

Access to Argyll & Bute (A83) Strategic Environmental Assessment & Preliminary Engineering Services
Route Corridor Preliminary Assessment
Route Corridor 10 – Helensburgh – Cowal – Cairndow

Route Corridor Details	
Route Corridor Option	Route Corridor 10 – Helensburgh – Cowal – Cairndow
Route Corridor Description	This route corridor links the A814 and A818 at Helensburgh to the A83 Trunk Road at Cairndow via Cowal and the provision of fixed link crossings at Gare Loch and Loch Long. The route corridor connects the A814 and A818 to Cowal via approximately 1.5km and 2.6km fixed link crossings either side of the Rosneath Peninsula and the route corridor generally follows the B833 whilst on the Rosneath Peninsula. Having crossed Loch Long on the western side of the peninsula, the route corridor generally follows the existing A880, C09 and A815 to tie back into the A83 Trunk Road at Cairndow. The approximate overall length of the full route corridor is 50km in length. The fixed link crossing over Gare Loch and Loch Long will present considerable challenges as both lochs are used by large marine vessels as well as Ministry of Defence (MOD) submarines which are based at Faslane and Coulport.
Rationale for Route Corridor	The Helensburgh – Cowal – Cairndow route corridor was identified by the Cowal Fixed Link working group and has subsequently been considered as a potential route corridor by Transport Scotland's Strategic Transport Projects Review team. This route corridor is considered to offer a potential alternative access route into Argyll and Bute bypassing the main landslide risk area on the A83 at the Rest and be Thankful and connecting to the main route to the central belt, the A82 Trunk Road via the A814 or A818 from Helensburgh.
Geographic Context	The route corridor lies within the Argyll & Bute region, which comprises solely of the entirety of the Argyll & Bute local authority area. The route corridor end points are located a straight line distance of approximately 23-37 miles from the city of Glasgow. The eastern extents of the route corridor is situated on the eastern shores of the Gare Loch at Helensburgh. The route corridor then heads west, across the Gare Loch and around the southern tip of the Rosneath Peninsula, passing through Kilcreggan before crossing Loch Long just south of Cove. It then travels north-west along the banks of Loch Long to Ardentinnny, through Glen Finart and along the banks of Loch Eck until it reaches Strachur where it turns north-east along the banks of Loch Fyne. The northern extents of the route corridor is situated between Cairndow and Arrochar on the A83 Trunk Road. The route corridor is located partially within the Loch Lomond and The Trossachs National Park (LLTNP) and there are environmentally designated sites both within and in proximity of the route corridor. With respect to transport links, the route corridor joins the two aforementioned trunk roads and it also intersects the West Highland Line railway in proximity to Garelochhead.

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<p>Social Context</p>	<p>Given the geographically remote nature of large areas of Argyll & Bute, reducing the duration of journey times and improving journey time reliability for both strategic and local traffic has the potential to impact positively on deprivation levels, both geographic and economic.</p> <p>The Scottish Index of Multiple Deprivation (SIMD) identifies concentrations of deprived areas across Scotland. Argyll & Bute consists of 125 data zones, with 10 data zones (8%) identified as being amongst the 15% most overall deprived data zones in Scotland. These are located in the region’s 5 main towns - Helensburgh, Oban, Dunoon, Campbeltown and Rothesay. The Geographic Access to Services considers deprivation in terms of drive times and public transport times to a selection of basic services such as schools, health services and retail centres. Forty-eight (38%) of Argyll and Bute’s data zones are within the 15% most ‘access deprived’ data zones in Scotland – most of which are located outside the main towns.</p> <p>The region’s population has been in decline for over a decade, against a backdrop of a population increase at the national level.</p> <p>Data from NHS Highland estimates that there are 26,000 referrals for Argyll & Bute patients each year, of which 44% are to hospitals within the region and 56% are to hospitals in the NHS Greater Glasgow and Clyde area. Disruption on the transport network can lead to missed appointments and have an adverse impact on patients’ health and wellbeing.</p> <p>The region has twenty-three inhabited islands, more than any other local authority in Scotland, with seventeen percent of the regions’ population inhabiting the islands. The A83 Trunk Road provides accessibility to services on the mainland via Kennacraig port, where ferry services depart to Islay with onward connections to Jura and Collonsay.</p>
<p>Economic Context</p>	<p>The A83 Trunk Road is one of only two east-west strategic trunk road network connections between Argyll & Bute and the central belt. The lack of a reliable strategic route linking Argyll & Bute with the rest of the country is understood to be constraining economic growth in the region. When the road connection via the A83 Trunk Road is severed, the impact on residents, visitors and businesses is severe due to the lack of alternative transport options.</p> <p>The A83 Trunk Road is known to carry goods of significant value to both the regional and national economy (including whisky and seafood). The A83 Trunk Road is also a key route for tourism, and a proposal to transform the Crinan Canal into a major tourism attraction in Mid-Argyll, could benefit significantly from improved resilience and / or access to the</p>

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	<p>region. Anecdotal evidence suggests closures and restrictions cost the local economy £50k-£60k per day in addition to longer-term impacts on business investment within the region and, subsequently, the region's job market.</p> <p>This route corridor follows for part of its length, the route of the A815 road which is the main road link between Toward at the very south of the Cowal peninsula, the town of Dunoon, many smaller communities along its length including Sandbank and Strachur, and the A83 Trunk Road near Cairndow. This road provides an important link for businesses, residents and visitors in the Cowal peninsula with the wider strategic trunk road network.</p> <p>Due to a large proportion of the region's geographic remoteness from the major economic centres of the central belt, only a few large scale, high skill industries are located within the area. The region's economy tends to be heavily influenced by sectors with lower growth, such as agriculture and public services. Given the focus on economic recovery post-COVID-19, enhanced connectivity for the Argyll & Bute region could contribute towards increasing inward investment and job opportunities for local communities. Reliable access for Bute and Cowal and Mid-Argyll, Kintyre and Islay has the potential to have a transformational effect on local/regional economies.</p>
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Transport Planning Objectives		
Objective	Performance against planning objective	
TPO1	Resilience – reduce the impact of disruption for travel to, from and between key towns within Argyll & Bute, and for communities accessed via the strategic road network.	<p>This route corridor offers enhanced resilience, through the provision of an alternative route, for both strategic A83 Trunk Road traffic accessing Cowal & Bute and Mid-Argyll, Kintyre and the Islands, and for local traffic travelling to / from and between key towns and communities within Argyll & Bute. The impact of landslide induced closures on the existing A83 Trunk Road, between Cairndow and Tarbet, is largely mitigated for a proportion of strategic A83 trunk road traffic, as a result of this route corridor. The main landslide risk area on the A83 Trunk Road, at the Rest and be Thankful, is effectively bypassed by this route corridor.</p> <p>While this route corridor potentially includes fixed link crossings, which can be impacted by severe weather (particularly during the winter period) risks of disruption to traffic would be minimised through the design of any structures required. It should also be recognised, however, that the provision of fixed link crossings may remove the need for ferries to be used to</p>

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		<p>complete certain trips. Ferry services can be impacted by severe weather and mechanical issues with vessels. This route corridor may, therefore, offer a more resilient means of travel for trips to and from areas of Cowal, including the key town Dunoon which, due to the peninsular nature of the area, currently has a single road connection (the A815) linking the area to the wider road network.</p> <p>In providing an additional route to the existing A83 Trunk Road (assuming it remains operational) enhanced resilience will be provided for large parts of Argyll & Bute, offering a more reliable connection between the region, the central belt and beyond.</p>
TPO2	Safety – positively contribute towards the Scottish Government’s Vision Zero road safety target by reducing accidents on the road network and their severity.	Due to the longer travel distances required for the majority of strategic traffic travelling to/from Argyll & Bute under this route corridor (Dunoon-Glasgow trips will benefit from shorter journeys), it is deemed that traffic related casualties are unlikely to be impacted favourably by an intervention of this nature. Based on the traffic levels likely to re-route to the new route corridor, the expected accident savings are low.
TPO3	Economy – reduce geographic and economic inequalities within Argyll & Bute through improved connectivity and resilience.	<p>Through reducing the potential impact of landslides on the trunk road, this route corridor would improve resilience of access to key domestic and international markets. Additionally, as a result of the more direct connections to the central belt provided, enhanced competitive access between Argyll & Bute and key markets could be realised. Through providing enhanced connectivity to Cowal the route corridor is likely to provide enhanced access to a larger geographical area.</p> <p>This route corridor offers the potential to reduce economic and geographic deprivation, particularly within the Bute & Cowal (Dunoon and Rothesay both have data zones within the most deprived 10%) and, to a lesser extent, Mid-Argyll, Kintyre and Islay regions of Argyll & Bute (Campbeltown has data zones within the most deprived 20%).</p>
TPO4	Sustainable travel – encourage sustainable travel to, from and within Argyll & Bute through	Through the provision of fixed links to Cowal, improvements in mobility & inclusion and reductions in transport poverty could be facilitated through the enhanced connectivity provided by this route corridor.

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	facilitating bus, active travel and sustainable travel choices.	<p>However, it should be recognised that the infrastructure provided by this route corridor on its own merely facilitate improvements in these areas. Further interventions (such as enhanced public transport services) would be required to score positively against these sub-objectives.</p> <p>It is judged that, as a result of the provision of trunk roads in currently largely rural areas (particularly in Cowal) potential negative impacts on active travel could be experienced by communities within these areas. This includes, but is not limited to, potential reductions in actual or perceived road safety and potential severance issues, which could adversely impact active travel. Investment in a new route corridor within the region would however provide an opportunity to include enhanced active travel provision as part of the design.</p>
TPO5	<p>Environment – Protect the environment, including the benefits local communities and visitors obtain from the natural environment, by enhancing natural capital assets and ecosystem service provision through delivery of sustainable transport infrastructure.</p> <p>An example of ecosystem service provision is improving water quality regulation.</p>	<p>The range and scale of potential environmental effects identified for this route corridor is such that it is likely that extensive environmental mitigation will be needed and there is the potential for a range of significant environmental impacts that could affect ecosystem service provision.</p>

Existing Corridor Conditions		
Engineering	Corridor Length	The route corridor is approximately 50km long.
	Existing roads	<p>The route corridor intersects the A814 and A818 at its eastern extents and the A83 Trunk Road at its northern extents.</p> <p>The route corridor generally follows the Local Authority operated / maintained 'A' / 'B' / 'C' roads listed below: B833, A880, C09 and A815.</p>

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		<p>The route corridor intersects the following Local Authority operated / maintained 'A' / 'B' / 'C' roads. B833, C73, A880, A815, C57, C56, A886 and B839.</p> <p>The route corridor also includes part of the Ministry of Defence owned and operated road between Garelochhead and Coulport.</p>
	Existing accesses	<p>A class road: 4 B class road: 2 C class road: 6 Unclassified road/direct access: 336</p> <p>Relative to the other route corridors, the high number of accesses noted above is attributed to the route corridor passing through Rosneath, Kilcreggan and numerous settlements.</p> <p>All local accesses from the A83 in the area around Glen Croe would be retained should this route corridor be taken forward; however, the additional work to retain these accesses has not been included in the Preliminary Assessment of this route corridor.</p>
	Topography and Land Use	<p>Ground levels in the centre of the route corridor at the A814 near Helensburgh are generally at sea level on the eastern shores of the Gare Loch. The route corridor immediately crosses Gare Loch and enters the Rosneath Peninsula near the town of Rosneath. Ground levels in Rosneath slope up from the western shores of Gare Loch to a ridge of higher ground that rises to approximately 200m above ordinance datum at the Clach MacKenny. The route corridor centre then generally follows the B833 road round the southern part of the peninsula and passes between the Clach MacKenny and Gallow Hill. Ground levels along the B833 road rise from sea level at Rosneath to approximately 60m above ordinance datum, before falling again towards the town of Kilcreggan which is generally at sea level.</p> <p>Land use within this section of the route corridor is primarily residential/commercial/recreational, and mainly associated with properties within Helensburgh, Rhu, Shandon, Clynder, Rosneath, Kilcreggan and Cove. There are pockets of coniferous and mixed woodland, both on the Rhu side of the Gare Loch crossing and on the Rosneath Peninsula. There are also numerous areas of agricultural land throughout this section The West Highland Line</p>

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		<p>railway is located at the eastern most extents of the route corridor running through Helensburgh before continuing to head northwest along the east side of Gare Loch, behind Shandon towards Garelochhead.</p> <p>At this point the route corridor turns west and crosses Loch Long entering Cowal in proximity of the community of Blairmore which is located generally at sea level. After crossing Loch Long the route corridor turns north, and encompasses an area of land that rises steeply from sea level on the western shores of Loch Long towards a line of summits including Blairbeg Hill at approximately 385m above ordnance datum. After passing through the community of Ardentinny which is at sea level on Loch Long, the route corridor heads north west along Glen Finart, generally following the route of the C09 road, the wide valley floor gradually narrows and ground levels starts to rise. Levels along the C-class road rise up to approximately 160m above ordnance datum, with higher ground extending above 200m above ordnance datum located both to the north and south of the C-class road in the route corridor centre. Ground levels in the centre of the route corridor then generally fall quite steeply, towards Whistlefield on the banks of Loch Eck which is elevated at between 25m and 50m above ordnance datum.</p> <p>Land use within the route corridor is primarily coniferous plantation woodland on the lower slopes between Strone and Ardentinny. There are numerous residential/commercial properties throughout this section, but are mainly associated with Strone, Blairmore and Ardentinny. Blairmore Farm and Stronchullin Farm both have agricultural land within the section.</p> <p>The route corridor then heads generally north, following the A815, which typically follows the eastern bank of Loch Eck for approximately 4 kilometres. Ground levels along the A815 in the route corridor centre are typically between 20m and 30m above ordnance datum. Ground levels to the east of the A815 in the route corridor typically rise steeply towards a line of summits which are in excess of 600m above ordnance datum. As the A815 heads north west and leaves Loch Eck, it typically follows the valley floor and the River Cur. Ground levels along this length of the A815 in the route corridor centre towards Strachur are typically between 30m and 50m above ordnance datum with ground levels in the route corridor both to the south west and north east of the A815, typically rising above the base of the valley.</p> <p>Land use within this section is primarily agricultural with residential/commercial properties located within Invernoaden, Glenbranter and Strachur and numerous other individual properties throughout the section. Again, the lower slopes within this section have significant coniferous planation woodland coverage.</p>
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		<p>The route corridor then heads generally north then north east on the eastern shores of Loch Fyne. Ground levels in the centre of the route corridor, along the A815, are typically at sea level or within approximately 20m of sea level. Ground levels to the east of the A815 in the route corridor typically rise steeply towards a line of summits which are generally between 300m and 600m above ordnance datum. Within proximity of the settlement of Ardno, the A815 rises slightly to an elevation of approximately 110m above ordnance datum, with ground again rising to the east within the route corridor and ground falling to sea level to the west of the corridor. As the route corridor heads east it approaches the A83 Trunk Road, and levels start to fall again with the junction between the A815 and the A83 Trunk road elevated at approximately 75m above ordnance datum. In this northernmost part of the route corridor, ground levels surrounding both roads rise steeply.</p> <p>Land use within this section is primarily coniferous plantation woodland, which covers most of the lower slopes of the surrounding hillsides. Along the banks of Loch Fyne there are numerous residential/commercial properties. There are also pockets of agricultural land throughout this section.</p>
	Hydrology and Drainage	This is covered under 'Water Environment' in the 'Environment' part of this table.
	Geology / Geomorphology	<p>The eastern end of the route corridor comprises a fixed link from Rhu to Rosneath across Gare Loch. The route corridor then follows the B833 to Kilcreggan before traversing round the southern end of the Rosneath peninsula following the shoreline. The terrain on the peninsula is relatively shallow, with slopes up to around 150mAOD. A second fixed link connects Cove and Blairmore; the route corridor then follows the A880 north to the A815. The A880 follows the western shoreline of Loch Long, with steep vegetated slopes to the immediate west of the road.</p> <p>As the route corridor veers to the west away from the loch it follows the U-shaped valley floor of Glen Finart. The terrain becomes steeper after Sligrachan as the route corridor climbs over the head of the valley and drops down to the A815. The route corridor then follows the A815 along the eastern shoreline of Loch Eck. The loch is bound to the east by steep sided slopes along its full length. Numerous channels provide drainage pathways from the hillsides above Glen Finart and Loch Eck, and it is notable that the majority of the lower slopes are currently forested. The River Cur flows within a steep sided U-shaped valley along the flat valley floor into the northern end of Loch Eck. The route corridor follows the valley to Strachur on the shore of Loch Fyne and then follows the</p>

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		<p>shoreline north bound to the east by steep slopes, again with numerous channels draining the hillsides above, to the junction of the A815 and A83 at the northern end of the route corridor.</p> <p>The superficial geology beneath the route corridor at Gare Loch comprises extensive Raised Marine Deposits, with Beach and Tidal Flat deposits mapped along the shorelines and into Gare Loch at Rhu and Rosneath. Inland is predominantly mapped as glacial Till with some outcrops of bedrock. Raised Marine Deposits follow the shoreline around to Cove. A large area of peat is mapped in the centre of the route corridor, extending along the upland areas of the Rosneath Peninsula.</p> <p>To the west of the fixed link at Blairmore, a thin strip of Raised Marine Deposits is mapped along the shoreline, some glacial Till is mapped inland on the upper slopes and within the Blairbeg Burn and Stronchullin Burn valleys. Alluvium is mapped in association with Stronchullin Burn, with Alluvial Fan Deposits mapped at the mouth of the burn extending into the loch.</p> <p>More extensive deposits of Marine Beach Deposits, Raised Marine Deposits and Alluvium are recorded in Glen Finart, with localised areas of Hummocky (Moundy) Glacial Deposits (diamicton, sand, gravel) present further up the glen and in places on the upper slopes. Extensive deposits of Alluvium are recorded along the base of the valley between Loch Eck and Strachur; these may contain soft or loose deposits. An isolated area of Peat is recorded above the A815 at Strachur.</p> <p>Further deposits of glacial Till remain on the slopes above the A815, within valleys around Strachur, and to the north of Ardnò. The existing route of the A815 from Strachur to Ardnò is shown to be located upon Raised Marine Deposits along the shoreline, with superficial deposits largely absent from the hillside slopes. Where the route corridor follows the Loch Fyne shoreline, the superficial geology is mapped as Marine Beach Deposits, with areas of glacial Till and hummocky deposits mapped towards the A83.</p> <p>An area of worked ground (void), likely to be a sand and gravel pit, is mapped adjacent to Stronchullin Burn, south of Stronchullin. Made ground is anticipated across the route corridor in association with existing development and infrastructure.</p> <p>Bedrock in the east of the route corridor comprises with pelites and metalimestones of the Dunoon Phyllite Formation and psammites and pelites of the Bullrock Greywacke Member. To the west side of the Loch Long fixed link, metavolcaniclastics of the Loch Katrine Volcaniclastic Formation are mapped. The remainder of the proposed route corridor is underlain by Dalradian metamorphic rocks, comprising predominantly pelite, semi-pelite and</p>
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		<p>psammite, with some phyllite north of Strachur. A number of igneous dykes of various ages cross the route corridor; these are generally oriented east to west or north-northeast to south-southwest. Faulting is indicated throughout the route corridor; the orientations are variable, although many are oriented north-northeast to south-southwest.</p> <p>Gare Loch Fixed Link Crossing</p> <p>Superficial geology is mapped as Beach and Tidal Flat Deposits extending into the loch from both the east and west shores of the loch. Raised Marine Deposits are mapped further inland across Helensburgh, Rhu and Rosneath. Glacial Till is mapped up the slopes to the east and the west of the fixed link crossing. A large number of boreholes have been undertaken at Rhu Narrows at the fixed crossing location. Boreholes show superficial cover of soft becoming firm to stiff silts and clays up to 19m deep. The solid geology at the crossing is mapped as pelite and metalimestone of the Dunoon Phyllite Formation to the west of the crossing, and psammite and pelite of the Bullrock Greywacke member to the east. The Dunoon Phyllite Formation shows north-south oriented normal faulting across the route corridor.</p> <p>Loch Long Fixed Link Crossing</p> <p>Superficial deposits are recorded to comprise Raised Marine Deposits along the eastern and western shorelines of the fixed crossing. The slopes of Rosneath Peninsula at the eastern end of the fixed link are mapped as glacial Till, with Peat mapped across the plateau on the outskirts of the route corridor. A small area of glacial Till is mapped on the slopes above Blairmore on the western end of the fixed link. No GI information was available for review along the waterline or within the loch at the proposed location of the crossing. Two boreholes have been completed offshore to the west of Kilcreggan, just south of the proposed crossing. One indicated silt deposits to 22m below bed level, overlying moderately weak phyllite. Geophysics surveys in the form of seismic reflection has been undertaken just south of the proposed route corridor. Further assessment of the available information and preliminary GI would be required at an early stage to determine the influence of these conditions on any proposed bridge / tunnel.</p> <p>The solid geology at the eastern end of the crossing location is recorded as comprising metamorphic rocks of the Dunoon Phyllite Formation: pelite, psammite and metalimestone. Solid geology at the western end is recorded as comprising psammites of the Loch Katrine Volcaniclastic Formation. To the west of Blairmore two faults trending north are mapped, forming the western boundary to the fault block mapped within the route corridor. Several faults are recorded on the east of the crossing, trending northwest. These are mapped into the loch, it is likely that further faults are present within the loch in this area.</p>
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		<p>References:</p> <ul style="list-style-type: none"> British Geological Survey, Geological Survey of Scotland, 1:63,360/1:50,000 geological map series. Accessed via BGS maps portal https://www.bgs.ac.uk/information-hub/bgs-maps-portal/, October to December 2020. British Geological Survey, Onshore GeoIndex, https://mapapps2.bgs.ac.uk/geoindex/home.html, accessed October to December 2020. Datasets used include National Landslide Database (NLD), Mass Movement Deposits (1:50,000 scale), Superficial Deposits (1:50,000 scale), Bedrock Geology (1:50,000 scale), Linear Features (1:50,000 scale), Borehole Records. British Geological Survey, The BGS Lexicon of Named Rock Units, https://webapps.bgs.ac.uk/lexicon/home.cfm. Accessed October to December 2020.
	Structures	<p>The following structures are noted within this route corridor.</p> <ul style="list-style-type: none"> 2 no. Existing single span watercourse crossing 45 no. Existing culverts to be retained possibly needing upgrade
Environment Considerations	Biodiversity, Fauna and Flora	<p>6.7ha of Glen Etive and Glen Fyne SPA falls within the route corridor.</p> <p>222.8ha of Beinn an Lochain SSSI falls within the route corridor.</p> <p>All of Ardchyline Wood SSSI (176.8ha) falls within the route corridor.</p> <p>253.0ha of Loch Eck SSSI falls within the route corridor.</p> <p>Most of Craighoyle Woodland SSSI (66.6ha) falls within the route corridor.</p> <p>141 parcels of woodland listed on the AWI fall within the route corridor.</p>
	Population and Human Health	<p>The noise environment in the vicinity of the route is characterised by the road traffic on existing A and B roads. The route corridor passes through predominantly rural areas and there are a number of settlements within the route</p>

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		<p>corridor including Helensburgh, Rhu, Rosneath, Kilcreggan, Cove, Strone, Blairmore, Ardentinny, Strachur, and St Catherine's.</p> <p>Several core paths are located within the route corridor, including:</p> <ul style="list-style-type: none"> • C220a and b (Strachur village back road) • C221a (Cowal Way - Strachur to Lochgoilhead); • C221b (Cowal Way - Strachur to Balliebeg); • C289a, b and c (Kilcreggan to Auchengower Caravan Park); • C525 (North Ailey Road, Cove); • C319c and d (Barbour Road, Kilcreggan); • C290a, b and c (School Road to Church Road via Fairfield Gardens); • C291 (School Road to Church Road); • C282a, b, d, f and g (Kilcreggan to Peaton Hill (Peninsula Path)); • C286a, b, c and d (Rosneath to Kilcreggan); • C499 (Portkil Point, Kilcreggan); • C288 (Portkill Bay to B833 Kilcreggan/Rosneath); • C285 (Rosneath to Clachan Glen); • C311 (Rosneath to Clynder); • C414 (Silver Hills to Ferry Land, Rosneath); • C415 (Clachan Burn, Rosneath); • C413 (Tom a' Mhoid, Rosneath); • C283 (Clynder High Road); and • C279c and d (Helensburgh Pier to Garelochhead via Shandon). <p>Cowal Way, a long distance walking path, intersects the route corridor at Strachur and travels in a south-easterly direction alongside the A815 until it meets Loch Eck.</p>
	Water Environment	<p>The route corridor crosses or is in the vicinity of multiple water bodies classified under the Water Framework Directive, including:</p> <ul style="list-style-type: none"> • Four river water bodies, Kinglas Water, River Cur (u/s Glenbranter), River Cur (Glenbranter to Loch Eck) and River Finart; • One WFD loch, Loch Eck;

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		<ul style="list-style-type: none"> • Two transitional WFD water bodies Clyde Estuary – Outer and Gare Loch; and • Three coastal water bodies, Firth of Clyde Inner – Dunoon and Wemyss Bay, Loch Fyne – Middle Basin and Loch Long (South). <p>The route corridor also crosses approximately 150-160 minor watercourses.</p> <p>SEPA Flood Maps (SEPA, 2020) indicates that the route corridor may be at existing coastal flood risk around the A814 at Gare Loch, B833 and A880 at Loch Long, A886 at Loch Fyne and at existing fluvial flood risk from Kilcreggan Burn, River Finart, around A815 at Loch Eck, Allt na h-Airigh and Allt Ruadh, the River Cur, Eas Dubh, Allt Coire No and Kinglas Water during a medium likelihood event (0.5% Annual Exceedance Probability (200-year) event).</p> <p>The Loch Eck SSSI and the Upper Loch Fyne and Loch Goil Marine Protected Area are within the vicinity of the route corridor.</p> <p>The Loch Fyne Shellfish Water Protected Area is within the route corridor. There are Active Aquaculture Sites, CAR licenced fish farms and Classified Shellfish Harvesting Areas within the vicinity of the route corridor.</p> <p>The route corridor passes through one surface water Drinking Water Protected Area.</p> <p>No bathing waters are in the vicinity of the route corridor.</p>
	Soils	<p>Soil type within the route corridor is mixed with peaty podzols, peaty gleys, mineral gleys, mineral podzols, brown soils and alluvial soils all present. Mineral soils predominate with peaty gleys and peaty podzols at Loch Eck and north of Strachur. The route corridor where peat is present predominantly transects peat identified as Class 5 (no peatland habitat recorded, soils are carbon rich and deep peat) and Class 3 (not priority peatland habitat with carbon rich soils and some areas of deep peat) in the Carbon and Peatland 2016 Map. However, the route corridor also transects pockets of peat identified as Class 2 (nationally important carbon-rich soils, deep peat and priority peatland habitat, areas of potentially high conservation value and restoration potential) at Blairmore and Strachur. There is one small area of Class 1 peatland (nationally important carbon rich soils, deep peat and priority peatland habitat, areas likely to be of high conservation value) on the Rosneath Peninsula. Given the combination of soils, climactic conditions and topography the Land Capability for Agriculture (LCA) Class within the route corridor is predominantly Class 5 (Class 5.1, 5.2 and 5.3) with Class 4 (Class 4.1 and 4.2) on the more productive mineral soils and Class 6 (Class 6.1, 6.2 and 6.3) on the steeper and higher slopes.</p>

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		<p>There are two Geological Conservation Review (GCR) sites in the route corridor, these being Rhu Point and Cove Bay to Kilcreggan. These sites are shoreline/sea-bed sites.</p> <p>The Land Capability for Forestry (LCF) class is mixed ranging from Class F2 on the Rosneath Peninsula, at Ardentinny and at Strachur to Class F6 on the higher steeper slopes in between. There are existing stands of commercial forestry throughout the route corridor. The route corridor includes land identified in the Argyll & Bute Council Woodland Forestry Strategy as Preferred (land that offers the greatest scope to accommodate future expansion of a range of woodland types, and hence, to deliver on a very wide range of objectives, Sensitivities are limited) on the Rosneath Peninsula and at Strachur. Other areas identified include existing woodland, Sensitive (areas where the nature or combination of sensitivities restricts the scope to accommodate further woodland expansion or removal) and Potential (considerable potential to accommodate future expansion of a range of woodland types, but where at least one 'sensitivity' exists).</p>
	Air Quality	<p>The route corridor passes through predominantly rural areas and there are a number of settlements within the route corridor including Helensburgh, Rhu, Rosneath, Kilcreggan, Cove, Strone, Blairmore, Ardentinny, Strachur, and St Catherine's.</p> <p>There are no Air Quality Management Areas (AQMAs) in the route corridor or in the Argyll and Bute council area and 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 & Bute Air Quality Annual Progress Report, 2020).</p> <p>Air quality in Argyll and Bute is considered to be generally very good and complies with all the air quality objectives for Scotland (Argyll and Bute Air Quality Annual Progress Report, 2020). Modelling results for sources of nitrogen dioxide and fine particulates in the Argyll and Bute Air Quality Annual Progress Report (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. The Argyll and Bute APR did not identify any areas where air quality objectives may be under threat and where specific actions would be required to improve air quality.</p>
	Climatic Factors	<p>The baseline for climatic factors is not considered to differ greatly between the 11 route corridors.</p> <p>As indicated in the 'Water Environment' section, the corridor may be at existing coastal flood risk around the A814 at Gare Loch, B833 and A880 at Loch Long, A886 at Loch Fyne and at existing fluvial flood risk from Kilcreggan Burn, River Finart, around A815 at Loch Eck, Allt na h-Airigh and Allt Ruadh, the River Cur, Eas Dubh, Allt Coire No and Kinglas Water during a medium likelihood event.</p>

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		As outlined in the 'Soils' section, there are several areas of peatland and woodland in the route corridor with a high carbon sequestration and sink value. As outlined in the Biodiversity, Flora and Fauna section, there are several areas of forestry in the corridor which also has a high carbon sequestration and sink value.
	Material assets	<p>The route corridor contains a variety of natural material assets. As outlined in the Climatic Factors section, there are areas of forestry within the route corridor and as listed in the Soils section, there are sections of peat soils and a mixture of LCF classes.</p> <p>There is also a variety of built material assets in the corridor. The route corridor generally follows existing road infrastructure including a mixture of 'A' 'B' and 'C' roads. There is one ferry service within the route corridor, at Gare Loch linking Kilcreggan to Gourock.</p> <p>The route corridor requires a structural crossing of Gare Loch, downstream of HMNB Clyde. Consideration for clearance and maritime navigation must be given to facilitate continued passage for naval shipping at Gareloch.</p> <p>There are minor renewable energy developments along the route corridor, mostly comprised of micro hydro schemes. The closest waste disposal facility is located at Dalinlongart to the north of Dunoon and Blackhill at Helensburgh.</p>
	Cultural Heritage	There are three Conservation Areas (Rosneath, Cove and Kilcreggan and Rhu), six Scheduled Monuments, 171 Listed Buildings and one Garden and Designed Landscape (Ardkinglas and Strone), within the route corridor. There are concentrations of Listed Buildings at Rosneath, Cove, Kilcreggan, Blairmore, Ardentinny and Strachur. The Cove and Kilcreggan Conservation Area almost completely bisects the route corridor. The route corridor also includes concentrations of Listed Buildings and large Conservation Areas at Rhu and Helensburgh.
	Landscape and Visual Amenity	The route corridor is approximately 50km long and generally runs along existing roads but involves two new crossings at Gare Loch and Loch Long linking Cowal to Helensburgh. Approximately 23 km of the route corridor is located within the LLTNP and Argyll Forest Park. There are no National Scenic Areas within the route corridor. The northern section of the route corridor runs within the North Argyll and East Loch Fyne (Coast) Areas of Panoramic Quality (APQs) for approximately 15km on the eastern side of Loch Fyne and passes through Ardkinglas And Strone Garden and Designed Landscape (GDL). There are also several Open Space Protection Areas within the route corridor around Strachur, Kilcreggan and Rhu and Conservation Areas in Cove and Kilcreggan, Rosneath and Rhu.

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		<p>The Landscape Character Types (LCTs) within the route corridor comprise Rugged Mountains LCT, Steep Ridges and Mountains LCT, Rocky Coastland – Argyll LCT, Steep Ridges and Hills LCT, Straths and Glens LCT, Straths and Glens with Lochs LCT, Settled Coastal Fringe LCT, Open Ridges LCT and Rolling Farmland with Estates – Argyll LCT. There are several Seascape Character Areas (SCAs) within the route corridor, namely Loch Fyne - Inveraray to St Catherines SCA, Loch Fyne - St Catherines to Newton Bay SCA, Loch Long - Strone Point to North of Blairmore, North of Blairmore to Shepherd's Point and Coulpport to Barons Point SCAs, Inner Firth of Clyde - Holy Loch and Kilcreggan to Rosneath Point SCAs and Gareloch - Rosneath Bay to Clynder, Rosneath Point to Rosneath Bay and Rhu SCAs.</p> <p>Land cover within the route corridor for this route option comprises small and scattered settlements, sea and freshwater lochs and coasts, open grassland and moorland, native woodland, coniferous forestry and numerous watercourses.</p> <p>This route corridor would cross and likely be visible from the Loch Lomond and Cowal Way (Strachur to Lochgoilhead section) and the Argyll Paddle Trail. Parts of the route corridor would also be visible from large sections of Loch Fyne, Loch Long, Gare Loch and Firth of Clyde coastline as well as numerous residential and recreational receptor locations.</p>
Traffic		<p>Annual average daily traffic (AADT) flow levels on the A83 Trunk Road in 2019 were 2,300 vpd (vehicles per day) on the stretch between Campbeltown and Tarbert and 4,400 vpd west of Tarbet, with the HGV percentage between 5% and 9%. At the Rest and Be Thankful, A83 Trunk Road traffic volumes were in the order of 4,500 vpd 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 Trunk Road 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.</p> <p>Travel routes to/from, and within, Argyll & 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.</p>

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Implementability		
Engineering	Topography and Alignment Considerations	<p>The route corridor starts on the east side of Gare Loch where it is significantly constrained. Steep, high (361m high point) hills run the width of the route corridor to the west with the towns and villages of Helensburgh, Rhu and Shandon also spread across the east of Gare Loch. Additionally, the West Highland Line railway extends the width of the route corridor, and Faslane Military Base sits just outside the extents. The alignment will entirely be dictated by the location of the Gare Loch crossing point, and due to the built-up area and topography will likely prove difficult to achieve a compliant design without significant engineering challenges.</p> <p>On the west side of Gare Loch sits the Rosneath Peninsula, which again is significantly constrained. A ridge line effectively runs down the middle in a north-south direction with steep slopes falling east and west towards Gare Loch and Loch Long where the toe is very close to the respective coast lines. Additionally, the settlements of Rosneath and Cove spread around the coastline. Alignments will be dictated not only by the crossing location from the Gare Loch but also Loch Long. Due to the high elevation and steep topography north of Rosneath, it is unlikely that compliant geometry will be achievable without significant engineering intervention such as a tunnel or very high structure. South of Rosneath there is a flatter area which would likely allow for compliant geometry to be achieved, although it is anticipated that there would still be engineering challenges depending on the location of the Loch Long crossing. The centreline follows the B833 from Rosneath to Cove which would result in stretches of sub-standard horizontal alignment geometry, particularly through the two settlements.</p> <p>The western side of Loch Long is again significantly constrained by topography where steep slopes and localised gullies in the hillside fall towards the coastline with properties across the width adjacent to the shore. Crossing type will dictate the alignment; however, a structure will require minimum clearance of 75m which will result in the landing being located on the slope. Achieving compliant vertical alignment geometry may be possible by descending longitudinal along the contours; however, the sharp changes and steep slope will make it difficult to achieve horizontal alignment geometry compliance without significant cutting or structural intervention such as tunnels and viaducts.</p> <p>Heading north towards Ardentinny, similar constraints are observed in the route corridor where steep slopes fall towards the shore of Loch Long on the west of the centreline along with a number of properties, and Loch Long on the east. The centreline follows the A880 which is the most likely route an alignment would take due to the above-mentioned constraints. Compliant vertical alignment geometry should be achievable as levels do not vary significantly along the length. Generally, compliant horizontal alignment geometry is expected with the exception of</p>

		<p>a few localised spots. Depending on location an engineered solution may be possible such as cutting or building over the loch, but in other locations along the road it is constrained by properties.</p> <p>The centreline of the route corridor travels up Glen Finart from Ardentinny to the junction with A815. A compliant alignment should be achievable for the most part up the wide floor of the valley although Glen Finart Burn, hillside topography and several properties do provide some constraints. Towards the top of the glen, elevation increases from 40m above ordnance datum to a saddle of 150m above ordnance datum over 1.2km and this steep incline will provide a challenge. On the opposite side of the saddle down to the A815 at Whistlefield, there is a similarly steep drop. Again, this may cause issues for the alignment through this section. The topography will limit available alignment options and will likely result in sub-standard geometry. Introducing a tunnel between Glen Finnart to Whistlefield will allow compliant geometry to be achieved.</p> <p>From Whistlefield to the top of Loch Eck, the route corridor centreline follows the existing A815 with steep slopes constraining on the east side and Loch Eck itself on the west. Along the length there are a number of properties which will need to be considered. It is likely that existing route of the A815 will need to be utilised. There are no obvious issues which may cause issue for vertical alignment geometry. Generally, the horizontal alignment geometry should be compliant; however, some sections of sub-standard geometry have been identified. The topography will constrain the available options to easily achieve a compliant design and cuttings/ rock cuts or structural solutions may be required.</p> <p>Heading north to Strachur, the valley floor widens offering more space to the west, although the River Cur meanders and does provide some constraint. On the east side, the centreline continues to be constrained by steep slopes. Compliant vertical alignment geometry is expected along the relatively flat valley floor. Generally, the horizontal alignment geometry will be to standard with available space where improvements are required. Some settlements and properties along the length will need to be considered.</p> <p>Between Strachur and Cairndow, the centreline of the route corridor continues to follow the A815. The centreline is significantly constrained on both sides with Loch Fyne on the west side and steep slopes as well as properties on the east, and any route will likely follow the existing A815 through this section. Along the length, the vertical alignment geometry is expected to be compliant, although localised sections of sub-standard existing geometry have been identified. Localised sections of horizontal alignment geometry are likely to be sub-standard and will need to be improved. At some points along this section of the route corridor achieving a compliant alignment and carriageway cross-section will be extremely challenging, especially at locations with properties immediately next to the existing</p>
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		<p>carriageway on the east and Loch Fyne on the west side. To overcome these difficult locations additional engineering works such as retaining walls, steep cuttings or structures might be required.</p>
	<p>Geology / Geomorphology Considerations</p>	<p>The National Landslide Database records landslides to have occurred within the route corridor. It should be noted that additional landslides may have occurred which are not recorded within the database. Potential landslide hazards may require measures to protect any route alignment and this should be considered as part of detailed assessment should this route corridor be retained. The database records landslides to have occurred at the following locations:</p> <ul style="list-style-type: none"> • on the slopes of Beinn Bheula on the eastern margins of the route corridor to the east of Invernoaden (although this location is at the edge of the route corridor and any future landslide at the same location is considered unlikely to affect any road alignment within the route corridor due to the slope aspect and topography). Mass movement deposits are mapped in association with this record; however, they do not encroach on the route corridor; • between Strachur and St Catherine’s (Loch Fyne). No mass movement deposits are mapped by the British Geological Survey (BGS) in association with this record; and • at the western end of Glen Kinglas close to the A815/A83 junction. The BGS records mass movement deposits in association with this record. <p>Additionally, the local authority provided anecdotal evidence of localised, recurring landslide events at the following locations within this route corridor:</p> <ul style="list-style-type: none"> • Invernoaden; • Close to St Catherine’s, north of Strachur; and • On the A815, close to the junction with the A83. <p>Potential links to deforestation debris entering neighbouring watercourses and blocking culverts were identified in some locations, although no inspection / assessment has been undertaken at this stage.</p> <p>An assessment of other potential issues including potentially difficult ground conditions is summarised below:</p>

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		<ul style="list-style-type: none"> • Potential for compressible ground associated with deposits of peat, alluvium and raised marine deposits with possible implications for road alignment. These deposits may require excavation and replacement with fill or suitable improvement treatment. • Potential for peat slides to occur in cuttings due to presence of peat deposits on hillsides and in upland areas of the route corridors, particularly in the Rosneath area and at Strachur. • Potential presence of soft or loose deposits (alluvium and raised marine deposits). • Presence of compressible Tidal Flat Deposits at the eastern end of the Gare Loch fixed crossing, south of Rhu extending into the loch. • Shallow rockhead and variability in rock strength due to the presence of igneous intrusions of high strength which may cause difficulties for shallow excavations and any tunnelled sections. • Faulting can create zones of weak and/or highly fractured rock which is a significant hazard when tunnelling or excavating cuttings. Conversely faulting can create zones of extremely strong 'welded' fault rock, which would pose a significant hazard for tunnelling or areas of cutting in relation to excavatability. • Faulting in the area of the fixed link sections may result in zones of highly fractured rock with reduced bearing capacity. • The presence of faults may provide a preferential pathway for groundwater flow, and groundwater may pose significant issues for excavation in cuttings and for tunnelling if the groundwater table is high. • Areas of artificial ground including worked ground and voids may include disturbed and/or loose deposits or voids, and may have been infilled with potentially contaminated material.
	Hydrology and Drainage Considerations	This is covered under 'Water Environment' in the 'Environment' part of this table.
	Structures Considerations	<p>The following structures are likely to be needed for a new road within this route corridor.</p> <ul style="list-style-type: none"> • 1 no. New 1,500m long (900m main span) cable stayed or suspension bridge across Gare Loch. • 1 no. New 2,600m long suspension bridge across Loch Long. • 1 no. New land tunnel 3,100m long under Larach Hill between Glen Finart and the A815 at Whistlefield. • New land tunnels (depending on local alignment of approximately 1,870m and 1,680m length on the west side of Loch Long, the extents of which will depend on the localised alignment developed. • 1 no. New multi-span 400m long steel composite single carriageway viaduct on piled reinforced concrete abutments and piled intermediate piers (at Cairndow)

		<ul style="list-style-type: none">• 9 no. New single span composite concrete Y beam deck single carriageway bridges on piled or spread footing abutments• 50 no. New piped or box culverts <p>Constructability, operation and maintenance in relation to structures is discussed elsewhere within the document.</p> <p>Key structures issues are as follows:</p> <p><u>Gare Loch Cable Stayed or Suspension Bridge</u></p> <ul style="list-style-type: none">• The length of bridge suggests a cable stayed bridge may be an option and would offer the benefit of enhanced long-term durability. However, for the location at the mouth of Gare Loch and navigation by large military surface and submarine vessels, there may be an advantage in locating the towers as close to shore as possible. This increases the main span favouring a suspension span form. The precise requirements of ship/submarine navigation would need due examination and liaison with MOD. For the present, a suspension form is assumed.• On the east side of Gare Loch at Helensburgh, there are a number of properties in close proximity of the crossing point. This could result in a complex arrangement/ design being required to limit the impact on these properties or the consideration to move the crossing further north. Moving the crossing of Gare Loch would also result in the Loch Long crossing being required to moved further north, to a location closer to the route within route corridor 4.• The bridge design aim would be to minimise its length, locate the towers as close to shore as possible and set the deck level at a height above Gare Loch to enable the passage of commercial and military marine vessels. The Defence Infrastructure Organisation (DIO) have advised that the required minimum clearance is +75m above sea level. For the purposes of initial estimation, an allowance of 5m is made for the maximum deflection of a suspension bridge deck and 5m for its construction depth. Thus, the carriageway height would require to be at least +85m above loch level.• The east approach commences at the A818 Luss Road north of Helensburgh and descends on the landform to a point between the built-up areas of Helensburgh and Rhu. An approach viaduct would be required.• The western landfall is at Castle Point where an approach viaduct would descend to the road network.• It is estimated that the suspension bridge solution would comprise a main span of approximately 900m with back spans of up to 300m (total length up to 1,500m).• The bridge must remain straight with consequences for the approach alignment on both the east west shores.
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- High tower construction on the Gare Loch Bridge. If deck height is above +85m, tower heights are estimated to be 200 – 250m.
- The bridge deck must be wind resilient and will require wind barriers similar in form to those provided on the Queensferry Crossing. However, a slender single carriageway long span suspension bridge presents a design challenge to ensure the adequacy of the deck's aerodynamic response.
- Consideration should be given to winter resilience, principally deck surface and cable/tower de-icing.

Loch Long Suspension Bridge

- A suspension bridge crossing is required 2,600m long shore-to-shore
- The bathymetry indicates water depths of approximately 60m on mud and sands.
- The bridge crosses the main navigation channel entrance to Loch Long.
- Given the need for navigation minimum clearance of +75m and allowing for deck construction depth and deflection, the carriageway would have to be placed at approximately +85m above sea level.
- The towers would extend to heights of approx. 200 -250m or upwards of 300m from sea-bed level. Unlike the northern Loch Long crossing (Route Corridors 4 and 5), locating the towers onshore would result in too long a main span, therefore for this crossing, towers must be located in relatively deep water.
- Ship collision protection to the towers would be a major factor; navigation requirements include military surface and submarine vessels and very/ultra large crude oil carriers (VLCC/ULCC). Navigation transit velocities through the channel depends on the Piloting arrangements and transit speed for vessel steering may increase to allow for tidal currents. Particularly for the VLCC and ULCC, their masses combined with transit speed is expected to result in considerable potential impact energies that must be able to be absorbed by the bridge footings/ship collision protection measures.
- The bridge decks must be wind resilient and will require wind barriers similar in form to those provided on the Queensferry Crossing. However, a slender single carriageway long span suspension bridge presents a design challenge to ensure the adequacy of the deck's aerodynamic response. This is particularly important for these long span suspension bridges. Research and wind tunnel testing would be required to determine if a slender single carriageway suspended road deck of that length is feasible. Conceivably, additional lateral and vertical restraint/damping would be required.
- The west approach to the bridge is considerably constrained by topography and a curved approach viaduct is required to connect the bridges western landfall to Ardentiny in the north.

		<p>The route joins the existing A83 Trunk Road at Cairndow by means of a 400m long composite steel multi-span viaduct. The bridge would be of conventional design but consideration must be given to the possibility of cross-wind effects.</p> <p><u>Tunnels within Route Corridor 10</u></p> <ul style="list-style-type: none"> • Tunnels are considered to be required to satisfy a practical road alignment through the route corridor. The proposed tunnels would be approximately 1.7km and 1.9km in length with a constant gradient of about 2.5-3.5% and are straight. • It is initially considered that the tunnel would be constructed by a single bore providing a single carriageway with bi-directional traffic through the tunnel; however, there are important fire life safety, and associated ventilation and escape provisions, backed up by European and National highways standards that will govern the tunnel configuration. • For a single carriageway, bi-directional tunnel, these provisions are quite complex. The ventilation system must be in permanent operation and in the event of a fire, smoke and heat have to be removed from the tunnel using semi-transverse ventilation, which draws the smoke and heat into an overhead duct. Escape from the fire is also more problematic in that an escape duct has to be provided within the tunnel section. • Accordingly, a twin bore, dual carriageway tunnel may be more appropriate. In such tunnels, in the event of a severe vehicle fire, longitudinal jet fan ventilation is ramped up to full strength to blow the smoke and heat in the direction of flow of traffic, away from vehicles queued behind the incident, while those ahead of the incident escape by continuing as normal. For those trapped in the tunnel, they can escape into the other non-incident bore through cross-passages, at say 100-300m intervals, and can be evacuated by rescue vehicles. Intermediate shafts would not typically be required other than to vent pollution; however, given the likely move to electric vehicles by the time tunnel construction would be completed, these may not be needed, and further consideration would be required.
	<p>Constructability Considerations</p>	<p><u>Major Structures Constructability Considerations – Bridges</u></p> <p>Gare Loch Cable Stayed or Suspension Bridge</p> <ul style="list-style-type: none"> • The channel depth reaches 60m. Navigation includes military surface vessels, submarines and commercial and private/leisure craft. Marine management and control are crucial factors governing the construction process.

		<ul style="list-style-type: none">• The eastern approach between Helensburgh and Rhu is a curved elevated highway viaduct while the west may also have to be curved to follow the shoreline at Castle Point for the descent to the road network. Both east and west viaducts would be concrete box or steel composite decks on leaf piers on piled foundations. The approach viaducts' curvatures would appear to preclude incremental launching as these would be built conventionally span by span.• The bridge towers would be high H- or A-frames enclosing the single carriageway road deck. The location of the towers would require large diameter caissons fabricated nationally or internationally. Single or twin caissons would be required for each tower footing, floated by semi-submersible into location and sunk to seabed possibly in up to 50m depths. These would then be sunk by their own mass and by perimeter jetting to penetrate and sink through to rockhead whereupon jet grouting would form a seal prior to excavation and underwater concreting.• An alternative foundation method would be the construction of large diameter pile caps within the caissons and large diameter piles to rock.• The mass of the caisson and internal concreting mass would be designed to provide the energy absorption required and may govern the overall diameter of the caissons. It is estimated caissons of approx. 30m diameter would be required. Large fendering installation would be necessary to prevent hull over-sail impacting the towers. The potential for submarine collision is also an unusual factor.• Road access to east and west ends of the bridge is reasonably good.• The abutments both located in populated areas and construction of these is likely to cause significant disruption to the road network comprising the B833 and A814 on each side of Gare Loch. Impact on the community may also be significant due to the size of the piers and extensive working areas, plant and equipment required to construct.• Marine transfer of personnel, materials and equipment would be a major challenge where the tower construction would require to be serviced by east-west marine transport across the loch.• Cable installation would be by aerial spinning. Cable anchorages would occupy additional land and require careful alignment interaction with the approach road/viaduct alignments.• Importantly for the bridge is the time deck segment delivery barges must stay on station to allow segment lifting onto the suspension catenaries. The deck height of +85m lengthens the time taken to jack the segments to deck level. On station times of up to 12 hours could be expected (2 hrs GPS locating and anchoring, 10 hrs jacking). During this time exclusion zones will limit or divert marine traffic. In this respect, the crossing location on Gare Loch is particularly constrained and military vessel movements would have to be carefully managed – consultation would be required at an early stage to determine specific requirements and constraints as there are no alternative marine routes to Faslane.
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		<ul style="list-style-type: none"> • The towers would be constructed by jump-forming. For a deck carriageway height of +85m, tower heights are estimated to be 250 to 300m above sea level. <p>Loch Long Suspension Bridge</p> <ul style="list-style-type: none"> • Navigation at the entrance to Loch Long includes military surface and submarine vessels, very/ultra large crude oil carriers (VLCC/ULCC), commercial and private/leisure craft. Marine management and control are crucial factors governing the construction process bridges. • The eastern approach from the Rosneath Peninsula is from elevated land and will require a curved approach viaduct. The western landfall is more difficult in that the approach has to descend in a constrained shoreline space towards Ardentinny. The viaduct form would be a post-tensioned concrete box or a steel composite box girder deck on discrete or leaf piers on piled foundations. Incremental launching would appear not to be suitable on east or west approach. • The towers would be high H- or A-frames enclosing the single carriageway road deck. The location of the towers would require large diameter caissons fabricated nationally or internationally. Single or twin caissons would be required for each tower footing, floated by semi-submersible into location and sunk to seabed possibly in up to 60m depths. These would then be sunk by their own mass and by perimeter jetting to penetrate and sink through to rockhead where jet grouting would form a seal prior to excavation and underwater concreting. • An alternative foundation method would be the construction of large diameter pilecaps within the caissons and large diameter piles to rock. • The mass of the caisson and internal concreting mass would be designed to provide the energy absorption required and may govern the overall diameter of the caissons. It is estimated caissons of approx. 30m diameter would be required. Large fendering installation would be necessary to prevent hull over-sail impacting the towers. The potential for submarine collision is also an unusual factor. • The west end of the bridge is isolated and considerable temporary haul road construction would be required from Strone in the south or from Ardentinny in the north – however, access from the north would require considerable completion of the road and tunnel works from Whistlefield through Glen Finart. Alternatively, considerable marine transfer operations would be required between across the loch. • Marine transfer of personnel, materials and equipment to the towers would be a major challenge where east-west construction marine transport would cross the north-south navigation route. • Cable installation would be by aerial spinning. This would occupy additional land and require careful alignment interaction with the approach road/viaduct alignments especially at the west approach.
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- Importantly for the deck construction interface with marine traffic is the time deck segment delivery barges must stay on station to allow segment lifting onto the suspension catenaries. The channel depths lengthen the time taken to anchor the barges on station – anchor line length in 60m depth is considerable. The deck height of +85m lengthens the time taken to jack the segments to deck level. On-station times of up to 10 hours could be expected (2 hrs GPS locating and anchoring, 8hrs jacking). During this time exclusion zones will limit or divert marine traffic. Military vessel movements would have to be carefully managed – consultation would be required at an early stage to determine specific requirements and constraints.
- The road network delivery route to west approach is long and vulnerable to the ongoing closure risk of the A83 at Rest and Be Thankful.
- The towers would be constructed by jump-forming. For a deck carriageway height of +85m, tower heights are estimated to be 250 to 300m above sea level.

Major Structures Constructability Considerations – Tunnels in Route Corridor 10

- The tunnels within the route corridor, as described in the ‘Structures Considerations’ section, could be advanced by drill and blast techniques or by using a large Tunnel Boring Machine (TBM).
- Whichever technique is used, short sections of cut and cover tunnel would be required at each portal location to form a vertical portal face in reasonably competent rock from which the tunnel can be advanced. At each drill-and-blast advance the flat-bottomed “horseshoe”-shaped excavation of newly cut rock would be evaluated by a geologist, classify it and strengthened using a pre-set combination of supporting elements (rockbolts and sprayed concrete, etc.), to form a stable primary lining before the next advance is drilled and charged with explosive. Although this may seem a slow and laborious process it can be an economic method to construct tunnels in rock. The tunnel can be completed more quickly if the drill-and-blast sequence can be repeated at the opposite portal, or even from intermediate shafts. Once the tunnel is completed an in-situ cast secondary lining can be installed to form a durable final structure.
- Alternatively, the tunnels can be bored using a large Tunnel Boring Machine (TBM), starting at one end and boring the tunnel consecutively. Although this involves a large capital investment in a TBM and large site set-up at the portal locations, when compared with drill-and-blast, the final circular structural lining of pre-cast segments can be formed as the tunnel advances.

Issues specific to various tunnel options are as follows:

- Blairmore Tunnels – The construction of the southern tunnel may be best carried out from the southern end where it will minimise interactions with the adjacent viaduct works at the northern end, although the

		<p>northern portal would require some construction prior to the southern viaduct abutment. The difficulty of accessing the tunnel portals along with the relatively short length of tunnel may make use of a drill and blast method more likely than a TBM. The northern tunnel would likely be best constructed from the northern end to maximise access as early as possible in the programme. Depth under the mountain at the northern tunnel end is up to 250m on a particularly steep mountain, which may be difficult to access should vertical shafts be required. This tunnel is relatively short, so it is not likely that shafts would be required.</p> <p><u>Other Constructability Considerations – Road and Small Structures</u></p> <p>Rhu to Blairmore</p> <p>This section of road comprises 2 large marine crossings described above, connected by a new surface road crossing the peninsula between Rosneath and Cove. The construction of the new surface road in the central section indicates a large amount of earthworks likely to impact the B833 through extensive vehicle usage. Depending on the cut and fill balance it may be necessary to establish a borrow pit in the nearby vicinity to avoid importing fill, as the area is remote with limited access.</p> <p>Blairmore to Ardentinny</p> <p>This section is approximately 8.4km in length and comprises a new offline road constructed through a combination of 4no viaducts and 2no short tunnels to the north (approximately 1.2km length) and south (approximately 1.68km length) ends of the section respectively. The viaducts from north to south are approximately 465m, 687m, 1230m and 543m in length. There is also a new road required on the hillside comprising sections of cut and fill earthworks for approximately 1.95km of the route. The route ties into the proposed new road through the valley at Ardentinny in the north and connects to the proposed Loch Long crossing east of Blairmore in the south. The route has the following considerations for construction:</p> <ul style="list-style-type: none">• The existing roads are bi-directional single lane, so would not be suitable for providing most of the access to the works, therefore a separate haul road will be required along the route to connect with the A880 in the south west or possibly via an extended haul route network to the A815 at Loch Eck. Haul roads could make use of existing tracks on the hillside by making required improvements and appear to be able to run end to end for the route.• A marine facility is likely to be a preferred option for material supply and removal of unsuitable material and could be combined with a facility to support the proposed link road crossing of Loch Long. The location of any marine facility will need to consider residential areas to avoid or minimise disruption during operation.
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		<ul style="list-style-type: none"> • Earthworks on the hillside is likely to require extensive cut operations and may involve several retaining walls with the steep working areas making access along the hillside more difficult, potentially requiring use of hill climbing plant in the early stages. • Construction of the viaduct piers and abutments would need to be carried out on steep slopes, particularly in the southern part of the route, making access for large piling plant and cranes a notable issue requiring fairly extensive temporary works to create suitable working platforms. • Deck launching may be the most suitable construction solution and is likely to require completion of the 2 southernmost viaducts consecutively to provide access to the abutments for each bridge in sequence which could stretch programme durations somewhat. At the northern end of the route the access is somewhat more viable which should mitigate the issues. <p>Whistlefield Inn to Barnacabber</p> <p>This section is a new route that connects the A815 to the west side of Loch Long at Ardentinny and incorporates a 3.5km section of tunnel from the A815 east of Loch Eck with a new surface road to be constructed through Glen Finart to Ardentinny. The following are key considerations within this route corridor:</p> <ul style="list-style-type: none"> • Access to the working areas is very limited by existing road with only the A815 at the western end providing possible access from the west. Other widening works on this stretch of road are likely to impact the capacity of this road also, making its use undesirable for delivering materials and tunnelling spoil removal. As a result, it may be desirable to establish a marine loading facility on Loch Long at the bottom of the valley and establish a haul road network from the works area to the facility. This could be shared for the earthworks on the Ardentinny to Blairmore stretch of road which are also notable in scale. • To supply any offloading facility in the loch which could be created, the works would require creation of a haul road network along the valley floor and may require temporary bridging in some locations to cross the watercourses. If the A815 is to be used for earthworks material transport, then coordination with widening works on that road will be vital to ensure that capacity is maintained for public traffic. • The tunnel portal at the western end of the tunnel is quite close to the existing A815 so it would be advisable to relocate this further away from the road, especially if tunnelling is to commence from that end. • Construction of roads and river crossings in the valley should be relatively straightforward with due consideration for the supply of materials and impacts to access roads already mentioned <p>Whistlefield to Cairndow</p> <p>Road improvement on this section of the A815 are currently assumed to require widening at existing road level only,</p>
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		<p>so significant earthworks and other heavy civil engineering activities are not anticipated for this part of the scheme. The widening works would require the traffic to be restricted to a single lane on the opposite side of the road from where the work is being carried out with work progressing linearly along the road in 500m sections for each work front. The number of sections under progress may be restricted according to traffic modelling requirements, but would likely be completed in short lengths with a potential limit on the number of work fronts that can be working concurrently. Some minor bridge replacements on the route may be required and would likely require extensive diversions to allow for road closures during demolition and construction, although it may be possible to utilise temporary bridges to open up the road or divert locally. The northernmost point of the route corridor is where the proposed new Trunk Road alignment meets the existing A83 Trunk Road at Cairndow. At this point, the new Trunk Road alignment is completed by a new 400m multi-span steel composite bridge deck on leaf piers and piled foundations.</p>
<p>Environment Considerations</p>	<p>Biodiversity, Fauna and Flora</p>	<p>6.7ha of Glen Etive and Glen Fyne SPA falls within the route corridor There could be temporary and permanent habitat loss within the SPA, which would be a major negative environmental effect. Disturbance to the designated feature breeding golden eagle could occur during construction and operation, which would be a major negative environmental effect.</p> <p>222.8ha of Beinn an Lochain SSSI falls within the route corridor. There could be temporary and permanent habitat loss within the SSSI including the loss of designated features tall herb ledge and upland assemblage, which would be a major negative environmental effect. Moderate negative environmental effects could also occur as a result of nitrogen deposition.</p> <p>All of Ardchylene Wood SSSI (176.8ha) falls within the route corridor. This could result in considerable temporary and permanent loss of SSSI habitat, including the loss of designated features upland oak woodland, which would be a major negative environmental effect. Moderate negative environmental effects could also occur as a result of nitrogen deposition.</p> <p>253.0ha of Loch Eck SSSI falls within the route corridor. There could be temporary and permanent habitat loss within the SSSI, including the loss of designated features bryophyte assemblage, flood-plain fen and oligotrophic loch, which would be a major negative environmental effect. Moderate negative environmental effects could also occur as a result of nitrogen deposition.</p> <p>Most of Craighoyle Woodland SSSI (66.6ha) falls within the route corridor. This could result in considerable temporary and permanent loss of SSSI habitat, including the loss of designated features bryophyte assemblage and lichen</p>

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		<p>assemblage, which would be a major negative environmental effect. Moderate negative environmental effects could also occur as a result of nitrogen deposition.</p> <p>141 parcels of woodland listed on the AWI fall within the route corridor. This could result in the loss of nationally important habitat, which could require compensation and would be a major negative environmental effect. Moderate negative environmental effects could also occur as a result of nitrogen deposition.</p> <p>There is potential for effects on terrestrial and aquatic species from construction activities, as follows:</p> <ul style="list-style-type: none"> • Disturbance from noise and vibration and light pollution • Injury or mortality from vegetation removal, vehicle movements, or becoming trapped in uncovered holes and pipes during construction • Fragmentation and loss of habitat suitable for shelter, foraging and commuting • Changes in water flow conditions from runoff, or alterations to watercourses and groundwater. <p>During operation, there is potential for habitat loss and fragmentation for protected species as a result of tree and vegetation clearance and loss of irreplaceable AWI.</p>
	<p>Population and Human Health</p>	<p>There is potential for localised noise and vibration effects on receptors within the route corridor during the construction phase. For example, noise nuisance and vibration caused by traffic and activities associated with construction works could result in general annoyance and/or sleep disturbance for receptors. Construction of watercourse crossings in particular could result in a longer construction period and could involve activities such as piling with high levels of noise and vibration.</p> <p>During the operation phase, there is potential for receptors close to the route to experience new or increased noise and vibration impacts from increased vehicle traffic.</p> <p>As there are a number of settlements within the route corridor, in addition to noise and vibration there is potential for other minor negative effects on population receptors resulting from construction traffic. Increased traffic volumes and construction activities could result in diversions and affect journey lengths for both vehicle travellers and non-motorised users (NMUs).</p>

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		<p>During operation, the watercourse crossing would provide significant journey savings around Loch Long and Gare Loch. The route corridor generally would improve connectivity from the central belt to Argyll and Bute.</p> <p>It is expected that the route corridor would provide greater accessibility to the Cowal Way and the core path network in and around the route corridor. There is also potential for paths to be severed as a result of the route corridor.</p> <p>Land-take from properties would be required to facilitate the operation of the route corridor. Land take and potentially demolition would also be required in order to construct the tunnels, as described in the 'Structures Considerations' section, that would be necessary to provide a road through the challenging topography to the west of Loch Long, and north-west of Glen Finart.</p> <p>There is also potential for air quality effects which could affect human health; these are discussed further under Air Quality.</p>
	Water Environment	<p>Construction within the route corridor and operational structures and discharges may affect the hydromorphology and surface water quality of approximately four Water Framework Directive (WFD) classified river water bodies, three WFD coastal, one WFD loch and two transitional WFD water bodies and approximately 150-160 minor watercourses.</p> <p>SEPA Flood Maps (SEPA, 2020) indicates that the route corridor may be at coastal flood risk around A814 at Gare Loch, B833 and A880 at Loch Long A886 at Loch Fyne and at fluvial flood risk from Kilcreggan Burn, River Finart, around A815 at Loch Eck, Allt na h-Airigh and Allt Ruadh, the River Cur, Eas Dubh, Allt Coire No and Kinglas Water during a medium likelihood event (0.5% Annual Exceedance Probability (200-year) event). Potential for coastal flooding from new crossings on Loch Long and Gare Loch, which could impact flooding on associated road infrastructure.</p> <p>May affect the Loch Eck SSSI and the Upper Loch Fyne and Loch Goil Marine Protected Area.</p> <p>Loch Fyne Shellfish Water Protected Area is within the route corridor and may be affected by the route.</p> <p>There are Active Aquaculture Sites, CAR licenced fish farms and Classified Shellfish Harvesting Areas within the vicinity of the route corridor, which may be affected.</p> <p>The route corridor passes through one surface water Drinking Water Protected Area, which may be affected.</p>

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		Construction and operation within the route corridor could result in significant negative effects on the water environment, subject to appropriate mitigation.
	Soils	The route corridor is assessed as having a minor negative or uncertain environmental effect. This recognises the route corridor is likely to avoid potential effects on Class 1 and Class 2 peatland habitat (nationally important and of potentially high conservation value and restoration potential) and the GCR sites. Loss of existing commercial forestry and land identified as Preferred and Potential within the Argyll & Bute Woodland Strategy is likely to be unavoidable within the route corridor, but mitigation is likely to be achievable to reduce the potential for major negative environmental effects.
	Air Quality	<p>There is potential for localised air quality effects on receptors within the route corridor during the construction phase: for example, dust generated from site activities, including construction of large structures across Gare Loch and Loch Long, and pollutant emissions from vehicular movements, which could result in annoyance for local residents.</p> <p>There is potential for receptors within the route corridor to be affected by pollutant emissions (e.g. carbon monoxide, sulphur dioxide, particulate matter) from vehicle traffic during operation.</p> <p>Although the existing air quality in the region is good, there are a number of settlements within the route corridor which could potentially experience air quality negative effects; however it is expected that these would be reduced through mitigation measures.</p> <p>Potential air quality impacts on ecological receptors are assessed under Biodiversity, flora and fauna.</p>
	Climatic Factors	<p>Construction of the route corridor would have major negative effects on climate due to the release of carbon emissions associated with the construction materials and installation process. This includes the widening of 27.7km of existing A class carriageway and 19.5km of other roads to be upgraded.</p> <p>There is a significant cumulative quantity of embodied carbon associated with constructing the elements set out in the Material Assets section.:</p> <p>Once operational, forecast traffic levels (and associated vehicle-derived greenhouse gas emissions) are relatively low, for this route corridor, assuming the continued operation of the A83 through the Rest and Be Thankful.</p> <p>Effects on the route as a result of predicted changes to the climate and weather should also be considered. Sections of the route are situated within or in close proximity to zones that may be at risk of coastal or fluvial flooding, as</p>

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		<p>indicated in the 'Water Environment' Section. The anticipated increase in severity and frequency of rainfall events caused by climate change could pose greater risk from flash-flooding.</p> <p>As indicated in the 'Soils' section, the route corridor is located on areas identified as peatland which would lead release of sequestered carbon and a loss of high value carbon sink land which could lead to minor negative or uncertain environmental effects.</p> <p>Felling would be required which would also reduce the carbon sink value of forested areas within the route corridor and could result in major negative environmental effects. Woodland and Forestry Strategy areas, including existing planted woodland, potential, preferred and sensitive sites, need to be considered in the route corridor selection process.</p>
	Material Assets	<p>As outlined in the Climatic Factors section, there are several natural material assets including woodland, peat soils and farmland that could be affected by the route corridor.</p> <p>As indicated in the 'Soils' section, the route corridor is located on areas identified as peatland which would lead release of sequestered carbon and a loss of high value carbon sink land which could lead to minor negative or uncertain environmental effects.</p> <p>Felling would be required which would also reduce the carbon sink value of forested areas within the route corridor and could result in major negative environmental effects. Woodland and Forestry Strategy areas, including existing planted woodland, potential, preferred and sensitive sites, need to be considered in the route corridor selection process.</p> <p>Loss of natural material assets would result in minor negative or uncertain environmental effects for soils and major negative effects on woodland.</p> <p>In terms of built material assets, construction of the route corridor would have major negative effects as a result of raw material requirements for the following elements:</p> <ul style="list-style-type: none"> • 1 no. new 1,500m long (900m main span) cable stayed or suspension bridge over Gare Loch. • 1 no. new 2,600m long main span suspension bridge over Loch Long. • A tunnel approximately 3,100m long. Under Larach Hill between Glen Finart and the A815 at Whistlefield. • Depending on local alignment across Gare Loch and Loch Long, potential for a tunnel approximately 1,870m long on the west side of Loch Long.

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		<ul style="list-style-type: none"> Depending on local alignment across Gare Loch and Loch Long, potential for a tunnel approximately 1,680m long on the west side of Loch Long. 1 no. new 400m long multi-span steel composite single carriageway viaduct on piled reinforced concrete abutments and piled intermediate piers near the tie in to the existing A83 Trunk Road. Approximately 9 no. new single span composite concrete Y beam deck single carriageway bridges on piled or spread footing abutments. Approximately 50 no. new piped or box culverts. <p>The Firth of Clyde is a busy shipping route for naval vessels accessing HMNB Clyde and cargo vessels accessing Clydeport Container Terminal at Greenock as well as ferry services. There is potential for effects on shipping during construction of the structural crossing. Appropriate clearance for shipping would be required to avoid effects on navigation for naval, commercial, fishing and leisure traffic.</p>
	Cultural Heritage	<p>Due to the relatively high numbers of cultural heritage resources within the route corridor (compared to route corridors 1 to 3) and the locations of these, it is considered unlikely that a route within this route corridor could be developed that would avoid major negative effects on these.</p> <p>The most cultural heritage constraints are where there are concentrations of Listed Buildings at Rosneath, Cove, Kilcreggan, Blairmore, Ardentinny and Strachur and where the Cove and Kilcreggan Conservation Area almost completely bisects the route corridor. The route corridor also includes concentrations of Listed Buildings and large Conservation Areas at Rhu and Helensburgh and these also represent a pinch point.</p>
	Landscape	<p>There is potential for effects on the LLTNP, the North Argyll and East Loch Fyne (Coast) APOs, one GDL and the local landscape and seascape character due to the construction and operation of the carriageway and supporting infrastructure. There is also potential for visual effects for residential receptors in proximity to the route corridor, as well as vehicle travellers using the existing roads and other outdoor receptors. The introduction of two new crossings at Gare Loch and Loch Long would affect the landscape character and visual amenity of the area.</p>
Traffic	Traffic Flows	<p>Due to the improved road links to Cowal, associated with this route corridor, traffic is likely to shift onto the new route when travelling to/from Dunoon, however within the context of typical traffic levels on the existing A83 Trunk Road, traffic using this corridor is forecast to be relatively low, with a corresponding reduction in traffic on the A83 through the Rest and Be Thankful (less than 25% in 2027). This assumes that the Rest and Be Thankful is operating under normal conditions.</p>

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		<p>There will be a degree of local re-routing of trips for vehicles accessing the new route corridor, with traffic increases forecast on the A814 south of its junction with A817 as well as on the A815 south of its junction with the new route. between Dumbarton and Arrochar, and on the A815 between Dunoon and its junction with the new road. Corresponding decreases are forecast on the A82 Trunk Road between Tarbet and Dumbarton, the A83 Trunk Road from Tarbet to Inveraray, and the A815 north of Strachur. Reductions would also be expected on the A817 and A818.</p>
	Accidents	<p>For those trips that utilise the new route corridor, accident reductions would be expected due to the shorter journey times that have attracted them to the new route. During times when the A83 Rest and Be Thankful is closed, the new route corridor would also provide an alternative route on a standard of road likely to be higher than the current diversion route, which includes a section of the A82 Trunk Road, with a known safety record. Based on the traffic levels likely to re-route to the new route corridor, the expected accident savings are low.</p>
Operational Considerations		<p>From a Trunk Road operation perspective, the main operational considerations within the route corridor are the risk of flooding and/or landslides where it passes through valleys or adjacent to waterbodies, based on the steep topography in these areas. In some areas, the centreline of the route corridor has a maximum elevation of approximately 200m AOD, with significant adjacent peaks providing shelter. This means it is likely that in these areas, snow accumulates within the route corridor during the winter months, with potential winter resilience operational issues.</p> <p><u>Bridges within Route Corridor 10</u></p> <p>Long span bridges will require the Trunk Road Operating Company to maintain an on-site bridge management and control facility with bridge traffic management and control, communications with Traffic Scotland, marine navigation and MOD liaison along with inspection, maintenance and repair capabilities. Additionally, facilities will be required for maintaining equipment and collecting telemetry from a Structural Health Monitoring System.</p> <p><u>Tunnels within Route Corridor 10</u></p> <ul style="list-style-type: none"> • There is a need for regular inspection and maintenance of such tunnels. A tunnel manager, tunnel safety officer and a tunnel design & safety consultative group (TDSCG) must be set up early in the design process and continue through operation. The location and type of tunnel operations centre would need to be

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	<p>reviewed and investigated further, depending on the final location and length of tunnel provided. A sufficient power supply will be required to allow operation of the tunnel ventilation system and any other systems, particularly those required in the event of an emergency incident.</p> <ul style="list-style-type: none"> • The use of the tunnel by vehicles carrying potentially hazardous materials or dangerous goods (such as fuel tankers) is largely dependent on fire safety and ventilation, and may require a tunnel ventilation system that allows for a larger design fire size. Dependent on the evaluation of risks, dangerous goods vehicles may need to be escorted through the tunnel in a convoy. It should be noted that a twin bore dual carriageway tunnel configuration is considered likely to result in fewer road traffic accidents (due to no bi-directional traffic flow), theoretically attracting a lower risk of emergency incidents. • For a twin bore dual carriageway configuration, vehicle cross-overs may need to be provided at intervals if practicable, as per recommendation from the European Directive EUD 2004/54 EC. In addition, lay-bys should be provided at intervals. • The development of any tunnel design should be informed by consultation with emergency services and other relevant stakeholders and guided by European and National Standards to ensure that appropriately robust measures in the event of an emergency incident are put in place.
Financial Considerations	The estimate cost range of a scheme within this route corridor is approximately £5.62Bn - £7.39Bn.
Estimated Time to Completion	It is estimated it would take approximately 15 years to achieve a fully operational road in this route corridor assuming constructed as a single contract. If construction was phased with contracts in sequence, the time for completion would be greater.
Public Acceptability	Consideration of the feedback received during the public consultation held during September / October 2020 shows that there were more statements of opposition to this route corridor than supportive comments.

STAG Criteria	
Criteria	Assessment Summary
Environment	Refer to Implementability Assessment – Environment
Safety	Refer to Implementability Assessment – Accidents

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Criteria		Assessment Summary
Economy	Transport Economic Efficiency	<p>Journey time saving for strategic traffic currently using the A83 Trunk Road as a result of this route corridor are expected as the option provides enhanced connectivity for the Bute and Cowal Region of Argyll and Bute.</p> <p>Based on traffic forecasting for 2027 using Transport Model for Scotland (TMfS14), journey time savings between Tarbert and Glasgow are forecast to be negligible (<5 minutes) in 2027. Journey time savings between Dunoon and Glasgow are expected to be moderate (in the region of 15-45 minutes) compared with existing road only options, following the construction of the route corridor.</p> <p>A high-level cost-benefit analysis undertaken for the different route corridor options proposed suggests that, assuming normal operation of the existing A83 Trunk Road, the benefit to cost ratio for the proposed route corridor is expected to be very low. Quantification of the economic benefits of the scheme will require further analysis of the cost of closures to the economy.</p>
	Wider Economic Impacts	<p>This route corridor offers substantial changes in connectivity and, therefore, is best not solely characterised as a solution to unreliability at the Rest and Be Thankful. Rather, it provides the opportunity to radically improve connectivity to some of the remote communities of Argyll and Bute.</p> <p>The route corridor offers more direct connections from Cowal to the more populous areas of Garelohead, and Helensburgh, providing substantial improvements in onward journeys to the central belt.</p> <p>The route corridor, therefore, has the potential to provide a significant positive contribution towards wider economic benefits for Argyll & Bute. Significant benefits would likely be provided for key sector businesses, such as whisky, aquaculture and tourism, through enhanced access to both national and global markets.</p> <p>It is also worth noting that, while rural depopulation (a significant issue within Argyll & Bute) is linked to wider economic outcomes, indications are that headline economic conditions are not the main driver of this. Transport interventions could likely play a part in arresting population decline, but only if considered alongside an integrated package of economic, cultural and social regeneration measures. A package of</p>

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STAG Criteria		
Criteria		Assessment Summary
		measures of this type, coupled with upgraded access to Kintyre, Bute and Cowal, has the potential to arrest population decline and reinvigorate local communities within Argyll & Bute.
Integration	Transport Integration	<p>An integrated transport system aids accessibility by connecting people to opportunities and goods to markets. This route corridor may provide multi-modal opportunities to enhance transport integration.</p> <p>The intervention 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 intervention address the needs of recreational walkers, cyclists and equestrians, as well as commuters, who may be given the opportunity to travel via active modes to transport interchanges. The intervention may help to reduce issues regarding actual and perceived severance, due to the provision of fixed links, with active travel infrastructure benefiting communities in Cowal, with improved linkages across the route corridor to Helensburgh, Rosneath and beyond.</p> <p>The intervention will provide enhanced resilience and potential journey time and journey time reliability benefits for strategic and local bus and coach services. The resilience and enhanced connectivity provided may provide bus and coach operators with an opportunity to review timetables, translating to more efficient operations and, potentially, a change in service frequency, scope for interchange between services and the number of communities served.</p> <p>Landslide induced incidents on the A83 Trunk Road at the Rest & Be Thankful can lead to road closures and diversions. Should the Old Military Road also be closed, the diversionary route for A83 traffic between Tarbet and Inveraray is approximately 25 miles longer in length than if using the A83. Depending on journey origin and destination, the longest diversion length experienced by travellers would be over 60 miles. The improved resilience may contribute towards a reduction in the variability of bus journey times and the likelihood of full closures, leading to service cancellations. This may also provide a health and welfare benefit to bus drivers, due to the reduction in instances where bus services are forced to travel via longer diversion routes.</p>

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Criteria	Assessment Summary
	<p>This route corridor is not expected to have a major impact on the perception of a seamless public transport journey, as ticketing will not be affected to any great extent. However, there is potential for enhanced interchange between bus services, due to the enhanced connectivity provided.</p> <p>The intervention will improve journey time reliability and resilience, providing more efficient opportunities for freight transport, facilitating more efficient and effective transportation of goods of significant value to the regional and national economies, including high value aquaculture produce and whisky.</p>
Transport and Land Use Integration	<p>The main aspect of appraisal within the transport and land-use integration criteria is identifying and mitigating any conflicts between the intervention and land-use planning policy and environmental designations.</p> <p>If selected as the preferred route corridor, a strategic assessment of the impact of the route corridor on the environment would be carried out in the Strategic Environmental Assessment (SEA). More detailed Environmental Impact Assessment would be carried out as part of the DMRB Assessment Process.</p> <p>The route corridor is expected to support enhanced accessibility to and from developments in the wider region, and may support investment decisions in Argyll & Bute, more generally.</p> <p>This route corridor is, however, judged to deliver slight negative impacts in terms of promoting sustainability and reducing the need to travel. The enhanced connectivity for Cowal provided by this route corridor could result in higher levels of traffic as a result of the improved access provided for currently geographically remote communities. While this could result in a short-term negative impact, in terms of delivery against the climate action goals, cognisance of the likely timescales for the delivery of an intervention of this scale should be made, given that it is likely that the regional / national vehicle fleet may be largely decarbonised, by this stage. The overall impact on Land Use Transport Integration is considered to be Minor Negative.</p>
Policy Integration	<p>The route corridor contributes to strategic policy objectives set by the Scottish Government and Transport Scotland. A wide range of national and regional level policies from various plans, programmes and</p>

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	<p>strategies have been reviewed, including Argyll and Bute's Local Development Plan, its' Strategic Environmental Assessment and the LLTNP Local Development Plan. The various relevant policies contained within these documents have been taken into account in the TPOs, the existing corridor conditions and the implementability assessment. No over-riding conflicts have been identified and, in specific instances, the route corridor may contribute towards the delivery of specific policies.</p> <p>The A83 was identified in Transport Scotland's STPR as a route requiring network optimisation through route management and targeted investment. Transport Scotland's emerging STPR2 continues to appraise the need for investment in improved access to Argyll & Bute.</p> <p>It is likely that this route corridor will contribute positively to the NTS2 vision and several of the underpinning priorities and outcomes, including 'takes climate action' and 'helps deliver inclusive economic growth'. Achieving positive outcomes against several of the priorities and outcomes, however, will be dependent on the quality and nature of the infrastructure provided, particularly related with the facilitation and promotion of travel via active modes.</p> <p>This route corridor is likely to contribute positively towards the NPF3 vision, in terms of delivering 'a successful, sustainable place', 'a low carbon place' 'a natural resilient place' and 'a connected place'. NPF3 recognises that Scotland's varied coast and islands have an exceptional, internationally recognised environment and notes the opportunity to secure growth from renewable energy generation as well as other key economic sectors including tourism and food and drink (of key importance to the regional economy). It is recognised that infrastructure investment, including improved transport links are required to bring employment, reverse population decline and stimulate demand for development and services in rural areas.</p> <p>This route corridor is likely to contribute positively towards key objectives as set out within Argyll & Bute's Local Development Plan. An intervention within this route corridor will likely assist in the improvement of:</p> <ul style="list-style-type: none"> - Argyll and Bute's connectivity, transport infrastructure, integration between land use, transportation and associated networks.

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STAG Criteria	
Criteria	Assessment Summary
	<ul style="list-style-type: none"> - Argyll and Bute’s main towns and key settlements, as increasingly attractive places where people want to live, work and invest. - the economic and social regeneration of smaller rural communities. - the continued diversification and sustainable growth of Argyll and Bute’s economy, with a particular focus on sustainable assets in terms of renewables, tourism, forestry, food and drink, including agriculture, fishing, aquaculture and whisky production. - addressing climate change impacts and reducing the region's carbon footprint. <p>This route corridor is likely to contribute positively towards the strategic principles set out within the LLTNP Local Development Plan. An intervention within this route corridor will contribute to the National Park by aiding the delivery of 'a successful, sustainable place', 'a low carbon place', 'a natural, resilient place' and 'a more connected place'.</p> <p>While the route corridor is likely to largely fit with policies related with transport based emissions, the nature of the construction and engineering activities required to deliver this route corridor are likely to result in significant emissions, on the basis of existing technologies. It is anticipated, however, that efficiencies in construction practices and the materials used, could be identified e.g. sustainably sourced materials, with a lower embodied carbon content. This would aid in ensuring that any emissions associated with construction activities are minimised, as far as practicably possible, making best use of advances in emerging decarbonisation technology.</p> <p>It is expected that the route corridor would be delivered in-line with measures, as set out within the Scottish Government’s ‘Update to the Climate Change Plan’ (2018 – 2032), and associated documents, including the emerging findings from the ‘Deep Decarbonisation Pathways for Scottish Industries: Research Report’ relating with the decarbonisation of industry, including the construction sector.</p> <p>A further assessment of carbon, and opportunities for carbon reduction in design, would be considered in later stages of the project assessment process.</p>

Access to Argyll & Bute (A83) Strategic Environmental Assessment & Preliminary Engineering Services
Route Corridor Preliminary Assessment
Route Corridor 10 – Helensburgh – Cowal – Cairndow

STAG Criteria		
Criteria		Assessment Summary
Accessibility and Social Inclusion	Community Accessibility	<p>It is considered that this route corridor offers the potential for positive impacts on accessibility, in terms of public transport usage, with enhanced access provided for Cowal and Rosneath. It is considered unlikely, however, that this route corridor would have any significant impact on reducing transport poverty or reducing reliance on private cars. This is primarily due to the nature of the route corridor and the areas within which it is located.</p> <p>There 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 corridor would be significant.</p> <p>This route corridor 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, and to the fixed links which, in and of themselves, may be an attractor for visitors and tourists, wishing to park and proceed via active modes.</p> <p>Potential enhancements in resilience provided as a result of mitigating landslide induced closures could aid community accessibility, through better, more reliable access to services, both locally and further afield.</p>
	Comparative Accessibility	<p>Due to the rural nature of the Argyll & 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 through delivery of an intervention within this route corridor include more reliable journeys to employment opportunities, recreation, education and health services located both within and outwith the region.</p>

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STAG Criteria	
Criteria	Assessment Summary
	<p>Visitors and leisure users would also likely benefit from NMU infrastructure provided, linking to core paths, existing cycle networks, outdoor activities and viewpoints. The design of such infrastructure should ensure that local communities benefit fully from such facilities and are not adversely impacted by them.</p> <p>Freight users may see health and wellbeing benefits from the enhanced resilience provided by this route corridor, with fewer closures resulting in the need for lengthy diversion routes, which can add a significant duration to journeys, contributing towards driver fatigue and stress. Given the rural nature of the region, journeys made using the A83 Trunk Road, may already be several hours in length.</p> <p>Positive impacts can be expected, in terms of mitigating impacts on socially excluded groups - Argyll & Bute has a higher proportion of older residents than the national average. Enhanced resilience may provide more reliable access to key services, including healthcare.</p> <p>This route corridor could contribute significantly towards reducing economic and geographic deprivation for currently socially disadvantaged groups (Argyll & Bute has several areas within the 10% most deprived communities in Scotland) through the significant improvement of accessibility to Cowal and Rosneath and the enhancement of business confidence driving an associated increase in inward investment and jobs.</p>

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Assessment Summary

Transport Planning Objectives		Assessment						
Objective		Major Negative	Moderate Negative	Minor Negative	Neutral	Minor Positive	Moderate Positive	Major Positive
TPO1	Resilience – reduce the impact of disruption for travel to, from and between key towns within Argyll & Bute, and for communities accessed via the strategic road network.						✓	
TPO2	Safety – positively contribute towards the Scottish Government’s Vision Zero road safety target by reducing accidents on the road network and their severity.					✓		
TPO3	Economy – reduce geographic and economic inequalities within Argyll & Bute through improved connectivity and resilience.						✓	
TPO4	Sustainable travel – encourage sustainable travel to, from and within Argyll & Bute through facilitating bus, active travel and sustainable travel choices.					✓		
TPO5	Environment – Protect the environment, including the benefits local communities and visitors obtain from the natural environment, by enhancing natural capital assets and ecosystem service provision through delivery of sustainable transport infrastructure.	✓						

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Implementability		RAG Rating		
		RED	AMBER	GREEN
Engineering	Topography and Alignment Considerations	RED		
	Geology / Geomorphology Considerations		AMBER	
	Structures Considerations	RED		
	Constructability Considerations	RED		
Environment	Biodiversity, Fauna and Flora	RED		
	Population and Human Health		AMBER	
	Water Environment	RED		
	Soils		AMBER	
	Air Quality		AMBER	
	Climatic Factors	RED		
	Material Assets		AMBER	
	Cultural Heritage	RED		
	Landscape and Visual Amenity	RED		
	Traffic	Traffic Flows		AMBER
Accidents			AMBER	
Operational Considerations			AMBER	
Financial Considerations		RED		

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STAG Criteria		Assessment						
Criteria		Major Negative	Moderate Negative	Minor Negative	Neutral	Minor Positive	Moderate Positive	Major Positive
Environment		Refer to Implementability Assessment – Environment						
Safety		Refer to Implementability Assessment – Accidents						
Economy	Transport Economic Efficiency	✓						
	Wider Economic Impacts				✓			
Integration	Transport Integration				✓			
	Transport and Land Use Integration			✓				
	Policy Integration				✓			
Accessibility and Social Inclusion	Community Accessibility						✓	
	Comparative Accessibility						✓	