Appendix C: Air Quality - Detailed Baseline and Assessment

2. Air quality

2.1 Introduction

2.1.1 This section sets out the strategic air quality assessment for the route corridor, which aims to determine the potential for effects on air quality to arise as a result of the project.

2.2 Methodology

Overview

2.2.1 The assessment approach is focussed on the 2km-wide route corridor study area, and is based on:

- Consideration of the baseline data from the following sources:
  - Scottish Air Quality website;
  - Ordnance Survey map data and AddressBase;
  - Road traffic statistics from the Department for Transport website (2021); and
  - Argyll and Bute Air Quality Annual Progress Report (2020), which sets out the region's compliance with Scottish Air Quality Standards and Objectives.
- Available information on possible route options as described in Chapter 5 (Project Description).
- SEA Objectives and Guide Questions set out in Chapter 6 (SEA Approach and Methods).

2.2.2 Potential effects on air quality have been assessed using the scoring criteria defined in Table C2.1.

Table C2.1: Assessment Criteria for Potential Effects on Air Quality

Score	Description	Colour coding and symbol
Minor positive effect	The route corridor has potential for a positive effect, by improving air quality through reducing emissions or providing enhancements.	+
Minor negative or uncertain effect	The route corridor has potential for minor negative or uncertain effects on air quality from increased pollutant emissions.	-
Significant negative effect	The route corridor has potential for significant negative effects on air quality from increased pollutant emissions.	--

2.2.3 The assessment approach is qualitative and uses professional judgement. No air quality monitoring or modelling has been undertaken due to the early stages of design development of the project. Traffic count data provided by Transport Scotland has been included to assist in understanding the baseline scenario.

2.2.4 Due to the potential for different air quality effects to arise at different stages, both construction and operation of the project have been considered separately.

2.2.5 The assessment refers to the duration of effect in terms of short-term, medium-term, and long-term effects. A definition of these durations is provided in Chapter 6 (SEA Approach and Methods). Effects reported would be reversible unless otherwise stated.

2.2.6 In addition to human health, changes in air quality can also impact on biodiversity. Air quality in relation to ecological receptors is discussed in Appendix C (Section 5: Biodiversity).

Limitations to Assessment

2.2.7 STPR2 considers a number of different scenarios in the Argyll and Bute region in terms of future traffic flow forecasts, however in terms of the specifics of the A83, traffic flow forecasts are not currently available. It is therefore not possible, at this stage, to consider the specific implications of the various traffic flow forecasts on future A83 traffic volumes and on air quality.

2.2.8 Covid-19 pandemic restrictions have radically changed the way we go about our daily activities, changing demand for travel, trip distribution patterns, peak profiles and our choices with respect to our mode of travel. To what extent these changes carry on into the future depends on a range of factors including the effectiveness of vaccination programmes and the policies employed by government to take advantage of the opportunities and mitigate the adverse impacts and uncertainties resulting from the pandemic. It should be noted that the uncertainties around the effect of Covid-19 on future traffic flows or travel trends – and the potential effect on air quality – have not been taken into account in this assessment.

2.3 Detailed Baseline

Overview

2.3.1 Poor air quality can have detrimental impacts on human health and quality of life. Air pollution stems from the release of substances into the atmosphere from a variety of sources, including organic and man-made sources. Regulations on pollutant sources and advancements in combustion technology have led to Scotland currently experiencing the best air quality since pre-industrial revolution times. Despite this, air quality is still a concern for many in the country, particularly those living in urban and industrial areas. Poor air quality can result in human health conditions such as asthma, respiratory problems and cardiovascular disease (Royal College of Physicians 2016). The UK government estimates that air pollution reduces the life expectancy of every person in the UK by 7-8 months, with related costs of up to £20 billion to the economy annually (Air Quality in Scotland 2019).

2.3.2 Transport is a significant contributor to nitrogen oxide (NO_x) and particulate matter (PM_{10} and $PM_{2.5}$) emissions and the transport sector is the most significant source of air pollution in the UK. Transport generates just over one-sixth of Scotland's total particulate matter and over one-third of the total emissions of nitrogen oxides. The majority of these emissions are caused by road transport. Emissions of NOx from road transport are reducing but not at the expected rate.

Route corridor Baseline

2.3.3 The ambient air quality environment within the route corridor is representative of its rural nature, with no population centres in the vicinity. Traffic on the A83 could reasonably be considered the primary source of emissions to air along the route corridor.

2.3.4 A total of 14 receptors have been identified within the route corridor that could be sensitive to changes in air quality, as well as receptors in the wider area, as shown on Figure C2.1. The highest concentration of receptors within the route corridor is at the Rest and Be Thankful, on the Old Military Road. However, these receptors are predominantly tourist amenities; only two residential receptors are located within the route corridor.

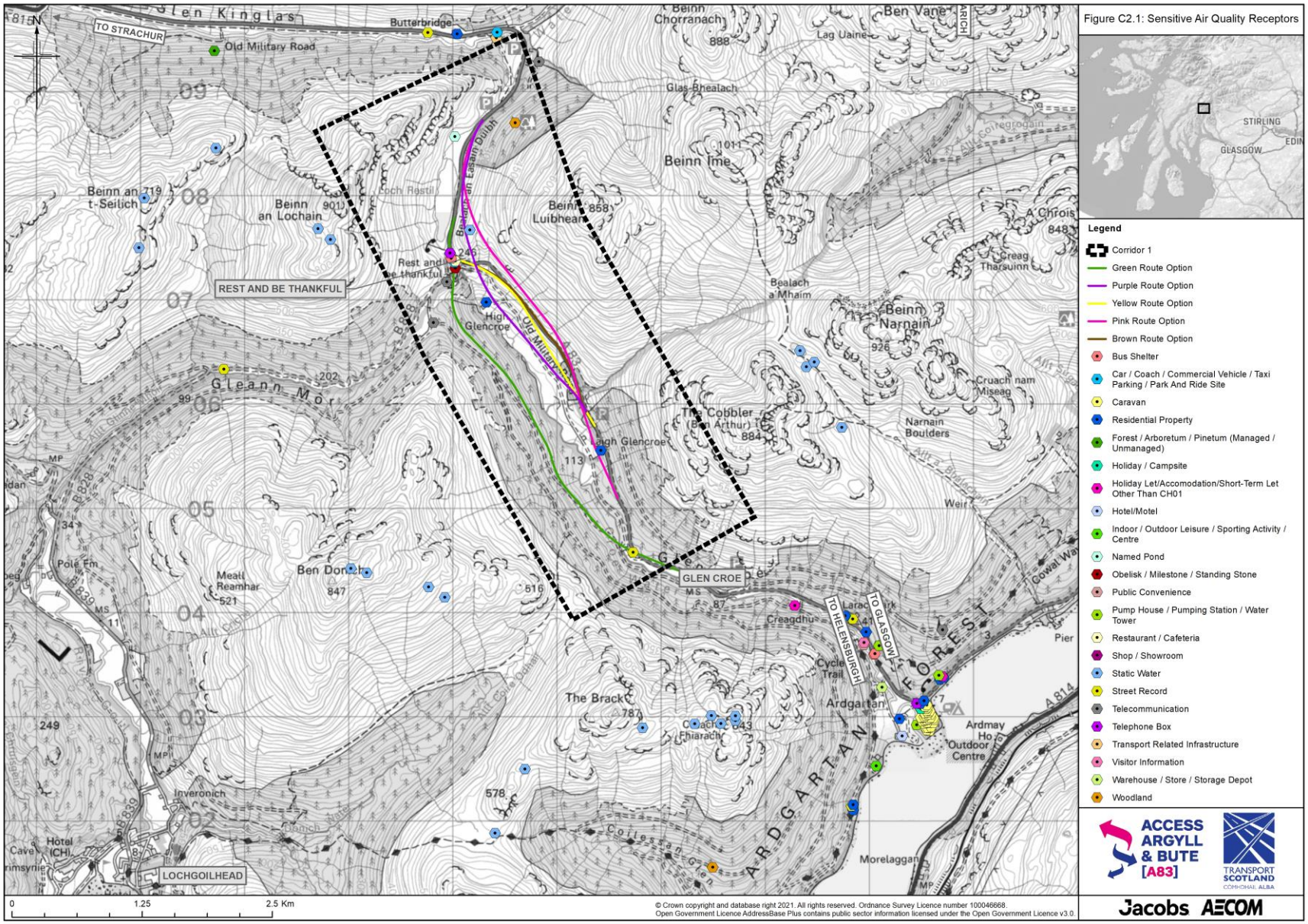

Figure C2.1: Sensitive Air Quality Receptors

Traffic Flows

2.3.5 Traffic monitoring data provide an indication of how frequently a route is used. The higher the traffic flows, the higher the level of emissions generated by vehicles is likely to be, which can have a negative effect on air quality and human health, as outlined in paragraph 2.3.1.

2.3.6 Road traffic statistics are available from the Department for Transport website, which provides street-level data for every junction to junction link on the motorway and 'A' road network, and for some minor roads in Great Britain.

2.3.7 The street-level road traffic estimates provide the number of vehicles that pass the 'Count Point' location at site number 764 on the A83, as indicated by the marker on Image C2.1.

Image C2.1: Site Number 764 Count Point Location *© 2021 Google*

2.3.8 Table C2.2 sets out the average Annual Average Daily Flow (AADF) recorded at the 'Count Point' location, which refers to the number of vehicles that travel past (in both directions) the location on an average day of the year.

Table C2.2: Annual Average Daily Flow (AADF) at Site Number 764 Count Point Location (DFT 2020)[1]

Year	Count Method	Method of Transport						
		Pedal cycles	Two wheeled motor vehicles	Cars and taxis	Buses and coaches	Light goods vehicles	Heavy goods vehicles	All motor vehicles
2019	Automatic counter	0	56	3110	111	782	413	**4472**
2018	Automatic counter	0	51	2854	108	726	384	**4122**
2017	Automatic counter	0	54	3176	123	769	420	**4543**

[1] Noted that the figures for 2018 and 2017 should total 4123 and 4542 respectively, but the figures from the DFT (2020) website have been kept.

2.3.9 At the Rest and Be Thankful, A83 Trunk Road traffic volumes were approximately 4,500 vehicles per day in 2019, with the HGV percentage around 9%, suggesting that, on average, around 400 HGVs pass through Glen Croe on a daily basis. Additionally, around 17% of average daily traffic in 2019, on the A83 within Glen Croe (approximately 800 vehicles) was a light goods vehicle. Approximately 100 buses and coaches per day passed through Glen Croe via the A83 Trunk Road in 2019.

2.3.10 Travel routes to/from, and within, Argyll and Bute are highly seasonal, with greater volumes of people movements within the region during the summer months (predominantly as a result of increased visitor levels). Due to the geography and topography of the region, seasonal fluctuations in traffic volumes and the presence of slow-moving vehicles, travel times via the A83 Trunk Road between the key main towns/cities can be long relative to the distances involved and unreliable.

2.3.11 Data for the year 2020 is not yet available on the Department for Transport website, however the data is unlikely to be representative of usual traffic flows due to the Covid-19 pandemic as well as the prolonged closure of the route due to landslides in late 2020. There are uncertainties around the effect of Covid-19 on future traffic flows or travel trends, as outlined in paragraph 2.2.8.

Air Quality Standards and Objectives

2.3.12 A set of Air Quality Standards and Objectives have been developed in Scotland for several pollutants of concern for human health (Scottish Air Quality 2021). Air Quality Management Areas (AQMAs) are designated by local authorities in areas where Air Quality Strategy Objectives in relation to harmful objectives are not (or are unlikely to be) met. Henceforth, local authorities are required to develop and implement a plan to improve air quality in the AQMA (Scottish Air Quality 2020). A summary of the Air Quality Objectives in Scotland currently in place is shown in Table C2.3.

Table C2.3: Air Quality Objectives in Scotland (Air Quality in Scotland, 2021)

Pollutant	Air Quality Objective	
	Concentration	Measured as
Nitrogen dioxide (NO_2)	200 µg/m3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m3, not to be exceeded more than 7 times a year	24-hour mean
	18 µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean
Sulphur dioxide (SO_2)	350 µg/m3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m3, not to be exceeded more than 35 times a year	15-minute mean
Benzene	3.25 µg/m^3	Running annual mean
1,3 Butadiene	2.25 µg/m^3	Running annual mean
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean
Lead	0.25 µg/m^3	Annual mean

2.3.13 In June 2020 Argyll and Bute Council published the 2020 Air Quality Annual Progress Report (APR), which set out that air quality in Argyll and Bute is considered to be generally very good and complies with all the air quality objectives for Scotland. Modelling results for sources of nitrogen dioxide and fine particulates in the APR illustrate that background concentrations are very low, with the traffic considered as the main potential source of pollution in the absence of industry hotspots in the region.

2.3.14 The Argyll and Bute APR did not identify any areas where air quality objectives may be under threat and where specific actions required to improve air quality. The Argyll and Bute APR states that: *'Argyll and Bute Council currently does not have any AQMAs and this current and past annual assessments suggest that it will be very unlikely to be necessary to declare any AQMAs in the future based on current air quality objectives'* (Argyll and Bute Council 2020a).

2.3.15 There is no APR available online for the Loch Lomond and The Trossachs National Park. However, the Environmental Report for the Loch Lomond and The Trossachs Local Development Plan (LLTNPA 2016) states that the baseline air quality for the Loch Lomond and The Trossachs National Park is good, with NO_2 and SO_2 levels monitored by the local authorities found to be well below the risk levels of national standards. Key local development plan considerations for maintaining and improving air quality are:

- Maintaining good air quality by encouraging clean home heating, reducing energy consumption, and encouraging sustainable development; and
- Reducing transport emissions.

2.4 Evolution of Baseline and Trends

2.4.1 Air quality in Scotland has improved considerably over the last few decades. However, environmental trends suggest that, without mitigation, concentrations of air pollution may increase in the future, particularly in urban or industrial areas. Climate changes, such as higher humidity, could also potentially exacerbate the risks of worsening air quality to human health.

2.4.2 While poor air quality may be a national concern in the coming years, based on the above information from the Argyll and Bute Council and Loch Lomond and The Trossachs National Park Authority, air quality is not a key concern for the region in the foreseeable future.

2.5 Assessment

Construction

2.5.1 During construction of any of the possible route options it is expected that there would be short-term, temporary, localised effects on the 14 receptors within the route corridor and potentially outwith the route corridor extents due to the nature of construction activities. Changes in air quality could arise as a result of dust generated from site activities and emissions from vehicular movements to and from the site, which could result in annoyance for local residents. At this stage it is not possible to differentiate between effects on individual receptors but generally it is expected that those situated closest to the alignment would be impacted the most.

2.5.2 In general, construction of structures is associated with activities such as tunnel boring and extensive movement of materials, which has potential to generate increased dust emissions. Bridge or viaduct structures would be required for all five possible route options, and tunnels would be required for the Pink Route Option and Purple Route Option. The potentially extensive earthworks associated with the Yellow Route Option and the Green Route Option could also generate increased dust emissions. The difference in potential construction dust impacts between the route options would depend on the volume of material being moved, which is not known at this stage.

2.5.3 The Brown Route Option largely follows the existing road alignment and while a debris shelter and viaduct would be required, it is expected that these activities would be of a lesser extent and duration than the tunnels and earthworks associated with the other possible route options. There is potential for the Brown Route Option to have the least construction dust impacts of all five possible route options.

2.5.4 An assessment of the level of pollutant emissions generated from construction traffic would utilise data relating to the potential number of vehicles required to facilitate construction for each possible route option, which is not known at this stage. However, the Brown Route Option could require fewer vehicle trips and result in lower emissions, as the activities required to facilitate its construction would potentially be of a lesser extent and duration than the other route options.

2.5.5 It is expected that adherence to appropriate guidance and legislation and adoption of best practice and standard construction mitigation measures would reduce the significance of these negative impacts.

Operation

2.5.6 The operational assessment considers the air quality SEA objective and guide questions in relation to the baseline described above and is detailed in Table C2.4. The possible route options within the route corridor are not considered to provide significant differentiation for air quality effects during operation; however, the possible route options are referred to where there is potential for slight variations of impact. At this stage it is not possible to differentiate between effects on individual receptors but generally it is expected that those situated closest to an alignment would be impacted the most.

Table C2.4: Air Quality assessment using SEA Objectives and Guide Questions

Air Quality SEA Objective	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Route Corridor Assessment
Reduce all forms of transport-related air pollution and improve air quality	Encourage and facilitate the use of active travel, particularly for short journeys?	Active travel is an important consideration in design development and provision for non-motorised users (NMUs) will be incorporated into the project design at subsequent DMRB stages. There exists an opportunity to positively impact on the level of active travel undertaken within the route corridor through integration of pedestrian and cycle paths within the project design. While there is the potential for local trips to be made via active modes, and for additional trips to be generated resulting from increased use of the infrastructure provided by visitors and tourists. However, due to the rural location and generally strategic function of the A83 route, it is unlikely that the future level of active travel trips within the route corridor would be significant. Additionally, the route corridor provides a potential opportunity for the provision of enhanced parking facilities, improving access to the scenic area within which the route corridor is located. This could provide enhanced access to the natural environment for those wishing to park and proceed via active modes.
	Help to reduce traffic congestion?	The A83 has relatively low traffic flows (see Table C2.2) and is not considered a congested route, despite seasonal fluctuations in flows due to tourism. The project is likely to constitute a S2 carriageway[2], and the higher desired speeds associated could potentially lead to greater levels of conflicts during 'summer' periods between vehicles i.e. cars vs campervans. Additionally, should the improvement involve a tunnel such as that proposed for the Purple Route option and Pink Route

[2] Standard single carriageway cross section with one lane in each direction and hard strips adjacent to the running lanes.

Air Quality SEA Objective	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Route Corridor Assessment
		option, it is not unreasonable to assume a speed limit, lower than the national speed limit for a S2 carriageway, would be enforced. These factors could lead to platooning[3] and driver frustration. However, any periods of congestion would be likely to be seasonal and not significant. Any increase in traffic emissions resulting from congestion are not expected to be at a level that would impact on air quality. A key driver of the project is the need for an efficient and resilient route linking Argyll and Bute with the central belt of Scotland. In recent years, closures at the Rest and Be Thankful has forced vehicle travellers to follow diversions up to 59 miles long (if the Old Military Road diversion route is not operational), resulting in increased emissions. Implementation of the project would remove the need for these diversions and therefore reduce emissions across the road network as a whole.
	Help to limit polluting traffic growth?	The project will provide improved, more resilient road infrastructure that brings opportunities to increase public transport provision along the route, particularly for buses. However, it is considered unlikely that this route corridor would have any significant impact on public transport usage due to the nature of the route corridor and the areas within which it is located. The A83, at the Rest and Be Thankful, carried approximately 4,500 vehicles per day in 2019, of which around 400 (9%) were HGVs. Given the enhanced connectivity and resilience provided by the improvement, it is not unreasonable to assume an increase in traffic volumes, primarily relating to summer tourism and enhanced business confidence, could follow, albeit at a relatively low level. Through the improvement in resilience provided as a result of the mitigation of landslide induced closures, there may be greater opportunities for residents of Argyll & Bute to transition from a petrol/diesel car to an electric vehicle, due to enhanced certainty regarding travel distances. Similar impacts could be realised for the transportation of road-based freight, and for visitors/tourists accessing the region by private car, the result of which could be lower emissions and improved air quality. While the improvement could result in a potentially limited level of induced demand (due to the enhanced connectivity provided), as a consequence of the likely timescales for the delivery of an intervention of this scale, it is expected that there would be a reduction in the number of new petrol and diesel cars and vans on the road network, by this stage. As such, negative impacts related to transport-based emissions and air quality (resulting from induced demand) may be short-lived and largely insignificant.
	Reduce emissions of key air pollutants (NOx, particulates, SO_2) from all forms of transport, but focusing on the most polluting vehicles and areas of known	The route corridor does not pass through any urban areas and there are no AQMAs present within the Argyll and Bute Council area or Loch Lomond and The Trossachs National Park Authority area. The air quality in the route corridor and surrounding area is very good and is expected to remain so in the coming years. The Climate Change Plan Update (Scottish Government 2020) sets out that Scotland will 'phase out' the need for new petrol and diesel cars and vans by 2030

[3] In transportation 'platooning' refers to a group of vehicles being driven together, reducing the distance between them.

Air Quality SEA Objective	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Route Corridor Assessment
	poor air quality, e.g. diesel emissions in urban areas?	at the same time as investing in charging points for electric vehicles and engaging with industry to understand how technology and innovation can help to reduce carbon emissions from HGVs. As outlined above, by the time the project is operational, it is expected that there would be a reduction in the number of new petrol and diesel cars and vans on the road network. In line with current policy, Transport Scotland is rolling out vehicle charging points in conjunction with Local Authorities and private developers in order to support an increase in uptake of electric vehicles, as envisaged in the Scottish Government's Climate Change Plan Update (2020). project
	Promote green infrastructure at all spatial scales, to help remove pollutants from the air?	It is expected that the landscape and ecological planting that would accompany the project would include planting of native/broadleaved woodland species to improve amenity, encourage biodiversity and help to remove pollutants from the air. The project planting would be complementary to the intended planting at the Rest and Be Thankful, which is expected to be implemented in 2021. The project has potential to promote the green infrastructure of the landscape in which it is situated. As detailed above, the Rest and Be Thankful is a popular parking location for tourists and the project is expected to improve parking facilities and encourage appreciation of the natural beauty of the area. There are opportunities for the new parking facilities to incorporate green infrastructure – for example, by providing electric vehicle charging points and using natural terrains to reintroduce biodiversity. Further details on landscape and ecological planting is provided in Appendix C (Section 9: Landscape and Visual Amenity).

2.6 Inter-relationships with other SEA topics

2.6.1 Table C2.5 presents the inter-relationships identified between air quality and the other SEA topics.

Table C2.5: Inter-related SEA topics

SEA Topic	Relationship with Air Quality
Climatic Factors	Air quality and climate change are inherently linked. Extreme weather events as a result of climate change can negatively impact air quality. For example, during heat waves, areas of high pressure create stagnant air that concentrates air pollutants in one area, and dry, dusty air during hot weather periods increases the level of particulate pollution. It is not expected that the project would result in an inter-relationship between air quality and climate change that would result in significant effects.
Population and Human Health	The link between air pollution and poor health has been set out in this assessment and is also discussed in Appendix C (Section 3: Population and Human Health). There is potential for inter-relationships to arise with air quality and other population effects; for example, noise and vibration, visual impacts, or impacts on accessibility. A combination of impacts arising as a result of the project has the potential for cumulative effects on population receptors; such effects will be considered throughout design development, and reduced where practicable through route alignment and appropriate mitigation measures.

SEA Topic	Relationship with Air Quality
Biodiversity	In relation to ecological receptors, air pollution can impact on the functioning of ecosystems; for example, the growth of trees and other fauna can be affected by acid and nitrogen deposition and sulphur dioxide. Air quality effects in relation to biodiversity are discussed in Appendix C (Section 5: Biodiversity).

2.7 Conclusions

2.7.1 Table C2.6 sets out a summary of the potential effects on air quality identified at the SEA stage.

Table C2.6: Summary of Effects on Air Quality

Source of Air Quality Effect	Potential Effect Description	Effect Duration	Scoring Criteria
Construction activities	Dust generated from site activities and emissions from vehicular movements to and from the site resulting in annoyance for local people and a localised reduction in air quality.	Short-term, temporary	Minor negative or uncertain effect
Operational vehicle emissions	Pollutant emissions generated by vehicles using the road, resulting in a reduction in air quality.	Uncertain	Minor negative or uncertain effect

2.7.2 As shown in Table C2.6, there is potential for the project to have a **short-term, minor negative effect** on air quality in the local area during the construction phase. However, there are very few sensitive air quality receptors in the route corridor and it is expected that any negative effects that may arise would be largely mitigatable through construction environmental management planning and best practice.

2.7.3 As shown in Table C2.6, **a minor negative or uncertain effect** is anticipated for air quality at SEA level from the project during its operation. The duration of potential operational effects is uncertain at this stage. Further assessment of potential air quality effects and identification of appropriate mitigation measures for construction and operation of the project would be outlined at DMRB Stages 2 (route options appraisal) and DMRB Stage 3 (preferred route option design and Environmental Impact Assessment).

2.7.4 In relation to the overarching Air Quality SEA Objective to '*Reduce all forms of transport-related air pollution and improve air quality*', during operation the project would not inherently reduce all forms of transport-related air pollution and improve air quality. However, air quality in the Argyll and Bute region is already very good and it is considered it is likely that the current standards would be maintained with the project in place.

2.7.5 Given the enhanced connectivity and resilience provided by the improvement, it is not unreasonable to assume an increase in traffic volumes, primarily relating to summer tourism and enhanced business confidence, could follow, albeit at a relatively low level. Opportunities exist to increase electric vehicle uptake in the region through improved route resilience and provide green infrastructure to enhance air quality as part of the project. Any negative impacts related to transport-based emissions and air quality (resulting from induced demand) are expected to be short-term and unlikely to be significant.

2.8 Design Development, Mitigation and Enhancement Recommendations

2.8.1 Table C2.7 sets out the SEA recommendations in relation to air quality mitigation and enhancement.

Table C2.7: Potential mitigation, enhancement, and design recommendations in relation to Air Quality

Mitigation / Enhancement / Monitoring Measure	Stage of Implementation (e.g. DMRB Stage 2, DMRB Stage 3)	Responsible Party for Implementation / Monitoring of Measure	Consultation/ Approvals Required
Adopt construction and traffic management methods which, as far as practicable, reduce dust and pollutant emissions. This information is to should be included in Construction Environmental Management Plans (CEMPs).	Construction	Contractor To be monitored through implementation of construction environmental management plans.	Consultation with Argyll and Bute Council and LLTNPA
Explore integration of green infrastructure in project design (for example at the Rest and Be Thankful parking facilities)	DMRB Stage 2 DMRB Stage 3	Designer To be monitored by Transport Scotland during subsequent DMRB stages.	Consultation with Argyll and Bute Council and LLTNPA

2.9 References

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