Appendix C: Population and Human Health - Detailed Baseline and Assessment

3. Population and Human Health

3.1 Introduction

3.1.1 This section assesses the potential impacts of the project on the local and wider population in terms of human health, deprivation, social inclusion, rural affairs, tourism and recreation, and safety.

3.1.2 While air quality is explored as a standalone topic in Appendix C (Section 2: Air Quality), this section also makes reference to the potential for air quality effects in relation to human health.

3.2 Methodology

3.2.1 The assessment has been undertaken using a qualitative approach and professional judgement in relation to the SEA objectives and guide questions for Population and Human Health, and the assessment scoring criteria set out in Chapter 6 (SEA Approach and Methods).

3.2.2 The study area for the assessment is focused on the population within the route corridor, as well as the wider context of the Argyll and Bute region. The assessment baseline has been informed by a desk-based study of publicly available sources and mapping data, including (but not limited to):

- ProjectMapper (a GIS mapping tool) and AddressBase data;
- Scottish Index of Multiple Deprivation (SIMD) 2020;
- National Records of Scotland and 2011 Scottish Census data;
- Scientific literature in relation to human health; and
- Relevant national and local development plans and strategies.

3.2.3 Table C3.1 sets out how the sub-topics considered for the assessment and how these relate to 'population' and 'human health'.

Table C3.1: Inter-relationships between Population and Human Health sub-topics

Topic	Sub-Topic	Scope
Population	Deprivation	Considers how the project may result in a positive or negative effect on deprivation and inequality for the population within the route corridor and wider Argyll and Bute region, with reference to the Scottish Index of Multiple Deprivation (SIMD) (linked to **Human Health**).
	Social Inclusion	Considers how the project may result in a positive or negative effect on social inclusion for the population (considering connectivity and access to services) within the route corridor and wider Argyll and Bute region (linked to **Human Health**).
	Tourism	Considers how the project may affect tourism in the route corridor and Argyll and Bute region, resulting in positive or negative economic and social effects on the population.
	Recreation	Considers how the project may have a positive or negative effect on recreation in the route corridor and wider Argyll and Bute region, either by encouraging or preventing opportunities to access to the outdoors for recreational purposes (linked to **Human Health**).
	Rural Affairs	Considers how the project may have a positive or negative effect on agricultural activities within the route corridor and wider Argyll and Bute region.
	Safety	Considers how the project may have a positive or negative effect on safety for road users in the route corridor and wider Argyll and Bute region (linked to **Human Health**).
Human Health	Air Quality	Considers how the project may have a positive or negative effect on air quality in the route corridor and wider Argyll and Bute region, resulting in human health effects for the population.

Topic	Sub-Topic	Scope
	Noise and Vibration	Considers with how the project may have a positive or negative effect on noise and vibration in the route corridor and wider Argyll and Bute region, resulting in human health effects for the population.
	Climate (Flooding)	Considers with how the project may have a positive or negative effect on climate on a global scale and the potential for increased likelihood of flood events in the route corridor and wider Argyll and Bute region, and resulting effects on the population and human health.
	Access to Outdoors	Considers with how the project may have a positive or negative effect on providing access to outdoor spaces and the path network in the route corridor and wider Argyll and Bute region, and how this may result in effects on human health (linked to **Social Inclusion**).

3.2.4 Accessibility has been considered under the 'social inclusion' topic with cognisance of Transport Scotland's Scottish Transport Appraisal Guidance (STAG) criteria (2008, 2014), which includes the following:

- Community Accessibility – including consideration of public transport network coverage and access to local services.
- Comparative Accessibility – concerning the distribution of accessibility impacts by people group and by location.

3.2.5 Cognisance has also been given to Design Manual for Roads and Bridges (DMRB) guidance LA 112, 'Population and Human Health', though the SEA necessarily adopts a more high-level, strategic approach.

3.2.6 The potential effects on population and human health have been assessed using the scoring criteria defined in Table C3.2.

Table C3.2: Assessment Criteria for Potential Effects on Population and Human Health

Score	Description	Colour coding and symbol
Minor positive effect	The route corridor has potential for a positive effect on population/human health receptors through providing opportunities and enhancements.	+
Minor negative or uncertain effect	The route corridor has potential for a minor negative or uncertain effect on population/human health receptors.	-
Significant negative effect	The route corridor has potential for a significant negative effect on population/human health receptors.	--

Limitations to Assessment

3.2.7 As outlined in paragraph 3.2.2, the health profile created for the people living within the route corridor is based on data gathered from secondary sources. However, baseline data was not available for the same geographic region for each of the parameters assessed. As a result, the baselines have been informed by a combination of data available for the both the communities within the route corridor and surrounding areas, and the Argyll and Bute region as a whole.

3.2.8 It should also be noted that this assessment does not consider the implications of the ongoing Covid-19 pandemic on the population and health baselines and on trends for the people living within the route corridor and surrounding areas, as this information is currently unknown.

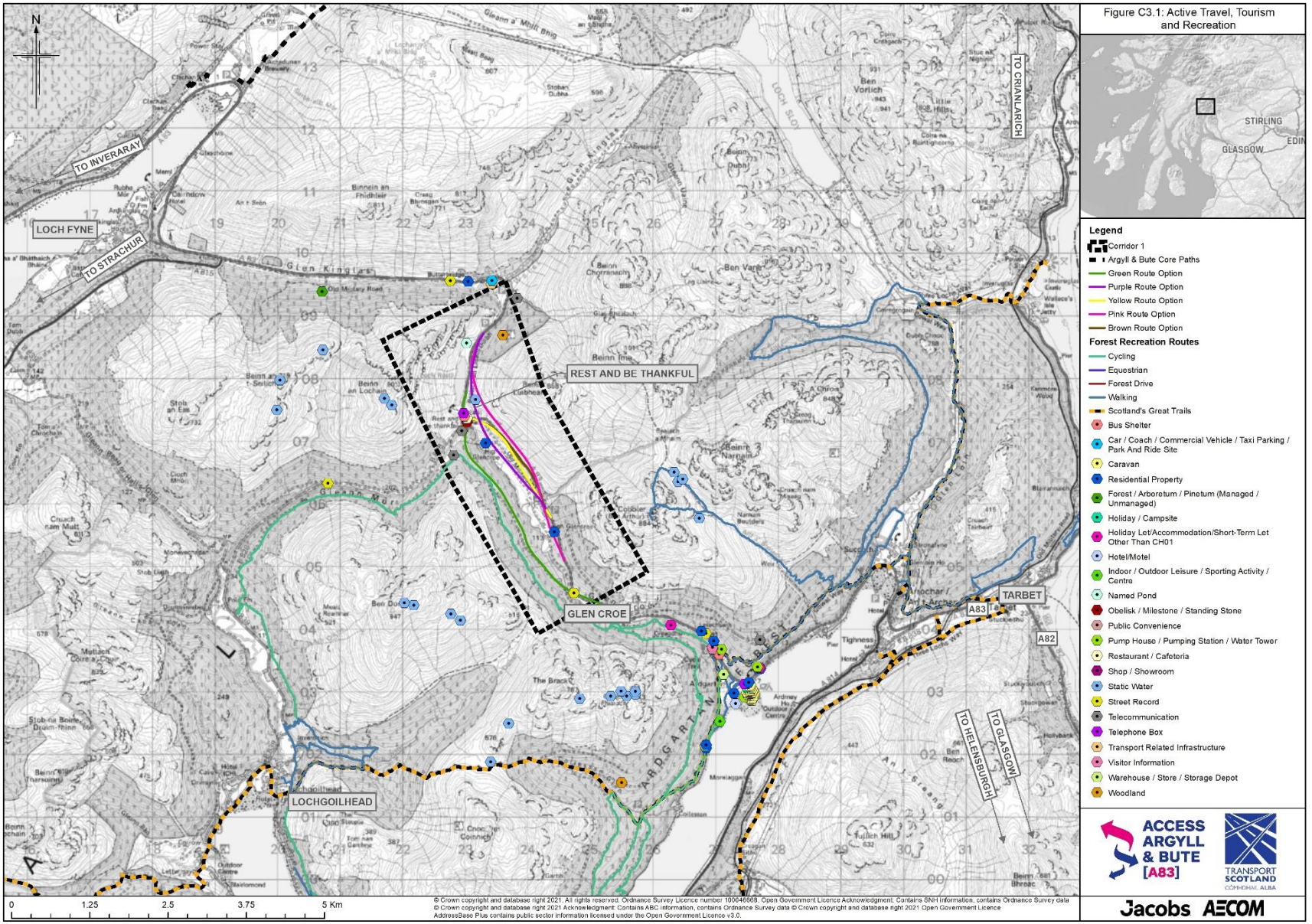


Figure C3.1: Active Travel, Tourism and Recreation

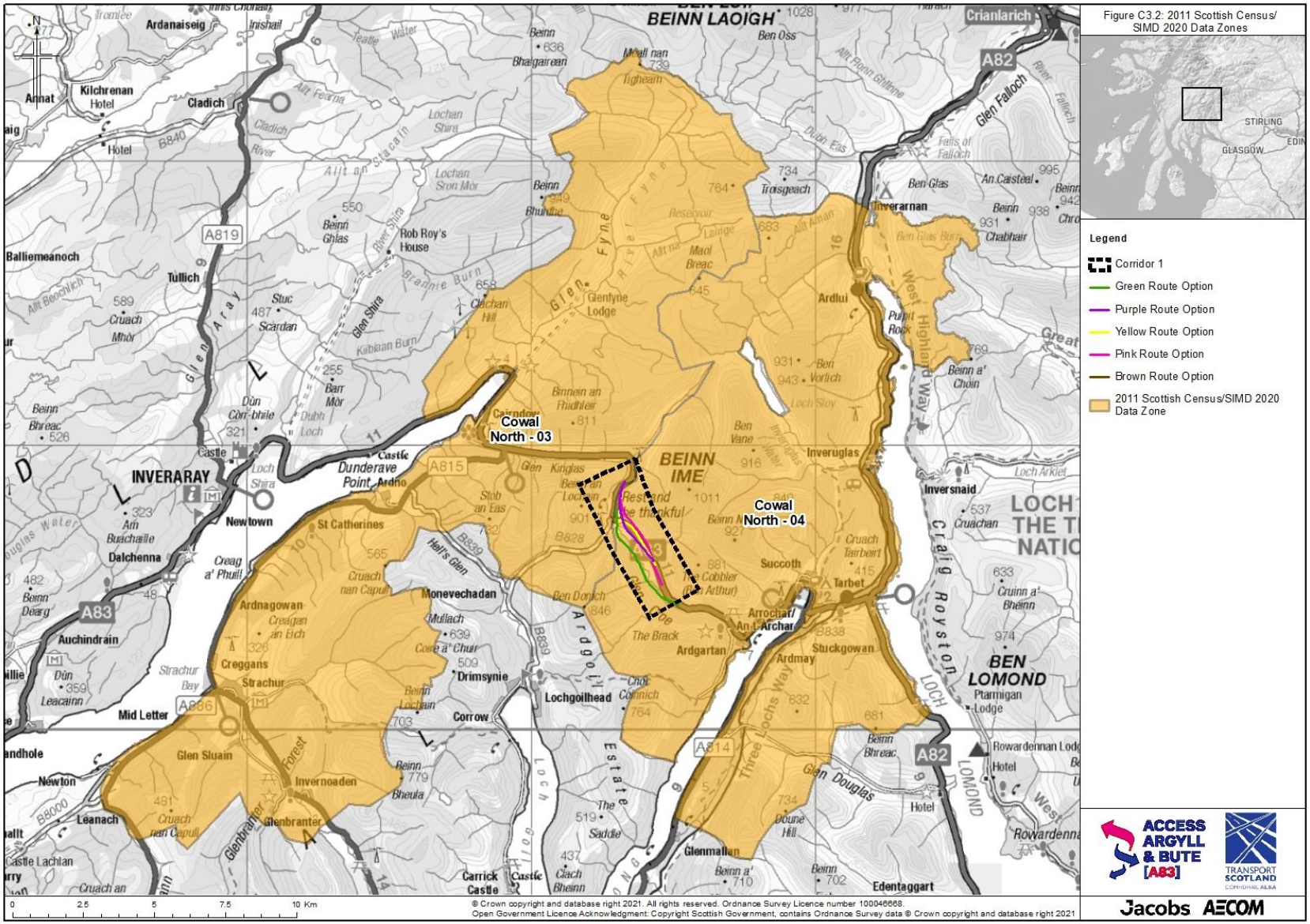


Figure C3.2: 2011 Scottish Census / SIMD 2020 Data Zones

3.3 Detailed Baseline

Overview

3.3.1 Argyll and Bute Council area had a population of 85,870 in 2019 (National Records of Scotland 2019a). The largest settlement in Argyll and Bute is Helensburgh, which has a population of approximately 15,610 (National Records of Scotland 2016). Argyll and Bute experienced a population decline between 2018 and 2019, in contrast with the national population growth during the same time period. At a decrease of 0.5%, this decline was the greatest amongst Scotland's 32 local authorities. As with Scotland as a whole, Argyll and Bute Council area has an ageing population, with the percentage of those aged 65 and over increasing by 18% between 2009 and 2019 (National Records of Scotland 2019a).

3.3.2 The proposed route corridor is rural in nature, with no population centres located within it or within its immediate vicinity. There are 14 receptors located in the route corridor which could potentially be impacted by the project, including two residential properties. These receptors are shown on Figure C3.1, in addition to further receptors located within the immediate and wider vicinity of the route corridor.

3.3.3 The proposed route corridor is located within two 2011 Scottish Census and Scottish Index of Multiple Deprivation 2020 data zones (referred to as 'Cowal North – 03' and Cowal North – 04', as shown on Figure C3.2. These data zones have been used to inform the baseline for the population and human health assessment by providing data and context regarding the population residing within the route corridor and surrounding areas.

Population

Deprivation

3.3.4 People living in deprived areas in Scotland are more likely to die early from disease and have more years of ill health (Public Health Scotland 2019). The Scottish Burden of Disease Study Deprivation Report (2016) notes that more deprived areas have double the rate of illness or early death than less deprived areas, that people living in Scotland's wealthiest areas are more likely to live in ill health than die prematurely due to ill health, and that the number of years of life affected by ill health are much fewer (Public Health Scotland 2019). Those living in deprived areas are also more vulnerable to the effects of environmental change due to the prevalence of pre-existing health problems and inequities amongst these communities.

3.3.5 The Scottish Index of Multiple Deprivation (SIMD) 2020 is a tool used to identify areas where poverty and inequality exist within Scotland to allow targeted investment in these areas. Scotland's data zones are ranked from most to least deprived using 38 different indicators of deprivation across seven 'domains' comprising of income; employment; health; education, skills and training; geographic access to services; housing and crime (Scottish Government 2020c).

3.3.6 Of Argyll and Bute's 125 data zones, 13 were identified as being amongst the 20% most overall deprived data zones in Scotland (Argyll and Bute Council 2020). Under the geographic access to services domain, which considers access deprivation in terms of drive times and public transport times to a selection of basic services such as schools, GP surgeries, retail centres and petrol stations, 52 of Argyll and Bute's data zones were identified as being within the 20% most access deprived data zones in Scotland (Argyll and Bute Council 2020).

3.3.7 The route corridor is partially located within two of Argyll and Bute's SIMD 2020 data zones, 'Cowal North – 03' and 'Cowal North – 04', which cover the same geographical area as the 2011 Scottish Census data zones as shown on Figure C3.2.

3.3.8 Both SIMD 2020 data zones are identified as being within the 60% and 70% least overall deprived areas in Scotland respectively (Scottish Government 2020d). However, both data zones perform poorly under the geographical access domain, with both identified as being within the 10% most deprived areas in Scotland under this measurement (Scottish Government 2020d).

3.3.9 In addition, according to the Scottish Public Health Observatory (ScotPHO), 9.8% of those living in Argyll and Bute are income deprived compared with 12.0% of the overall Scottish population (ScotPHO 2021). Similarly, 8.0% of Argyll and Bute's working age population are employment deprived compared with 9.3% nationally (ScotPHO 2021). However, the unemployment rate for 16 to 24-year olds is higher amongst the Argyll and Bute population, at 66.8% compared to the national rate of 57.9% (ScotPHO 2021).

Social Inclusion

3.3.10 The Charity Commission notes that the term 'social inclusion' is often used to describe the opposite effect to 'social exclusion', and typically results from positive action taken to change the circumstances and habits that lead to social exclusion, such as enabling people or communities to fully participate in society (Charity Commission 2001).

3.3.11 Social exclusion can therefore be defined as '*being excluded from society, or parts of society as a result of one or more factors*' such as unemployment, financial hardship, youth or old age, ill health (physical or mental), poor housing or poor educational or skills attainment (Charity Commission 2001).

3.3.12 Rural communities typically experience greater levels of social exclusion due to limited access to resources and key services. In particular, access to integrated transport infrastructure is a key issue within rural communities. Increasing connectivity between modes of transport can provide a number of benefits, such as reducing congestion and supporting more sustainable modes of transport. Green infrastructure provided as part of transport improvements can also provide active travel networks and increase accessibility and connectivity.

3.3.13 In addition, barriers to accessing healthcare is an influencing factor for causing health inequalities. The lack of an integrated public transport infrastructure, its high cost or an inadequate public transport service act as barriers to those on lower incomes. In certain areas, accessing healthcare facilities can also be difficult. In the rural regions, there is greater reliance on private vehicles due to a lack of regular public services and road travel being the only method of transport.

3.3.14 The Scottish Government Urban Rural Classification defines urban and rural areas across Scotland according to two key criteria:

- population (as defined by the National Records of Scotland (NRS) and categorised into subgroups ranging from 'Large Urban Areas' to 'Very Remote Rural Areas' based on population size); and
- accessibility (based on drive time analysis to differentiate between accessible and remote areas).

3.3.15 The Urban Rural Classifications of Scotland and the Argyll and Bute Local Authority area are shown in Table C3.3.

Table C3.3: 8-fold Urban Rural Classifications of Scotland and Argyll and Bute (Scottish Government 2018b)

Location		Percent of population in each 8-fold Urban Rural category						
	Large Urban Areas	Other Urban Areas	Accessible Small Towns	Remote Small Towns	Very Remote Small Towns	Accessible Rural	Remote Rural	Very Remote Rural
Scotland	34.6	36.2	8.5	2.3	1.2	11.2	3.2	2.8
Argyll and Bute	0.0	17.9	4.2	0.0	30.6	4.2	5.4	37.6

3.3.16 According to the above data, 68.2% of Argyll and Bute's population lives in very remote areas, i.e. areas that are more than a 60-minute drive time from a Large or Urban Area. At present, the route corridor includes the A83 Trunk Road, one B class road (B828) and six unclassified roads/direct accesses. Table C3.4 details the average drive time to various amenities and services in the two data zones which the route corridor passes through.

Table C3.4: Travel-based Indicators of Access to Services for SIMD 2020 Data Zones within the Route Corridor and Scotland as a whole (Scottish Government 2020d)

SIMD 2020 Data Zone	Average drive time (minutes) to								
	Petrol	GP surgery	Post office	Primary school	Retail centre	Secondary school	GP surgery (via public transport)	Post office (via public transport)	Retail centre (via public transport)
Scotland	3.9	3.6	2.9	3.0	5.3	6.1	10.5	8.9	13.5
Cowal North – 03	4.0	4.6	2.3	5.7	25.0	28.0	15.9	11.3	41.8
Cowal North – 04	3.6	3.5	2.7	4.9	26.6	26.7	12.9	7.8	45.0

3.3.17 The data in Table C3.4 indicate that the average drive times to petrol stations, GP surgeries and post offices in the two relevant data zones are relatively similar to the national average, while the average drive time to primary schools in these areas of Argyll and Bute is slightly longer. However, there are significant differences in the average drive times to retail centres and secondary schools in the specified data zones. Indeed, travel to retail centres and secondary schools takes approximately 4.7 times and 4.6 times longer in 'Cowal North – 03', and approximately 5 times and 4.4 times longer in 'Cowal North – 04' when compared to the national average.

3.3.18 In addition, using public transport as a means of travel results in moderately longer average drive times to GP surgeries in both data zones, and to post offices in 'Cowal North – 03'. Notably, travelling to retail centres via public transport takes approximately 3.1 times and 3.3 times longer in 'Cowal North – 03' and 'Cowal North – 04' respectively when compared to the national average of 13.5 minutes. Three bus routes currently serve the route corridor: Scottish Citylink service number 926 (which connects Glasgow to Campbeltown), Scottish Citylink service number 976 (which connects Glasgow to Oban) and Garelochhead Coaches service number 302 (which connects Helensburgh to Carrick Castle). The closest train station to the route corridor is Arrochar and Tarbet, which is on the Glasgow to Oban service operated by Scotrail.

3.3.19 Ofcom's Connected Nations 2020 Scotland report found that 180,000 homes, or 94% of residential premises, in Scotland have access to a superfast broadband connection (at least 30Mb/s download speed) (Ofcom 2020). However, significant differences in the availability of superfast broadband in urban and rural areas persist, with 98% of residential premises in urban areas having access compared to 72% in rural areas (Ofcom 2020). Of Scotland's 32 local authority areas, Argyll and Bute has the fourth lowest proportion of residential premises with access to superfast broadband at 79% (Ofcom 2020). Further, the SIMD 2020 data for access to services indicates that the proportion of residential premises with access to superfast broadband within the route corridor is even lower, with 59% and 77% of premises in the 'Cowal North – 03' and 'Cowal North – 04' data zones possessing access respectively (Scottish Government 2020d).

3.3.20 Historically, Argyll and Bute has also had unreliable geographic mobile phone coverage, with 3G and 4G coverage limited to the region's larger settlements. However, pressure from the public sector has resulted in major improvements in 4G coverage in the area in recent times, particularly along major roads (Argyll and Bute Council 2019). Image C3.1 shows the availability of mobile voice coverage in the vicinity of the route corridor.

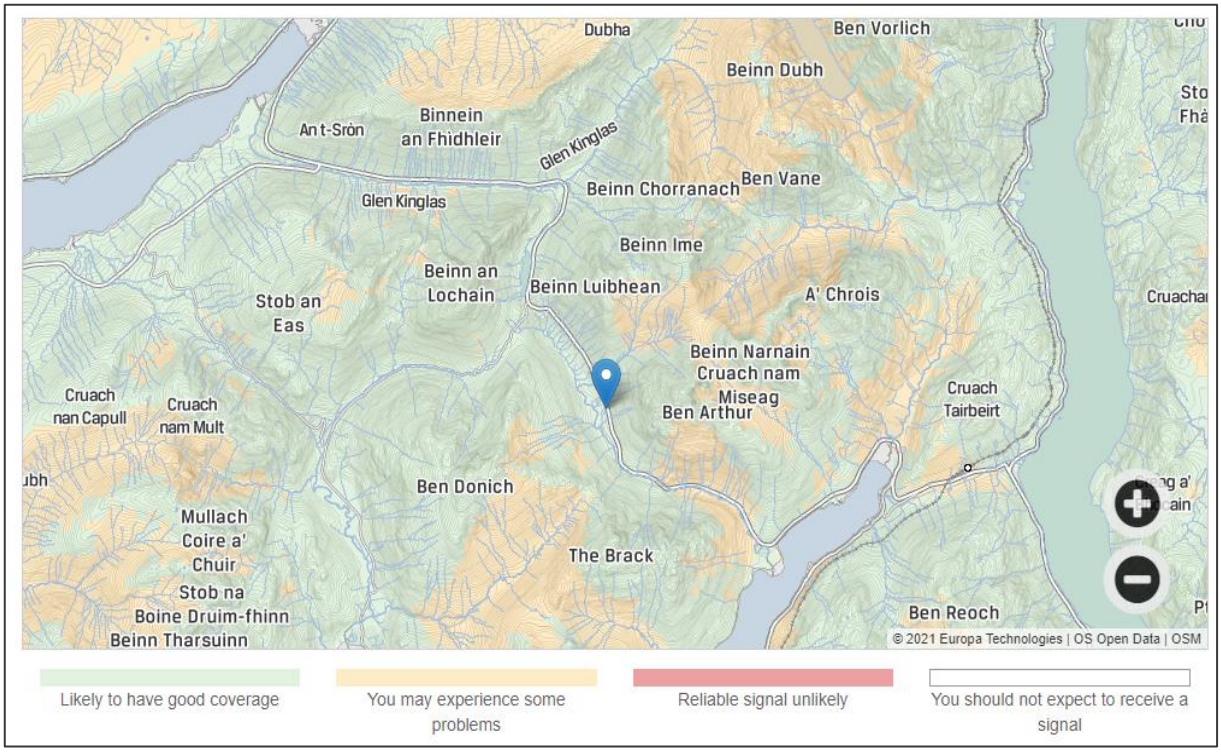


Image C3.1: EE mobile voice coverage in vicinity of the route corridor (Ofcom 2021)

3.3.21 Throughout the ongoing Covid-19 pandemic, Argyll and Bute has experienced fewer cases and deaths when compared with other local authorities in Scotland. This is likely due to the geographic context of Argyll and Bute as set out in Table C3.3 and Table C3.4. Indeed, a study undertaken by Public Health Scotland found that more remote and rural areas were associated with having fewer Covid-19 related deaths (Public Health Scotland 2020).

3.3.22 While there have been indications of adaptation throughout the pandemic (e.g. reductions in anxiety levels), links have also been made between increased mental distress and a range of factors related to social isolation, such as loneliness, childcare, home schooling and working from home (Scottish Government 2020b). It is anticipated that there will be a worsening incidence of mental health disorders throughout Scotland, with the rates of traumatic reactions, substance misuse, self-harm and suicide all expected to increase (Scottish Government 2020b). Furthermore, studies have shown that some population groups are more at risk of experiencing negative mental health impacts due to Covid-19, including younger adults, women, those living on low incomes and individuals with pre-existing mental health conditions (Scottish Government 2020b). There is also growing evidence that interventions such as social distancing and school closures may have an adverse effect on the mental health and wellbeing of children. Traumatic experiences of Covid-19 in hospitals and care homes could also potentially lead to mental health problems, such as post-traumatic stress disorder (PTSD) for patients, residents, family members, healthcare workers and staff. However, the long-term secondary effects of Covid-19 on health and wellbeing are currently unknown.

Tourism and Recreation

3.3.23 Tourism is one of Argyll and Bute's most important sectors, contributing almost £480 million to the local economy and providing essential employment in some of the area's most geographically challenged communities, including its 23 inhabited islands (Argyll and Bute Council 2019). Indeed, tourism represents 15% of total employment in Argyll and Bute compared with the national average of 8% (Scottish Government 2018a). Similarly, the share of employment in the sustainable tourism sector is over 30% higher in Argyll and Bute than the Scottish economy as a whole, clearly demonstrating the area's reliance on tourism as an employer (Scottish Government 2018a).

3.3.24 While there are limited options for water-based recreational activities within the route corridor, the A83 provides access to Loch Fyne which provides opportunities for such activities.

3.3.25 Woodland and forests also provide opportunities for recreation and tourism. In Argyll and Bute, several woodlands located close to settlements are regularly used for recreational purposes, including Bishop's Glen, Duchess Wood, Dunollie woodlands and Kilmory Woodland Park (Argyll and Bute Council 2011). Nationally renowned gardens and arboreta also attract significant numbers of visitors to the area each year, and the enjoyment of Argyll and Bute's woodlands is a quintessential part of the tourism experience (Argyll and Bute Council 2011). Access to woodlands and outdoor green space provide opportunities for people to experience and enjoy nature regularly, which is important for human health and quality of life.

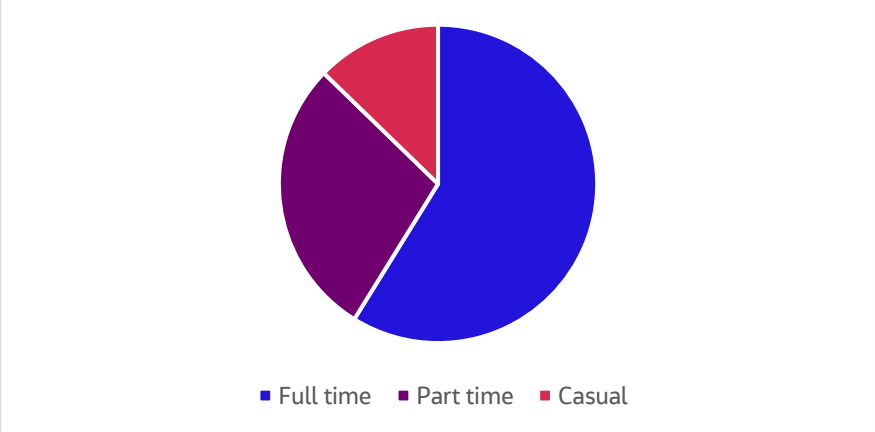
3.3.26 The majority of the route corridor is located within Loch Lomond and The Trossachs National Park, offering ample opportunity for a range of recreational activities such as climbing, cycling, hiking, mountain biking, camping and long-distance walking (Loch Lomond and the Trossachs National Park Authority (LLTNPA) 2013). An LLTNPA core path traverses the west of Croe Water through the centre of the route corridor and continues west at the Rest and Be Thankful. Loch Restil, located within both the route corridor and the National Park, offers further opportunities for water-based recreational activities such as angling. Sections of the Argyll Forest Park are also located within the route corridor, including a large stretch to the west of the A83 which encompasses part of the Ardgartan Peninsula Circuit, a forest recreation cycling route. In addition, the section of the A83 trunk road within the route corridor is a popular hill climb route for cyclists to the Rest and Be Thankful site. There are also several Corbetts and Munros popular with hill walkers within the route corridor, including Ben Arthur (The Cobbler), Beinn an Lochain, Ben Donich and Beinn Luibhean, with the Ardgartan Peninsula Circuit providing access to the base of Ben Donich.

3.3.27 As shown on Figure C3.1, there are 14 population receptors located within the route corridor which could potentially be affected by the project. The majority of these receptors are located near the A83 Rest & Be Thankful and comprise facilities commonly used by tourists and visitors, such as a bus shelter, car park, viewpoint, catering van and telephone box. There is also a car park located immediately outwith the northern extents of the route corridor which is used by tourists and visitors frequenting the area for recreational purposes.

Rural Affairs

3.3.28 In addition to tourism, Argyll and Bute has above average levels of employment in rural-based sectors such as agriculture, forestry and fishing, with 6% of the population employed in these sectors compared to 2% in Scotland overall (Argyll and Bute Council n.d.). Diagram C3.1 illustrates the working patterns of those employed in the agriculture sector in the area.

Diagram C3.1: Working patterns of people in agricultural employment in Argyll and Bute (Scottish Government n.d.)



3.3.29 It is estimated that there are 2,000 crofts and farms covering an area of 485,000 hectares in Argyll and Bute, most of which comprise grass or rough grazing (Scottish Government n.d.). The area also has an estimated 8,000 dairy cows, 20,000 beef cows and 440,000 sheep, and 1,200 active farming businesses (Scottish Government n.d.).

3.3.30 Aquaculture also provides opportunities for economic growth and employment in Argyll and Bute, including its most rural and coastal communities; in 2020, Barcaldine Hatchery opened on the shores of Loch Creran near Oban, expanding Argyll and Bute's involvement in the sector. However, a 2019 report produced by Argyll and Bute Council noted that one of the major obstacles facing the growth of aquaculture in the region is the availability of affordable housing for potential employees of the sector. In addition, the report highlighted that challenges regarding digital connectivity, mobile phone coverage and roads networks are also significant albeit resolvable (Argyll and Bute Council 2019).

3.3.31 There are also opportunities for field sports in Argyll and Bute, including deer stalking and shooting.

Safety

3.3.32 Currently, accidents or incidents (e.g. roadworks, landslips, flooding) occurring on any part of the A83 in Argyll and Bute can effectively cut off parts of the region for a period, significantly impacting residents, business and visitors due to the significant length of alternative routes and the travel times involved.

3.3.33 Between 2014 and 2018 three serious road accidents were recorded within the route corridor, with two of these occurring on the A83 and one on the B828. One slight road accident was also recorded on the A83 within the same time period.

3.3.34 Recent landslides on the A83 Rest and Be Thankful also pose a potential safety risk to vehicle travellers along the route. There were four road closures at the A83 Rest and Be Thankful as a result of landslips between October 2018 and September 2020, with three of these occurring in 2020 alone (Scottish Government 2021). The 2020 landslips, which occurred in January, August and September, caused the A83 Rest and Be Thankful to be closed for a total of 2.5, 33.5 and 86.5 days respectively (Scottish Government 2021). In addition, a coach rolled down an embankment as a result of high winds at the A83 Rest and Be Thankful in March 2015 (Lennon and Fedeli 2021). Extreme weather caused by climate change also has the potential to increase the severity and frequency of landslides.

Human Health

Overview

3.3.35 The World Health Organisation (WHO) defines human health as *'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'* (WHO 2020). As such, the baseline for human health within the route corridor is informed by a range of health determinants including life expectancy and the prevalence of long-term health conditions (physical and mental).

3.3.36 Life expectancy data gathered by the National Records of Scotland indicate that life expectancy for both sexes is slightly higher in Argyll and Bute than in Scotland as a whole (National Records of Scotland 2018a, 2018b). Indeed, men and women living in Argyll and Bute have an average life expectancy of 77.9 years and 81.8 years respectively, while men and women living throughout Scotland have an average life expectancy of 77.1 years and 81.1 years respectively. Life expectancy data were unavailable for the two data zones in which the route corridor is located.

3.3.37 As noted in (paragraph 3.3.1), Argyll and Bute and Scotland has an ageing population. Scotland's Census (2011) gathered data on the age demographics of the populations living within the two relevant data zones that fall under-age groups that may be more vulnerable to potential effects on human health (i.e. the young and the elderly). The data indicates that data zone 'Cowal North – 03' has a more elderly population than both Argyll and Bute and Scotland overall, with a higher percentage of people over the age of 65 (Scotland's Census 2021). While 'Cowal North – 04' has an elderly population comparable with Scotland, it is lower than the elderly population of Argyll and Bute as a whole. Both data zones have a smaller proportion of the population aged under 16 than both Argyll and Bute and Scotland (Scotland's Census 2021).

3.3.38 Scotland's Census (2011) data also illustrate the general health profiles of the two data zones in which the route corridor is located. The vast majority of people living in both data zones experience very good, good or fair health, and the percentage of those who experience bad health is comparable or lower than the percentages recorded for Argyll and Bute Council area and Scotland respectively. While the percentage of those who experience very bad health in 'Cowal North – 04' is lower than the percentages recorded for Argyll and Bute Council area and Scotland, the percentage of those experiencing very bad health is higher in 'Cowal North – 03'.

3.3.39 The census data also indicate that the proportion of people in 'Cowal North – 03' reporting specific health conditions is higher than those reported in both Argyll and Bute and Scotland overall. Similarly, the proportion of those reporting 'other' health conditions is higher in 'Cowal North – 03' and lower in 'Cowal North – 04' than in Argyll and Bute and Scotland. The data also indicate that the proportion of those living with no long-term health condition in 'Cowal North – 03' is lower than in Argyll and Bute and Scotland overall, while it is higher in 'Cowal North – 04'.

3.3.40 Data relating to deaths from various diseases which could be influenced by exposure to air pollution were unavailable for the two data zones in which the route corridor is located. However, data show that Argyll and Bute has fewer deaths due to chronic lower respiratory diseases, malignant neoplasm of trachea , bronchus and lung and cerebrovascular disease in comparison to Scotland as a whole, but more deaths due to ischaemic heart disease than the nation overall.

Health Determinants

3.3.41 Health determinants are defined in DMRB LA 112 as the range of *'personal, social, economic and environmental factors which determine the health status of individuals and communities.'* (Highways England et al 2020). The health determinants considered relevant to the project are shown in Table C3.5. Changes to health determinants can affect the health status of different individuals or communities depending on their characteristics and sensitivity to change (Highways et al 2020), as noted in paragraph 3.3.37.

Table C3.5: Health Determinants and Potential Health Effects

Health Determinant	Potential Health Effect
Air Quality	The damaging effects of air pollution on human health are well documented. Particulate matter (PM) as a result of anthropogenic activities, including transport emissions, is of concern to human health. PM is a mixture of solid particles and liquid droplets found in the air which are emitted from a range of sources such as construction sites, fires, power plants and motor vehicles. Potential effects on human health related to exposure to PM in the short-term are as follows: • increased use of medication (e.g. asthma inhalers); • days off work and days with restricted activity; • hospital admission for lung and heart disease; and • risk of death from asthma, chronic obstructive pulmonary disease (COPD) and heart disease (Ramsay 2019). The air quality baseline for the route corridor is provided in Appendix C (Section 2: Air Quality).

Health Determinant	Potential Health Effect
Noise and Vibration	Environmental noise is defined as 'unwanted or harmful outdoor noise creased by human activities, including noise emitted by means of transport, road traffic, rail traffic, and from sites of industrial activity' (Transport Scotland 2018). Noise from transportation is the biggest source of environmental noise in Scotland, and population exposure to environmental noise have been linked to adverse health effects. Annoyance and sleep disturbance are the key direct effects on the population. Evidence also suggests that high levels of noise nuisance and vibration cause by traffic and activities associated with construction works can result in indirect effects such as increased aggression, and impaired communication (WHO 1995). The noise environment within the route corridor is rural and characterised by existing road traffic. Noise monitoring has not been undertaken at this stage.
Climate (Flooding)	Flood maps produced by the Scottish Environment Protection Agency (SEPA) suggest that areas of the existing A83 and Old Military Road within the route corridor may be at risk from flooding from the Croe Water (SEPA 2021). Furthermore, it is anticipated that climate change will exacerbate flood events in the future due to more frequent, high intensity rainfall which can increase the risk of flash flooding from surface water or sewers for inland communities. Flooding has extensive and significant effects on health including injuries, infections, poisoning and greater mental-health problems such as post-traumatic stress disorder (PTSD), depression and anxiety.
Access to Outdoors	Greenspaces, such as parks, the countryside, woodlands, play areas, beaches and riversides, have substantial health and wellbeing impacts. Such spaces can promote both mental and physical health, with studies showing that benefits include, but are not limited to, reduced cardiovascular mortality in adults, lower levels of depression, anxiety and fatigue, and higher birth weight (Public Health England 2020). Furthermore, greenspaces can improve community cohesion, social connectedness and community resilience (Scottish Government 2020a). Opportunities for access to the outdoors within the route corridor are described in (paragraphs 3.3.24 to 3.3.26).

3.4 Evolution of Baseline and Trends

3.4.1 Health is generally improving in Argyll and Bute, with several indicators of poor health (e.g. Chronic obstructive pulmonary disease (COPD) incidence, COPD related deaths, early deaths from cancer and cancer registrations) either falling or remaining unchanged in recent years (ScotPHO 2021). However, mental health issues persist, with suicide rates amongst both males and females increasing in Argyll and Bute in recent years (ScotPHO 2021). Barriers to health equality will persist unless action to remove them is taken – for example, relating to accessing health care services or affordable public transport. Improvements to local and strategic roads, such as those proposed for the Access to Argyll and Bute (A83) project, will be key for ensuring the future reliability of the transport network.

3.4.2 Similarly, efficient route connectivity provided by improvements to local and strategic roads are crucial to improving social inclusion and promoting tourism and recreational opportunities in Argyll and Bute. This will be of particular importance during the reconstruction and rebuilding of the tourism industry following the Covid-19 pandemic, during which time it is anticipated that domestic 'staycations' will increase in popularity amongst Scottish (and UK) tourists (Lennon and Fedeli 2021).

3.4.3 Climate change and associated extreme weather such as flooding of the water environment disrupts the lives of individuals and communities, limiting access to vital services and impacting on the population's physical and mental health; these events are expected to become more commonplace in the future. Existing social and health inequalities could be exacerbated as a result of climate change unless action to prevent this is taken.

3.4.4 At the time of writing, the impact of the ongoing Covid-19 pandemic on the health baseline and trends for Argyll and Bute Council is uncertain, but will be taken into account in future assessments if more information becomes available.

3.5 Assessment

Construction

3.5.1 During the construction phase, there is potential for short-term, temporary, localised noise and vibration effects on the population within the route corridor. Noise nuisance and vibration caused by traffic and activities associated with construction works could result in general annoyance and/or sleep disturbance for local people. Dust generated from construction activities and emissions from vehicles could also result in short-term, temporary, localised, changes in air quality within the route corridor and potential for annoyance for local people. Changes in air quality could also result in potential health issues, particularly for vulnerable groups, i.e. the young, the elderly and people with pre-existing health conditions. Potential construction effects on air quality are discussed further in Appendix C (Section 2: Air Quality).

3.5.2 Increased traffic volumes and construction activities could result in diversions and affect journey lengths for both vehicle travellers and non-motorised users (NMUs) during the construction phase. The amenity of NMU facilities within the route corridor, including the Ardgartan Peninsula Circuit, LLTNPA core path and A83 itself, could also be negatively affected during the construction phase due to increases in noise levels, dust and emissions, and temporary changes to views.

3.5.3 In general, construction of structures is associated with activities such as tunnel boring and extensive movement of materials, which has potential to result in noise nuisance and vibration for local people and 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.

3.5.4 Due to the engineering works and timescales associated with tunnelling, the indicative alignment of the Purple Route Option and Pink Route Option are considered to perform worse than non-tunnelled options in terms of potential impacts on local people from construction activities, such as increased noise and vibration levels, changes in air quality, and journey length/amenity impacts for NMUs. Diversions and the loss of hard shoulder and emergency refuge areas during the construction of the tunnels associated with the Pink Route Option and Purple Route Option could also result in equality effects on those with mobility and confidence issues (e.g. elderly people, people with certain disabilities, young people, and pregnant drivers and passengers).

3.5.5 The potentially extensive earthworks associated with the Yellow Route Option and the Green Route Option could also result in noise nuisance and vibration and generate increased dust emissions. The difference in potential construction noise and vibration and dust impacts between the options would depend on the volume of material being moved, which is not known at this stage.

3.5.6 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 options. It is therefore considered likely that the Brown Route Option would have the least potential construction noise and vibration and dust impacts of all five possible route options. An assessment of the levels of noise and vibration and pollutant emissions generated from construction traffic would utilise data relating to the potential number of vehicles required to facilitate construction for each option, which is not known at this stage. However, it is considered that the Brown Route Option would potentially require fewer vehicle trips and therefore result in lower construction noise and vibration and emissions, as the activities required to facilitate its construction would potentially be of a lesser extent and duration than the other options.

3.5.7 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

3.5.8 Effects on population and human health anticipated from the project during operation are detailed in Table C3.6. This assessment considers the Population and Human Health SEA objectives and guide questions in relation to the sub-topics set out in Section 3.3. The possible route options within the route corridor are not anticipated to result in any significant differentiations in population and human health effects, however they have been referred to in Table C3.6 where there is potential for a slight variation in effect.

3.5.9 Land-take from properties may also be required to facilitate the operation of the route corridor, however the extents of the land required are not yet known at this stage.

3.5.10 Potential effects on air quality during operation are assessed in Appendix C (Section 2: Air Quality).

Table C3.6: Population and Human Health Assessment using SEA Objectives and Guide Questions.

Population and Human Health SEA Objectives	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Relevant Population / Human Health Sub-Topic(s)	Route corridor Assessment
Improve quality of life and human health and increase sustainable access to essential services, employment and the natural environment	▪ Encourage sustainable access to the natural and historic environment?	▪ Access to Outdoors ▪ Tourism and Recreation	The project provides a potential opportunity for the provision of enhanced parking facilities, improving access to the scenic area within which the route corridor sits. This could provide enhanced access to the natural environment (including the LLTNP) for those wishing to park and proceed via active modes. Access to the historic environment could also be enhanced, with the route corridor potentially providing improved access to the Rest and Be Thankful Memorial Stone for tourism and recreational purposes. Improved access to the natural and historic environments could potentially provide health and wellbeing benefits by encouraging local residents and visitors to the area to spend more time outdoors.
	▪ Reduce and avoid community severance or other detriment to existing active travel routes, including maintaining or improving pedestrian crossings?	▪ Tourism and Recreation ▪ Access to Outdoors ▪ Social Inclusion ▪ Deprivation	The project provides the opportunity to enhance linkages to walking and cycling routes and core paths. There also exists an opportunity, through the infrastructure provided, to positively impact on the level of active travel undertaken within the route corridor. 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, it is unlikely, however, that the future level of active travel trips within the route corridor would be significant. As part of the design process, it will be ensured that NMU facilities provided as part of the project address the needs of recreational walkers, cyclists and equestrians, as well as, to a more limited extent in this route corridor, commuters. Enhanced linkages to walking and cycling routes and core paths, and the provision of NMU facilities could potentially provide health and wellbeing benefits for vulnerable groups and the local population by improving and promoting access to nature and other greenspaces, including the LLTNP.
	▪ Improve accessibility to open spaces and the path network for physical recreational purposes?		
	▪ Plan for future capacity of the active travel network, taking into account demographic or other changes?		

Population and Human Health SEA Objectives	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Relevant Population / Human Health Sub-Topic(s)	Route corridor Assessment
	▪ Provide increasing transport choice that meet the needs of the population?		
	▪ Ensure safe and sustainable access for all users to essential services and employment?	▪ Social Inclusion ▪ Deprivation ▪ Safety ▪ Rural Affairs ▪ Tourism and Recreation	Due to the rural nature of the Argyll and Bute region, the distances between key towns and a lack of suitable public transport services (in some areas), car ownership levels are greater than the national average. Due to the current high dependency for travel by car, the scale of accessibility benefits that would be delivered to this main user group within the route corridor include more reliable journeys to employment opportunities, recreation, education and health services located both within and outwith the region. Through reducing road closures, the improved resilience could potentially benefit social inclusion for vulnerable groups and the wider population of the region by enhancing community accessibility, through better, more reliable access to services, both locally and further afield. In addition, the route corridor is expected to support enhanced accessibility to and from developments in the wider region, and may support investment decisions in Argyll and Bute, more generally. The project could potentially contribute to reducing economic and geographic deprivation for currently socially disadvantaged groups through the improvement of accessibility and the enhancement of business confidence driving an associated increase in inward investment and jobs.
	▪ Increase and enhance provision of non-motorised transport, especially walking and cycling links and facilities? ▪ Promote linking up existing or planned new communities through the active travel network?	▪ Access to Outdoors ▪ Tourism and Recreation ▪ Social Inclusion	The project provides the opportunity to enhance linkages to walking and cycling routes and core paths. As part of the design process, it will be ensured that NMU facilities provided as part of the project address the needs of recreational walkers, cyclists and equestrians, as well as, to a more limited extent in the route corridor, commuters.
	▪ Allow for greater journey time reliability?	▪ Social Inclusion ▪ Deprivation ▪ Safety	The resilience provided by the project (i.e. mitigating landslide induced closures and diversions) has the potential to provide bus and coach operators with an opportunity to review their timetables, resulting in more efficient operations and possible changes in service frequency and the number of communities served. Furthermore, it is anticipated that this improved resilience will significantly reduce the variability in bus journey times and likelihood of closures caused by landslides on the A83 Rest & Be Thankful. As a result, the project provides potential for improved community accessibility and social inclusion for the local population. However, as the route corridor is located within the existing

Population and Human Health SEA Objectives	SEA Assessment Guide Questions *'Does the Access to Argyll and Bute (A83) route corridor…?'*	Relevant Population / Human Health Sub-Topic(s)	Route corridor Assessment
			Glen, it is unlikely that the project would result in any significant benefits in terms of journey time savings when compared to the current A83 trunk road at this location.
Reduce noise and vibration associated with the transport network	▪ Reduce noise and vibration on the transport network particularly at sensitive locations?	▪ Noise and Vibration	Given the enhanced connectivity and resilience provided by the project, it is not unreasonable to assume that an increase in traffic volumes, primarily relating to summer tourism and enhanced business confidence, could follow, albeit at a relatively low level. In turn, this could potentially result in an increase in noise and vibration and air quality effects at a localised level. While there are relatively few residential receptors within the route corridor, this could potentially result in negative effects on human health for residents such as general annoyance and/or sleep disturbance.
Promote, invest in, build and maintain infrastructure to support the development of high-quality places	▪ Support the development of places that feel safe to all users?	▪ Safety ▪ Rural Affairs ▪ Tourism and Recreation ▪ Deprivation ▪ Climate	As a result of the enhanced resilience provided through mitigating landslide induced closures and, subsequently, increased business confidence and associated inward investment, the project has the potential to provide a positive contribution towards wider economic impacts within the wider Argyll & Bute region, and provide employment opportunities for socially disadvantaged groups. Further, minor reductions in transport-related casualties could, potentially, be realised as a result of reductions in vehicle kilometres associated with fewer landslide induced road closures and the associated long diversion routes for strategic traffic travelling to and from Argyll and Bute.
Improve safety on the transport network	▪ Reduce the likelihood of transport-related road accidents and casualties?	▪ Safety	Minor reductions in transport-related casualties could, potentially, be realised as a result of the project. With fewer road closures and the associated long diversion routes for strategic traffic travelling to and from Argyll and Bute, the project would result in reductions in vehicle kilometres across the wider road network. It is therefore anticipated that the project would result in a minor positive contribution towards the Scottish Government's Vision Zero road safety target of zero fatalities and injuries on Scotland's roads by 2050 (Transport Scotland 2020).

3.6 Inter-relationships with other SEA topics

3.6.1 Table C3.7 presents the inter-relationships identified between air quality and the other SEA topics.

Table C3.7: Inter-related SEA topics

SEA Topic	Relationship with Population and Human Health
Air Quality	The project has the potential to affect air quality. Exposure to air pollution can exacerbate health inequalities between different demographic groups, and there are significant effects from air quality on human health both in the short term and the long term.
Climatic Factors	The project has the potential to affect climatic factors through carbon emissions and flood risk in the area. Climate change affects many of the social and environmental determinants of health such as clean air, safe drinking water, sufficient food supplies and secure shelter (WHO 2018). In addition, people living in flood prone areas, or remote or island communities, can be particularly susceptible to extreme weather events, the severity of which is exacerbated by climate change. More frequent flood events, storms and strong winds can cause damage and disruption to such communities, limiting access to vital services and impacting on people's physical and mental health (Scottish Government 2019). The project would also improve the resilience of the route to the effects of climate change.
Material Assets	The population relies upon material assets for everyday functions. Built transport assets are used to facilitate travel and natural assets such as forestry and peat provide a range of benefits for people including as energy sources, and as carbon sequestration for mitigating against the effects of climate change. Forests also provide important health and wellbeing benefits as described below. Disruption to the transport network or loss of material assets, as a result of the project could result in effects on the population such as journey delays and removal of the benefits of carbon sequestration of forestry and peat, and of the positive effects of forests on health and wellbeing .
Biodiversity, Cultural Heritage, Landscape and Visual Amenity	Connections exist between the Population and Human Health topic and the Biodiversity, Cultural Heritage, Landscape and Visual Amenity SEA topics due to the numerous health and wellbeing benefits provided by access to nature, cultural heritage and greenspaces, providing people with opportunities to participate in recreational activities and experience the local landscape qualities of the region. This is of particular importance during the ongoing Covid-19 pandemic, especially for those without or with limited access to such spaces whilst lockdown measures are in place. The project has the potential to affect all of these topics and therefore result in effects on population and human health.

3.7 Conclusions

3.7.1 A summary of the effects on population and human health at the SEA stage is provided in Table C3.8.

Table C3.8: Summary of Effects on Population and Human Health

Population and Human Health Subtopic	Potential Effect Description	Effect Duration	Scoring Criteria
Population			
Deprivation	Improvements in levels of deprivation due to enhanced connectivity between Argyll and Bute and the central belt, access to key services and reliability of public transport	Long-term, permanent	Minor positive effect
Tourism and Recreation	Increased traffic volumes and construction activities could result in diversions and affect accessibility and journey lengths to tourism and recreation facilities for both vehicle travellers and NMUs	Short-term, temporary	Minor negative or uncertain effect
	Improved access to tourism and recreational facilities for local	Long-term, permanent	Minor positive effect

Population and Human Health Subtopic	Potential Effect Description	Effect Duration	Scoring Criteria
	residents and tourists / visitors to the region		
Rural Affairs	Increased business confidence and associated inward investment due to enhanced connectivity with the central belt and improved resilience of the road network in the region	Long-term, permanent	Minor positive effect
Social Inclusion	Enhanced access to key services and resources and connectivity with the central belt	Long-term, permanent	Minor positive effect
Safety	Minor reductions in transport-related casualties and enhanced climate change resilience	Long-term, permanent	Minor positive effect
Human Health			
Air Quality	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
Noise and Vibration	Noise nuisance and vibration caused by traffic and activities associated with construction works could result in general annoyance and/or sleep disturbance for local people	Short-term, temporary	Minor negative or uncertain effect
Climate (Flooding)	Improved resilience of the road network in the region against climate change-related events	Long-term, permanent	Minor positive effect
Access to Outdoors	Decrease in health and wellbeing resulting from increased traffic volumes and construction activities which could result in diversions and affect accessibility and journey lengths to nature / greenspaces (including the LLTNP)	Short-term, temporary	Minor negative or uncertain effect
	Improved health and wellbeing resulting from enhanced linkages to NMU facilities and access to nature / greenspaces (including the LLTNP)	Long-term, permanent	Minor positive effect

Population

3.7.2 As shown in Table C3.8, there is potential for the project to have a **temporary, short-term, minor negative effect** on tourism and recreation in the local area during the construction phase due to temporary reduced access to tourism and recreational facilities for local residents and tourists / visitors to the region.

3.7.3 There is also potential for **long-term, minor positive effects** on deprivation, tourism and recreation, rural affairs, social inclusion and safety as a result of the project. On completion, it is expected that the project would generally improve quality of life and increase sustainable access to essential services, employment and the natural environment within the route corridor through improved resilience of the A83 (i.e. mitigating landslide induced closures), allowing for more reliable and frequent public transport services, and the provision of enhanced NMU and parking facilities, including linkages to walking and cycling routes and core paths. It is also anticipated that the route corridor would generally improve connectivity between the central belt and Argyll and Bute, and it is expected that it would provide greater accessibility to active travel routes, including the Loch Lomond and The Trossachs National Park core path network in and around the area, and hill walking routes such as The Cobbler.

3.7.4 It is anticipated that the project could provide an opportunity to contribute towards the Scottish Government's Vision Zero road safety target of zero fatalities and injuries on Scotland's roads by 2050 through reductions in vehicle journeys associated with fewer road closures and the associated long diversion routes for strategic traffic travelling to and from Argyll and Bute.

Human Health

3.7.5 During the construction stage, the project could result in **temporary, short-term, minor negative effects** on air quality and noise and vibration for local residents. However, through the implementation of best practice methods, it is not anticipated that these effects would be significant.

3.7.6 Due to a lack of data available in relation to future traffic flows, the potential for effects on air quality and noise and vibration to arise during operation are currently uncertain and would be considered at subsequent DMRB stages once the design has been further developed. Potential effects on individual landowners from land-take required to facilitate the project would also be considered.

3.7.7 There is also potential for **long-term, minor positive effects** on climate (flooding) and access to outdoors as a result of the project. Improvements to the road network could provide resilience against climate change-related events, and enhanced linkages to NMU facilities and access to nature / greenspaces and key services could result in the improved health and wellbeing of local residents.

3.8 Design Development, Mitigation and Enhancement Recommendations

3.8.1 Table C3.9 sets out the SEA recommendations in relation to population and human health mitigation and enhancement.

Table C3.9: Potential Mitigation, enhancement, and design recommendations in relation to population and human health

Mitigation / Enhancement / Monitoring Measure	Stage of Implementation (e.g. DMRB Stage 2, DMRB Stage 3)	Responsible Party for Implementation	Consultation / Approvals Required
Implementation of a communications strategy to keep local communities informed of the progress of the project and to provide channels for input/complaints/enquiries, (e.g. telephone helpline, website, email, postal address etc).	DMRB Stage 2 DMRB Stage 3 Pre-construction Construction	Designer & Contractor To be monitored by Transport Scotland during subsequent DMRB stages and by contractor during construction.	n/a

Mitigation / Enhancement / Monitoring Measure	Stage of Implementation (e.g. DMRB Stage 2, DMRB Stage 3)	Responsible Party for Implementation	Consultation / Approvals Required
Appointment of a community liaison officer to facilitate regular meetings with local communities to provide project updates and allow for feedback/input.	Pre-construction Construction	Designer & Contractor To be monitored by Transport Scotland during subsequent DMRB stages and by contractor during construction.	n/a
Early consultation with key stakeholders and active travel groups in order to develop active travel proposals to complement the project.	DMRB Stage 2 DMRB Stage 3	Designer To be monitored by Transport Scotland during subsequent DMRB stages.	n/a
Regular consultation with outdoor/access officer, head of tourism and other relevant stakeholders within the LLTNPA to ensure that any effects on the normal operations of the Park during construction of the project are minimised as far as practicable.	Pre-construction Construction	Designer & Contractor To be monitored by Transport Scotland during subsequent DMRB stages and by contractor during construction.	Consultation with LLTNPA
Design for the protection / enhancement of green and open spaces.	DMRB Stage 2 DMRB Stage 3 Detailed design	Designer To be monitored by Transport Scotland during subsequent DMRB stages.	Throughout project lifecycle
Ensure the project complies with the Equalities Act 2010, and considers mitigation and enhancements for protected characteristic groups in the project design, including the design of linkages to walking and cycling routes and core path networks.	DMRB Stage 2 DMRB Stage 3 Detailed design	Designer To be monitored by Transport Scotland during subsequent DMRB stages.	Throughout project lifecycle
Design any permanent diversion in NMU routes to provide the same or improved standard of pathway.	DMRB Stage 2 DMRB Stage 3 Detailed design	Contractor To be monitored through implementation of construction environmental management plans.	Consultation with Argyll and Bute Council and LLTNPA
Schedule and control the timing of construction activities to minimise noise impacts on sensitive receptors. This information is to 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

Mitigation / Enhancement / Monitoring Measure	Stage of Implementation (e.g. DMRB Stage 2, DMRB Stage 3)	Responsible Party for Implementation	Consultation / Approvals Required
Adopt construction and traffic management methods which, as far as practicable, maintain access for road users and NMUs during construction periods. This information is to be included in a Construction Traffic Management Plan.	Construction	Contractor To be monitored through implementation of construction environmental management plans.	Consultation with Argyll and Bute Council and LLTNPA

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