

A83 Medium Term Solution
Options Assessment
Offline MTS

Option Details	
Option	Offline MTS (Medium Term Solution) Option
Option Description	<p>The Offline MTS Option generally follows the Long Term Solution (LTS) Green Route option on the western slopes of Glen Croe within the lower slopes of Ben Donich. It consists of a two-way single carriageway with verges. The option is approximately 3.5km long.</p> <p>This Option commences at a junction with the A83 Trunk Road, approximately 200m north of the current junction with the Old Military Road (OMR), and crosses Croe Water before heading westbound to join the alignment of the LTS Green Route, where they overlap horizontally and vertically for approximately 2.0km. Where the LTS Green Route heads across the Glen valley via viaduct towards the Rest and Be Thankful carpark, the Offline MTS Option veers west to join the remaining section of the forestry track and tie into the B828 Glen Mohr local road. The section of the B828 Glen Mohr local road from the forestry track junction to the A83 Trunk Road at the Rest and Be Thankful carpark will require to be upgraded to allow two-way working with priority given to the A83 Trunk Road traffic at the junction with the continuing B828 Glen Mohr local road.</p>
Rationale for Option	<p>A two-way Offline MTS Option is considered to offer a potential diversion route for trunk road traffic if the A83 Trunk Road is closed and is therefore included as a potential option that could form part of the overall Medium Term Solution strategy. It is comparable operationally to the A83 Trunk Road with two-way working but placed on the western side of Glen Croe.</p> <p>In addition, recognising concerns over the potential for cumulative impacts with multiple corridors being developed, the Offline MTS Option has been developed to overlap with the LTS route option that sits on the west side of the Glen: the Green Route. It seeks to maximise the overlap with the LTS Green Route and therefore could be considered an early phase of the long term strategy, supporting a phased approach to the construction of the LTS Green Route whilst providing an interim diversion route that could be utilised in the medium term.</p>

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Project Objectives		
Objective		Performance against objective
1	Increase resilience of a temporary diversion route through Glen Croe by reducing the likelihood of it being closed during landslide, flooding and other incidents	<p>The Offline MTS Option will provide a new alternative high standard two-way temporary diversion route through the southwestern side of the Glen, effectively bypassing the main landslide risk area on the northeastern side. It would be operationally comparable to the A83 Trunk Road with two-way working over its entire length, with no need for convoy or a lengthy diversion.</p> <p>However, the southwestern slopes have also been identified as being susceptible to a variety of forms of instability, including debris flow, landslide, boulder fall and rock fall. Further work is required to improve understanding of the geohazards on this side of the Glen to support the development of appropriate mitigation measures. Nevertheless, this option provides the opportunity to build in mitigation from the outset thereby reducing the likelihood of closures.</p>
2	Maximise operational benefits of a temporary diversion through Glen Croe route for all vehicles by providing a route that achieves a proportionate balance of time to implement, cost and impact	<p>Although the potential operational benefits of increased reliability and reduced journey time could be substantial, the costs will be high, and timescales to construct will be substantial.</p> <p>Indeed, the estimated cost and timescale associated with this option may be viewed more appropriate for the long term solution. The option will also have an environmental impact, being located in a currently relatively undisturbed part of the Glen.</p>
3	Reduce the likelihood of accidents on a temporary diversion route through Glen Croe.	<p>The Offline MTS Option will provide a higher standard diversion option to that provided by the other MTS options. The Offline MTS Option is proposed to operate with a 30mph speed limit. This will keep vehicle speeds low and in turn should minimise the likelihood of accidents. At the same time, geotechnical and flood mitigation measures will also reduce the likelihood of vehicles being impacted by a weather-induced event.</p>

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Implementability		
Engineering	Topography and Alignment Considerations	<p>The length of the Offline MTS Option between the OMR/A83 Trunk Road at-grade direct access and the B828 Glen Mhor local road/A83 Trunk Road junction is approximately 3.56km.</p> <p>This comprises approximately:</p> <ul style="list-style-type: none"> • 480m of offline construction crossing the Croe Water; • 2,000m overlap with the LTS Green Route; • 570m of offline construction diverting from the LTS Green Route; • 540m of the B828 Glen Mhor local road. <p>The LTS Green Route sits on the southwestern slopes of Glen Croe, roughly following the line of the lower forestry track in that area. The position of the route allows a long stretch of 5.35% gradient while minimising the amount of cut and removing any fill in situations where sitting on steep downslopes. The LTS Green Route will become part of the A83 Trunk Road and hence, designed to 100kph DMRB Design Standards. Therefore, the 2.0km section of the Offline MTS Option overlapping with the LTS Green Route is to 100kph DMRB Design Standards.</p> <p>The tie ins at either end drop in standard to a 50kph DMRB design to help navigate the steep topography. This is due to the steep climb required by the Offline MTS Option to deviate from the long stretch of 5.35% and reach the B828 Glen Mohr local road where the option joins to continue back to the A83 Trunk Road.</p> <p>The standard of the B828 Glen Mohr local road upgrades will be relative to the existing road standard in order to minimise earthworks and reduce impact on the adjacent SSSI. Steep gradients and loop connector standard horizontal geometry is expected.</p> <p>The horizontal alignment therefore varies along its entire length. The first section of offline alignment has a minimum curve of R=255m. The standard increases along the LTS Green Route overlap with a minimum curve of R=360m (two steps below Desirable Minimum). The offline section that climbs from the LTS Green Route to the B828 Glen Mhor local road is a winding section to traverse the steep topography with a minimum curve of R=50m. This is below standard for a 50kph design speed; however, it is situated at the junction where the Offline MTS Option will join the realigned B828 Glen Mhor local road, hence speeds will be low. The last section along B828 Glen Mhor local road</p>

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		<p>maintains the existing road geometry but increases cross section to allow two-way working to the Rest and Be Thankful carpark.</p> <p>The vertical alignment rises consistently from the bottom of the glen to the B828 Glen Mhor local road. A vertical gradient of 7.88% is applied to reach and join the LTS Green Route where a long stretch of 5.35% gradient is applied for the full 2,000m overlap. The climb continues to the B828 Glen Mhor local road junction with a maximum gradient of 8.67% applied for 525m. The existing vertical geometry is maintained on the upgraded B828 Glen Mhor local road with a maximum gradient of 10% applied over 65m.</p> <p>In terms of the cross section, the proposed width of the Offline MTS Option varies throughout its length. Along the 2km LTS Green Route overlap full S2 Single Carriageway cross section (7.3m carriageway, 1.0m hardstrips, 2.5m verges) has been applied. At either end of the overlap the hardstrips have been removed and the verges have been reduced to 1.0m long the existing B828 Glen Mhor local road. This is due to the temporary nature of these ends. The Offline MTS Option will be upgraded to become the Long Term Solution with the ends being made redundant. Hence, a reduction in cross section to minimise overall footprint and impact on abortive works.</p>
	<p>Geotechnical / Earthworks Considerations</p>	<p>The southwestern slopes of Glen Croe are steep and densely forested. The forestry is mature and closely spaced, with limited visibility of slope conditions possible from the existing forestry tracks and limited access possible through the plantations. The slopes above and below the existing lower forestry track are steep over much of the route, with evidence of some localised failures associated with watercourses, poor drainage and over-steepened earthworks. Rock exposures are present adjacent to the forestry track in places along much of its length.</p> <p>From a geotechnical perspective, construction of a two-lane route on steep side long ground presents challenges in terms of the scale of the earthworks which would be required to accommodate the required carriageway width. Steepened cuttings, supported by geotechnical measures such as soil nails, would be required to limit the lateral extent and height of the cutting slopes. Such measures are expected to be required for cuttings along much of the route where cuttings are in soil and also in cuttings where soil is present overlying rock. Cuttings within rock may also be steepened subject to favourable conditions being present. Construction of the route alignment on embankment on the downslope side onto steeply sloping terrain would also be difficult; measures would be required to limit the extent of the earthworks footprint and consequently the volume of material required for construction. These may include use of higher-grade fills and means of providing a secure foundation to support the toe of the embankment. Whilst both of the above scenarios present challenges, it is anticipated that cutting into the upper slope would be less problematic and the alignment has been developed along these principles.</p>

		<p>High resolution topographic data has recently been obtained for the southwestern slopes. Further modelling and refinement of the alignment will be required using this higher resolution data to obtain a more accurate earthworks model. Once ground investigation data is available this will also be reviewed to determine anticipated ground conditions, whether cut slopes will be in soil, rock or both, and provide information such as rockhead depth and the orientation of discontinuities within the rock. This may allow some refinement of proposals. However, it is anticipated that earthworks heights and required geotechnical measures will still be significant. Site observations to date suggest that the orientation of discontinuities in the rock may not be conducive to forming steep, and hence lower height, rock cuttings.</p> <p>The alignment developed to date is a minimum width based on a standard road width. This would need to increase, potentially quite significantly, to allow space for protection from geohazards, possible rock slope design measures (traps and berms), drainage including up-slope drainage, protection of adjacent slopes up-slope and down-slope, etc. and watercourse crossing protection. This will result in an increased earthworks footprint, and greater cutting heights than those currently modelled for the alignment alone.</p> <p>Due to the scale of the earthworks required to deliver this option, a substantial detailed ground investigation scope would be required. Due to the significant scale of the investigation, it is anticipated that this may result in a slower procurement process than a smaller investigation scope would require. In addition, a longer site operations phase would be required to deliver the necessary investigation works on a site with challenging access due to steep slopes and dense forestry. Therefore, the expected programme required to obtain ground investigation information necessary to inform the development of the design of the earthworks and mitigation measures required for this option is lengthy in comparison with the alternative options.</p>
	<p>Geohazards</p>	<p>In relation to geohazards, the southwestern slopes of Glen Croe have been identified as being susceptible to a variety of forms of instability, including debris flow, landslide, boulder fall and rock fall. The dense forestry cover currently obscures visibility of the surface condition and features which may provide information about the geomorphological history of the slope. It is possible that relict landslide failure surfaces exist at depth within the superficial deposits.</p> <p>These may be reactivated by changes in the loading conditions on the surface, for example by constructing earthworks on the slopes, or by changes in the local groundwater regime which may be triggered by felling forestry and stripping vegetation to form new earthworks. If unidentified relict failure planes remain following construction, a residual risk of reactivation would remain during the operation of the route(s).</p> <p>The forestry upslope of the route would require to be felled in advance of construction, as the presence of the route</p>

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		<p>would limit safe access for felling operations thereafter. However, the felling process would alter the ground and groundwater conditions and may result in increased susceptibility to instability. Replanting with a suitable mix of species may reduce this hazard in the long term however it would take some time to become sufficiently established and is unlikely to have an effect within the anticipated operational timespan of the MTS.</p> <p>Detailed assessment is required of remote sensing data which has been gathered during 2021. This, together with further site inspection before and after the necessary forestry felling has been completed, will inform the design of suitable geohazard mitigation measures to protect the route. These may take the form of catch pits, debris and rockfall barriers or other measures.</p>
	Hydrology and Drainage Considerations	This is covered under 'Water Environment' in the 'Environment' part of this table.
	Structures Considerations	<p>A number of culverts will be required for minor watercourses. The location, size and number of these small culvert structures will be dependent on the requirements of hydraulic modelling. These structures are not considered to be complex.</p> <p>A bridge structure is required to cross the Croe Water. A proprietary temporary structure from a supplier could provide adequate span for the crossing required. In the current planned crossing location, it would be feasible to cross the Croe Water and the OMR in a single span. At the current location the structural depth of the bridge is not considered to negatively affect flooding extents due to the level difference between the proposed road level and the existing ground level. For a single span structure, it is expected that circa 17m high abutments are required adjacent to the Croe Water. These abutments can be in the form of reinforced concrete or reinforced soil walls/ retaining walls. This is a significant height of retention and there could be significant design issues of a retaining structure of this height. For a 17m abutment, approximately 70m of wingwall per abutment would be required. Flood relief culverts are expected to be required through the embankments to provide additional flow during flood events. These culverts would not be considered significant structures.</p> <p>A multi-span bridge structure would reduce the required height of abutments. However, adding additional spans would change the structural complexity from the substructure design to the superstructure design. A multi-span structure would impose limitations on the highway design as the structure would likely need to be straight (vertically and horizontally) over the length of the structure if using proprietary bridge units. A 17m pier would be a reasonably complex structure. Having multiple spans would be beneficial to the flood analysis as the abutment or base of</p>

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		embankment could be moved further from the Croe Water.
	NMUs / WCHs	<p>NMU provision via a The Loch Lomond and The Trossachs National Park (LLTNP) Core Path on the western side of Glen Croe is encroached upon by this Option at discrete locations. This happens where the Core Path joins the lower forestry track from the upper forestry track up to the Glen Mhor forestry track. The encroachment is due to the significant earthworks required for the option.</p> <p>Due to the limited NMU facilities in the adjacent area, only one possible diversion route has been identified which will not be suitable for all users and, depending on destination, could be considerably long. From a desktop review, the most likely destinations using the route are Rest and be Thankful carpark via the Glen Mhor Forestry Track, access to the Ben Donich hill path and Lochgoilhead, most likely for cyclists.</p> <p>Part of the core path network, NMUs could be diverted along a section of the Cowal Way by heading south at the Ardgartan visitor centre and then west through Coilessan Glen to Lochgoilhead. At this point, users can head north continuing on the core path network which will lead them to the top of the Glen Mhor Forestry Track at the top of the Single Lane Lower Forestry Access Track.</p> <p>The diversion consists of steep terrain with varying quality of paths. It is likely that this would only be suitable for active walkers and not wheelers or cyclists. No obvious alternatives are available for cyclists other than joining the convoy.</p> <p>Approximate distances to destinations noted above from Ardgartan Visitor Centre:</p> <ul style="list-style-type: none"> Lochgoilhead via the diversion route is approximately 10.8km compared to approximately 15.4km via the forestry Track. <p>Top of Glen Mhor Forestry Track / Start of Ben Donich hill path via the diversion route is approximately 18.7km compared to approximately 6.1km.</p>
Constructability Considerations	Construction Sequencing & Methodology	The construction phase of the MTS offline option will be challenging for several reasons. The primary challenge for a contractor will be the constrained working room which will result in lower productivity rates and a longer construction duration than a typical road construction scheme. Typically, a roads construction project can be constructed on multiple work fronts to complete in a reasonable timeframe. This is not possible with this option. As the new alignment needs to be formed through the greenfield site only two work fronts would be possible, working from either end. The available working room at the workfaces limits the number of vehicle movements that can be carried out safely. Steep side slopes present a safety risk and access to works on the downslope side will be challenging. Rock

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		<p>head level appears to be close to existing ground level with little or no superficial deposits and it is likely that cuttings will be mostly into rock. Due to the volumes of rock expected to be removed, drill and blasting could be the most optimal solution. Earthworks movements could be undertaken in a bidirectional method due to the width of the new road, however this would be with road legal 20t capacity tippers. The use of larger earth moving equipment such as articulated dump trucks (ADT's) would be precluded due to the limited width of the new road and the need to pass each other on the newly formed alignment. Site won material movements also needs to use public roads to reach the material processing areas and to deposit processed material across workfaces.</p> <p>After the pre-earthworks drainage is completed the upslope cuttings, road box cut and drainage works would commence. Due to the need to use the formed road box cut as a haul route for muck away it will be subject to heavy trafficking from construction equipment and temporary running surfaces may be needed. Typically, the staged construction for roads allows for an 'offline' haul route such that the 'new' road is not being trafficked; this would not be possible for these works. The dual use of haul road during construction will add time and cost to the construction process. Road construction will be hindered due to the number of items of plant needed to surface a road and the need for them to work concurrently. This will result in smaller items of plant being used and hence longer durations than what would typically be expected for a road upgrade scheme. The road pavement construction would most probably be constructed at the end of the earthworks campaign such that damage to the finished road is minimised which adds time to the overall duration.</p>
	Control of surface water and protection of surrounding environment	<p>Control of the volume and rate of flow of surface water runoff from upslope of the track along its full length is a significant risk and the contractor will need an engineered drainage solution during construction so that the works, the workforce and the surrounding environment are protected.</p> <p>Pre earthworks drainage will be needed in the form of upslope lined diversion drains and additional temporary culverts. Localised over pumping may be needed with backup systems as required if water builds up during construction. Managing contaminated runoff from the works will be difficult and require complex and sizeable temporary treatment systems to deal with the volume of water, all of which will add time/cost to the project. Diverting clean water from the works will be the priority to reduce the risk of polluting any receiving watercourses. Dewatering excavations, runoff from exposed ground, runoff from the track itself and disturbance of the slopes will generate silty water. It is recommended the contractor engages with SEPA prior to the construction phase to discuss what level of treatment is sufficient and agree what final discharge is acceptable which will govern what type of treatment processes are required. Implementation of settlement lagoons would not be practical due to the proximity of suitable space to create the ponds and contaminated water may need to be removed from site by tanker directly from the workface. Alternatively, suitable diversionary drains could be created to smaller localised settlement ponds however the high</p>

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		<p>volume of water coming from upslope may be prohibitive to this type of system due to the size of ponds needed and the lengths of pipes and pumping systems needed to reach the ponds. It is expected that treatment systems to control the pH levels will be installed at the workface which will allow discharge back to the natural environment and can be moved easily as the works progress.</p> <p>Installation of a significant number of new culverts, headwalls and outfalls will be needed and some of these could be installed as part of the pre-earthworks drainage to reduce construction time.</p>
	Site Location	The site location presents challenges for procurement of materials and resources. The remote location will result in an uplift in rates and attract a premium in general from the supply chain. The haulage routes and distance to nearest quarries will result in higher unit rates for import/export/haulage of material. Site accommodation for labour/staff may need to be considered due to the remote location and limited local available accommodation which could add further costs to the scheme.
	Logistics, access and working room	Material laydown areas will be setup at either end of the scheme. It is anticipated that two site compounds would be setup at the North and South ends. Double handling of materials will be needed which further reduces efficiency and increases cost. Access to the site contains substandard width roads and narrow structures but it is not expected that any abnormal loads would be needed to transport material to site, although the proposed temporary bridge may need to be transported to site which could be considered an abnormal load, however this will be risk assessed by the contractor / supplier as to the best route to site. Working room throughout the construction phase will be limited and congestion at the workface will create a health and safety risk.
	Earthworks Construction	The earthworks construction for this option is expected to be challenging due to the significant volume of rock to be removed and the need to drill and blast (D&B). Accessways will need to be formed for the D&B activity and the limited working room that will be available will limit the number of excavators that can load 20t tippers for the muck away process. This slower methodology will add time to the overall duration. Forming embankments on the downslope side will be challenging from a safety perspective due to access being difficult on the steep side slopes; material retention of any embankments on such steep ground also presents a risk for the contractor.
	Temporary Works	There is not considered to be any complex temporary works needed on this option. There may be a need to support excavations, temporary accesses for downslope/upslope works, standard formwork, creation of working platforms and surface water management however these are expected to be standard solutions.

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	<p>Health & Safety Risks (Construction)</p>	<p>Due to the elevation of the site, weather risk is significant, and it is anticipated that works would need to be undertaken over the winter period, possibly over two winter seasons. Heavy, prolonged rainfall and snowfall present a risk to the contractor that will need managed and will add time to the construction phase. If snowfall is particularly bad, works may not be possible during this time and the site could be closed during the winter season – however, any winter closure is a contractor consideration depending on their appetite for risk, historical weather data and resource/supply chain resilience etc. and will be agreed at tender stage as to the possibility of such an event. If implemented a winter closure could add c. 3-4 months to the duration of the works.</p> <p>Other construction H&S residual risks include working on steep ground in an active landslide risk zone, people/plant interface, access/egress, emergency access routes and control of temporary works.</p>
<p>Environment Considerations</p>	<p>Biodiversity, Fauna and Flora</p>	<p>The removal of an extensive area of woodland to accommodate the track widening (and associated earthworks) has the potential to have a significant effect on any species present including protected species, some of which are likely to use the forestry track as a wildlife corridor. It should be recorded that in November 2021, Scottish Forestry served a Statutory Plant Health Notice on FLS for a site at High Glencroe, due to the presence of Phytophthora ramorum. This will require local felling of trees that are affected by this disease. Loss of habitat would occur during construction and operation. Disturbance (noise, vibration and light pollution), injury or mortality could also occur during construction. It is noted that this is commercial forestry and scheduled for removal felling in the next 5-10 years, however this would also be subject of environmental assessment and likely re-planting. A new road introduces a new risk to existing species through direct contact and displacement and woodland would not be replaced in the location of the road.</p> <p>Depending on how the B828 Glen Mhor local road is widened, there could be a direct impact on the SSSI, with temporary or permanent loss of habitat within that designated area. This could have a significant negative environmental effect. The increase in traffic adjacent to the SSSI could also have moderate negative environmental effects as a result of nitrogen deposition. Mitigation may be feasible for all such impacts.</p> <p>Non-native species could be spread during construction, which could be an offence under the WCA.</p> <p>To the north of the B828 Glen Mohr local road is the Beinn an Lochain Site of Special Scientific Interest (SSSI) which is a sensitive designation within the EIA Regulations. Other ecological designations are more distant and unlikely to be affected. There is a small area of native woodland within the forest on the western slope towards the southern extent of the option.</p>

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		<p>The Preliminary Ecological Assessment (PEA) indicates otter to be using the Croe Water and there is evidence of badger and pine marten close to the alignment option. The habitat is also suitable for red squirrel and wildcat which may be present, as well as nesting birds including raptors.</p> <p>The removal of an extensive area of woodland has the potential to have a significant effect on any species present including protected species. It is noted that this is commercial forestry and scheduled for felling in the next 5-10 years, however this would also be subject of environmental assessment and likely re-planting. A new road introduces a new risk to existing species through direct contact and displacement and woodland would not be replaced in the location of the road. There is the potential for significant effects here.</p> <p>Depending on how the B828 Glen Mohr local road is widened, there could be a direct impact on the SSSI and loss of part of that designated area. This could be a significant detrimental effect. The increase in traffic adjacent to the SSSI would also have some potential impact in terms of pollutants. Mitigation may be feasible for all such impacts.</p>
	<p>Population (land use and accessibility) and Human Health</p>	<p>There are a number of buildings on the lower slopes / floor of the glen with the majority of these being associated with agriculture (agricultural outbuildings). There are also some residential properties in the vicinity, however they are a distance from this alignment option. The route would sit higher than these properties. Given the relative distance between the alignment option and these properties, impacts on human health is highly unlikely.</p> <p>The land is in use as commercial forestry and the alignment option would affect a track through the forest which is used for recreation and is part of a Core Path. The effect would be from the stabilisation of the slope above the road. The land involved is within control of FLS.</p> <p>The community assets largely relate to the use of the rural environment including hillwalks, the 'Rest and Be Thankful' viewpoint, and a Core Path which runs through the forest on the western slope. The Core Path would be directly affected however mitigation includes the provision of an alternative route for this which could provide some betterment. There are unlikely to be any other significant effects, although the visual impact from the viewpoint is considered in the Landscape and Visual Amenity section.</p> <p>The A83 Trunk Road is an important route for access in Argyll and Bute and its closure has a detrimental effect on local communities and businesses. The provision of an alternative route over a short length and does not result in significant delay would be a positive environmental effect of this alignment option.</p>

	<p>Water Environment</p>	<p>This Option crosses the Croe Water (major crossing), 6 OS mapped watercourses and 201 mapped flow pathways as it traverses the southwestern slopes of the valley. The option has significant slope cuttings and this impacts on many watercourses with realignment and cascades being the dominant engineering features with the culvert under the road. It should be noted that although the small watercourse would not require CAR Licences for the culverts, any vertical or horizontal realignment associated with the cut slopes would be licensable activities. Early engagement with SEPA on a proportionate approach to CAR is recommended to ascertain approach to this aspect.</p> <p><i>Flood risk</i></p> <p>The Croe Water crossing is in a known area of flood risk but the proposed road vertical alignment is above the flood levels. Detailed assessment of this area is underway to determine accurate flood extents and levels for a range of storm events. Based on the crossing being an open span structure with significant embankments within the floodplain extent it is likely that the crossing will impact on flood storage and mitigation may be required to allow flood water to pass on either side of the bridge abutments in the form of flood relief culverts. The provision of Compensatory Flood Storage (CFS) is likely to be required and there appears to be local areas to the crossing where the topography would be suitable.</p> <p>The standard of protection is proposed at the 0.5%AEP (200-year) event plus an allowance for climate change (CC) based on the upgrade of this option to the Long-Term Solution.</p> <p>There are a total of 207 watercourse crossings and there is the potential for significant surface water flooding to the road if this hillslope run-off is not managed effectively. Where the road and earthworks footprint is greater than 12m it will be necessary to install 1200mm diameter culverts. Where the road and embankment is less than 12m then smaller culverts can be specified and this is likely to be more in line with the peak flows generated by the relatively small watercourses.</p> <p><i>Hydromorphology</i></p> <p>The Croe Water is a WFD classified water body and the Croe Water crossing has the potential to alter river process and function, although a clear span bridge and careful siting of the crossing will minimise the impacts on hydromorphology</p> <p>Extensive channel realignment will be required to many minor watercourses. Approximately 5.5km of watercourse length would be impacted by the option due to the extensive cuttings and requirement for cascades and new culverts.</p>
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		<p>There may also need to be downstream works on the watercourse to prevent fluvial erosion and limit any slope destabilisation should this risk be identified. This is a significant increase to the extent of morphological pressures compared with the other options.</p> <p><i>Surface Water Quality</i> Due to the significant earthworks there is a high risk of pollution during construction activities which could impact the Croe Water due to the number of small tributaries impacted by the scheme. Construction drainage and surface water management will be challenging and requires consideration and mitigation to reduce the risk to the water environment.</p> <p>The SuDS provision on the steep slopes and likely SuDS features are also challenging given the limited flat areas for attenuation and treatment.</p> <p><i>Hydrogeology</i> Due to the extensive new cuttings, it is possible that groundwater flow pathways may be intercepted. It may be necessary to include toe drainage to intercept and channel these flows to adjacent culverts. This may require segregation of this run-off from road drainage.</p>
	Soils	<p>There is likely to be made ground associated with the forest tracks.</p> <p>There is no evidence of mineral quarrying or coal extraction in the area.</p> <p>The likelihood of contamination is low, although the presence of hydrocarbons is possible from vehicles using the forest track.</p> <p>The soils within the forest are likely to be significantly affected by the proposals with significant cut and fill required to achieve the gradients required for the road and the associated stabilisation. Soil contamination risks are low.</p>
	Air Quality	<p>There are no Air Quality Management Areas (AQMAs) in the vicinity and air quality is considered to be good. The MTS is not expected to result in an increase in traffic and therefore it is not envisaged that air quality in the area would be significantly different from the baseline. As noted, bringing greater volumes closer to the B828 Glen Mohr local road could have a slight adverse impact on the SSSI in terms of air pollutants.</p>

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	Material Assets	<p>The route corridor contains a variety of natural material assets. There are significant areas of forestry within the route corridor and as listed in the Soils section, there are peat soils present.</p> <p>The route corridor is located in a rural environment with few built material assets. The existing A83 Trunk Road is the main piece of infrastructure within the route corridor. The region contains several pieces of energy infrastructure, but none fall within the route corridor. There is a car park at the Rest and Be Thankful Viewpoint where the B828 Glen Mohr local road meets the A83 Trunk Road.</p> <p>The closest waste disposal facilities to the route corridor are approximately 25km to the south in Helensburgh.</p> <p>During construction, there is likely to be impacts in terms of materials and waste. A larger volume of material will be required to construct a new road although waste impacts would likely be from the construction process alone as no demolition is proposed.</p>
	Cultural Heritage	<p>There are no designated areas of built heritage along this alignment option. There is a slight overlap with the OMR at the southern extent, however at this point there has already been significant modification to the original layout of the OMR.</p> <p>There are several non-designated cultural heritage assets on the western slopes of Glen Croe however these are of low value. There are two which may interact with this alignment option however it may be possible to design the road to avoid them. If this is not possible, then the recording of these assets would be sufficient mitigation given their low value. This would lead to some cultural heritage impact but not significant.</p>
	Landscape and Visual Amenity	<p>This Option is located within the LLTNP which is considered a sensitive designation in the EIA Regulations. The 'Rest and Be Thankful' car park provides an important viewpoint across the whole of Glen Croe and sits elevated to the alignment option. The viewpoint is angled to the site but it is likely that views towards the alignment option will be possible. The landscape is rural in nature and largely unspoilt and natural, although there are modern interventions with the two roads, commercial forestry and sporadic buildings.</p> <p>Views to this alignment option are intermittent from the A83 Trunk Road, as they are obscured at times by trees and topography. More complete and stationary views are afforded from the surrounding mountains used by hillwalkers and the 'Rest and Be Thankful' viewpoint.</p> <p>During construction and operation, there is likely to be a significant visual and landscape impact on the local landscape character. The alignment option would lead to the loss of a large area of plantation forestry, reprofiling of</p>

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		<p>the slope and introduction of significant embankments and cuttings. This cumulative effect is likely to have a significant visual impact on the landscape setting of the LLTNP, particularly in views from the A83 Trunk Road and potentially the Rest and Be Thankful viewpoint. Some of this may be temporary to the construction process, and may be reduced subject to the design and implementation of screening and barriers once the road is complete and operational. It is noted that some of the plantation forestry is scheduled for felling within the next 5-10 years and thus the removal of woodland is likely to occur anyway. The visual impact of the alignment option however would be significantly higher given the introduction of a long stretch of road with significant embankments and engineering solutions relative to the bare earth that would remain from woodland felling alone. It is also likely that the forest would be re-planted in some form following removal by FLS, while this will not be fully possible with this road alignment option.</p> <p>The alignment option is likely to have a significant landscape and visual impact that is unlikely to be fully mitigated. It would also introduce a third (and new) road into the landscape. The alignment option would lead to a permanent visual and landscape impact on the western slope of the glen.</p>
Operational Considerations	How it operates	<p>This Option will operate with two-way working for all Trunk Road traffic in the event that the A83 Trunk Road is closed. The two-way working will continue on the B828 Glen Mohr local road to the junction with the A83 Trunk Road at the Rest and Be Thankful carpark. This will have priority in the junction set up with the minor road being the existing B828 Glen Mohr local road southbound which will remain single track with passing places.</p> <p>The route will operate with a speed limit of 30mph.</p>
	Risk of Closure – Highways	<p>From a Highways perspective, the primary threat of closure is from vehicle breakdowns and / or traffic incidents.</p> <p>Two-way working and appropriate geometry, throughout the full length of this route, results in the likelihood of major traffic incidents being considered as low, and no requirement for any special breakdown recovery plan.</p>
	Risk of Closure – Flooding	<p>Flooding at the Croe Water crossing may lead to closure during more extreme events. The period of closure would be short (hours) due to the flashy nature of the catchment with peak flows subsiding quickly.</p>

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		<p>The design of watercourse culverts and drainage will mitigate the potential for flooding from streams and hillslope run-off. Culvert blockage is a risk from potential slope instability which could lead to closure for management and maintenance of watercourse crossings.</p>
	<p>Risk of Closure – Geotechnical / Geohazards</p>	<p>The impact of landslide induced closures at the main landslide risk area on the A83 Trunk Road, at the Rest and be Thankful, is effectively bypassed.</p> <p>It is considered that this option has a medium likelihood of closure with any such closures of potentially short to moderate duration.</p> <p>It is proposed to include measures to mitigate the geohazard threat within the scheme but due to the current uncertainty of the level of geohazard threat posed to the route, the design of such measures will require to be informed by detailed geohazard assessments of the wider slope. The presence of the dense forestry on the slope may impact on these assessments and the subsequent removal of the forestry will alter the ground and groundwater conditions such that slope instabilities which had not been identified through the geohazard modelling may be instigated or reactivated. Landslides, debris flows, or other geohazard events may affect the route, with material potentially being deposited on the carriageway and restricting its use as a diversion.</p> <p>Geohazard occurrence, deposition of material on the carriageway or on the associated earthworks, and any wash-out failure of the downslope may also compromise the earthworks by causing instability or damage. This may also affect the route and restrict its use as a diversion.</p>
	<p>Safety</p>	<p>This Option is expected to operate with a 30mph speed limit. This will keep vehicle speeds low along its length and in turn should minimise the likelihood of incidents occurring on the uphill direction where there will be slow moving vehicles and on the downhill direction where increased speeds pose a higher risk of an incident occurring. There would be a risk of non-compliance with the speed limit if enforcement was not introduced.</p> <p>A risk-based assessment will take place to determine where safety barrier is needed along the route. There will be locations where watercourses will cross the carriageway, steep downslope sections, long stretches of steep gradient and structural elements that will require edge protection along the route.</p>

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	Journey Times	<p>The journey time for the Offline MTS Option has been assessed based on an HGVs performance travelling in the uphill (westbound) direction. This was calculated using the Acceleration/Deceleration for HGVs graph presented in the ASSHTO Design Standards.</p> <p>The graph showed that the maximum speed an HGV would reach travelling in the uphill direction on the Offline MTS Option is 43kph. This drops down to 20kph when the steeper 8.75% gradient is reached on approach to the junction.</p> <p>This speed profile allowed an average journey time of 7.6 minutes to be calculated from the junction at the A83 Trunk Road, along the Offline MTS Option and the B828 Glen Mohr local road, ending at the junction with the A83 Trunk Road at the Rest and Be Thankful carpark (westbound).</p> <p>In the downhill (eastbound) direction the same implications do not apply as HGVs will be able to maintain a speed limit of 50kph based on the Design Speed for the route. This gives an average journey time of 5 minutes in the eastbound direction.</p> <p>Taking journey times either side into consideration: Journey time between Tarbet and beginning of Offline MTS Option = 9 minutes. Journey time between end of Offline MTS Option and Inveraray = 20 minutes.</p> <p>The existing journey time for the OMR diversion when there is no wait time at the convoy section is 13 minutes.</p>
Financial Considerations	Capital	<p>The initial cost estimate for the Offline MTS Option is within the range of £85M-£113M at 2021 prices. This cost estimate includes approximate structures cost, value for bulk earthworks, prelims, preparations, land and supervision costs, non-recoverable VAT and an optimism bias.</p> <p>No cost has been included for safety barrier, geotechnical hazard mitigation or works required for drainage requirements due to the preliminary nature of the design. It is likely significant costs will be required for these items due to the major earthworks proposed and the number of watercourses along the route.</p>
	Operational	<p>Minimal operational costs are expected due to two-way working of the Offline MTS Option with 2km of the route being to Trunk Road Standards. Monitoring and ongoing management of slope/ground conditions will be required.</p>

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Estimated Time to Completion	Implementation	If progressed as a whole, depending on a number of factors such as decision to proceed, land purchase, Ground Investigation, EIA Reporting and consultation requirements, this option has the potential to be open to traffic by autumn 2026.
	Construction	<p>An outline construction programme was developed for this option to understand the expected range of construction duration. Consideration was given to the various constraints, construction risks and challenges in constructing this option. One of the key risks to programme is weather and the impact this will have on the construction duration. As works will be undertaken over a winter season it is highly likely that the progress of the works will be impacted and may even result in a winter closure (typically Nov – Feb) if prolonged snowfall/rainfall occurs. To allow for such weather impact a time risk allowance of 20% has been included within the construction duration. This also includes procurement, supply chain and resource risks that will exist in a scheme of this nature given the location of the works.</p> <p>The anticipated construction duration range is between 24 and 30 months. The range is dependent on weather impact and reduced productivity due to the nature of the existing ground and site conditions. If a weather closure is implemented, up to 4 months could be added to the above stated durations.</p>
Interface with FLS		This option encroaches upon the lower forestry track within FLS managed woodland. This only leaves the upper forestry track for access for FLS. Close cooperation will be required with FLS during times that FLS need work/maintenance carried out. A consultation is likely required to ensure that the proposed option also meets the needs of FLS.
Consenting Considerations	Need for EIA	An assessment will be required to determine if an EIAR is needed. It is not certain that this will be required, although consideration will have to be given to the potential for significant effects within the LLTNP (a sensitive designation under the EIA Regulations), in particular considering the potential for significant landscape & visual effects.
	Need for 3 rd party land	<p>The length of this Option lies entirely within Scottish Ministers land. Therefore, it is not expected that any third-party land will be required, however, burdens will need to be checked prior to its implementation.</p> <p>The improvements to the B828 Glen Mohr local road between Glen Mohr and A83 Trunk Road junction may need to acquire third-party land. This will depend on the extent of the proposed upgrades out with the carriageway footprint.</p>

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	Need for Orders	<p>The need for an Order will be determined by Transport Scotland's preferred strategy for taking the Offline MTS Option forward.</p> <p>The need for an order on the B828 Glen Mohr local road will be determined by who undertakes any upgrade works. If these are completed by Transport Scotland a notification under <i>Section 12 – Powers as respects roads that cross or join public roads other than special roads</i> of Roads (Scotland) Act 1984.</p>
Phasing Considerations with the LTS		<p>There are only impacts to the operation of this option if the Green Option is taken forward to construction. If this is the case then significant lengths of the offline MTS option overlap the Green Route and therefore keeping the Offline MTS Option in operation during construction of the LTS Green Route would be extremely challenging. A way to mitigate this and potentially keep the Offline MTS Option open during the construction of the Green Route is to construct the LTS cross section where it overlaps the Offline MTS Option during the MTS construction phases.</p> <p>Whilst this would result in a slightly longer construction duration for the MTS, the operability of the MTS could be maintained during the LTS construction phase.</p> <p>This approach would also have the added benefit of reducing the LTS construction phase duration due to some of the LTS work being done during the MTS construction phase.</p> <p>It would also benefit the delivery of other LTS options by facilitating a by-pass arrangement while on-line construction works on the A83 Trunk Road were undertaken, e.g. the Brown option and tie-ins for the other options. However, the programme to deliver this solution would be longer than the other options due to the time required to gather sufficient information to inform the design and manage the risks associated with the geotechnical elements and the geohazards, the extent of forestry felling which would be required and the construction programme to deliver the extensive earthworks necessary to accommodate the alignment.</p>

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Implementability		RAG Rating		
		RED	AMBER	GREEN
Engineering	Topography and Alignment Considerations			
	Geotechnical / Earthworks Considerations			
	Geohazards			
	Structures Considerations			
	NMUs/WCHs			
Constructability Considerations	Construction Sequencing & Methodology			
	Control of surface water and protection of environment			
	Site Location			
	Logistics, access and available working room			
	Earthworks			
	Temporary Works			
	Health & Safety Risks (Construction)			
Environment	Biodiversity, Fauna and Flora			
	Population (land use and accessibility) and Human Health			
	Water Environment			
	Soils			
	Air Quality			
	Material Assets			
	Cultural Heritage			
	Landscape and Visual Amenity			
Operational Considerations	How it operates			
	Risk of Closure – Highways			
	Risk of Closure – Flooding			
	Risk of Closure – Geotechnical / Geohazards			
	Safety			
	Journey Times			
Financial Considerations	Capital			
	Operational			

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Estimated Time to Completion	Implementation			
	Construction			
Interface with FLS				
Consenting Considerations	Need for EIA			
	Need for 3 rd party land			
	Need for Orders			
Phasing Considerations				