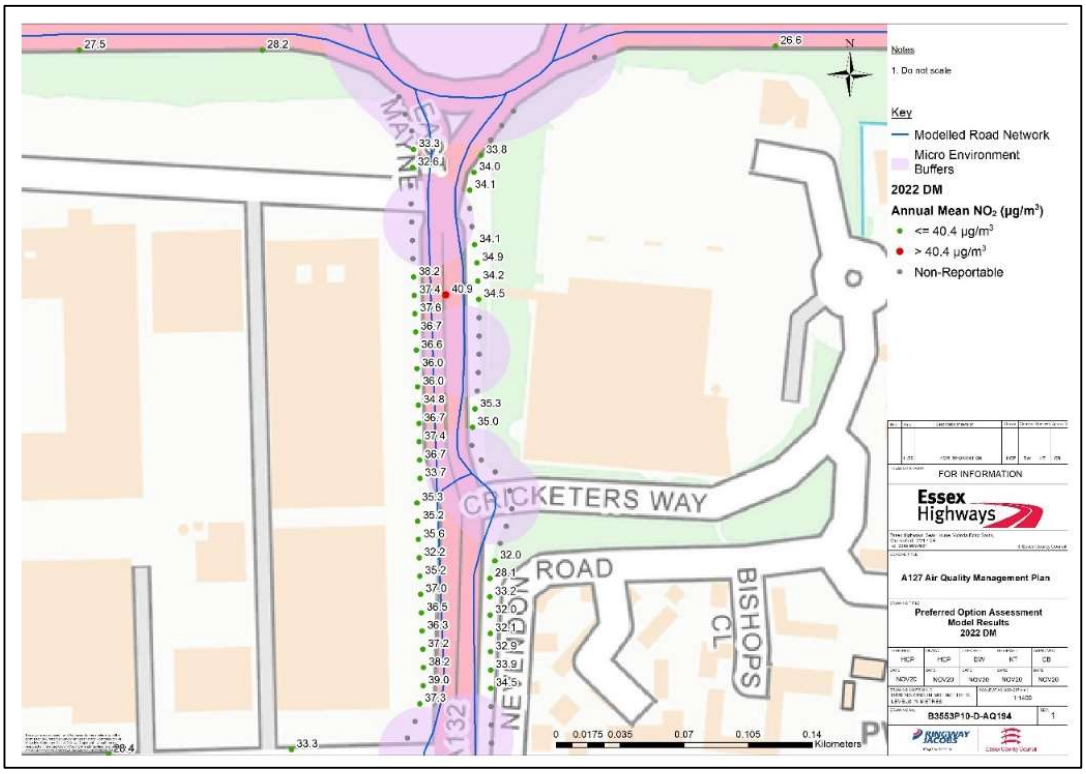


Figure 3-7: 2022 DM VISSIM Modelled Results – East Mayne

2022 Engineering Option (Preferred Option)

The preferred option scenario used the 2022 DM traffic conditions as its reference case but includes the impact of changing the locations of crossings and associated traffic signals and timings. The preferred option completely removes the path down the central reservation, making the central reservation receptor (ID P9849) non-reportable. It also moves the north bound crossing to the same location as the south bound crossing near Cricketers Way, making a further five receptors (ID P5369 to P5373) non-reportable. The footpath then utilises existing signals across Christopher Martin Road and then across the north bound part of East Mayne near the A127 interchange back to the central reservation to join with the existing shared footway/cycleway north towards Wickford.

With the central reservation receptor now classed as non-reportable, there were no reportable exceedances modelled. The highest annual mean NO_2 concentration on East Mayne was 39.2 µg/m^3 at receptor P5352, located adjacent to the north bound carriageway just north of the Paycocke Road. This is an increase of 0.2 µg/m^3 when compared to the 2022 DM result without the preferred option.

The largest modelled increase is 1.0 µg/m^3, at receptor P5367, located on the path adjacent the north bound link, near Cricketers Way. The concentration here increased from 34.8 to 35.8 µg/m^3. Receptors P5374 (adjacent to the now non-reportable central reservation receptor) and P5381 (on the NB carriageway of East Mayne near the A127 junction) modelled the largest decrease of 0.5 µg/m3. Modelled concentrations here reduced from 38.2 to 37.7 µg/m^3 and from 33.3 to 32.8 µg/m^3, respectively.

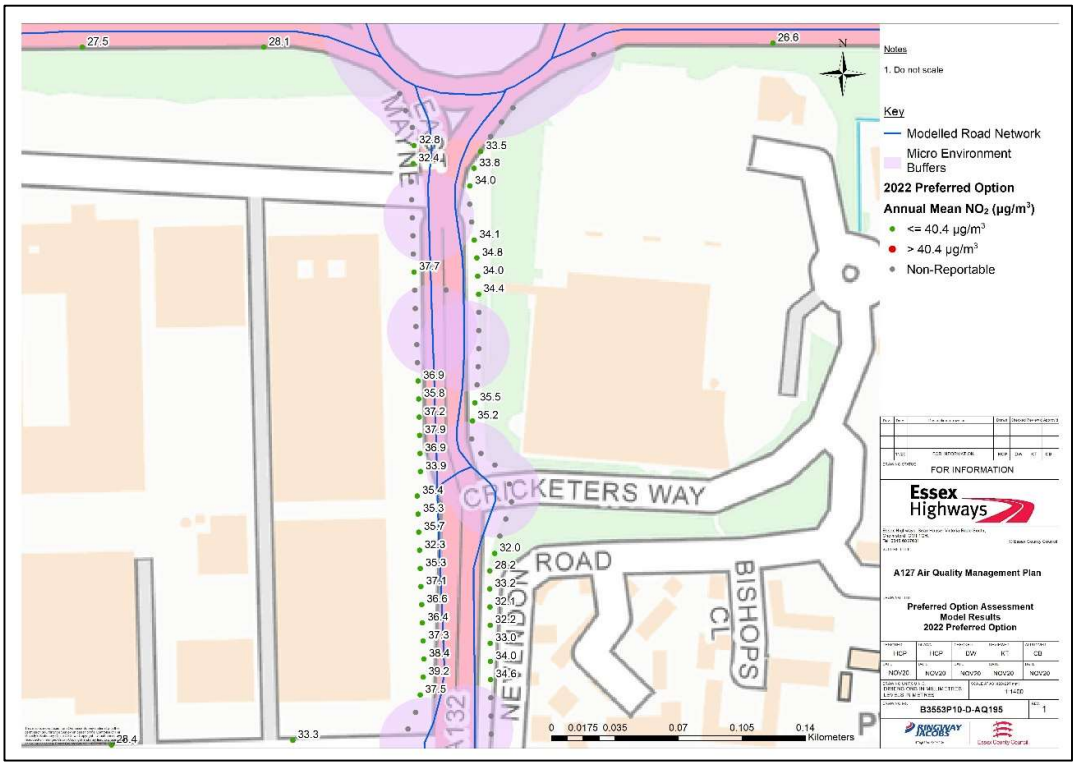


Figure 3-8: 2022 Preferred option modelled results – East Mayne

3.7 Logic Map

Figure 3-9 shows the overarching vision of change for achieving compliance with EU limit values for NO_2 in the shortest possible time. The logic map presents the 'theory of change' underpinning a programme and policy.

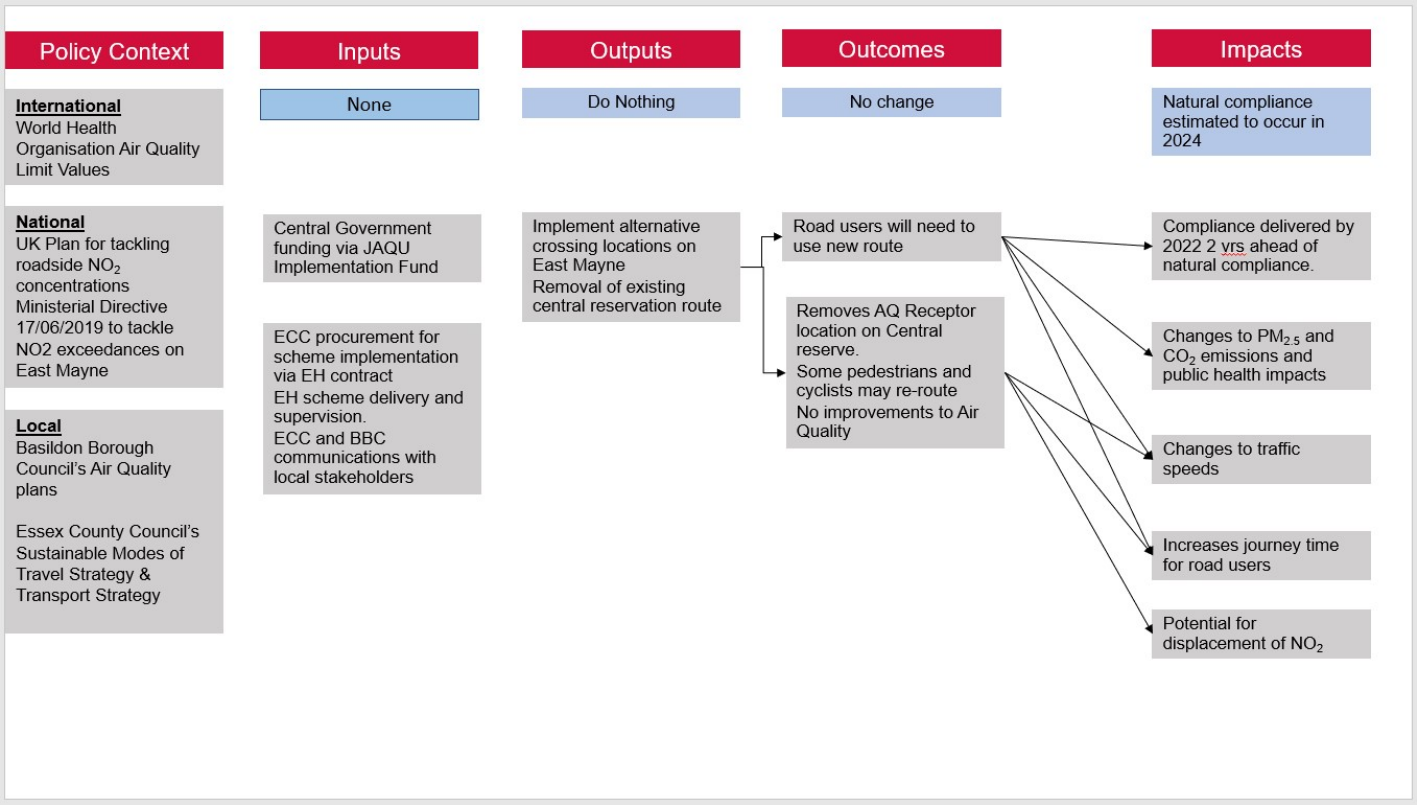


Figure 3-9: Logic Map

3.8 Communication Stakeholder Engagement

To support further development of our proposals for East Mayne, we shared our preferred option with the public and invited them to have their say as part of a public engagement exercise in November/December 2020. Responses were analysed and considered, as detailed in the Public Engagement Report (FBC Appendix H) and summarised in the Management Case.

A public notice, advising of the proposed changes to the Highway, was also published in April/May 2021. Three objections to the scheme were received and will be presented to Essex County Council's Cabinet Member for consideration and decision.

Further communications and engagement activity is planned to coincide with the approval of the scheme, implementation of the new crossings and the scheme going live, as well as during the subsequent monitoring period. This will include an online survey in 2022 and 2025 to measure people's views on air quality, review the wider impacts of the schemes and help evaluate the effectiveness of the communications.

The latest communications and engagement strategy can be seen in FBC Appendix D.

3.9 Benefit Management, Risks, Constraints and Dependencies

3.9.1 Benefits Management

A Benefits Realisation Plan is included in Section 7.6 of the Management Case.

3.9.2 Risk and Risk Management

A detailed risk register is included as part of the Management Case. Key risks for the Engineering Option 3b are highlighted here with their main mitigations.

- The scheme could reduce safety for cyclists – The scheme is designed with the most up to date design standards and the cycling community is an engaged stakeholder.
- The scheme does not improve air quality as receptors are only moved – The scheme may not improve overall air quality, but it moves people further away, and to an acceptable distance, reducing exposure to dangerous emissions.

3.9.3 Constraints and Dependencies

The implementation timescales for the preferred Engineering Option 3b are challenging and there are several governance and approval milestones to pass. Table 3-7 highlights the key milestones. The scheme implementation is not dependant on other infrastructure and there are not expected to be major unforeseen engineering challenges in delivery.

Table 3-7: Implementation timescales

Activity	Target Date
Award Contract	August 2021
FBC approval and confirmation of funding	August 2021
Build phase for new crossings and shared Cycle route	August 2021 to December 2021
Signals Certification	November/December 2021
Scheme Live	December 2021
Monitoring period to Year of Natural Compliance +1	January 2022 to December 2025

4 Economic Case

4.1 Introduction

This section of the business case sets out the economic case for the preferred Engineering Option against a Benchmark CAZ C scheme. The primary focus of this economic case is the assessment of the potential impacts of these schemes and a comparison between the two.

The preferred Engineering Option, also referred to as Engineering Option 3, was the third of four engineering options considered. Details of the options appraisal that was carried out to identify Engineering Option 3b as the preferred option are presented in the Options Appraisal Report (Appendix S).

It was determined that a Charging CAZ could not be delivered in the shortest possible time when measured against a scheme that removed public access to the location of exceedance. The Benchmark CAZ modelling was undertaken as a light touch exercise to provide the comparison required under JAQU Guidance but as this option was not being considered for implementation full modelling was not undertaken. This means that the economic details for the Benchmark CAZ are not to the same level of detail as for the preferred option. Further details on the Benchmark CAZ Opening Year Assumptions are provided in Section 1.5 of Appendix P (E1 Economic Methodology Report) and further details of the rationale for a CAZ C scheme are in Appendix E (Charging CAZ Benchmark).

The Do Minimum (DM) used for comparison recognises changes in exogenous factors, such as fleet composition and development at locations in the study area and assumes no new local or national policies are implemented targeting air quality. A cost-benefit analysis has been undertaken based on five assessments:

- Costs to Central Government, Essex County Council (ECC) and Basildon Borough Council (BBC) – costs associated with setting up and operating the two options;
- Costs to transport users associated with each option;
- Health and environmental impacts – from the reduction in NO_2, PM and CO_2 emissions generated for each option;
- Safety improvement benefits through accident reductions; and
- Noise impacts as a result from the impact on transport users.

A distributional impact assessment (DIA) has also been undertaken and the results of the assessment are contained in Appendix R (E3 Distributional Impacts Report). This considers both the Engineering Option and the Benchmark CAZ.

The economic assessment in this economic case has been conducted in line with JAQU guidance. The Economic Methodology Report (Appendix P) provides a detailed explanation of the methodology and this Economic Case focusses primarily on results.

4.2 Summary of Findings

The economic appraisal has been carried out for a ten-year period from 2022 to 2031 (inclusive). The results for the FBC are presented in 2020 prices to remain consistent with the OBC and have been discounted (in line with Green Book discount rates) to present a 2020 net present value (NPV).

The NPV for the engineering option is -£7.00m, which is primarily attributable to disbenefits arising from longer journey times. The benchmark CAZ C is estimated to have an NPV of -£11.63m. The largest disbenefits arising from welfare impacts of cancelling trips and worsening of CO_2 emissions.

Neither scheme is estimated to have a positive NPV but that is expected given their nature. In relative terms, the engineering option performs better than the benchmark CAZ C both in terms of environmental impacts and costs of implementation. However, in terms of accidents impacts, the opposite is true with the engineering option estimated to have increased risk of accidents due to the new crossings.

Traffic and air quality modelling indicate that air quality compliance is achieved on East Mayne in 2022 with the Engineering Option but not with the Benchmark CAZ C. Table 4-1 summarises the economic impacts of both options the 10-year appraisal period, the full breakdown is shown in *Table 4-15*.

The Benchmark CAZ C does not achieve compliance in 2022 modelling output. Should the behavioural assumptions be altered or the design of the CAZ scheme adapted then compliance in NO_2 concentration may be achieved. However, for the purpose of a benchmark comparison with the preferred Engineering Option, it was considered appropriate to use the Benchmark CAZ C scheme.

Table 4-1: Net Present Value (NPV) of implementing engineering option and benchmark CAZ C (£m 2020 discounted prices)

Monetised costs and benefits; £million (2020 PV & prices)	Engineering Option	Benchmark CAZ C
Total Net Benefits	(5.04)	(25.18)
Total Net Costs	(1.95)	13.55
Net Present Value (NPV)	**(7.00)**	**(11.63)**

4.3 Option Appraisal

The appraisal in this economic case assesses the potential impacts of Engineering Option 3b and the Benchmark CAZ C scheme, including monitoring and evaluation measures. Alternative Engineering Options were considered in earlier analysis and this is reported in the Options Appraisal Report (Appendix S).

The cost-benefit analysis is based on four distinct assessments:

1) Costs to ECC & BBC (government costs);
2) Costs / impacts to transport users;
3) Health and environmental impacts; and
4) Accident reduction benefits.

The Economic Case combines the results of the four assessment areas to derive the Net Present Value (NPV) of both options. The distributional impact assessment considers the impact on key groups to determine whether there is likely to be a disproportionate impact on one, or a number of, particular groups. This is reported in Appendix R (E3 Distributional Impacts Report).

The approach to assessing the economic impacts identified above was developed to be in line with guidance from JAQU and TAG Unit A1.1. Impacts identified were quantified through three main analytical approaches:

- A TUBA based assessment of user impacts (primarily journey time impacts);
- A spreadsheet-based assessment of air quality and greenhouse gases emissions; and
- COBA-LT based assessment of accident impacts

Costs have also been estimated separately (and detailed in the Financial Case) and have been converted to 2020 Net Present Values (NPV) using the same discounting and pricing assumptions as used in the economic appraisal.

4.3.1 Assumptions

The opening year for both options is 2022 and is the year modelled in the traffic model. It should be noted that the final forecast year modelled in the traffic model is 2032. However as per JAQU guidance, the economic impacts are assessed over a 10-year period, therefore between 2022 and 2031 inclusive. All figures presented are in 2020 prices and have been discounted to a 2020 present value as per Green Book discount rates. Additional assumptions underpinning the traffic model forecasts, demand assumptions and model parameters are contained in the traffic modelling reports.

4.3.2 Optimism Bias

In line with best practice guidance, we have applied the central optimism bias rate on all cost estimates, as per guidance from TAG and Her Majesty's Treasury Green Book. This has been applied to the costs used the Economic Case only, and consistent with an instruction from JAQU.

For the purpose of this FBC, we have used TAG's values for standard road schemes, and we have adopted the recommendation that the Stage 3 optimism bias (3% for CAPEX and 1% for OPEX)[13] should generally be used at FBC stage. We have not updated the Optimism Bias levels for the CAZ Benchmark as cost estimates have not been updated from the OBC.

4.4 Government costs

Capital expenditure (CAPEX) required to implement the Engineering Option 3b has been updated since the OBC and estimates are now provided for the FBC as tender prices from the appointed contractor Henderson & Taylor. For the CAZ Benchmark costs have not been updated from the OBC and have been estimated using professional judgement and experience on similar schemes by Essex Highways.

As per the project plans, CAPEX costs are forecast to be incurred from 2021 to 2025 for both options. Operating costs (OPEX) are expected to occur from the initial operational year, 2021 to 2031. Operational costs were based on engineering design input and anticipated monitoring and evaluation activities.

The Engineering Option is estimated to cost £1.89m (PV; 2020 prices) in total, of which £0.96m is CAPEX and £0.93m is OPEX. This includes design and construction fees,

[13] TAG Unit A1.2 (Scheme Costs)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940964/tag-a1-2-cost-estimation.pdf

resource costs, staffing costs, maintenance and optimism bias. It should be noted these figures differ from cost estimates in the Financial Case because they are discounted to provide a Present Value (PV) for economic appraisal purposes. For this reason, they are also not the same as the funding requests made to JAQU.

The Benchmark CAZ C is estimated to cost more at £5.03m (PV; 2020 prices). £4.62m is estimated to be CAPEX and the remaining £0.41m OPEX costs. Detailed breakdown of these costs, phasing and optimism bias for both options are discussed in the financial case. Table 4-2 shows a summary of the discounted scheme costs.

Table 4-2: Costs summary (from Financial Model), £s, 2020 discounted prices

Cost element	Benchmark CAZ C	Engineering Option
Capital Expenditure	4,018,173	930,549
Optimism bias	602,726	27,916
Total Capital Expenditure (including risk) + Optimism Bias	4,620,899	958,466
Operational Expenditure	355,304	920,609
Optimism bias	53,296	9,160
Total Operational Expenditure + Optimum Bias	408,600	929,769
Total Present Value of Costs	**5,029,499**	**1,888,234**

4.5 Costs to Transport users

4.5.1 Changes in journey times and vehicle operating costs

An appraisal of travel time and vehicle operating cost impacts was carried out using DfT's TUBA[14] software comparing the Do Something scenarios (Engineering option and benchmark CAZ C) with the Do Minimum case. This was based on outputs from the forecast traffic models for 2022 and 2032. The resulting transport user impacts were disaggregated by journey purpose[15] are set out below.

[14] TUBA (Transport Users Benefit Appraisal)
[15] Journey purpose splits are based on standard economic parameters in TUBA.

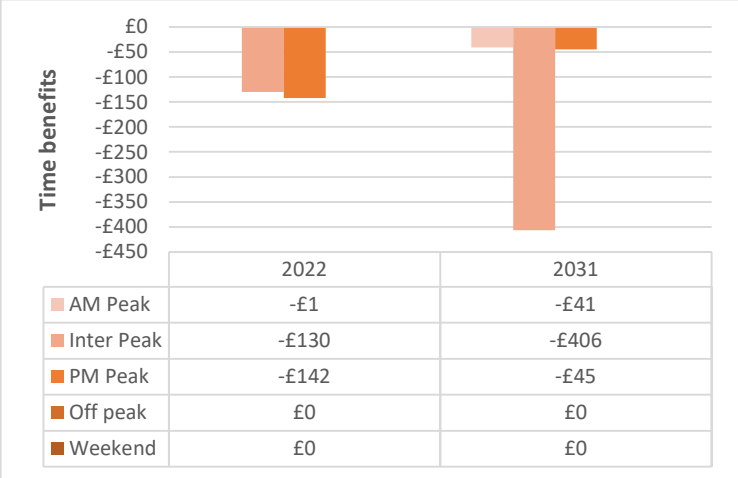
Table 4-3: User benefits (Time + VOC) by purpose £000's, 2020 discounted prices

Purpose	Engineering Option		Benchmark CAZ C	
	(£000's)	%	(£000's)	%
Business	(403)	10%	(33)	25%
Commuting	(3,812)	90%	(81)	62%
Other	0	0%	(17)	13%
Total	(4,215)	100%	(130)	100%

Engineering Option: Only business and commuting transport user trips are expected to see disbenefits as there is a risk that the engineering option will lead to additional queuing along East Mayne, resulting in longer journey times, which in turn lead to higher vehicle operating costs. This is expected given the high volumes of traffic flows that already exist and are forecast to increase during peak hours. The engineering option will increase the existing queuing currently occurring on East Mayne to an extent.

Figure 4-1 disaggregates time disbenefits by time periods, illustrating journeys made in the Inter-Peak and PM peak period experience the largest disbenefit in 2022 and 2031.

Figure 4-1: Engineering Option - User Time Disbenefits by Time Period, £000', 2020 discounted prices



	2022	2031
AM Peak	-£1	-£41
Inter Peak	-£130	-£406
PM Peak	-£142	-£45
Off peak	£0	£0
Weekend	£0	£0

Benchmark CAZ C: The assessed negative transport user impacts are expected across all journey purposes as the CAZ C will lead to rerouting LGVs and HGVs, thereby resulting in longer journey times not only for vehicles rerouting to avoid the CAZ but also the existing vehicles on other parts of the network. This leads to higher vehicle operating costs. The majority of the disbenefits are for 'Commuting' trips (62%) which primarily occur in the peak periods in wider transport network not just those within the CAZ boundary.

Figure 3-2 disaggregates time disbenefits by time periods, illustrating journeys made in the AM peak period experience the largest disbenefit in 2022 and 2024 (final year the CAZ C is operational).

	2022	2024
AM Peak	-£55	-£18
Inter Peak	-£8	-£2
PM Peak	-£1	£0
Off peak	£0	£0
Weekend	£0	£0

Figure 4-2: Benchmark CAZ C - User Time Disbenefits by Time Period, £000', 2020 discounted prices

Relative to the Benchmark CAZ C, TUBA estimates the Engineering Option to have higher levels of transport user disbenefits. However, this should be viewed knowing the following:

- Operational period: The Engineering option is assumed to be in place for the entirety of the appraisal period (2022 to 2031), whereas the CAZ C is assumed to be only operational for 3 years (2022 to 2025).
- User charges: The CAZ C charges have not been estimated using TUBA, instead they have been calculated in economic appraisal model (E2). The reason for this is the charges paid by non-compliant HGVs and LGVs are transfer funds as illustrated in (Table 4-15 below). The user charges are estimated to amount to £18.75m which are a disbenefit to transport users but a revenue income for local government.

4.6 Health and Environmental Impacts

Air pollution, particularly NO_2, $PM_{2.5}$ and CO_2, is known to have damaging impacts on human health, productivity, amenity and the health of the environment. Traffic and air quality modelling identified exceedances of NO_2 concentration levels on East Mayne. The Engineering Option was developed specifically to address exceedances on East Mayne.

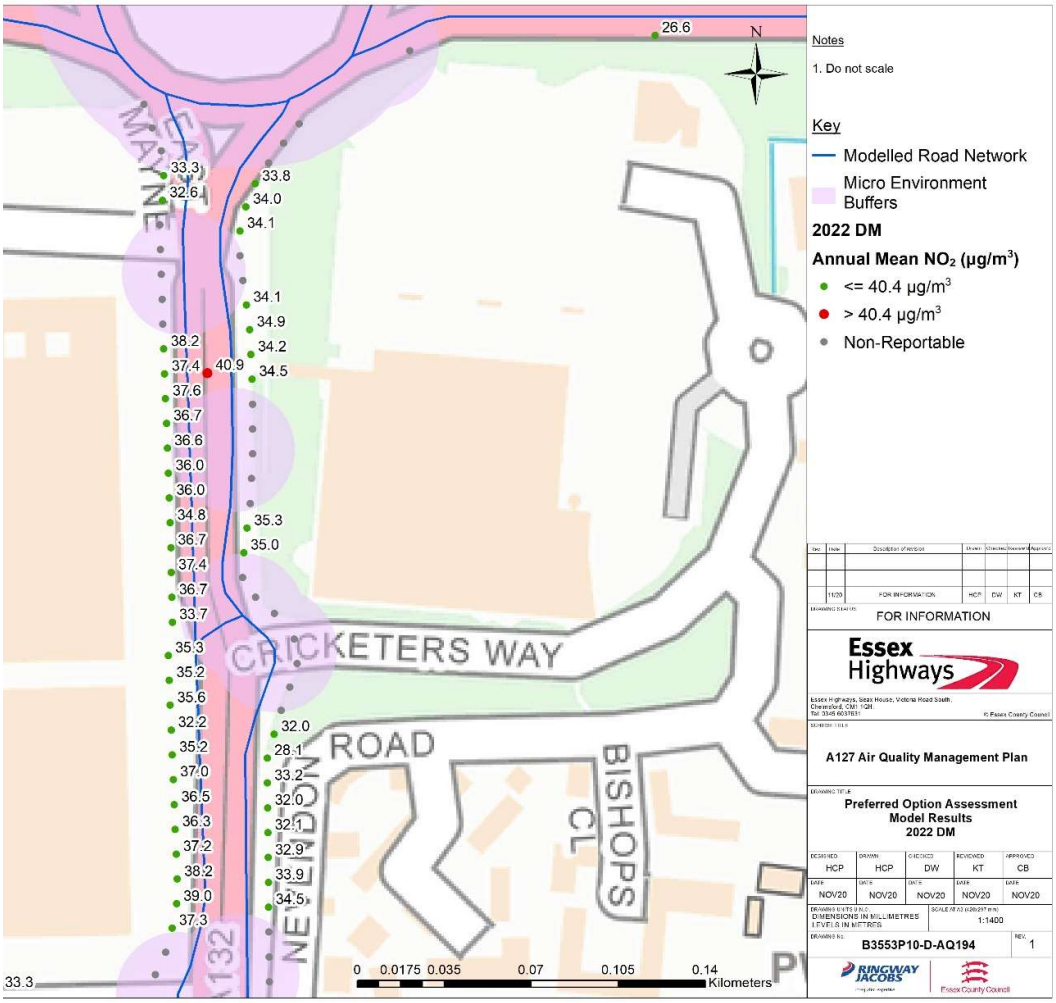


Figure 4-3: NO_2 exceedances within the study area (East Mayne) in 2022 Do Minimum

Modelling shows that the Engineering Option would result in compliance of NO_2 at all reportable receptors on East Mayne. Furthermore, the modelling also revealed that implementing the Engineering Option would not cause any new exceedances elsewhere on East Mayne (see Figure 4-4).

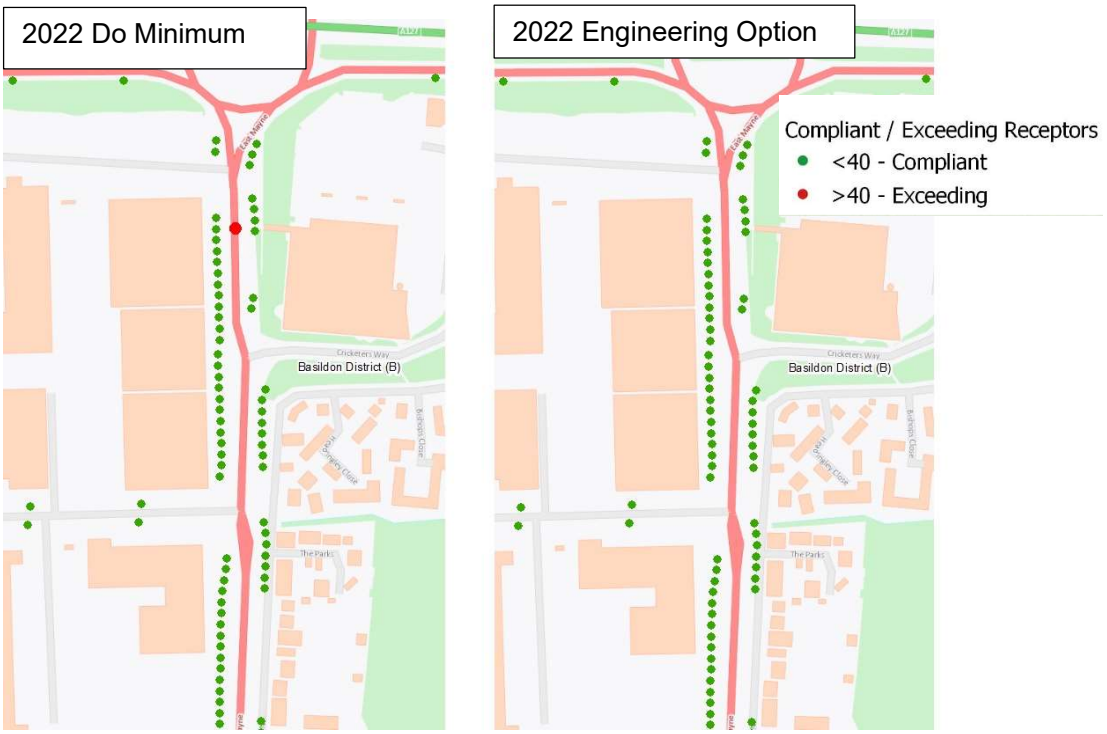


Figure 4-4: Do Minimum vs. Engineering Option Receptor Exceedances in 2022 on East Mayne

To calculate the health and environmental impacts of improvements in air quality as a result of the implementing this measure, Defra's damage cost approach has been used, based on the latest January 2019 guidance[16].

Damage costs are a set of impact values used to estimate the societal costs associated with a marginal change in pollutant emissions. For this study, damage costs are applied to estimated emissions of Nitrous Oxides (NOx) and Particulate Matter ($PM_{2.5}$). The damage cost values can be combined with forecasts of emission changes over time to provide an approximate valuation for the total health and environmental impacts of a policy. Damage costs values are used to calculate the effects of long-term exposure to air pollution on mortality rates, hospital admissions (associated with acute exposure), chronic heart disease, stroke, lung cancer, asthma in children, productivity (work days lost), ecosystems, material damage and building soiling.

As per TAG Unit A5.4, Basildon is identified as a large urban area using the FORGE classification and therefore the damage cost values (Table 4-4) corresponding to this definition have been applied in estimating the NO_x and $PM_{2.5}$ impacts.

[16] Defra, *'Air quality damage cost guidance' (January 2019), op cit.*

Table 4-4: Damage cost values for large urban FORGE areas

Pollutant	Low	Central	High
	Damage costs (£/tonne, 2017 prices)		
NO_x	976	11,170	43,037
$PM_{2.5}$	17,712	82,253	254,531

Source: Defra, Air Quality damage cost update May 2020

Table 4-5 and Table 4-9 below set out the estimated annual change in emissions of NO_x and $PM_{2.5}$ as a result of the engineering option and benchmark CAZ C, respectively. Whilst Table 4-6 and Table 4-10 showcase the resulting monetised benefits using the central values. Sensitivity tests are also carried out on how the overall results are impacted by using the Low and High results in Table 4-4.

4.6.1 Greenhouse Gas Emissions (GHG)

Similar to the expected change in NOx and PM2.5, the change in the traffic network as a result of implementing either an engineering option or benchmark CAZ C has the potential to result in changes in GHG emissions in the study area, and this assessment has been undertaken to explore this further. The difference in the level of GHG emissions between the Do Minimum and both options were calculated based on total CO_2 emissions at a link level for the DM and DS scenarios in year 2022 and 2032 but only appraised from 2022 to 2031.

Tables on the following pages are presented here as a summary of results. A detailed explanation of the health and environmental impacts and the analytical methodology applied is in Section 4 of Appendix P (E1 Economic Methodology Report).

Table 4-7 and Table 4-11 below sets out the estimated annual change in emissions of CO_2 as a result of the engineering option and benchmark CAZ C, respectively. Whilst

Table 4-8 and

Table 4-12 showcase the resulting monetised benefits using the central values.

Table 4-5: Engineering Option - Temporal change in NO_x and $PM_{2.5}$ emissions (tonnes)

NO_x	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	552	493	438	388	343	302	267	236	210	210
Do Something	552	492	438	388	343	302	266	236	210	210
Difference (rounded)	0	0	0	0	0	0	0	0	0	0
PM2.5	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	29	27	26	25	25	24	24	24	24	24
Do Something	29	27	26	25	25	24	24	24	24	24
Difference	0	0	0	0	0	0	0	0	0	0

Table 4-6: Engineering Option - Monetised emission change impacts of NO_x and $PM_{2.5}$, £ thousands, 2020 discounted prices using central values

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
NOx	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	**6.1**
PM2.5	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	**2.3**
Total	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	**8.4**

Table 4-7: Engineering Option - Temporal change in CO_2 emissions (tonnes)

CO_2	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	258,052	252,492	247,050	241,238	235,108	228,716	222,332	215,879	209,081	209,081
Do Something	258,007	252,447	247,004	241,191	235,060	228,667	222,282	215,828	209,029	209,029
Difference	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(52)

Table 4-8: Engineering Option - Monetised CO_2 emission change impacts, £ thousands, 2020 discounted prices using central values

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
CO_2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.3	**31.06**

Table 4-9: Benchmark CAZ C - Temporal change in NO_x and $PM_{2.5}$ emissions (tonnes)

NOx	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	552	493	438	388	343	302	267	236	210	210
Do Something	560	499	443	392	346	305	268	237	210	210
Difference	8	7	5	4	3	2	1	1	0	0
PM2.5	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	29	27	26	25	25	24	24	24	24	24
Do Something	29	28	26	26	25	24	24	24	24	24
Difference	1	0	0	0	0	0	0	0	0	0

Table 4-10: Benchmark CAZ C - Monetised emission change impacts of NO_x and $PM_{2.5}$, £ thousands, 2020 discounted prices using central values

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
NOx	(89.4)	(72.8)	(57.9)	(44.5)	(32.9)	(22.4)	(13.5)	(6.1)	0.0	0.0	(339.6)
PM2.5	(54.5)	(38.9)	(27.2)	(18.6)	(12.4)	(7.9)	(4.7)	(2.2)	0.0	0.0	(166.4)
Total	(143.9)	(111.8)	(85.2)	(63.1)	(45.3)	(30.4)	(18.2)	(8.2)	0.0	0.0	(506.0)

Table 4-11: Benchmark CAZ C - Temporal change in CO_2 emissions (tonnes)

CO_2	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Do Minimum	258,052	252,492	247,050	241,238	235,108	228,716	222,332	215,879	209,081	209,081
Do Something	266,836	260,279	253,861	247,006	239,777	232,238	224,709	217,098	209,081	209,081
Difference	8,784	7,787	6,811	5,768	4,669	3,522	2,377	1,219	0	0

Table 4-12: Benchmark CAZ C - Monetised CO_2 emission change impacts, £ thousands, 2020 discounted prices using central values

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
CO2	(612.4)	(531.8)	(455.6)	(377.8)	(299.4)	(221.1)	(147.9)	(74.2)	0.0	0.0	(2,720.5)

4.7 Accidents and Safety

Introducing either an engineering option or a CAZ C could potentially have an impact on the likelihood of collisions. The change in accident rates will impact safety benefits such as cost savings to the NHS, avoiding loss of productivity, as well as human costs[17].

To assess the impact on road safety, DfT's software COBA-LT[18] has been used to model the change in collisions before and after the implementation of both engineering option and benchmark CAZ C. Table 4-13 sets out the estimated reduction in accidents over the 10-year appraisal period.

Table 4-13: Predicted Accident and Casualty Changes for both options

	Total Change	
	CAZ Option (over 3-Year operational period)	Engineering option (over 10-Year operational period)
Reduction in number of accidents	0.2	-10.3 (increase)
Reduction in number of casualties		
Fatal	0.0	0.0
Serious	0.0	-0.8
Slight	-0.2	-13.8

As presented in Table 4-14, the monetary value of the overall change in accidents and casualties would be a disbenefit of £2.8k (2020 prices, discounted to 2020 prices) for the CAZ option and £869.1k for the engineering option.

Table 4-14: Accident Benefits

Scenario	Total (2020 Prices, discounted to 2020)	
	CAZ Option (over 3-Year operational period)	Engineering Option (over 10-Year operational period)
Links (Separate and Combined)	£27,137	-£3,324
Junctions	-£29,951	-£865,788
Total	-£2,814	-£869,112

It is notable that the COBA-LT modelling shows the Engineering Option to have a greater negative impact on safety that the CAZ option. When modelling the Engineering Option in COBA-LT, default accident rates were used for the pedestrian signalised crossing on East Mayne and the junction at Christopher Martin Road in the 'with scheme' scenarios. The

[17]https://ec.europa.eu/transport/road_safety/specialist/knowledge/speed/speed_is_a_central_issue_in_road_safety/speed_and_accident_risk_en
[18] COBALT (Cost and Benefit to Accidents - Light Touch)

existing pedestrian/cycle route is being removed and this will alter the pedestrian and cycle movements. This is in line with guidance because the junction arrangements will change, therefore the accident rate may be different from the currently observed rate.

While the modeling shows safety to deteriorate it is based on generalised assumptions and it may be possible that site specific design can mitigate the issues. Road Safety Audits will ensure that all reasonable measures are taken to reduce the risks and address concerns raised in the modelling.

4.8 Distribution Assessment

The key findings of the distributional assessment are summarised as follows and set out in detail in the E3 Distributional Impacts Analysis report (Appendix R).

Engineering Option
Air Quality Implementing the Engineering Option achieves compliance across all reportable receptors and does not cause any new exceedances in 2022, thereby achieving the objective the option was indeed to deliver.

Accessibility Given the nature of the Engineering Option, there are minimal changes to traffic flows around East Mayne in 2022.

Affordability There is a beneficial impact to low-income households in the surrounding areas of East Mayne. Overall, when costs per household are broken down over the cost of a year, the average cost per household are relatively minor and unlikely to be significant across all types of households, including low-income households.

Accidents Applying a conservative approach has illustrated that the Engineering Option is likely to have accident disbenefits. The disbenefit mainly arises at pedestrian crossing south of Christopher Martin Road, and could disbenefit those using the crossing, such as those accessing the pharmacy. The rest of the engineering option study area observes insignificant accident impacts.

Benchmark CAZ C Option
Air Quality The Benchmark CAZ C does not achieve compliance on the exceedances on East Mayne by 2022. It also is expected to increase NO_2 on other parts of the network due to traffic rerouting to other areas of Basildon. For further details of potential exceedances, please refer to the Assessment of exceedances paper.

Accessibility Implementing a CAZ C is expected to marginally increase traffic flows in other areas of Basildon but is expected to have a slight reduction on A127 and East Mayne due to rerouting to avoid the CAZ C zone.

Affordability The Benchmark CAZ C is estimated to have minimal impact across the network given that the scheme is only modelled to be operational for 3 years and mainly impacts LGVs and HGVs travelling in the area.

Accidents The majority of benefits occur on the A127 mainline, where the CAZ C Scheme will be implemented, due to reduction of traffic on this section. There will be accident disbenefits in other part of the network such as the A1235 (parallel to the A127) since traffic would shift away from the A127 to other alternative routes, resulting in higher flows on these roads. Overall, the total magnitude of these disbenefits is minimal.

4.9 Cost Benefit Analysis

4.9.1 Net Present Value

Table 4-15 summarises the economic impacts of both the Engineering Option and Benchmark CAZ C over the 10-year appraisal period. The table shows that the Benchmark CAZ C has a more negative Net Present Value (NPV) than the Engineering Option.

Table 4-15: Cost-benefit analysis £ millions, 2020 discounted prices

Monetised costs and benefits; £million (2020 PV & prices)	Engineering Option	Benchmark CAZ C
Benefits to transport users: Journey Time & Vehicle Operating Costs	(4.22)	(0.13)
Health Impact: NOX Emissions	0.01	(0.34)
Health Impact: PM2.5	0.00	(0.17)
Environmental Impact: CO2	0.03	(2.72)
Accident Reduction Benefits	(0.87)	(0.00)
Welfare loss from vehicle upgrading to transport users	N/A	(0.17)
Transaction costs of upgrading to transport users	N/A	(0.00)
CAZ Charge paid	N/A	(18.75)
Transaction costs of paying the CAZ charge	N/A	(1.33)
Welfare Impacts of cancelled trips	N/A	(1.57)
Welfare impacts of mode switch	N/A	0.00
Costs to councils of CAPEX	(0.99)	(4.78)
Costs to councils of OPEX	(0.96)	(0.42)
Revenues from CAZ Charges	N/A	18.75
Total Net Benefits	(5.04)	(25.18)
Total Net Costs	(1.95)	13.55
Net Present Value (NPV)	**(7.00)**	**(11.63)**

The NPV for the engineering option is -£7.00m, which is primarily attributable to disbenefits arising from longer journey times. The benchmark CAZ C is estimated to have an NPV of -£11.63m. The largest disbenefits arising from welfare impacts of cancelling trips and worsening of CO_2 emissions.

Neither scheme is estimated to have a positive NPV but that is expected given the nature of the schemes. In relative terms, the engineering performs better than the benchmark CAZ C.

4.10 Sensitivity Tests

To consider the sensitivity of the analysis to changes in key assumption two sensitivity tests have been undertaken. These tests have only been undertaken on the Engineering Option as part of the FBC analysis.

The value of time impact has been varied plus and minus 20% in the appraisal to consider how this affects results. This test provides an indication of how sensitive the analysis is to changes in the value of time. Table 4-16 shows that even with this significant change to the value of time impact the NPV remains between -£6m and -£8m. this indicates that changes to the value of time are highly unlikely to change the conclusions from drawn from the results and are also unlikely to affect the decisions to proceed with the Engineering Option over the Benchmark CAZ.

Damage Costs The damage cost sensitivity test applies the 'Low' and 'High' damage costs presented in Table 4-4 to the economic appraisal. As shown in Table 4-15 damage costs are a small positive impact on the NPV for the Engineering Option. This means that a lower impact from emissions has a negative impact on the NPV and a higher impact has a positive impact. Table 4-16 shows the impact on the NPV of using the low and high damage costs. The impact is small and does not affect the conclusions that can be drawn from the analysis.

Table 4-16: Sensitivity Test Results, £ millions, 2020 discounted prices

Monetised costs and benefits; £million (2020 PV & prices)	Engineering Option	VoT -20%	VOT +20%	Low Damage	High Damage
Total Net Benefits	(5.04)	(3.56)	(5.85)	(5.07)	(5.01)
Total Net Costs	(1.95)	(1.95)	(1.95)	(1.75)	(1.95)
Net Present Value (NPV)	**(7.00)**	**(6.37)**	**(7.80)**	**(7.02)**	**(6.96)**

These test show that relatively significant changes in the value of time and/or the damage costs do not significantly change the value for money of the scheme and should provide additional assurance of the robustness of the analysis.

5 Commercial Case

5.1 Introduction

The Commercial Case details the commercial viability and deliverability of measures to reduce public exposure to illegal levels of NO_2 that have been identified at exceedance locations on East Mayne in Basildon.

The Commercial Case outlines the required services and associated procurement strategies for this measure, including the mechanisms for management and payment of the procurement exercises used to engage the contractors and suppliers to deliver the scheme. Key milestones in the procurement timeline are highlighted here; detailed implementation timescales are presented in the project plan in the management case section.

5.2 Services to be procured

The measures identified require changes to the existing crossing layouts over East Mayne and changes to the shared cycle and pedestrian provision travelling south from the A127 Nevendon roundabout towards Cricketers Way as shown in Figure 5-1 below.

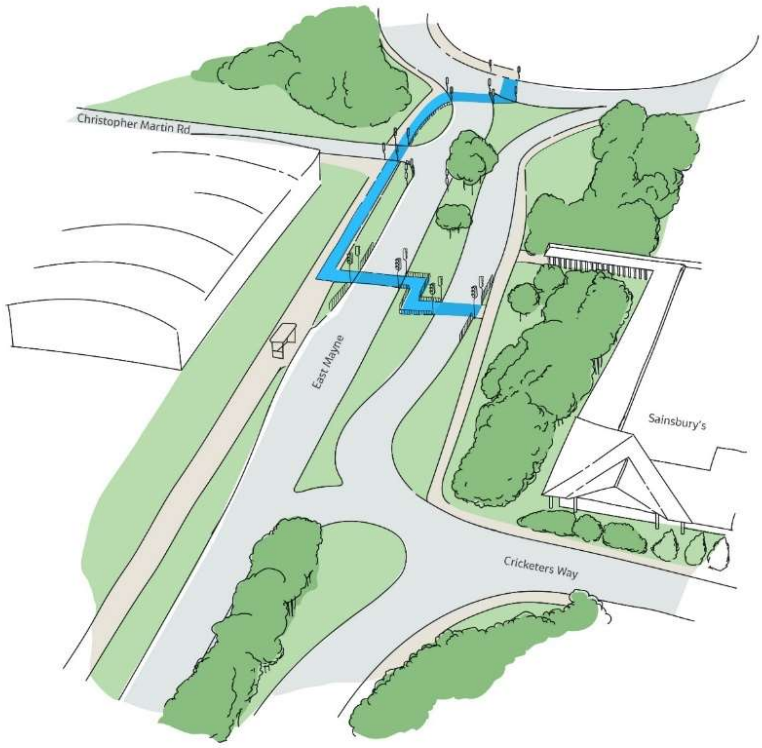


Figure 5-1- East Mayne Scheme

The tender pack was issued in March 2021 and returns analysed. The tender costs have been included in the scheme costs submitted with the FBC. The scope of work includes the following design stages from the Essex Highways Major Projects Design Manual.

OBC STAGE (Completed)

- Project Management

Due to the mix of design stages to deliver an accelerated programme, all project management tasks were undertaken as part of Stage 3C Detailed Design PM tasks.

- Preliminary Design

The Commission is of a smaller scale than that of the major projects that the contracts manual has been produced for. Tasks from Design Stages 1 and 2 along with a number of elements from Preliminary Design Stage 3A have been undertaken to develop the design sufficiently to achieve critical milestones of Road Safety Audit Stage 1 and a preliminary scheme cost estimate to inform the Defra / JAQU Client.

- Legal Orders

Requirements for legal advertising to enable provision of relocated controlled crossings and shared footway / cycletracks.

- Detailed Design

Development of design from Roads Safety Audit Stage 1. Elements of preliminary design tasks as according to Major Projects Design Contract Manual are assumed to be integrated with their detailed design counterparts in order to provide an accelerated design programme. Road Safety Audit Stage 2 is currently being undertaken.

FBC STAGE

- Tender Award
- Contract Administration
- Scheme implementation
- Project Completion and Close Out.

5.3 Procurement Strategy

The Procurement strategy has been followed as per Essex Highways' requirements.

The primary spending objective is to bring local NO_2 levels to within legal limits within the shortest possible time. The procurement route will therefore seek to utilise the most time efficient option available to bring forward likely legal compliance. Due to the time constraints imposed by the Directive issued to Essex County Council and Basildon Borough Council by Defra it may be necessary to undertake some procurement activities ahead of FBC formal approval.

The Directive required the scheme to be implemented in the shortest possible time. There are lead-in times for some elements of the procurement – in particular the traffic signals and the signage.

5.3.1 Procurement Routes

In 2012 Essex County Council (ECC) entered into a 10-year contract with Ringway Jacobs (RJ). ECC and RJ have agreed conditions under which this contract can now be extended for an additional 5 years, taking the end date to March 2027. Under this contract, Ringway Jacobs, operating as Essex Highways, is the approved supplier of highways maintenance and design, and all scheme implementation. Under the contract terms ECC will nominate Essex Highways to implement the scheme through a series of tendered contracts.

The existence of this framework contract means that ECC, which is the highways authority for Basildon, has a contractor in place for highways elements of this business case. This therefore makes the procurement strategy relatively simple in that Essex Highways has been identified as the implementation body and ECC will issue task orders instructing Essex Highways to proceed.

The Essex Highways contract has been fully OJEU tendered and is the contract under which any costs below £500,000 will be undertaken and with agreement any scheme elements up to a value of £2 million with Chief Officer Approval to confirm procurement process.

The Eastern Highways Alliance Framework 3 would be used for larger schemes. Multi-million-pound schemes can be tendered separately but for the proposed scheme going to open market would breach the timescales of implementing the measure in the shortest possible time. Therefore, Essex intends to use the Essex Highways Contract as the procurement route for the delivery of the project within the timescales required by the Directive.

For scheme elements between £500,000 and £2 million, ECC retains the right to go to market to ensure value for money. There is a framework contract in place, the Eastern Highways Alliance Framework 3, which is an alternative route for ECC to utilise at the implementation stage, as well as going to the open market. Due to the Ministerial Directive requiring the delivery in the shortest possible time ECC has approved the scheme to be delivered through the Essex Highways Framework.

Note that for all measures anticipated to be implemented through Essex Highways, cost estimates in the financial and economic cases are provided by Essex Highways. Each year ECC require a sample of works to be benchmarked by RJ. An annual report is provided to demonstrate the outcome and value for money achieved. RJ have received three quotes for these works, the costs will be at the best market value at the time of tendering. This is in line with how RJ would carry out ECC's programme of similar works which are delivered via RJ's local supply chain partners.

5.3.2 East Mayne Engineering Scheme Implementation

The Essex Highways contract sets out the procurement strategy on behalf of ECC. This strategy has been followed as per Essex Highways requirement.

The contract will be let under the NEC Option C – Target Price Contract. The Payment Mechanism will be in accordance with EH agreed Payment Mechanism within Frameworks agreement and in accordance with NEC Option C Target Cost Contract. A payment schedule will be included in the tender pack. Risk and Potential Change will be captured as per NEC Option C Contract (EWN Procedure) and dealt with in accordance with Clause 60.

The design, tender and implementation is delivered via Essex Highways and follows the procedure set out in the Essex Highways Contract Manual (Volume 1&2) in FBC Appendix U-1 & U-2.

Consistent with the framework agreement between Essex County Council and Ringway Jacobs the following tendered services would be used:

- Essex Highways would be the Principal Contractor and Principal Designer for the implementation.
- Essex Highways may subcontract elements of the civils implementation.
- Siemens is contracted by ECC as its ITS contractor.

All Supply Chain Partners are quality assessed through Tradex (RJ's approved supplier database) prior to them being awarded any works.

Works will be competitively tendered to a selection of Supply Chain Partners (typically a minimum of three) to obtain the best value for the scheme. The successful tenderer(s) will be expected to perform in accordance with Project requirements as outlined within the Work Information.

Essex Highways will identify and specify certain risks and tenderers will be requested, where possible, to include these within their price. Any unforeseeable risks shall be notified and administered / agreed via the Early Warning and Compensation Event process under the Subcontract. The contract terms to be used are NEC3 with Main Option C – Target Price Contract.

There remains a risk in relation to the exact location of underground utilities, but this is not feasible to price due to this unknown factor. Trial holes are being undertaken to reduce the risk of unforeseen utilities. However, the risk is still retained and will be dealt with on site if it may rise. No other risks have been identified in delivery of this element of the works. Considering reasonableness in pricing the works, we have clarified and made allowance for known risk. There are no allowances for any other unforeseen or unknown risk that we may come across on site.

5.4 Contractor Award

The invitation for tenders was sent on 05/03/21 with returns required by 06/04/21. Six subcontractors were initially invited to tender, three declined or did not respond and three bids were received from contractors for the works. A full commercial and operational review was undertaken to fully understand returns, spot checks on material quantities was completed, programmes and method/sequence of working were checked. This resulted in issues being identified with the two higher priced bids, one had not submitted pricing in the correct format and the other did not provide a programme for the works.

A Construction Cost proposal was completed using the pricing provided by Contractor 1 as they responded to the tender on time and provided all information to enable us to be comfortable with their submission, they were also the lowest price received.

A revised Tender pack was issued on the 23/04/21 for return on the 07/05/21. The revised design pack contained an increased scope of works of a similar nature to the initial design. It was agreed that due to time constraints the revised tender would only be sent to the contractor who was successful in round 1 of the tender, this was Henderson & Taylor. A full return was received on 12/05/21. This tender was then checked and programme/sequencing of works discussed. There were still queries regarding sequencing of work, so a meeting was arranged for the 13/05/21. The meeting highlighted a few works sequencing issues that were discusses and the contractor went away to check inclusions and amend as required. Final pricing was received on 13/05/21.

On the 17th May the construction and design teams met to discuss the construction cost proposal inclusions/exclusions and risk provisions, some amendments were requested to the

risk allowed, further discussions were also held on the 19/5/21. Contract award will not be made until instructed.

5.5 Communications programme

Communications activity would be undertaken by Essex Highways under its framework contract. Therefore, no procurement activity is envisaged.

There will be communication about the benefits of the crossing locations in delivering AQ benefits. Press releases, articles in resident newsletters and social media updates would provide information about the start date of the works and encouraging the use of the new cycle and pedestrian crossing facilities.

Communications will also be undertaken in the longer term to provide updates about the scheme, encourage participation in an online survey to assess people's views on air quality, and promote the delivery of the necessary NO_2 reduction.

5.6 Phasing of Implementation Works

The procurement timescale and key delivery milestones is included in the overall measure implementation programme provided Appendix W and summarised below in Table 5-1 below.

Table 5-1: Implementation timescales

Activity	Target Date
Traffic Orders and Noticing	March to May 2021
Award Contract	August 2021
FBC approval and confirmation of funding	August 2021
Build phase for new crossings and shared Cycle route	August 2021 to December 2021
Signals Certification	November to December 2021
Scheme Live	January 2022
Monitoring period to Year of Natural Compliance +1	January 2022 to December 2025

5.7 Risk Apportionment

The risk apportionment determines how risk would be apportioned between BBC, ECC and its suppliers and Defra. The project Risk Register is set out in FBC – Appendix T. Risks are allocated to the party best able to manage it, subject to relative cost. This is summarised for the three major cost elements in the risk allocation (Table 5-2 below).

Table 5-2 Risk allocation for East Mayne engineering measure

Risk	Risk Description	Risk Owner	Mitigation
Design Risk	As the East Mayne option cannot be designed to be fully in line with LTN 20/1 design standards then its delivery may be challenged	ECC	Added to Key Decision. DfT has provided advise on LTN 1/20 Compliance. Design option updated in 2021
Construction and development risk	If Utility infrastructure is discovered that impacts on the works then there could be delays in delivery and increases in cost	ECC / JAQU	C3 plans used during design process
Transition and Implementation Risk	If Utility infrastructure is discovered that impacts on the works then there could be delays in delivery and increases in cost	ECC	Information provided in tender pack
	If it is not possible to obtain road space then there may be difficulty in programming work to meet the timeline	ECC	Engage with roadspace booking team
	Elements of the OBC were not funded by JAQU. If further elements of the FBC are not funded there could be significant delay in commencing mitigation measures to manage the scheme (i.e. data collection / signal changes) and a delay in achieving compliance.	ECC	ECC provide alternative funding
Availability and Performance Risk	If monitoring shows that exceedances remain or increase along East Mayne then additional proposals may be required to deliver compliance There may be a risk that additional queuing may result in worsening NO_2	ECC / JAQU	Additional funding would be needed from JAQU to implement further proposals
Operating Risks	If cyclists choose not to use the western cycle route but cycle on the main carriageway then there could be an increase in cycle casualties	ECC	Explanation of risk set out in FBC Monitor annual casualty figures.
	If there is an increased number of crossings points then there may be a greater likelihood of collisions in the future	ECC	Explanation of risk set out in FBC Monitor annual casualty figures.

Risk	Risk Description	Risk Owner	Mitigation
Technology and Obsolescence Risk	If the active air quality sensors are not approved for inclusion in the scheme then there may be unintended consequences with increased NO2 levels in other receptor locations along East Mayne	ECC / JAQU	Explanation of risk set out in FBC Appendix F – Monitoring & Evaluation Report & Appendix T – Risk Register
Finance Risk	If the implementation grant is less than the funding applied for then the scheme cannot be delivered as ECC does not have additional funding to commit to the scheme	ECC / JAQU	Monitor. ECC and BBC S151 Officer signing KD on basis of funding for scheme from Defra
	If elements of the OBC proposals are not approved or funded then the delivery of the AQ requirements as set out in the Ministerial Directive may not be delivered	ECC / JAQU	Monitor. ECC and BBC S151 Officer signing Key Decision on basis of funding for scheme from Defra
	If the scheme cannot be implemented for the budget allocated due to significant unforeseen circumstances then the scheme may not be delivered (force majeure)	ECC / JAQU	Tender pack fully scoped on basis of existing information. Low risk
	If the scheme cannot be delivered for value of the scope of works tendered then additional funding will be required	ECC	Tender returns will be transferred into FBC. If the FBC tender costs are exceeded without justifiable reason then ECC would find the additional cost.
	If the contractor is required to undertake corrective measures then this will be at the contractors cost	Contractor	Tender pack fully scoped
Legislative Risk	If the East Mayne crossing relocation option is challenged as it only removes the receptor location and does not improve AQ then implementation may be delayed	JAQU	ECC to continue on programme. Would only pause work if SoS issue a directive to that effect
	If the AQ monitoring shows exceedances remaining or additional ones appearing then the scheme will not meet its objective of removing the exceedances and could result in legal challenges	JAQU / ECC / BBC	Low cost AQ sensors to be used to adapt the signal timings to minimise risk
	If there is a road death caused by cyclists choosing to not use the longer cycle route and additional crossings and this is investigated under the Road Death Investigation Manual then this could result in legal action against the council if it is shown the death occurred as a	JAQU / ECC	Scope prepared to ensure RSAs consider the change of route to less direct. RSA 2 to be undertaken on final design

Risk	Risk Description	Risk Owner	Mitigation
	result of the scheme not following the current standards and road safety audit recommendations.		RSA3 following scheme completion. Monitor casualties along route

The risk apportionment with the delivery contractor will be confirmed as part of the tender process from the Local Authority and would be part of the individual contract tender documents as and when they are prepared and have to be signed off by the Section 151 Officer for the authority letting the contract.

5.8 Payment Approach and Mechanisms

5.8.1 Ringway Jacobs (RJ) contract

The payment approach and mechanisms for the RJ contract are described in the Essex Highways Contract Summary Paper contained in FBC Appendix G with key information is presented below.

Key Performance Indicators are reported monthly and are included within the monthly Contract Review Meetings (CRM) agenda. The meetings cover areas such as day to day issues on each job, overall progress of work, contractor performance, finances, risk and audits. ECC's Information Officer receives and dissects the information presented from RJ and raises any concerns or challenges to the data produced. A team jointly appointed by RJ and ECC submit an annual performance report within two months of the end of each contract year.

The contract provides details of failure deductions and percentage increases for profit for exceptional performance.

RJ submit invoices to ECC on a monthly basis in respect of all non-completed task orders. RJ cannot invoice ECC for any charges with respect to Subcontractors unless they have already been paid or are entitled to be paid according to the contract.

The contract has a Risk Register and Contingency Plan associated with it. These are monitored by the ECC Commissioning Contract Manager (CCM) who primarily act as auditor to ensure that the listed risks are updated and appropriate action is undertaken.

5.8.2 Other contracts

The other relevant contracts include the Siemens Intelligent Traffic Systems (ITS).

5.9 Contractual Arrangements

Essex County Council has entered into an Integrated Services Contract with Ringway Jacobs to provide all aspects of Highway Services. This contract was tendered via the OJEU tender process and was awarded to Ringway Jacobs with a contract start date of 2012. The full contract extension to 2027 was approved by Cabinet Decision Feb 2020[i]

Full details of the Contract between ECC and RJ are detailed in FBC Appendix G – Essex Highways Contract Summary Paper.

5.9.1 Ringway Jacobs Framework

Essex County Council works in partnership with Ringway Jacobs to deliver the highways and road safety service in Essex.

ECC has entered into an Integrated Services Contract with Ringway Jacobs to provide all aspects of Highway Services. The contract includes a framework agreement with Ringway Jacobs to provide additional major projects design capacity and other specialist services to complement the Ringway Jacobs core services.

Ringway Jacobs provide the Essex County Council client with Highways and Transportation expertise across all aspects of the service including transport strategy and transport planning, design services scheme implementation and maintenance services. The contract provides a reach-back ability into the Parent Companies, Ringway (Eurovia) and Jacobs. The contract is managed via the Contract Board.

The management of the contract incorporates an annual review process including setting and monitoring key performance indicators to provide an ongoing appraisal of efficiency and Value for Money.

Collaboration is key to this contract and in April 2015, Essex Highways was one of the first Local Authority/ Service Provider partnerships to achieve BS11000 for its collaborative approach to business relationships. The Essex Highways contract was awarded the Transport Local Authority of the Year at the 2017 National Transport Awards. The Contract Manual Vol 1 sets out the contractual processes (FBC Appendix U-1).

The Air Quality project is jointly delivered by Basildon Borough Council as the Responsible Authority for Air Quality Management for the area and Essex County Council as the Highway Authority. Terms of Reference have been jointly adopted by the two authorities. Basildon Borough Council will provide the Chair for the joint Working Group. These are set out in FBC Appendix C.

5.10 Accountancy Treatment

All of the highway infrastructure asset from the project will remain in public sector ownership and will be maintained and subsequently decommissioned by the responsible Highway Authority. Essex County Council (ECC) has been identified as the lead authority and will be recipient of funding to design, implement and decommission where agreed and subject to approval. The Project Manager will oversee production of regular (Quarterly) budget reports, and these will identify any budgetary issues and appropriate mitigation will take place where necessary in consultation with JAQU.

5.11 Change Management

This is covered in section 3.2.7 of the Contract Manual Vol 1 which states that:

> *The PM will ensure that the Client is made aware of any changes to programme, cost, quality, scope or risk in a timely manner.*
>
> *Communications must be in accordance with the requirements of The Contract. Where appropriate the initial communication to the Client should be an Early Warning Notification, ensuring both the Client and Provider has an opportunity to mitigate any adverse impacts. Standard Forms are shown in Section 8 for Project change control and the latest versions are available for download from the RJ BMS Site.*
>
> *Where the PS has requested or agreed to a change of the approved scope of work or methodology, the programme and/or cost implications of such change will be calculated and reviewed by the PS through the Project change control process.*

5.12 Gateway review

Gateway Reviews are arranged and chaired by the ECC Project Sponsor and act as decision points where the ongoing viability of the Project is assessed. These are generally at the end of a design stage, or prior to a substantial expenditure an overview of the Gateway Review Process used by the EH contract is shown Figure 5-2.

Each Gateway Review requires the collation of summary information based on work undertaken leading up to the Gateway Review and which forms the basis of a decision on whether the Project should proceed. At each Gateway Review the submitted information is reviewed and is subject to approval in accordance with ECC standard governance procedures.

A number of consistent themes are to be considered at each Gateway and the amount of detail required shall be proportionate to the size of the Project and the degree of relevance.

The key themes will be based on the following considerations:

- Health & Safety
- Sustainability
- Design objectives and rationale
- Value for Money
- Risk Management
- Deliverability
- Modelling,
- Consultation.

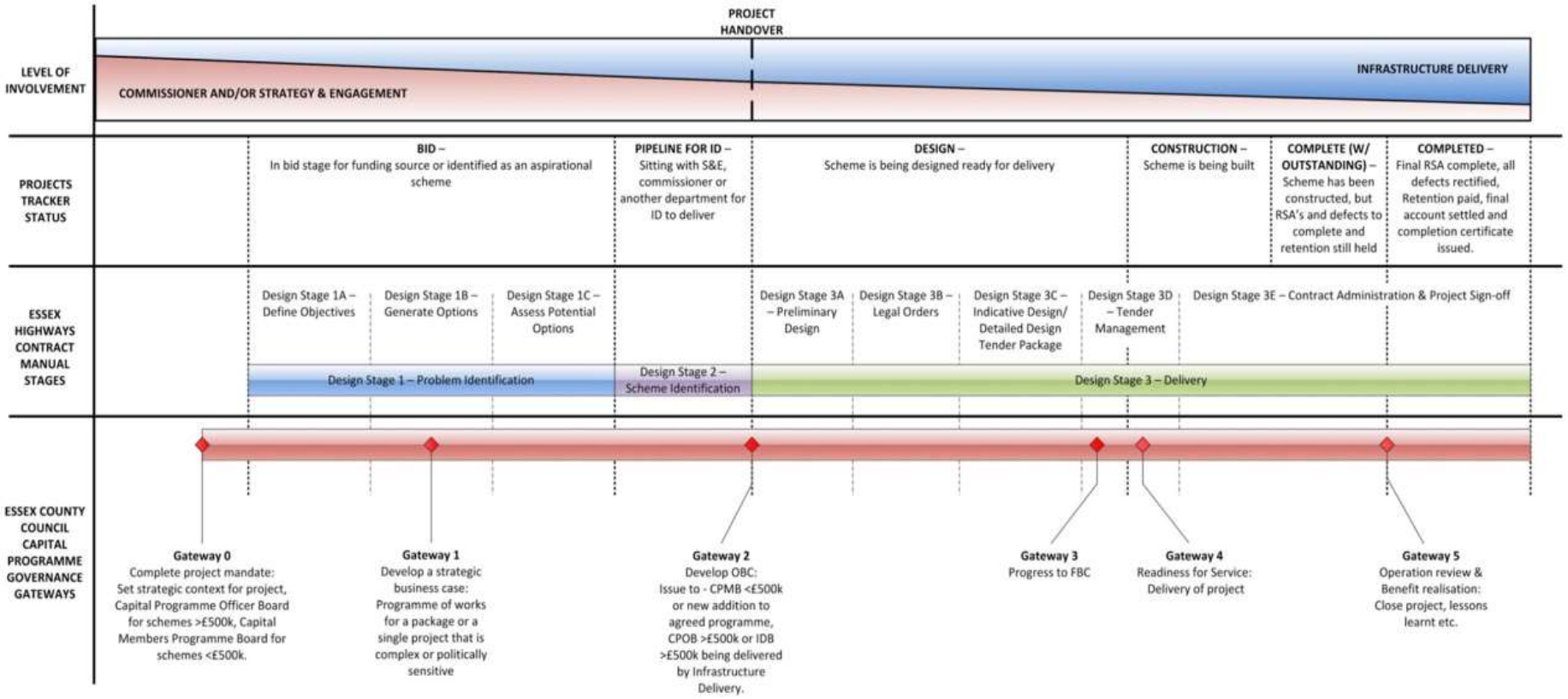


Figure 5-2: EH Gateway Review Process

5.13 Summary of Commercial Case

The commercial case sets out the procurement process for the development and delivery of the new signalised crossings and associated infrastructure. It includes the procurement of the Traffic Signals infrastructure and the electrical connections required to implement the scheme.

The proposed model uses the existing framework agreement with Ringway Jacobs, known as Essex Highways which is available to ECC. EH will use its established Supply Chain Partners in accordance with the ECC contract to deliver the works. This procurement route has been approved by the Director of Highways and Transportation for ECC in line with the contract requirements. This route enables a reduced procurement timescale to be realised and enable delivery within the shortest possible time as set out in the Directive issued to BBC and ECC.

The works will be procured via Essex Highways in accordance with the Essex Highways Contract Manual.

It is proposed to use the NEC Option C target cost contracting option for the civil works and an incentivised model to help drive cost and programme certainty through collaboration.

The risks associated with this project are set out in the Risk Register that can be found in FBC Appendix T.

6 Financial Case

6.1 Introduction

The purpose of this financial case is to support the application for grant funding from the Joint Air Quality Unit (JAQU). It provides evidence that the case is robust and sets out the financial assumptions and cost estimates behind the funding application. The indicative cost of implementing the speed reduction measure and the funding requirements are set out, as well as the on-going financial support required to maintain and operate the scheme.

The structure of the Financial Case is as follows:

- **Section 6.2** sets out the key financial findings and assumptions underpinning the financial modelling
- **Section 6.3** summarises the implementation, operating & maintenance and funding requirements of Engineering Option 3b and Benchmark CAZ C
- **Section 6.4** presents the breakdown of the implementation cost
- **Section 6.5** presents the breakdown of the operating & maintenance cost
- **Section 6.6** identifies the funding sources and subsequent funding allocation.

All values presented in the Financial Case are in nominal prices, unless stated otherwise. The costs presented in this section (rather than those in the economic case) should be used for funding totals.

6.2 Key Financial Assumptions

For the purpose of progressing the financial modelling and understanding the magnitude of the potential implementation and operating costs required for each option, several key assumptions were adopted, these are outlined below.

6.2.1 General Assumptions

Essex County Council (ECC) and Basildon Borough Council (BBC) assume Central Government will provide funding via both the JAQU Implementation and Monitoring and Evaluation funding sources.

JAQU funding horizon for operating and maintenance costs is to the year of natural compliance plus one year, therefore 2025. Any operating and maintenance costs past this period will require further funding that will be sought from JAQU.

The implementation fund will be the primary source of funding to cover the implementation and operating cost of the preferred option.

Engineering Option 3b is assumed to be constructed in 2021 and operational in 2022. Maintenance and operational expenditure is assumed to continue throughout the appraisal period (2022 to 2031).

Similarly, the Benchmark CAZ C is modelled on the assumption that it would be implemented in 2021 to be operational in 2022 for the purposes for the OBC appraisal and has not been updated for this FBC. This is because we have been requested not to undertake any further transport and air quality modelling for the CAZ. However, it should be noted that from a programme perspective we have estimated that a CAZ could not be implemented and operational until mid-to-late 2024 (please see Options Appraisal Report – Appendix S, for the potential timescale for implementing a CAZ). It should also be noted that our air quality modelling estimates the natural year of compliance to be 2024.

As result of the modelling restrictions, the CAZ is assumed to be operational for only 3 years (2022 to 2024 inclusive) and assumed to be decommissioned in 2025.

Construction and infrastructure costs are inflated using the BCIS General Civil Engineering cost index (Tender Price Inflation). Salary costs are inflated using TAG's Average Weekly Earnings forecast. All other costs are inflated with TAG's RPI forecast.

The financial model assumes all VAT associated with Benchmark CAZ C scheme is recoverable and the Central Government and ECC and BBC are under no obligation to pay VAT. All costs presented in this case exclude VAT.

6.2.2 Cost Assumptions

Cost estimates for the Engineering Option 3b have been provided by the appointed contractor Henderson & Taylor for the FBC. The costs for the CAZ benchmark are unchanged from the OBC. These were developed by Essex Highways from previous professional experience from similar schemes.

Total costs for each individual measure are shown in section 6.4 (capital / implementation costs) and section 6.5 (operating costs). A detailed breakdown of the cost estimate for each measure is shown in the Financial Model.

Note that the cost assumptions shown in the tables in this section include inflation but **exclude optimism (OB) bias.** However, optimism bias is applied in the Financial Model for the purposes of reporting in the economic case.

For the purposes of reference and labelling for the tables within the financial case, please see a brief description of the measures included in each option.

Engineering Option 3b labels include:

- "Engineering Option" refers specifically to the construction costs and any maintenance of the infrastructure built. It also includes the communication and engagement costs e.g. press releases, social media, surveys etc. This also includes the cost for QA analysis and reporting.
- "A127 Monitoring and Evaluation (M&E)" refers to capital and operating costs related to monitoring and evaluation of A127 speed limit reduction scheme.
- "East Mayne M&E" refers to costs related to monitoring and evaluation of East Mayne, therefore the area in which the Engineering Option 3b will be constructed.
- "Full Study Area AQ Monitoring" costs refers to the air quality monitoring of the full study area.

Benchmark CAZ C labels include:

- "Benchmark CAZ C" refers specifically to the construction costs and any maintenance of the infrastructure required i.e. cameras and sign posting. It also includes the communication and engagement costs e.g. press releases, social media etc, and decommissioning costs in 2025.
- "Full Study Area AQ Monitoring" costs refers to the air quality monitoring of the full study area.

It should be noted that the communication and engagement costs for both options are assumed to be identical for the purposes of this FBC. The costs include press releases, scheme launch materials, web content, social media, newsletter content, stakeholder briefing notes and meetings, monitoring annual review and surveys.

6.2.3 Optimism Bias

Optimism bias has not been applied for the reporting of the Financial Case, as per TAG and Her Majesty's Treasury Green Book guidance. Optimism bias has however been applied to the cost figures supporting the Economic Case.

6.3 Financial Case Summary

Table 6-1 summarises the total implementation and operating & maintenance costs of both options until to 2031, presented in nominal prices.

As set out in Table 6-1, the proposed total cost for the Engineering Option 3b is £2.10m over the 10-year appraisal period. Capital expenditure accounts for £0.987m of total costs, whilst operating expenditure is estimated to be £1.118m.

The estimated total cost to implement and operate a Benchmark CAZ C is £4.93m over the 10 years appraisal period. Capital expenditure (including decommissioning costs of £1.38m in 2025) accounts for 92% (£4.52m) of total costs, whilst operating expenditure is estimated to be only 8% (£0.42m).

Table 6-1: Summary of Financial Costs for both options (nominal prices; including inflation, excluding optimism bias)

Capital / Operating expenditure	Measure	Total Cost, £
Engineering Option 3		
Capital Expenditure	Engineering Option	749,059
Capital Expenditure	A127 M&E	96,578
Capital Expenditure	East Mayne M&E	118,447
Capital Expenditure	Full Study Area AQ	22,796
Total Capital Expenditure - Engineering Option		**986,880**
Operating Expenditure	Engineering Option	556,710
Operating Expenditure	A127 M&E	126,721
Operating Expenditure	East Mayne M&E	183,495
Operating Expenditure	Full Study Area AQ	251,045
Total Operating Expenditure - Engineering Option		**1,117,971**
Total Expenditure - Engineering Option		**2,104,851**
Benchmark CAZ C		
Capital Expenditure	Benchmark CAZ C	4,400,030
Capital Expenditure	CAZ C – Monitoring and Evaluation	115,813
Total Capital Expenditure - Benchmark CAZ C		**4,515,843**
Operating Expenditure	Benchmark CAZ C	80,546
Operating Expenditure	CAZ C – Monitoring and Evaluation	335,742
Total Operating Expenditure - Benchmark CAZ C		**416,288**
Total Expenditure - Benchmark CAZ C		**4,932,131**

6.4 Capital Costs

A summary of implementation (capital) costs for both options is presented in Table 6-2. The figures in the table how costs shown vary from those in the Economic Case, this is due to the inclusion of inflation, i.e. these costs are in nominal terms, and optimism bias is not included in the financial case as per Green Book guidance. The table below is to highlight the cost build up from real prices to those presented in the Economic Case.

Table 6-2: Total capital costs of implementing both options

Component	Capital cost (£) - real 2020 prices	*Inflation*	Capital cost (£) including inflation	*Risk*	Capital cost (£) including inflation and risk	*Optimism bias (OB - Central)*	Capital cost (£) including inflation, risk and Central OB
Engineering Option 3b / Monitoring & Evaluation							
Engineering Option	734,986	14,074	749,059	0	749,059	22,472	771,531
A127 M&E	94,124	2,454	96,578	0	96,578	2,897	99,476
East Mayne M&E	115,582	2,865	118,447	0	118,447	3,553	122,000
Full Study Area AQ	21,566	1,230	22,796	0	22,796	684	23,480
Total Costs - Engineering Option 3	966,258	20,622	986,880	0	986,880	29,606	1,016,486
Benchmark CAZ C / Monitoring & Evaluation							
Benchmark CAZ C	4,208,773	191,257	4,400,030	0	4,400,030	660,004	5,060,034
CAZ C – M&E	112,197	3,617	115,813	0	115,813	17,372	133,185
Total Costs - Benchmark CAZ C	4,320,970	194,873	4,515,843	0	4,515,843	677,376	5,193,220

Engineering option capital costs include:

- **Engineering Option** includes implementation costs and therefore includes prelims, site clearance, fencing, road restraint systems, drainage and service ducts, earthworks, pavements, kerbs, footways, paved areas, traffic signs and road markings, road lighting columns and brackets, electrical works for road lighting and traffic signs, air quality sensors, installation, annual replacement, landscaping and ecology, amongst others. A detailed list of these costs is set out within the financial model.

- **A127 M&E** include costs to set up the A127 ANPR at a single location and optical sensors at locations on the A127 and A13.
- **East Mayne M&E** includes purchasing a continuous analyser, ANPR, optical sensors, and active air quality monitors.
- **Full Study Area AQ** includes equipment costs related to monitoring air quality across the full study area (i.e. diffusion tubes).

Benchmark CAZ C capital costs include:

- **Benchmark CAZ C –** included within this cost category are signs, gantries, new camera sites, design and supervision and decommissioning costs in 2025.
- **CAZ C M&E** includes air quality diffusion tubes and ANPR/traffic counters required to set up monitoring.

Given that Essex County Council will own the capital that is bought in order to enforce either the engineering option or CAZ C measure, therefore capital bought will be an asset on the council's balance sheet. Assuming a straight-line depreciation and a salvage value of £0 by the end of the appraisal period (2031). For the engineering option depreciation is estimated to initially be £83,752 in 2022 and increases to £84,911 by 2025 when the final capital purchases are undertaken. Similarly, for the CAZ C, depreciation is estimated to initially be £310,929 in 2022 and increases to £511,143 by 2025 when the final purchases are complete.

Table 6-3: Engineering Option - Annual balance sheet impact of capital expenditure, nominal prices (£'s, including risk but excludes optimism bias)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Depreciation per year	83,752	83,752	83,752	84,911	84,911	84,911	84,911	84,911	84,911	84,911
Cumulative Asset	753,772	837,525	837,525	837,525	845,637	845,637	845,637	845,637	845,637	845,637
Cum. Asset Depreciation	(83,752)	(167,505)	(251,257)	(336,169)	(421,080)	(505,992)	(590,903)	(675,814)	(760,726)	(845,637)
Net Asset	670,020	670,020	586,267	501,356	424,557	339,646	254,734	169,823	84,911	0

Table 6-4: Benchmark CAZ C -Annual balance sheet impact of capital expenditure, nominal prices (£'s, including risk but excludes optimism bias)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Depreciation per year	310,929	313,196	313,719	511,143	511,143	511,143	511,143	511,143	511,143	511,143
Cumulative Asset	2,792,842	3,109,288	3,129,697	3,133,875	4,515,843	4,515,843	4,515,843	4,515,843	4,515,843	4,515,843
Cum. Asset Depreciation	(310,929)	(624,125)	(937,844)	(1,448,987)	(1,960,129)	(2,471,272)	(2,982,415)	(3,493,558)	(4,004,701)	(4,515,843)
Net Asset	2,481,913	2,485,163	2,191,853	1,684,888	2,555,714	2,044,571	1,533,428	1,022,286	511,143	0

6.5 Operating & Maintenance Costs

Table 6-5: Operating & Maintenance costs over the appraisal period for both options (£'s, nominal prices, including risk but excluding optimism bias)

Measure	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Engineering Option	153,134	57,523	52,036	53,650	58,889	83,624	0	0	0	0	97,854
A127 M&E	23,437	24,155	25,423	26,212	27,495	0	0	0	0	0	0
East Mayne M&E	41,592	31,321	35,440	36,540	38,603	0	0	0	0	0	0
Full Study Area AQ	54,904	53,425	46,008	46,844	49,865	0	0	0	0	0	0
Engineering Option - Total O&M (excl. optimism bias)	273,066	166,424	158,906	163,246	174,851	83,624	0	0	0	0	97,854
Benchmark CAZ C	16,070	18,904	12,233	12,612	20,727	0	0	0	0	0	0
CAZ C – M&E	71,061	69,982	62,801	64,141	67,757	0	0	0	0	0	0
CAZ C - Total O&M (excl. optimism bias)	87,131	88,887	75,034	76,753	88,484	0	0	0	0	0	0

Engineering option operating costs include:

- **Engineering Option** – within this cost category presented in the table above, maintenance costs of series 100, series 700 (pavements), series 1200 (traffic signs and road markings), series 1300 (road lighting columns, brackets, CCTV masts and cantilever masts), series 3000 (landscape maintenance costs) and Siemens system support. This also includes communication and stakeholder engagement costs such as press releases, web content, social media, newsletter content, stakeholder briefing notes and meetings, monitoring annual review communication and surveys and related activities.
- **A127 M&E** – operating and maintenance costs for equipment to monitor traffic on the A127 following the implementation of the speed limit scheme. This covers ANPR data collection services, optical sensors (pairs at 4 locations on the A127, and an additional pair on the A13) and data analysis labour costs and reporting.
- **East Mayne M&E** – operating costs related to monitoring air quality and traffic on the East Mayne. This covers 6x optical sensors, 7x active air quality sensors (including a background location), a continuous analyser, ANPR, data analysis labour costs and reporting.
- **Full Study Area AQ** includes operating costs related to monitoring the rest of the full study area air quality. This includes labour costs related to air quality diffusion tubes and site attendance reporting which will occur monthly from 2021 to 2025.

Benchmark CAZ C Operating costs include:

- **Benchmark CAZ C –** within this cost category presented in the table above includes communication and stakeholder engagement costs such as press releases, web content, social media, newsletter content, stakeholder briefing notes and meetings, monitoring annual review communication and surveys and related activities.
- **CAZ C M&E** includes operating costs related to monitoring and evaluation of the CAZ C measure. This includes labour costs related to air quality diffusion tubes and site attendance reporting which will occur monthly from 2021 to 2025. It also includes operating costs related ANPR data collection services, traffic counter data analysis and annual speed/average journey time data from Essex Highways.

6.6 Funding Sources

The 2017 plan stated that a £255 million Implementation Fund would be available to the councils required to develop clean air plans. An additional £220 million Clean Air Fund was announced in the 2017 Autumn Budget to support the implementation of these air quality measures and, in some cases, obviate the need for charging zones[19].

Engineering Option

The Engineering Option is expected to be funded through the combination of the Implementation Fund and Monitoring and Evaluation Fund. The Engineering Option would require £1.16m of Implementation Funding to cover £0.75m of capital expenditure.

JAQU's funding horizon for operating and maintenance costs is to the year of natural compliance plus one year. For the purposes of both options, this is 2025, therefore JAQU is estimated to initially fund £936,493 of operating expenditure in total (£225,694 from Implementation Fund and £710,798 from M&E fund). Further funding will be sought from JAQU to cover the remaining £181,479 between 2026 to 2031 (Table 6-6).

The Engineering Option is also expected to require £0.95m in funding from the Monitoring and Evaluation fund, of which £0.24m would be for capital expenditure and £0.71m for operating expenditure over the 10-year appraisal period.

Table 6-6: Engineering option funding requirement by source (nominal prices, including inflation and excluding optimism bias)

		2021 to 2025	2026 to 2031	Total
Implementation Funding Requirement				
Engineering Option	CAPEX	749,059	0	749,059
	OPEX	225,694	181,479	407,173
	Total	974,753	181,479	1,156,232
M&E Funding Requirement				
Engineering Option	CAPEX	237,821	0	237,821
	OPEX	710,798	0	710,798
	Total	948,619	0	948,619

Benchmark CAZ C

For comparison purposes, the Benchmark CAZ C would also be funded through the combination of the Implementation Fund and Monitoring and Evaluation Fund. The CAZ C would require £4.48m of Implementation Funding to cover £4.40m of capital expenditure and £0.08m for operating expenditure (Table 6-7).

The Benchmark CAZ C would also require £0.45m in funding from the Monitoring and Evaluation fund, of which £0.12m would be for capital expenditure and £0.34m for operating expenditure over the 10-year appraisal period.

[19] Defra, UK plan for tackling roadside nitrogen dioxide concentrations - an overview, July 2017, para 19

Table 6-7: Benchmark CAZ C funding requirement by source (nominal prices, including inflation and excluding optimism bias)

		2022 to 2025	2026 to 2031	Total
Implementation Funding Requirement				
Benchmark CAZ C	CAPEX	4,400,030	0	**4,400,030**
	OPEX	80,546	0	**80,546**
	Total	**4,480,576**	**0**	**4,480,576**
M&E Funding Requirement				
Benchmark CAZ C	CAPEX	115,813	0	**115,813**
	OPEX	335,742	0	**335,742**
	Total	**451,556**	**0**	**451,556**

6.7 Procurement and cost estimate sources

The procurement strategy is described in the Commercial Case. The majority of measures will be implemented by Essex County Council through its Essex Highways contract. Where Essex Highways delivers it will subcontract some elements of delivery through its approved supply chain partners but will act as principal designer and principal contractor in all cases. Where other contractors are required, engagement with them has occurred, and their input is the basis for the cost estimates presented in this Financial Case.

7 Management Case

7.1 Introduction

The Management Case provides an assessment of the achievability of the scheme and sets out the management methodology, governance processes and delivery plan for the proposed measures to address the exceedances identified on East Mayne. In line with UK Government' Joint Air Quality Unit (JAQU) guidance, the Management Case is part of the Full Business Case (FBC), providing recommendations for the management of the East Mayne engineering measures relating to the following:

- Project Dependencies
- Governance structure and reporting
- Project programme
- Risk management and mitigation
- Communication and stakeholder engagement
- Benefits realisation
- Monitoring and evaluation plan.

7.2 Project Dependencies

Key project dependencies include:

- Location of statutory undertakers' equipment within the highway that may limit the exact locations of the crossing points and traffic signals.
- Electricity supply connections for the traffic signals.
- Road Safety Audit may identify additional requirements that need to be considered relating to the cycle route and crossing locations.
- Consideration to be given to the DfT LTN 120 Best Practice Note for cycle routes and ECC's Highways Practice Note.
- Upgrading of the local fleet by local businesses, commuters and residents to meet that as set out in the Defra Emissions Factor Toolkit (EFT). Currently the fleet mix is significantly older than that assumed by the EFT. This is identified as a risk and it is noted that the fleet upgrade to bring it in line with the EFT will be required to enable the modelled air quality improvements to be delivered.
- The impact of committed development and future traffic schemes in the area has been taken into account. There is significant growth planned for the Basildon Enterprise Corridor which will impact on the already congested local highway network.

7.3 Project Governance Structure and Reporting

7.3.1 Overall governance structure

The project is led by Basildon Borough Council (BBC) as the responsible authority for the air quality non-compliance at locations of identified exceedance in Basildon. Essex County Council (ECC), as the Highway Authority, is leading on all highway related matters. The two authorities are working together as a joint working group.

An appropriate governance structure is essential to the successful delivery of the Basildon AQMP and to enable its successful delivery by the end of 2021 and its ongoing continued effectiveness. The project is managed collaboratively by the two local authorities through the officer working group. There is a dedicated project manager and a project team covering all aspects of the programme. FBC Appendix C sets out the project's overarching Terms of Reference in relation to governance, management and delivery.

ECC already has effective programme, risk and project reporting arrangements in place across its capital projects. The scheme will be delivered in line with ECC's project management and governance procedures which are based upon a PRINCE2 methodology. ECC has significant experience of delivering major projects. Essex Highways is the delivery vehicle for ECC's highways schemes which is managed through ECC's contract with Ringway Jacobs.

ECC has established a Project Board, Project Delivery Team and Stakeholder Team who will work together to deliver the Basildon AQMP. The various organisations involved in the delivery of the scheme hold the following roles:

- Scheme promoter: JAQU.
- Project Board and Assurance: ECC, BBC.
- Stakeholder Group: ECC, BBC.
- Project Delivery: Essex Highways, Ringway Jacobs (Principal Designer and Principal Constractor) responsible for project and construction management advice and supervision), Siemens ITS.

An overview of the personnel assigned roles and responsibilities in the delivery of the AQMP are outlined in the organogram provided in FBC Appendix C.

7.3.2 Project board

Senior Responsible Officers (SRO) from BBC and ECC will be responsible for the implementation and operational phases of the project. The SROs will have responsibility for ensuring the preferred option meets its objective and delivers the expected benefits within the timescale and budget set out in the business case.

The Project Board is made up of senior officers and relevant cabinet members from BBC and ECC. They will guide the direction of the project, ensure the objectives are met and ensure that the project is undertaken within the agreed scope. In order to achieve this, they will:

- Review and approve the Project Initiation Document, Final Plans, Resource Allocation and Final Project Close Out Report;
- Review and Approve any issues escalated by the Project Manager that may result in major deviations from the agreed Plans; and
- Communicate information about the project to other senior officers and members and liaise with the Project Manager regarding any feedback.

Following local elections in May 2021 the Councillors with responsibility for the project in both Essex CC and Basildon BC are identified in Table 7-1.

Table 7-1 Project Board 2020

Individual	Role	Role in own organisation
Paul Brace	Senior Responsible Officer (BBC)	Assistant Director Public Spaces, BBC
Andrew Cook	Senior Responsible Officer (ECC)	Director of Highways and Transportation, ECC
Cllr Craig Rimmer	Committee Chair (BBC)	Chairman Leisure and Environmental Committee
Cllr Kevin Bentley	Cabinet Member (ECC)	Leader of the Council
Cllr Lesley Wagland	Cabinet Member (ECC)	Cabinet Member for Economic Renewal, Infrastructure and Planning
Cllr Lee Scott	Cabinet Member (ECC)	Cabinet Member Highways Maintenance and Sustainable Transport

7.3.3 Stakeholder group

Stakeholders to the project have been identified across five categories:

- Political, including MPs, Ministers and Council Cabinet members
- Local Authority non-political roles
- Community authorities such as parish councils
- Statutory bodies
- Emergency Services

- Influencers.

The register of individual stakeholders and their contact details is maintained on a stakeholder tracker which will be continuously updated and progressed as the scheme develops and stakeholder relationships are progressed. A full Stakeholder Communications plan is set out in FBC Appendix D.

7.3.4 Project Delivery Team

The Project Manager will be responsible for day-to-day management of the project on behalf of the Project Board, ensuring that the objectives are met and that the project is undertaken within the agreed scope. The role will involve:

- Maintaining the Project Initiation Document.
- Obtaining approval from the board for the Project Initiation Document.
- Confirming the Discipline Input Statements and scope of work.
- Liaison with the Project Team regarding the Draft Issue Plans.
- Obtaining approval for the final issue plans from the Project Board.
- Chair the Project Team meetings and attend sub-group meetings as and when required.

The Project Team will consist of officers from BBC and ECC across a range of services, supported by technical consultants, the roles are set out in Table 7-2 below.

Table 7-2 Project Roles

Individual	Role	Role in own organisation
Andrew Cook	SRO (ECC)	Director of Highways & Transportation
Paul Brace	SRO (BBC)	Assistant Director of Public Spaces
	Project Lead (ECC)	Principal Transportation and Infrastructure Planner
	Project Lead (BBC)	Environmental Health Services Manager
	Essex Highways Project Manager	Senior Associate Director, Water & Environment, Essex Highways
	Discipline Lead, Air Quality	Technical Director (Air Quality & Climate)
	Transport Planning Lead	Divisional Director, Transport Planning, Essex Highways
	Technical Lead, Traffic Modelling	Technical Director, Transport Planning, Essex Highways
	Technical Lead, Business and Economics	Associate Director, Strategic Consulting, Essex Highways
	Technical Lead, Comms & Engagement	Stakeholder Engagement Manager, Essex Highways

Personnel are subject to change throughout the life of the project. Where changes occur staff of suitable skills will be utilised on the project.

7.3.5 Project Governance and Reporting Arrangements

The project governance and team organogram are presented in FBC Appendix C.

The AQMP will be delivered in line with Essex Highway's existing effective programme, risk and project management procedures. as Project Manager, will be responsible for co-ordinating the delivery of the scheme elements, identifying key interdependencies and ensuring that the overall project is delivered to programme, quality and budget. The Project Board will oversee the development and delivery of the scheme.

The Project Team will provide progress reports to the Project Manager summarising:

- Work done and work planned against the agreed Project Plan; and
- Any issues, risks or additional requirements that have resulted, or may result in deviation from the agreed plans.

The Project Team will also communicate information about the project to stakeholders as appropriate and liaise with the Project Manager regarding any feedback.

7.3.6 Reporting Cycle

The AQMP Board will be provided with monthly Highlight Reports by the Project Manager, summarising the information received in the Project Team's progress reports. The Project Manager will also escalate to the AQMP Project Board any reported issues, risks or additional requirements that have resulted, or may result, in major deviations from agreed plans.

The Essex Major Projects Board will receive monthly reports. This delivery board will oversee the delivery of the Speed Limit project and will provide project assurance. This board is chaired by the AQMP SOR.

The AQMP Project Group meets weekly. Monthly reports are prepared that are circulated to all members of the project team. Monthly reports are also provided to the Essex Major Projects Board highlighting any risks and concerns.

7.3.7 Continuity

Continuity will be achieved in the development of the AQMP scheme through the management of a proportionally sized team that will work closely together on project planning and delivery. This includes collaborative working between people, teams and organisations involved in the various tasks in business case development and scheme implementation, weekly conference calls will be held to ensure the project remains focused and all deliverable on track.

COVID risk management has been identified in the risk register but no specific allowance has been made in financial model.

7.4 Project Programme

The full project plan setting out the timescales for procurement activity, implementation and monitoring of the Air Quality Management Plan is shown in Figure 7-1.

The project plan below shows that compliance is expected to be achieved by 2022. The project plan has multiple interlinked work streams to reduce delays and ensure compliance is achieved in the shortest possible time. Actions have been identified to evaluate the benefits of the measures very early on and will identify if additional measures may be required to achieve compliance.

The key activity timelines for the project are set out in Table 7-3 below.

Table 7-3 Key Milestones

Activity	Date(s)
Submission of OBC	Dec 2020 *(complete)*
Detailed Design – Crossing locations and new shared cycle/footway	Oct 2020 – May 2021 *(complete)*
Detailed Design – Signals (ITS)	Oct 2020 – May 2021 *(complete)*
Procurement activities - Civils	Jan – May 2021 *(complete)*
Traffic Notices made	April – May 2021 *(complete)*
Preparation and submission of East Mayne Options FBC	April – June 2021 *(complete)*
Directive and funding East Mayne scheme	June - July 2021
FBC approval and confirmation of funding	August 2021
Build phase	Aug – Dec 2021
Scheme live	Dec 2021
Post-implementation monitoring period	Jan 2022 to Dec 2025 To Year of Natural Compliance + 1

The project plan is a live document listing all the tasks through to implementation and evaluation of the measures, with responsible officers identified for each action. Many of the tasks have dependent predecessors and successor actions, which are monitored by the project officer to ensure the project timetable is achieved. Resources are identified and monitored in the plan with regular review under a red/amber/green rating. Risks are also identified in the plan and are regularly reviewed under a red/amber/green rating.

Microsoft Project, the software being used to manage the project, ensures all tasks are allocated and a timeframe for delivery is set. The system allows for early warning of any potential risk to delivery, which the project officer can then highlight to the group for appropriate action to be taken.

A detailed project programme can be found in FBC Appendix X.

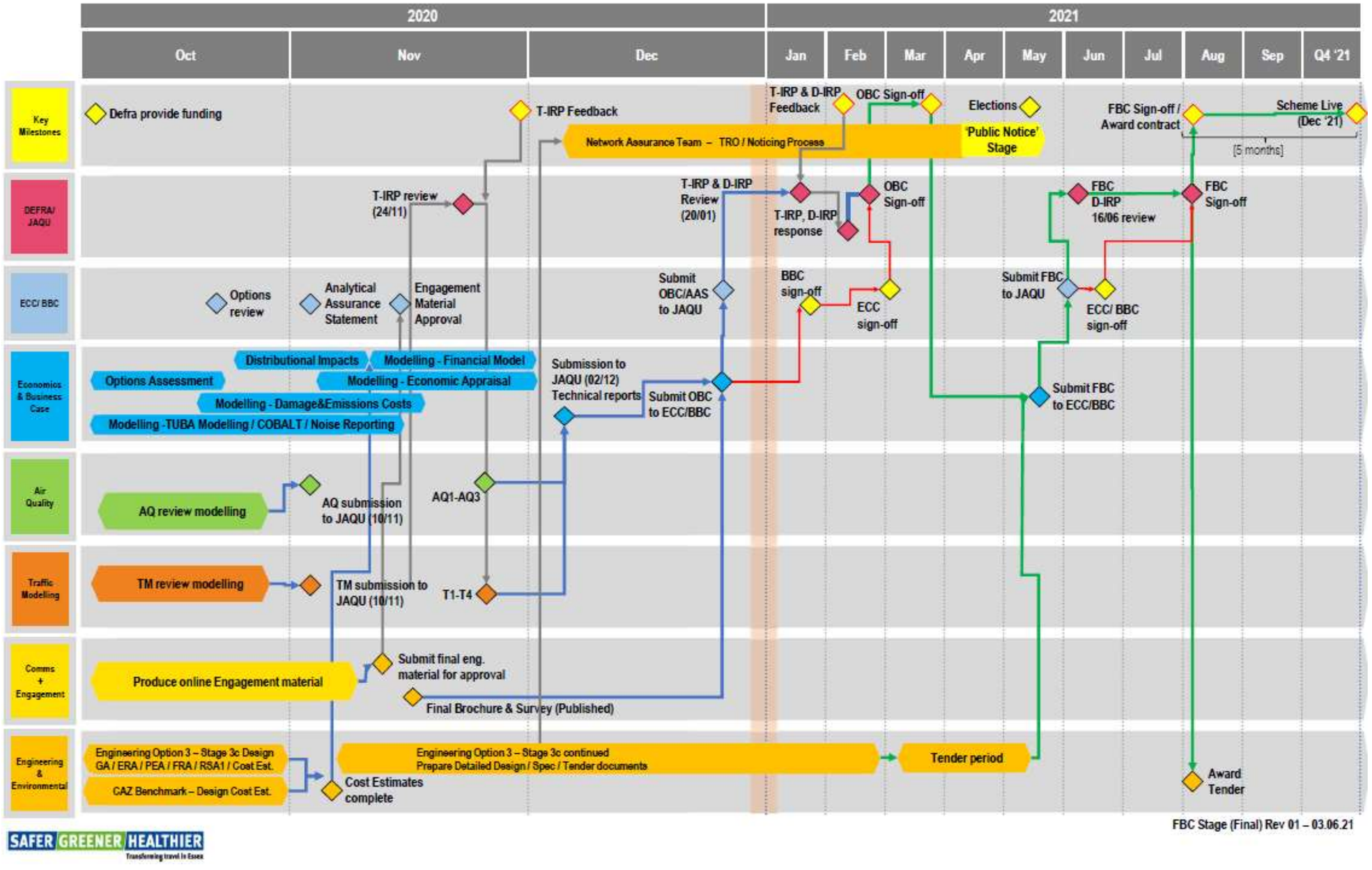


Figure 7-1 Project plan (Detailed project programme in Appendix X)

7.5 Risk management

The full project risk register is provided in FBC Appendix T with key risks summarised below in Table 7-4.

Table 7-4 Key project risks

Category	Risk Description	Pre-mitigation Risk Level	Mitigation Action
Programme	If the East Mayne crossing relocation option is challenged as it only removes the receptor location, there may be delays	Amber / Green	Discussions with SROs and Members have been undertaken. Communication Strategy developed
Programme	If utility infrastructure is discovered that impacts on the works then there could be delays in delivery and increases in cost	Amber / Red	Stats review undertaken
Programme	If the Road Safety Audit identifies aspects of the scheme design that need further design consideration then there could be increases in cost / impact on scheme completion	Amber	RSA 1 - completed RSA 2 designer response is being completed RSA 3 – to be completed
Compliance	If the AQ monitoring shows exceedances remaining on the westerns side of East Mayne then the scheme will not meet its objective of removing the exceedances	Amber / Red	Diffusion tube monitoring in place
Funding	If elements of the FBC proposals are not approved or funded then the delivery of the AQ requirements as set out in the Ministerial Directive may not be delivered	Amber / Red	All requirements set out in FBC
Operational	COVID IMPACT - If there are long lead in times for equipment purchase or shortage of contractor availability due to national infrastructure implementation programmes then there may be a programme delay	Amber	Engagement with Essex Highways ITS Team at early stage
Package of Measures	If the Active AQ Sensors are not included in the package of measures then ECC will not be able to identify the source of any new exceedances and adapt the scheme to them in a timely manner	Amber / Red	Active AQ Sensors are included in the OBC as part of the package of measures. No other methodology exists to enable this activity to be undertaken

7.6 Communications and Stakeholder Engagement

To support further development of our proposals for East Mayne, we shared our preferred option with the public and invited them to have their say as part of a public engagement exercise.

Across a four-week period – Friday, 13 November 2020 to Monday, 14 December 2020 – we engaged with the public on our plans to address air quality in East Mayne, Basildon. Because of the COVID-19 pandemic, we were unable to run any face-to-face public engagement events and, instead, focused on digital engagement. This centred on an online survey hosted on the Essex County Council consultation portal, which residents, businesses and visitors to Basildon, as well as any other interested parties, were encouraged to complete.

A brochure complemented the survey to set the scene, provide the background to the project and the subject of air quality, explain the preferred option and outline other efforts to tackle air pollution in Basildon. To ensure the survey and supporting information remained accessible to certain demographics and traditionally hard-to-reach groups, as well as those without internet access or online competency, we made printed engagement brochures available on request and used some traditional communications channels, such as letters, to complement other digital approaches.

In total, we received 164 responses to the survey – all of which were submitted online. The data collected as part of the survey enabled us to gain a fuller understanding of people's views on air quality and our proposals to help inform the decision-making processes and our business case for the scheme. It also enabled us to identify potential issues and concerns and to ensure that any feedback about our proposals could be taken into consideration as they were developed further.

Key findings from the public engagement were as follows:

- 81% of respondents indicated they felt improving air quality was an important issue.
- 74% said they were concerned about the impacts of poor air quality on the health of them, their family and friends.
- 88% were concerned about the impacts of poor air quality on the environment.
- 63% of those who responded to the survey said that, given the need to bring air quality in East Mayne to legal levels in the shortest possible time, they were either supportive (or very supportive) of the preferred option or described their views on the option as 'neutral'. 37% described themselves as opposed (or very opposed) to the preferred option.
- 52% of respondents indicated they thought the preferred option would have an impact in reducing people's exposure to air pollution, while 46% said they thought it would have no significant impact and 2% did not know.

We also noted concerns expressed about the perceived impacts of the preferred option on traffic flow, congestion, and the increased crossing points and journey times for pedestrian and cyclists, notably those travelling in the north/south direction between Wickford and Basildon. As a result of the concerns about the impact on some pedestrians and cyclists, design changes were made to the scheme to widen parts of the proposed crossing route. Potential future mitigation measures are also being investigated, outside of this particular project.

More information about the findings of the public engagement exercise can be found in FBC Appendix H – Engagement Report.

A public notice, advising of the proposed changes to the Highway, was also published in April/May 2021. Three objections to the scheme were received and will be presented to Essex County Council's Cabinet Member for consideration and decision.

Further communications and engagement activity is planned to coincide with the approval of the scheme, commencement of works to implement the new crossings and the scheme going live, as well as during the subsequent monitoring period. This will include an online survey in 2022 and 2025 to measure people's views on air quality, review the wider impacts of the schemes and help evaluate the effectiveness of the communications.

The latest communications strategy can be seen in FBC Appendix D.

7.7 Benefits Realisation Plan

The primary objective of the project is to deliver compliance with NO_2 concentration limits in the study area within the shortest possible time. This will be achieved by relocating the pedestrian and cycle layout to prevent access to the areas of high NO_2 concentrations and therefore remove the reportable exceedances in the central reservation.

The outcomes and delivery against the targets will be monitored and reported to JAQU via the quarterly reporting process. These reports will also be shared with the Project Steering Group. An annual report will be provided to the project SROs and Cabinet Members.

7.7.1 Expected Benefits

The outputs and benefits are those expected to be derived from the scheme:

- Outputs – tangible effects that are funded and produced directly as a result of the scheme; and/or
- Outcomes – final impacts brought about by the scheme in the short, medium and long term.

It should be noted that COBA-LT modelling of the closure of the existing route along the central indicated that there is likely to be a slight increase in casualties as a result of the increased road crossing points for pedestrians and cyclists. This has been included in the economic appraisal of the scheme.

7.7.2 Benefit Measurement Methods

To determine whether the scheme benefits are being realised, the desired outputs and associated outcomes have been converted into measurable indicators of scheme benefits, as set out in the table below. Outcomes have been classified as 'Quantitative' (Qn) or 'Qualitative' (Ql).

Quantitative benefits are those which can be measured in terms of specific numerical values on a continuous scale, whether in absolute or percentage terms, whereas qualitative benefits are measured in category based or descriptive terms.

Table 7-5 Realisation of benefits

Measurement						
Benefit	Description	QI/Qn	How	When	Baseline	Owner
DESIRED OUTPUTS						
Installation of new route and crossing locations	Completion of installation of speed reduction monitors	QI	Recorded completion of works and installation through Project Progress Reports	Reference project programme in Table 6.3 and Figure 6.1	Current monitoring equipment.	ECC / Contractor
DESIRED OUTCOMES						
Reduction in NO_2 at identified location of exceedance	Improved NO_2 concentrations bring about compliance with EU AQ Directive	Qn	Local NO_2 monitoring and modelling	Annually (Monitoring and Evaluation Report)	Reported in AQ Review and Assessment. Baseline exceeding EU AAQD.	ECC
Reduction in $PM_{2.5}$ at identified location of exceedance	Improved PM concentrations levels	Qn	Local PM monitoring	Annually (Monitoring and Evaluation Report)	Reported in AQ Review and Assessment. Baseline exceeding EU AAQD.	ECC
Minimise adverse traffic impacts	Minimise adverse impact in traffic flow along key corridors and links on the network.	Qn	Data available from existing ANPR camera network	Annually (Monitoring and Evaluation Report)	Reported in Traffic Report and Assessment.	ECC
Minimise the impact to business and residents	Minimise financial impact on local economy and residents	QI	Internal council data and ONS data from NOMIS web, relating to business demography.	Annually (Monitoring and Evaluation Report)	-	ECC

7.8 Monitoring and Evaluation Plan

The Monitoring and Evaluation Plan (MEP) (FBC Appendix F) sets out the methodology that will be used to track and assess the progress and effectiveness of the Basildon Air Quality Management Plan in meeting and continuing to meet the required NO_2 annual mean EU limit value of 40µg/m^3. The scoping and sifting process by which the strategy was developed is set out in the Options Appraisal Report (FBC Appendix S).

The MEP considers specific elements of both the proposed scheme and the Benchmark CAZ.

- Scheme Measures
    - Monitoring measures and appropriate metrics for the evaluation of the effectiveness of the scheme in delivering behaviour change.
- Air quality monitoring and evaluation
    - Monitoring measures and indicators to evaluate the air quality outcomes of the scheme, including whether or not compliance with the EU limit value is achieved. This will be undertaken using:
        - Ambient air quality sensors provided by Campbell Associates – these provide NO_2 concentrations at a high resolution at specific locations;
        - Optical sensors provided by Vivacity – these provide high resolution traffic data at specific locations, which will complement data from the air quality sensors;
        - Chemiluminescence continuous analysers – M-certified equipment that the ambient air quality sensors can be co-located with for additional confidence in the monitored results;
        - Diffusion tubes – low cost M-certified equipment that can be placed across a wide area, recording NO_2 concentrations on a monthly basis; and
        - ANPR survey – provides information on the fleet composition where the cameras are deployed, including vehicle classification, age and fuel type.
- Stakeholder engagement
    - Explains the approach that will be used to measure behaviour change.

The monitoring and evaluation measures and assumptions included in the Monitoring and Evaluation report are based on DfT's Monitoring and Evaluation Framework for Local Authority Major Schemes (2012)[ii].

The potential monitoring data sources have been evaluated and costs attributed to the monitoring activities. The local authority plans to share the data it produces with JAQU. It also offers to facilitate discussions between JAQU and the tertiary organisations on sharing their data.

The required monitoring was then reviewed to identify the most appropriate data collection measures and to confirm the cost of monitoring.

Following the appraisal of all the data collections methodologies and costs a monitoring and evaluation package has been developed for the FBC. The combination of the devices listed within the Plan have been thoroughly researched to meet the needs of JAQU (i.e. as part of

the Plan evaluation objectives), ECC and BBC who are ultimately responsible for ensuring that local residents are not subjected to air pollution which exceeds health based thresholds.

7.9 Management Case Conclusion

The Management Case describes how the delivery of the Basildon AQMP, East Mayne scheme, will be managed. It provides details of the Governance of the project and the management of the risks and shows how the outcomes of the project will be monitored and evaluated to ensure that the AQ outcome is met to reduce the NO_2 at the identified locations of exceedance.

The Project steering group is made up of Senior Officers and Members of both ECC and BBC. This group is responsible for the agreement and approval of the Full Business Case. The Terms of Reference are set out in FBC Appendix C.

The Joint Working Group ensures that there is full collaboration across all aspects of the project and that full account is taken of the Local Authorities' requirements.

The management section details the benefits realisation and sets out how the outputs of the Basildon AQMP and will be monitored and outcomes evaluated and how risks will be managed, mitigated and monitored.

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[i] https://www.ringway-jacobs.co.uk/updates/ringway-jacobs-secures-full-five-year-extension-to-essex-county-council-integrated-highway-partnership

[ii] *DfT Monitoring and Evaluation Framework for Local Authorities Major Schemes 2012*