



Access to Argyll and Bute (A83)

Medium Term Strategy

Options Assessment Report

A83OMR-ACM-GEN-ZZ_ZZ-RP-ZM-0003 | P01

13/01/23

Transport Scotland

TS/MTRIPS/SER/2018/11

Access to Argyll and Bute (A83)

Project No: A83OMR
Document Title: Medium Term Strategy Options Assessment Report
Document No.: A83OMR-ACM-GEN-ZZ_ZZ-RP-ZM-0003
Revision: P01
Document Status: S4 – SUITABLE FOR STAGE APPROVAL
Date: 13/01/23
Client Name: Transport Scotland
Client No: TS/MTRIPS/SER/2018/11
Project Manager: D. ROBERTSON
Author: E. AULD
File Name: A83OMR-ACM-GEN-ZZ_ZZ-RP-ZM-0003.doc

95 Bothwell Street
Glasgow, Scotland G2 7HX
United Kingdom
T +44 (0)141 243 8000
F +44 (0)141 226 3109
www.jacobs.com

© Copyright 2023 Jacobs UK Ltd and AECOM Limited. The concepts and information contained in this document are the property of Jacobs and AECOM. Use or copying of this document in whole or in part without the written permission of Jacobs and AECOM constitutes an infringement of copyright.

Limitation: This document has been prepared on behalf of, and for the exclusive use of Jacobs' and AECOM client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs, AECOM and the client. Jacobs and AECOM accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this document by any third party.

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
P01	13/01/23	ISSUED FOR APPROVAL	E.A.	M.S.	R.H.	R.H.

Contents

Executive Summary

1.	Introduction	2
1.1	Background to the Study	2
1.2	Purpose of this Report	3
2.	Existing Conditions	4
2.2	A83 Trunk Road	4
2.3	Old Military Road (OMR)	5
2.4	Forestry Tracks	6
2.5	B828 Glen Mohr Local Road	6
3.	Objectives	7
3.1	Medium-term Solution Objectives	7
4.	Initial Options Generation and Development	8
4.1	Online OMR Options	8
4.2	Operational Improvements	8
4.3	Geotechnical Hazard Mitigation	8
4.4	Flooding Mitigation	8
4.5	Infrastructure Integrity	9
4.6	Offline OMR Options	9
4.7	Further Online (OMR) Option Development	10
4.8	Existing OMR Option	11
4.9	Further Offline Option Development	13
4.10	Initial Offline Route Options - Sifting	19
4.11	Offline Options Aligning with the Forestry Track	21
4.12	Final Options for Initial Shortlisting	24
5.	Initial Short Listing	25
5.1	Initial Option Sifting	25
5.2	Assessment Approach	25
5.3	Initial Options Sifting Assessment Summary	26
5.4	Glen Option (H) – Further Development and Assessment	26
5.5	Forestry Track Option (L) – Further Development and Assessment	27
5.6	Agreed Short List	27
6.	Final Shortlisted Options	28
6.1	Introduction	28
6.2	Single Lane Forestry Track Upgrade	28
6.3	OMR Interventions	29
6.4	Offline MTS Option	29
7.	Assessment of Final Shortlisted Options	30
7.1	Option Assessment Summary Tables	30

8.	Options Fact Sheets / Key Findings.....	31
8.1	Fact Sheets.....	31
8.2	Journey Time Comparison.....	31
8.3	Cost Estimates.....	33
8.4	Construction Programme Estimates.....	33
9.	Conclusion and Recommendation.....	34
9.1	Introduction.....	34
9.2	Assessment Against Scheme Objectives.....	34
9.3	Comparative Assessment.....	36
9.4	Relationship of the Medium-term Solution to the Long-term Solution.....	37
9.5	Risks.....	38
9.6	Overall Recommendation.....	38

Appendix A: Single Lane Forestry Track Upgrade Option Drawings

Appendix B: OMR Interventions Drawings and Schedule

Appendix C: Offline MTS Option Drawings

Appendix D: Options Assessment Summary Tables

Appendix E: Fact Sheets

Executive Summary

This report sets out the option development and assessment process for a medium-term solution (MTS) to improve the resilience of the diversion route when the A83 Trunk Road is closed due to landslides, flooding, or other incidents, prior to a long-term solution (LTS) being introduced.

The option development and assessment process considered a range of options within Glen Croe, including options on or close to the line of the Old Military Road (OMR) and options off the line of the OMR, including along the southern slopes of the glen and on the line of or close to the forestry track.

The process concluded with the selection of three options:

- OMR Interventions;
- Single Lane Forestry Track Upgrade; and
- Developed Option L - Two Way Offline MTS along the line of the 'Green Route'.

The report presents assessment summary tables and fact sheets for these three options.

The summary tables and fact sheets are presented in Appendices D and E respectively. The report concludes the development and assessment work carried out.

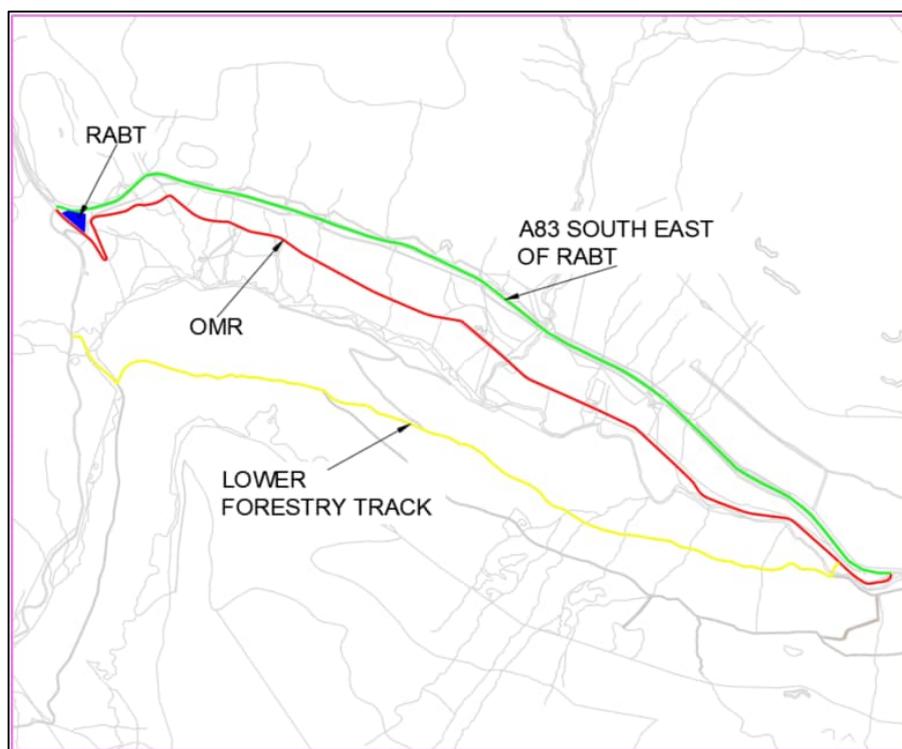
Based on the development and assessment work undertaken, the OMR Interventions is recommended as the preferred option for the MTS.

1. Introduction

1.1 Background to the Study

- 1.1.1 The Old Military Road (OMR) is a 4.0km road in the south of Argyll and Bute in the Scottish Highlands. The OMR currently serves as a temporary diversion to the A83 Trunk Road, southeast of the Rest and Be Thankful (RaBT), during periods when the A83 Trunk Road is closed.
- 1.1.2 The RaBT is the highest point on the A83 Trunk Road (approximately 265m above ordnance datum), separating Glen Kinglas from Glen Croe. It is also one of the places on the Scottish Trunk Road network with the highest risk of landslides and debris flow hazards, which has increased in recent years due to the frequency of heavy, intense periods of rainfall.

Figure 1: Plan of Glen Croe Southeast of RaBT



- 1.1.3 As a result, the A83 Trunk Road between Ardgartan and the RaBT car park has been subject of an increased number of closures over the past few years, notably since August 2020. This in turn has put additional pressure on the use of the OMR as the main diversion route. In addition, the OMR itself has had to be closed due to debris flow events above the A83 Trunk Road reaching the OMR, as a result of stream discharges over the OMR and flooding from Croe Water.
- 1.1.4 The Trunk Road Operating Company, BEAR Scotland, has implemented a number of landslip mitigation measures to improve the resilience of the A83 Trunk Road since 2007 and work continues with ongoing maintenance work at Glen Croe. In early 2021, BEAR Scotland constructed a new temporary 175m long HESCO bund to increase protection on the OMR and is continuing to investigate other measures to improve resilience in the short-term.
- 1.1.5 Nevertheless, in view of these recent events and potential future works to provide a long-term resilient alternative to the current A83 Trunk Road, consideration is being given to further measures to improve the resilience of the A83 diversion route in the medium-term.

1.2 Purpose of this Report

1.2.1 The purpose of this option assessment report is to document the development and assessment of medium-term solution route options, considering the scheme objectives and the engineering, environmental, traffic and economic advantages, disadvantages and constraints associated with each option.

1.2.2 Following this introductory chapter, the remainder of this report is set out within eight chapters, as follows:

- Chapter 2 Existing Conditions
- Chapter 3 Objectives
- Chapter 4 Initial Option Generation and Development
- Chapter 5 Initial Short Listing
- Chapter 6 Final Shortlisted Options
- Chapter 7 Assessment of Final Shortlisted Options
- Chapter 8 Options Fact Sheets / Key Findings
- Chapter 9 Conclusion and Recommendation

2. Existing Conditions

2.1.1 This chapter describes the existing conditions on the existing A83 Trunk Road, the OMR, the forestry tracks on the west side of Glen Croe and the B828 Glen Mohr local road. A thorough review of the existing conditions within Glen Croe is provided within the Access to Argyll and Bute (A83), Strategic Environmental Assessment & Preliminary Engineering Services, DMRB Stage 1 Assessment Report.

2.2 A83 Trunk Road

2.2.1 The A83 Trunk Road is a 98-mile (158km) road in the Argyll and Bute council area providing a strategic link to Central Scotland. The route is one of only two east-west strategic trunk network connections between Argyll & Bute and the Central Belt.

2.2.2 The road originates at Tarbet, at its junction with the A82 Trunk Road on the western side of Loch Lomond and terminates in Campbeltown at the southern tip of the Kintyre peninsula.

2.2.3 The section of the A83 Trunk Road through Glen Croe, between Ardgartan and the RaBT viewpoint at the A83 Trunk Road /B828 Glen Mohr local road junction, includes the highest point along the A83 Trunk Road at approximately 265m above ordnance datum and the adjacent hillsides have a history of instability leading to landslides and road closures.

2.2.4 From January 2007 onwards, the A83 Trunk Road has been closed on numerous occasions due to debris flow events blocking the road or as a precautionary measure because of a high risk of a debris flow event occurring. These closures have increased in regularity in recent years due to the increasing frequency of heavy, intense periods of rainfall. Table 2.1 lists the closures from 1 January 2007 to 18 November 2021.

Table 2.1: A83 Closures 2007 - 2021

Date Closed	Date Opened	Duration
28-Oct-07	11-Nov-07	14 days
08-Sep-09	10-Sep-09	2 days
01-Dec-11	03-Dec-11	2 days
22-Feb-12	25-Feb-12	3 days
22-Jun-12	23-Jun-12	1.5 days
01-Aug-12	03-Aug-12	2 days
19-Nov-12	20-Nov-12	1 day
03-Oct-13	04-Oct-13	1 day
09-Jan-14	10-Jan-14	1 day
06-Mar-14	11-Mar-14	5 days
28-Oct-14	02-Nov-14	5 days
30-Dec-15	01-Jan-16	2 days
04-Jan-16	07-Jan-16	3 days
09-Oct-18	18-Oct-18	9 days
30-Jan-20	02-Feb-20	2.5 days
04-Aug-20	06-Sep-20	33.5 days
13-Sep-20	22-Sep-20	10 days

19-Oct-20	21-Oct-20	3 days
29-Oct-20	07-Jan-21	70 days
11-Jan-21	12-Jan-21	1 day
14-Feb-21	15-Feb-21	1 day
18-Feb-21	02-Mar-21	12.5 days
28-Mar-21	29-Mar-21	2 days

2.2.5 As a result of ongoing concerns regarding the stability of the hillside, the A83 Trunk Road has frequently been closed and the OMR diversion utilised as a diversion route.

2.3 Old Military Road (OMR)

2.3.1 The OMR was the original road to link Dumbarton with Inveraray and was in operation until the late 1930s when improvements were carried out to form what is the A83 Trunk Road today. The road also has a rich history with Scottish motorsport because of its steep gradients and hairpin bends at the far west of the road and was used for hill climb events up until 1969. At present approximately 2.6km of the OMR is situated within land owned by a private landowner with the remaining 1.4km situated within land owned by Scottish Ministers and managed by Forestry and Land Scotland (FLS). Transport Scotland has an agreement with the landowner to use the OMR as a temporary diversion route when the A83 Trunk Road is closed.

2.3.2 The road is made up of a bituminous bound material. The section in Scottish Ministers ownership is largely two-way whereas the 2.6km section in private ownership is single lane, varying in road width between 3.0m and 3.5m with widening in place towards the hill climb of about 6-8m. The majority of its length is relatively level and straight beneath the A83 Trunk Road, however, the final third of the OMR rises steeply alongside winding geometry to reach the RaBT carpark at the top of the Glen.

2.3.3 The OMR was brought in to use as an emergency diversion route, during A83 Trunk Road closures, in 2013 following a study on the use of the OMR and the forestry tracks, located on the southwest slopes of the glen, as potential diversion routes. Due to the narrow-paved width, poor geometry and the presence of considerable hazards immediately next to the road (e.g. steep slopes), the OMR operates over part of its length under a one-way convoy system. The current journey time along the OMR is around 13 minutes with no wait time for the vehicles. This is in comparison to the normal journey time on the A83 Trunk Road from the start of the OMR to the end of the OMR heading westbound of about 2.5 minutes at a speed of 85kph.

2.3.4 The OMR is also at risk (albeit a lesser risk than the A83 Trunk Road) of debris flow events as it is situated directly downslope of the A83 Trunk Road. The OMR itself has had to be closed in 2020 due to debris flow events above the A83 Trunk Road reaching the OMR, stream discharges over the OMR and flooding from Croe Water. On occasions like this, when the A83 Trunk Road and OMR are both closed, traffic is diverted onto the longer pre-planned diversion route via the A82/A85/A819. Between January 2020 and December 2021, the longer diversion route was in operation on 63 days.

2.3.5 The most notable OMR closures were due to the significant landslide that occurred in August 2020 where 5,500 tonnes of debris dispersed down the hillside. 2,000 tonnes was collected by the landslip mitigation catch pit with 1,500 tonnes reaching the A83 Trunk Road and the remaining 2,000 tonnes continuing to the OMR. There was a secondary landslip in September 2020 that also contributed to the closures with a further 3,600 tonnes of debris blocked by the landslip mitigation fences.

2.4 Forestry Tracks

2.4.1 The existing forestry tracks on the southwest slopes of Glen Croe were formed into the very steep hillside generally in a cut-fill operation. The lower forestry track is approximately 3.5km in length. The track rises from approximately 91m above sea level at its eastern end to a height of approximately 292m at its western end. The track is owned by Scottish Ministers and managed by FLS and dates back around 70 years. FLS use it to access the surrounding forest, and, in the future, it will be used to access the forest for harvesting operations. The lower forestry track also forms part of a designated core path within the area.

2.4.2 The lower forestry track is unbound, and the alignment is changeable with variable horizontal and vertical geometry. The vertical alignment exhibits a steady climb travelling westbound with an average gradient of 6.5% but some sections are as steep as 14% in places. The average track width is 3.2m but there are localised sections as narrow as 2.6m due to erosion and downslope failures. The steep slope is separated by a soft verge ranging from as narrow as 0.2m to 6.6m with an average of 1.2m.

2.5 B828 Glen Mohr Local Road

2.5.1 The B828 Glen Mohr local road is the main route, from the east, to Lochgoilhead and Loch Goil. It is a single lane carriageway with narrow informal soft verges and drainage ditches. It is a local authority operated road, with winding, undulating geometry and passing places are situated approximately every 200m. The road is made up of a bound surface and from visual inspection appears to be generally in good condition.

3. Objectives

3.1 Medium-term Solution Objectives

3.1.1 The objectives for the MTS are:

- Increase resilience of a temporary diversion route by reducing the likelihood of closure due to landslides, flooding, or other incidents.
- Maximise the operational benefits of a temporary diversion route, for all vehicles, by providing a route that achieves a proportionate balance of time to implement, cost and impact.
- Reduce the likelihood of accidents on a temporary diversion route.

4. Initial Options Generation and Development

4.1 Online OMR Options

4.1.1 The OMR was analysed to identify existing problems and generate options to increase resilience of this temporary diversion route. The options generated were grouped into four categories: operational improvements; geotechnical hazard mitigation; flooding mitigation; and infrastructure integrity.

4.2 Operational Improvements

4.2.1 The following potential improvement measures were identified to address operational issues due to width constraints, significant vertical gradients and tight horizontal geometry at the northern section of the existing OMR:

- Increasing the radius of existing horizontal radii that are below Desirable Minimum for a Design Speed of 50kph (R=180m), where feasible.
- Curve widening on the three bends, in the northern section of the OMR, highlighted as particularly problematic by the Operating Company BEAR Scotland.
- Decreasing the vertical gradient to a maximum of 8% (a DMRB permitted relaxation), where feasible.
- Increasing the length of two-way working beyond the current 900m length at the southern end.

4.2.2 More discrete measures were also identified, including edge protection in the form of kerbing or hazard markers, safety fencing at high-risk areas, appropriate signage and road markings for clearer delineation.

4.3 Geotechnical Hazard Mitigation

4.3.1 The following measures were identified as potential options to increase resilience of the OMR to the risk of landslide and debris flow events:

- Raise the OMR level (embankments) at critical locations.
- Install further lengths of (HESCO) debris bunds at critical sections.
- Install lengths of rockfall catch fences at critical locations.
- Install lengths of debris catch fences at critical locations.
- Expedite short-term mitigation works.
- Reduce the A83 Trunk Road to single lane working and install or extend trunk road centre line barrier.
- Re-profiling of identified critical channels above the OMR.
- Bridging flow paths over the OMR.
- Install further catch fences on A83 Trunk Road for currently unprotected channels.

4.4 Flooding Mitigation

4.4.1 The following measures were identified as potential options to increase resilience by reducing the likelihood of closure due to fluvial flooding at the southern end of the OMR.

- Flood bunds
- Change vertical alignment / raise road at this location
- Re-align / relocate junction

- Install flood relief culverts.

4.4.2 The following measures were identified as potential options to increase the resilience by reducing the likelihood of closure of the OMR due to surface water flooding:

- Improvements to existing or provision of new side of road drainage and / or slope drainage in key locations to intercept flows.
- Attenuation ponds, catch pits or sacrificial areas for collecting surface water and debris before the road.
- Upslope bunds that capture out of bank flows.
- Strategic up-sizing of culverts.

4.5 Infrastructure Integrity

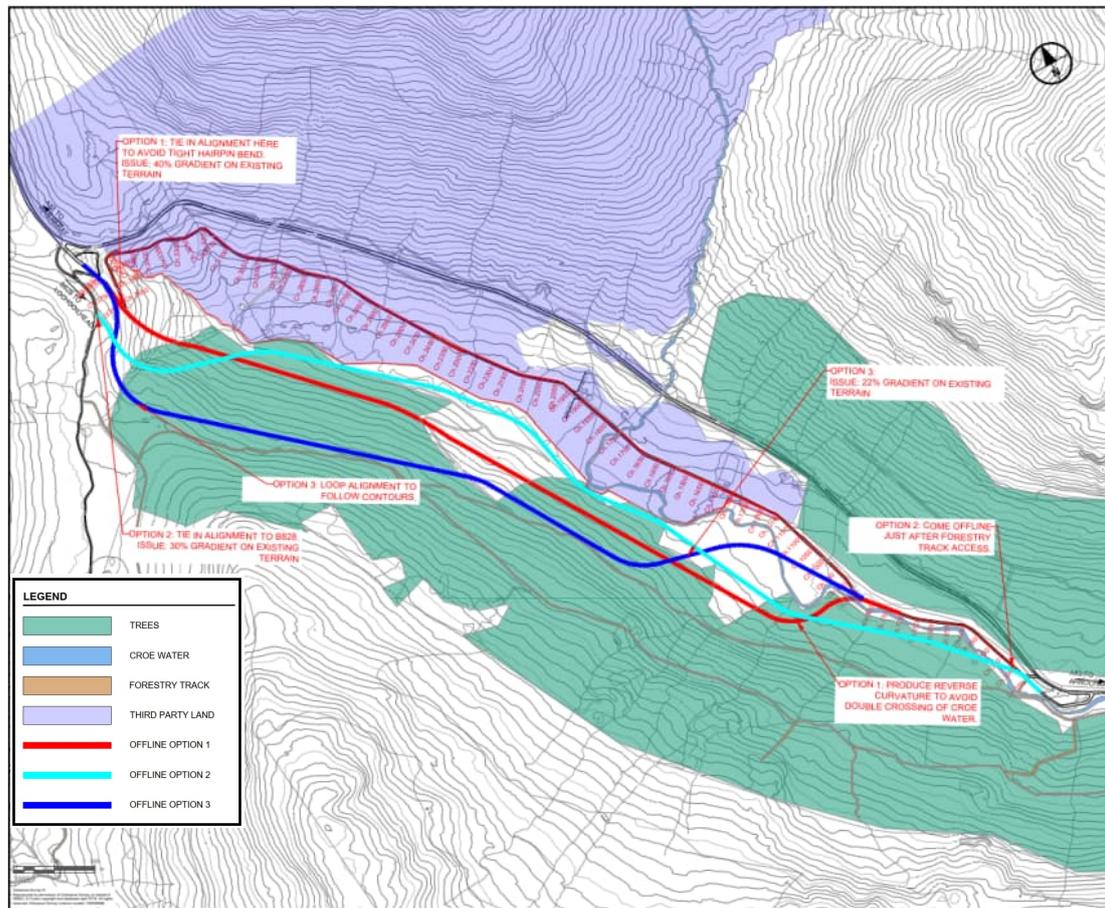
4.5.1 As part of the existing OMR analysis, the need for assessment of the existing infrastructure was identified, to establish if any remedial or improvement works are required, including:

- Soil nail slopes, rock blankets, and retaining walls between the A83 Trunk Road and OMR.
- Road pavement, i.e., carriageway reconstruction, re-surfacing or high friction surfacing may contribute to increased resilience of this temporary diversion route.
- Three existing bridges: two masonry arch bridges and one reinforced concrete.
- Numerous culverts and pipes of varying diameter and condition.

4.6 Offline OMR Options

4.6.1 Three potential offline OMR options, Options 1, 2 and 3, were identified. All three options avoided privately owned land and provided full two-way working. The three Offline OMR Options developed are presented in Figure 2 overleaf.

Figure 2: Potential Offline OMR Options



4.6.2 Option 1 (the red route in Figure 2) follows the OMR from its southern junction with the A83 Trunk Road for approximately 700m before heading west and crossing the Croe Water. Option 1 then follows the existing contours on the western slopes of the glen, before tying back into the northern section of the OMR, avoiding the hairpin bend. The gradient of the existing terrain, at this northern section tying back into the OMR, is approximately 40%.

4.6.3 Option 2 (the turquoise route in Figure 2) follows the existing OMR from its southern junction with the A83 Trunk Road for approximately 250m before crossing the Croe Water and following the existing contours near the foot of the western slope of the glen. Option 2 then ties back into the B828 Glen Mohr local road, rather than the OMR. The gradient of the existing terrain, at this northern section tying back into the B828 Glen Mohr local road, is approximately 30%.

4.6.4 Option 3 (the dark blue route in Figure 2) follows the existing OMR from its southern junction with the A83 Trunk Road for approximately 820m before heading west and crossing the Croe Water. Option 3 then follows the existing contours, near the lower forestry track, on the western slope of the glen, before tying back into the northern section of the OMR, bypassing the hairpin bend and looping around to follow contours and avoid the steep gradients at the northern end. The gradient of the existing terrain, to climb up to the lower forestry track, is approximately 22%.

4.7 Further Online (OMR) Option Development

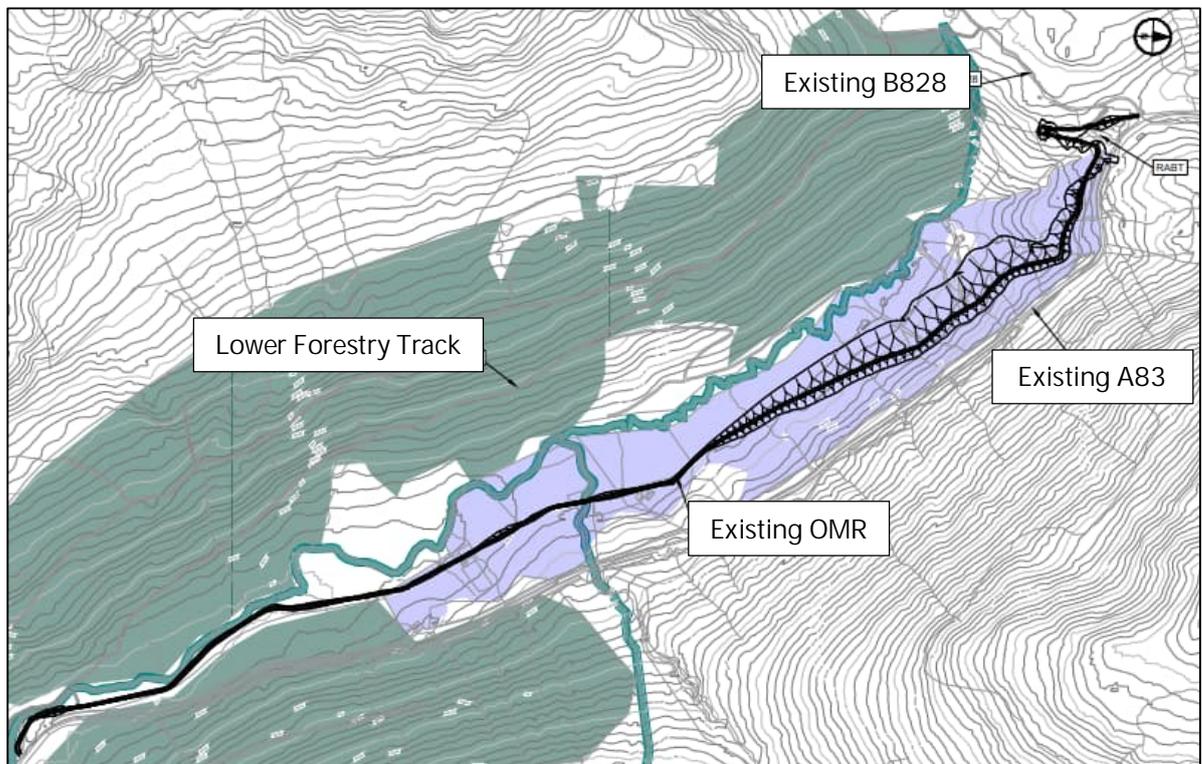
4.7.1 Additional options involving modifications to the existing OMR were also considered and three Online (OMR) Options were developed. These all provided a width suitable for two-way traffic and considered the potential for a maximum vertical gradient of 8%. The three Online (OMR) Options developed (Existing OMR Option, Option G and Option K) are described below.

4.7.2 An option was also considered that provided full two-way working along the line of the existing OMR over its full length, adopting the existing horizontal and vertical geometry. The widening required to achieve two-way working resulted in major engineering challenges, particularly in relation to extensive earthwork cuttings, resulting in substantial additional costs and making it extremely difficult to keep the OMR available as an emergency diversion route. This was not considered a proportionate response for a medium term solution. Consequently, this option was not pursued.

4.8 Existing OMR Option

4.8.1 The Existing OMR Option is approximately 4.0km in length and was developed based on a maximum vertical gradient of 8% over the majority of the route but using the existing sub-standard horizontal alignment. These vertical alignment improvements resulted in large embankments of over 58m in height at the northern end. The Existing OMR Option is shown below in Figure 3.

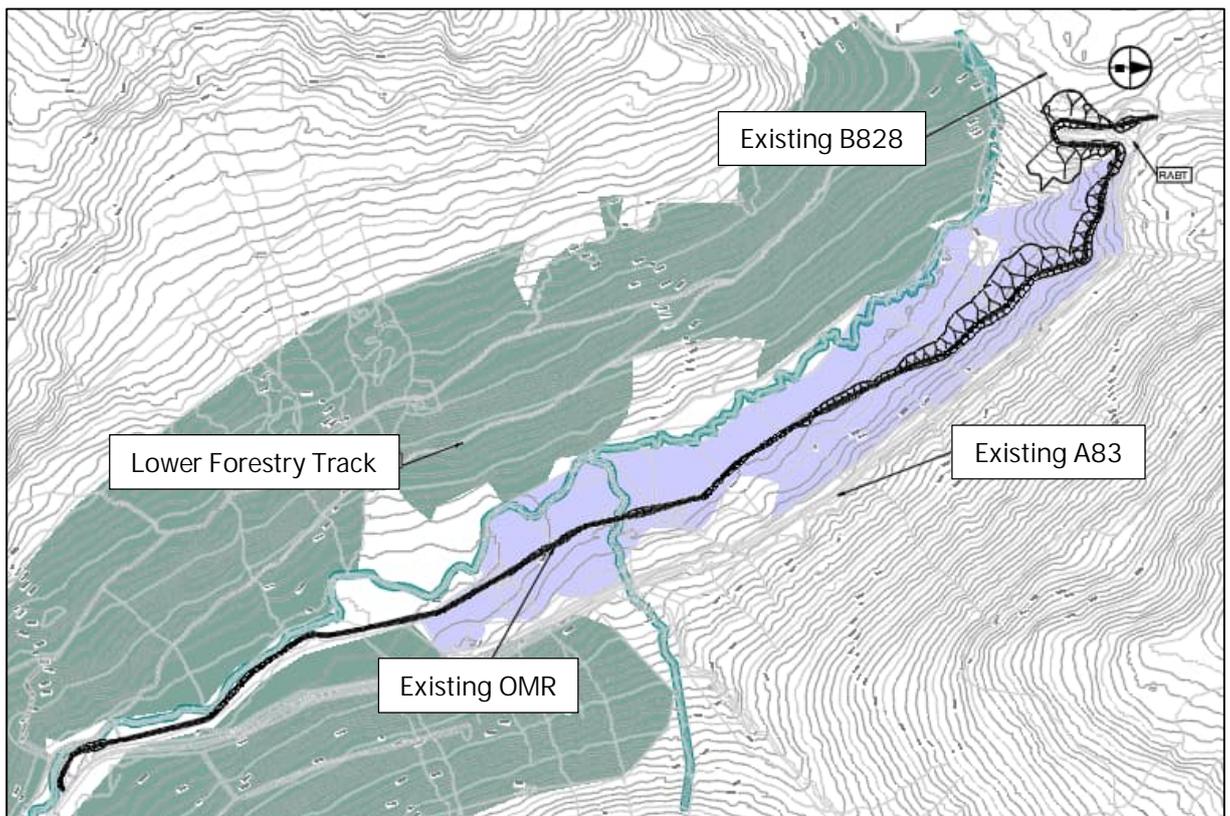
Figure 3: Existing OMR Option



Option G

- 4.8.2 Option G is approximately 4.0km in length and was also developed based on the existing sub-standard horizontal alignment but re-aligned at the hairpin bend. A relaxation of the 8% maximum to a 10% gradient was also applied to the climbing section in an effort to reduce the large embankment in the Existing OMR Option. However, even with a steeper gradient the height of the embankment was still over 40m and large cuttings of over 32m in height were present at the hairpin bend. Option G is shown below in Figure 4.

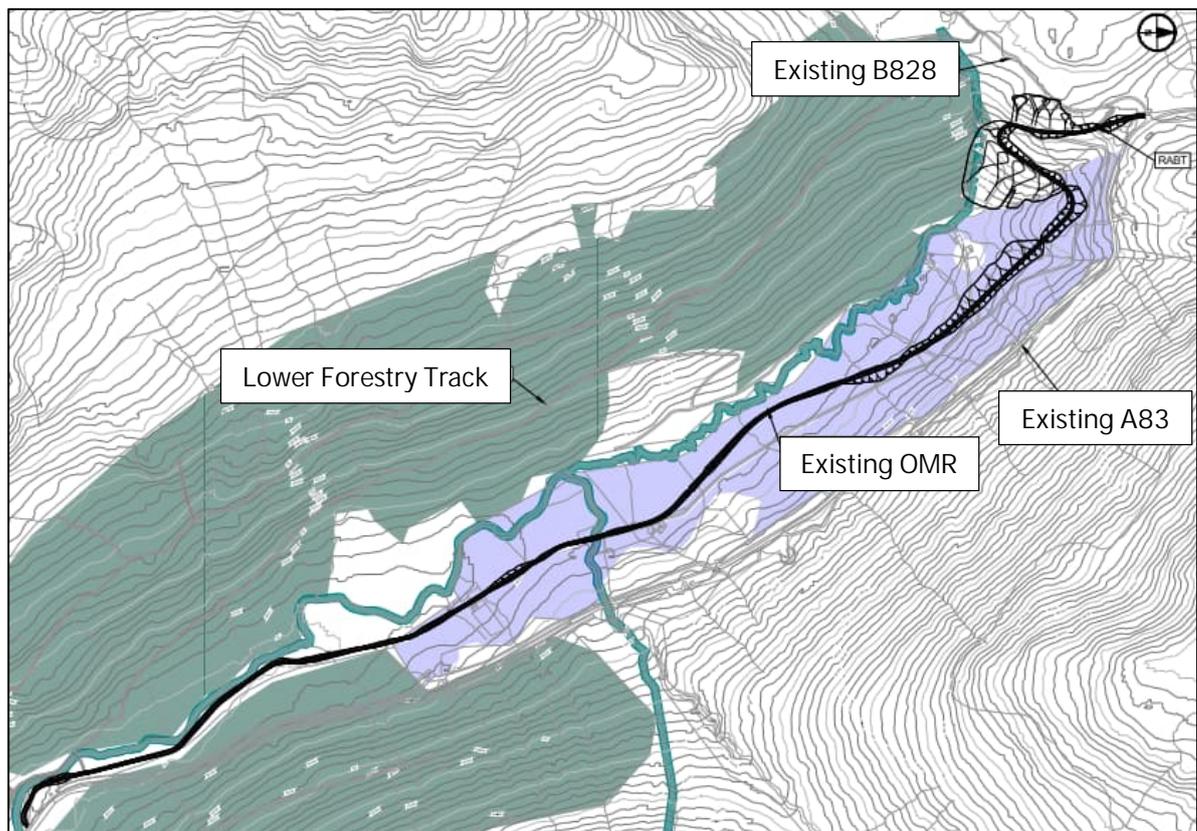
Figure 4: Option G



Option K

- 4.8.3 The final online (OMR) option is also approximately 4.0km in length and was designed to realign the northern section of the OMR horizontally to follow the existing contours at a 10% gradient and improve the geometry of the hairpin bend. Whilst the realignment helped to reduce the size of the embankment, to approximately 30m in height, the realigned hairpin bend requires a steep embankment of over 80m in height and large cuttings of over 45m in height. Option K is shown below in Figure 5.

Figure 5: Option K



4.9 Further Offline Option Development

- 4.9.1 Following initial consideration of the options, further development of the offline route options was taken forward. A variety of high-level options, based on the criteria list below, were developed. The Offline Options developed (Options A to F) are described below.

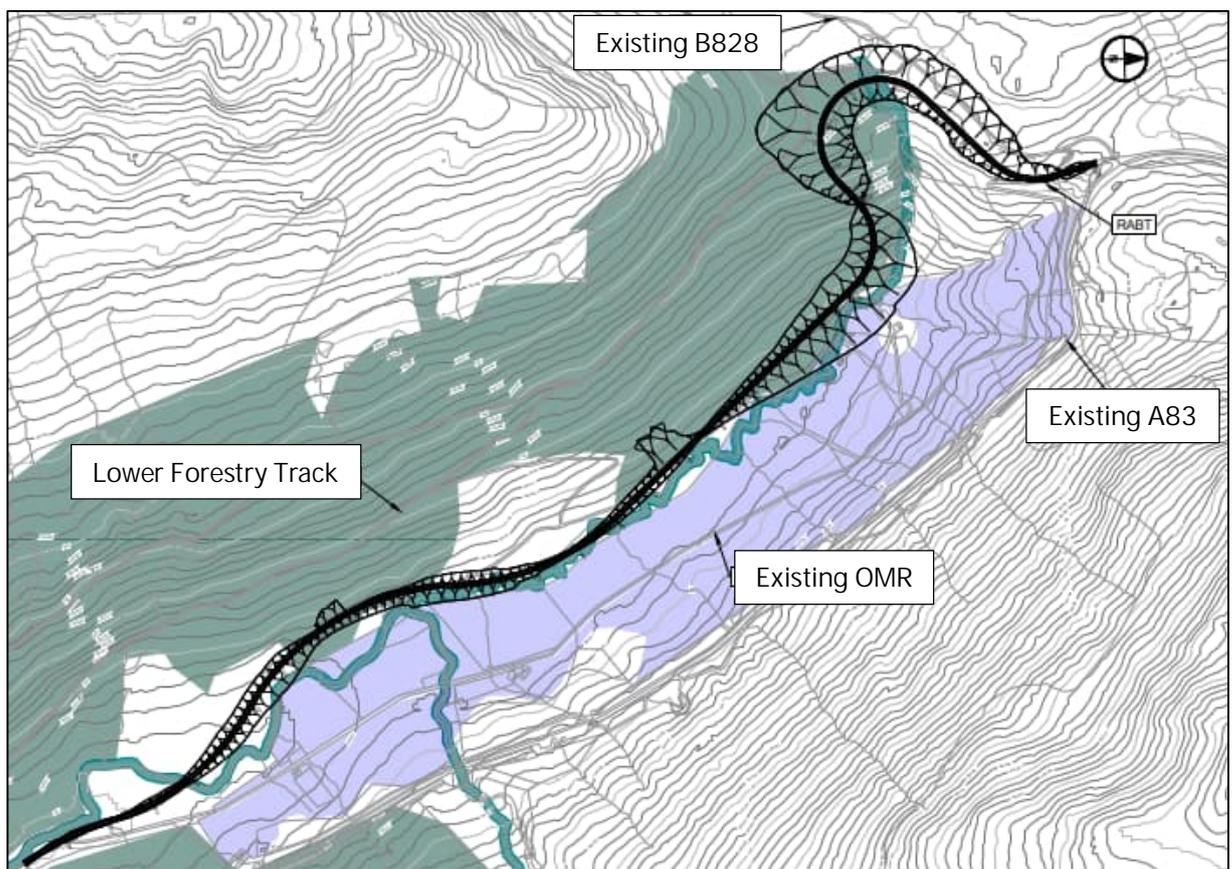
- 4.9.2 Offline route option development was carried out using the following design criteria:

- DMRB Design Standards using 50kph design speed.
 - Desirable Minimum Horizontal Radius $R=180\text{m}$
 - Desirable Minimum Crest Curve $K=10$
 - Desirable Minimum Sag Curve $K=9$
 - Minimum Vertical Gradient = 0.5%
 - Maximum Vertical Gradient = 6% (permitted relaxation of up to 8%)
- Cross section of 3.65m lane width, 1.0m verge width and 1:2 cut/fill slopes.

Option A

- 4.9.3 Option A is approximately 3.3km in length and follows the bottom of the Glen before making the climb up towards the RABT car park by looping along the contours to tie into the end of the hairpin bend. Figure 6 includes a plan of Option A.
- 4.9.4 It was not possible to maintain the permitted relaxation of 8% vertical grade due to the large level difference of the Glen and the RABT. A maximum gradient of 14% was required to climb the steep slope. This option produces large earthworks quantities and geotechnical measures would be required to strengthen the slopes and existing ground.

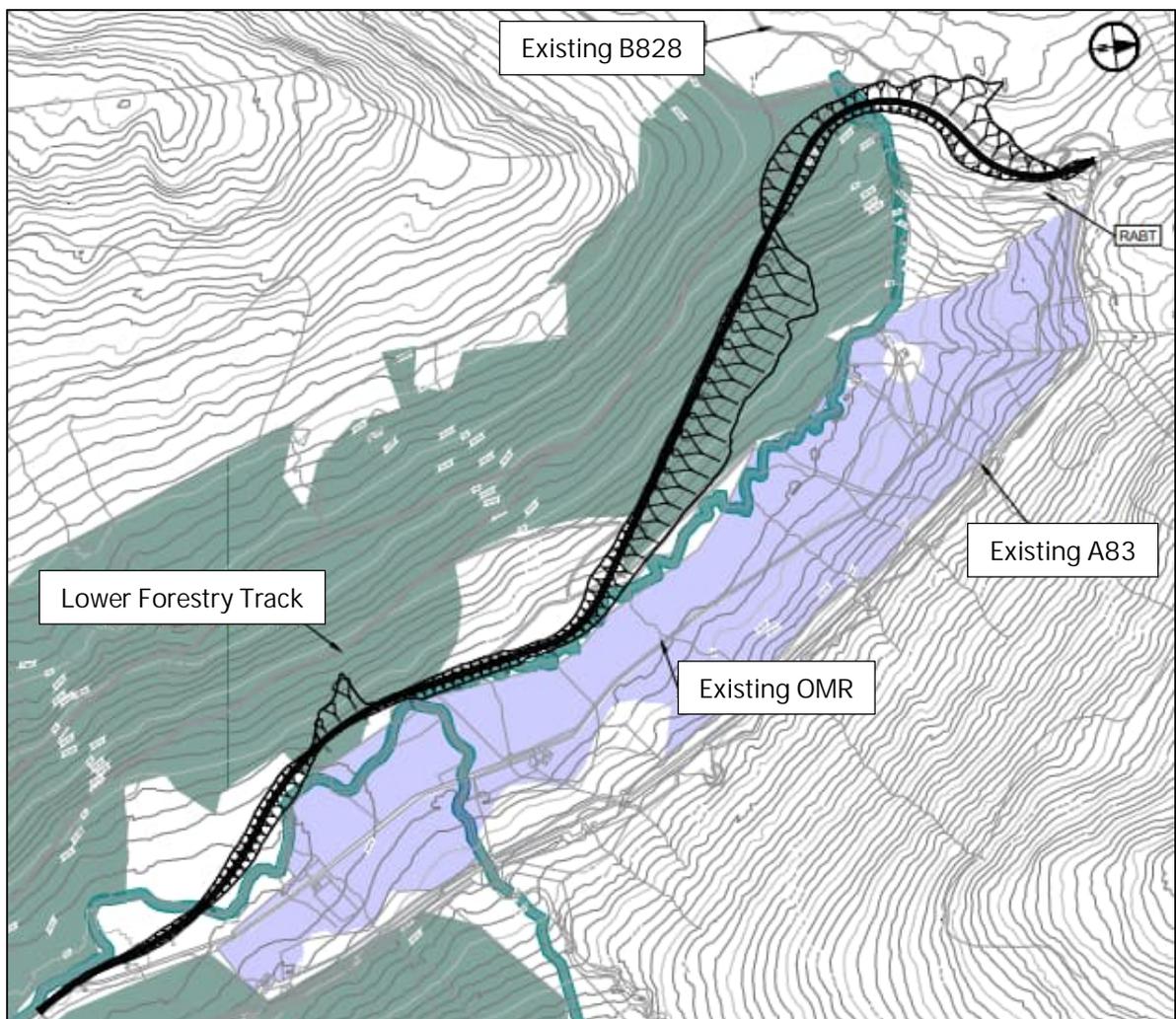
Figure 6: Offline Option A



Option B

- 4.9.5 Option B is approximately 3.1km in length and, again, follows the bottom of the Glen for the first half before heading towards the western side of the hillside and looping round to tie in at the RABT car park. Figure 7 includes a plan of Option B.
- 4.9.6 The same issue occurs here with the vertical grade. Again, the maximum gradient is approximately 14%. Although less than Option A, there is still a significant volume of earthworks which would require geotechnical solutions to strengthen the slopes and existing ground.

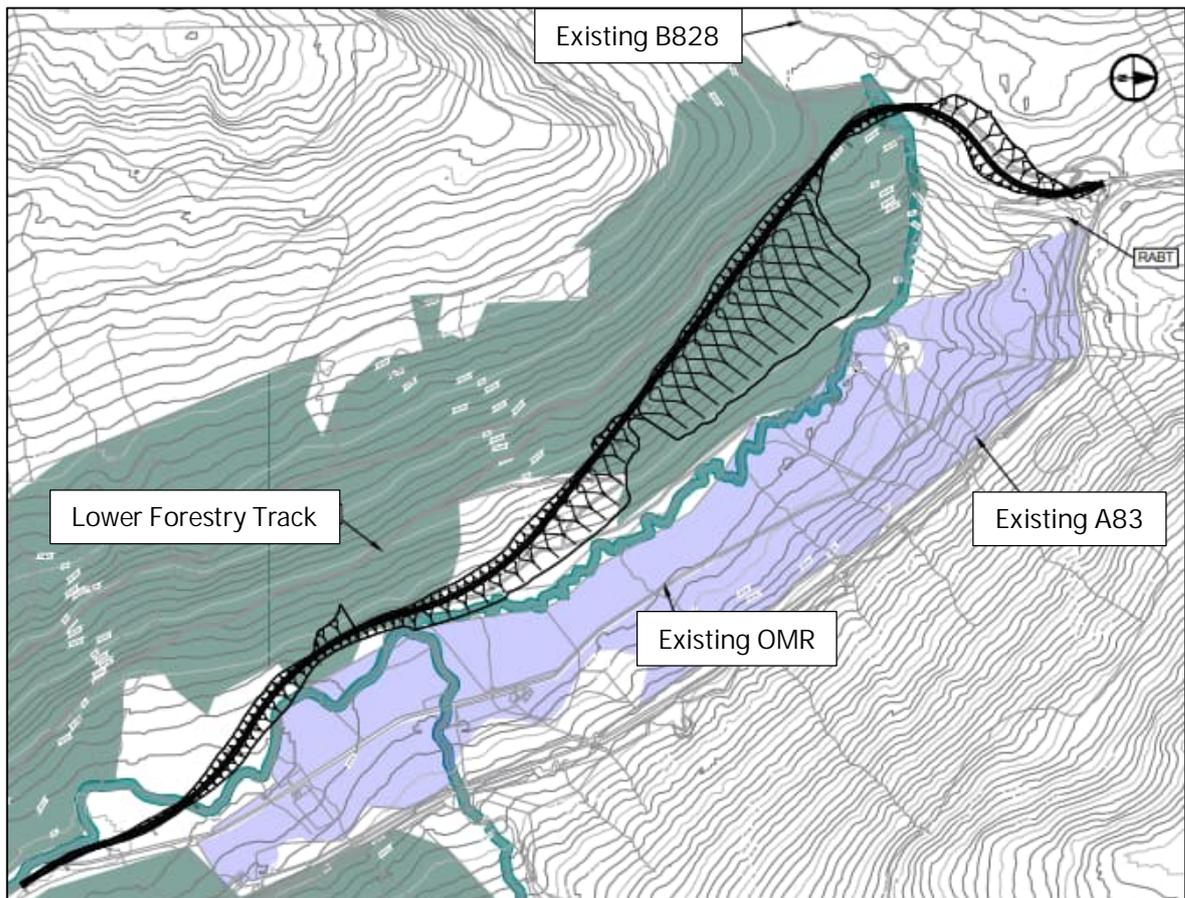
Figure 7: Offline Option B



Option C

- 4.9.7 Option C is approximately 3.0km in length and follows the same alignment as Option B but deviates from the Glen sooner to try and relax the maximum 14% gradient. Figure 8 includes a plan of Option C.
- 4.9.8 The maximum vertical grade on Option C is 13%, which is only a slight improvement on Option B and deviating earlier increases the height of the embankment on the uphill climb.

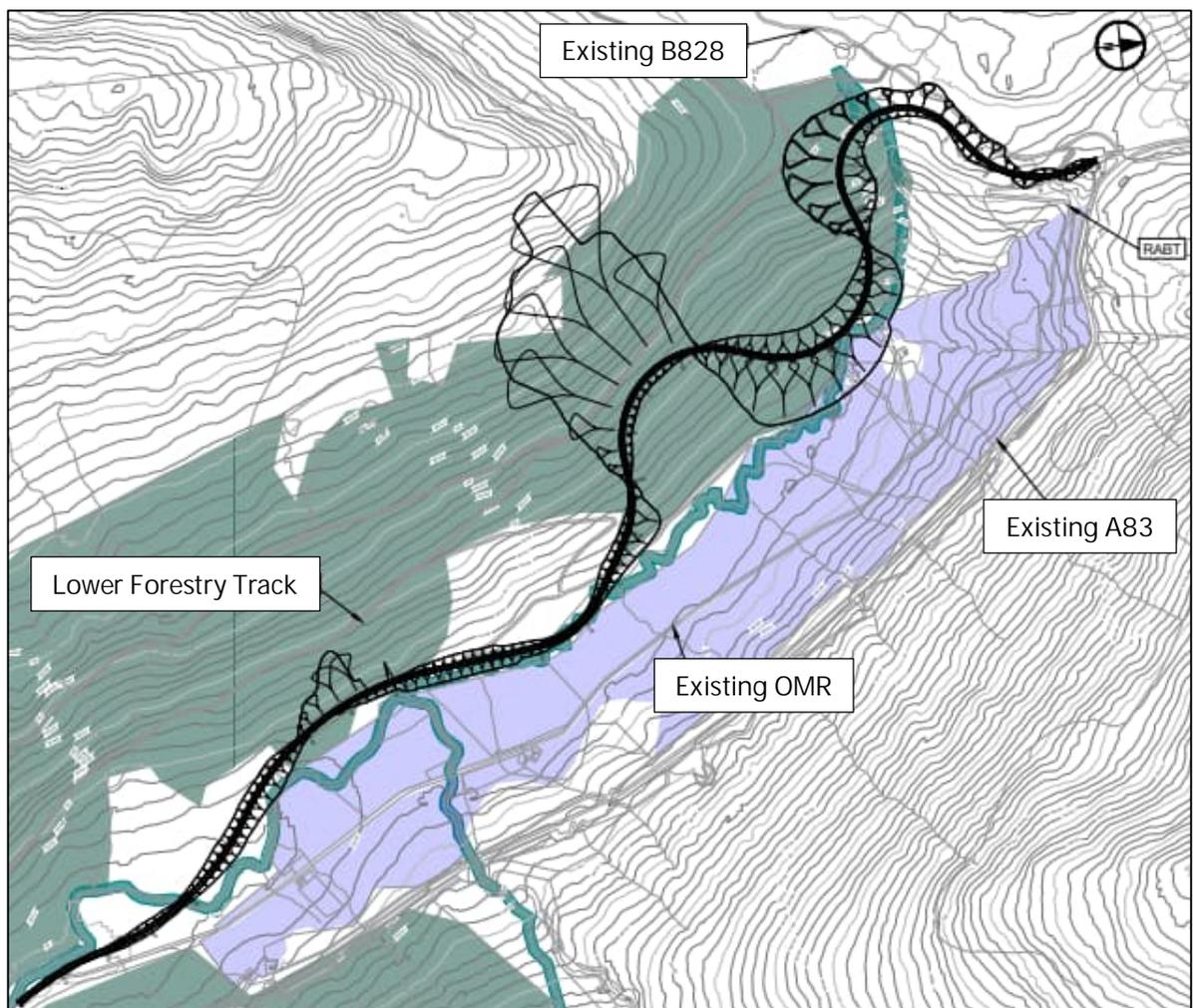
Figure 8: Offline Option C



Option D

- 4.9.9 Option D is approximately 3.3km in length and introduces a winding alignment along the western hillside to increase the length of the road and hence decrease the maximum vertical grade. It ties back into the RABT car park. Figure 9 includes a plan of Option D.
- 4.9.10 The winding alignment on the western hillside means that the topography becomes very hilly. In order to minimise the volume of earthworks, the alignment would need to follow the hilly sections. This produces vertical grades of up to 29% and large cut and fill heights.

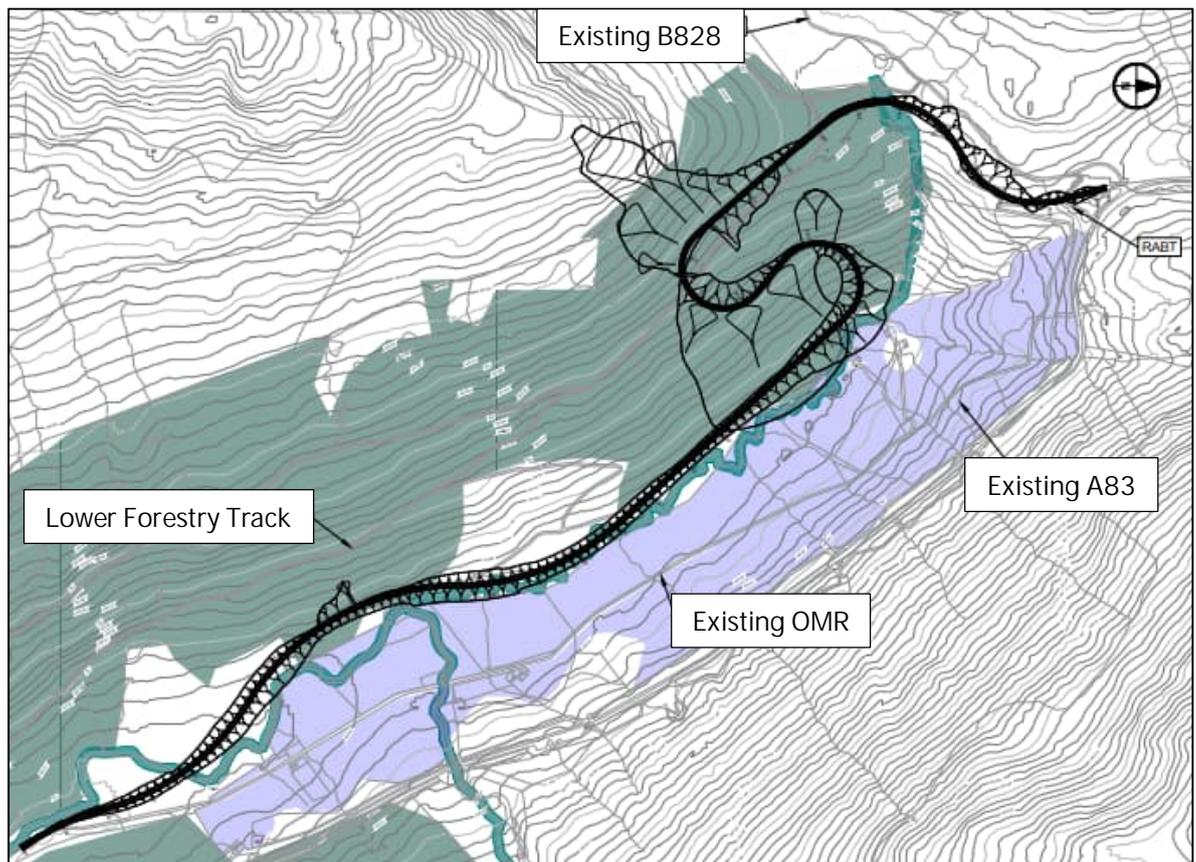
Figure 9: Offline Option D



Option E

- 4.9.11 Option E is approximately 3.9km in length and introduces a switchback arrangement on the western hillside to increase the length of road and hence decrease the maximum vertical grade. Figure 10 includes a plan of Option E.
- 4.9.12 Overall, earthworks are kept to a minimum except at the switchback section which would be located on a high embankment. This option does not help improve the maximum vertical grade, with a maximum gradient of approximately 23%.

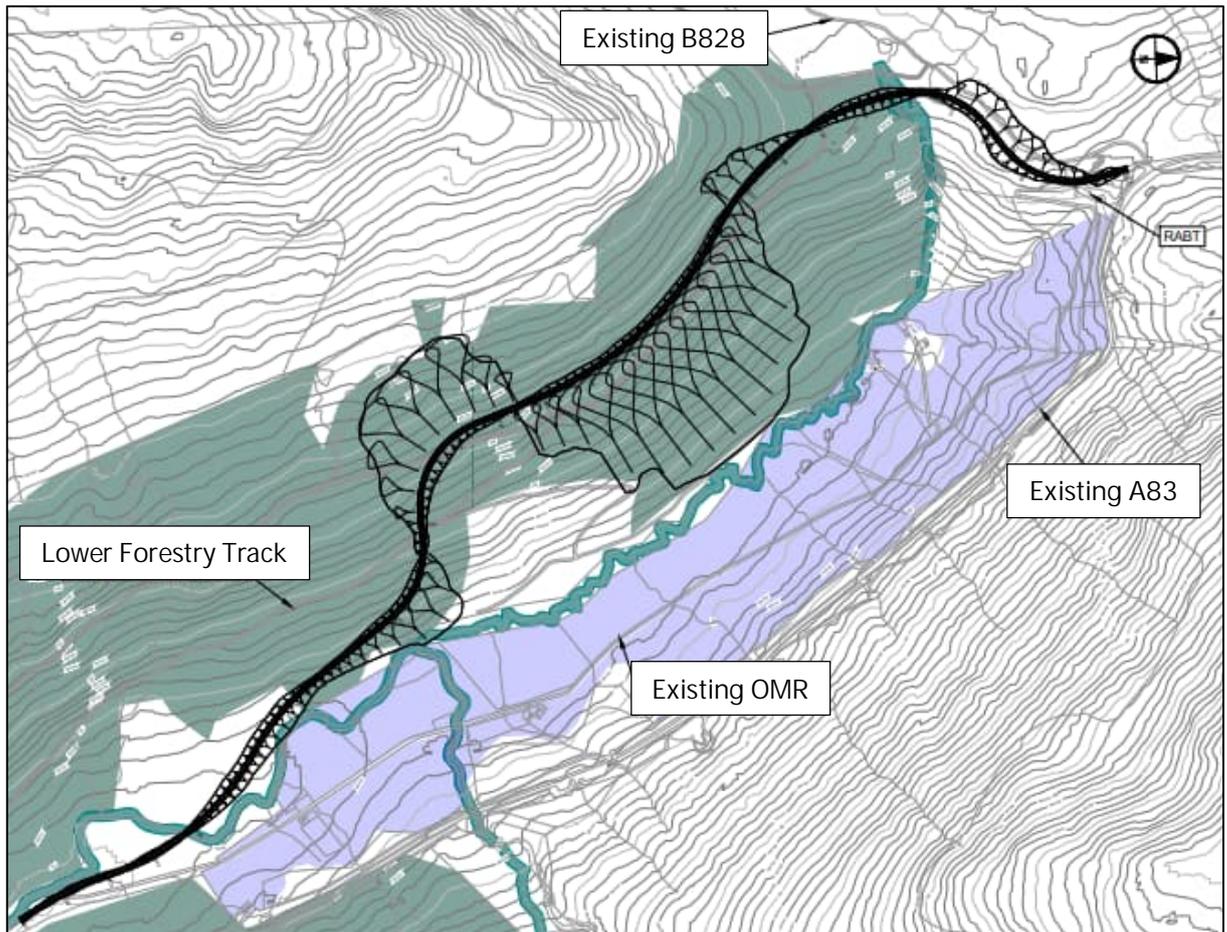
Figure 10: Offline Option E



Option F

- 4.9.13 Option F is approximately 3.1km in length and deviates from the Glen quite quickly after leaving the existing OMR carriageway to sit on the western hillside with the alignment following the contours of the hill. Figure 11 includes a plan of Option F.
- 4.9.14 Large earthworks volumes are generated, and the maximum vertical grade is approximately 27%.

Figure 11: Offline Option F



4.10 Initial Offline Route Options - Sifting

- 4.10.1 Options A – F were all discounted due to the steep vertical gradients and extensive earthworks, and refinements to these into two new options, Options H and J, were then considered.

Option H

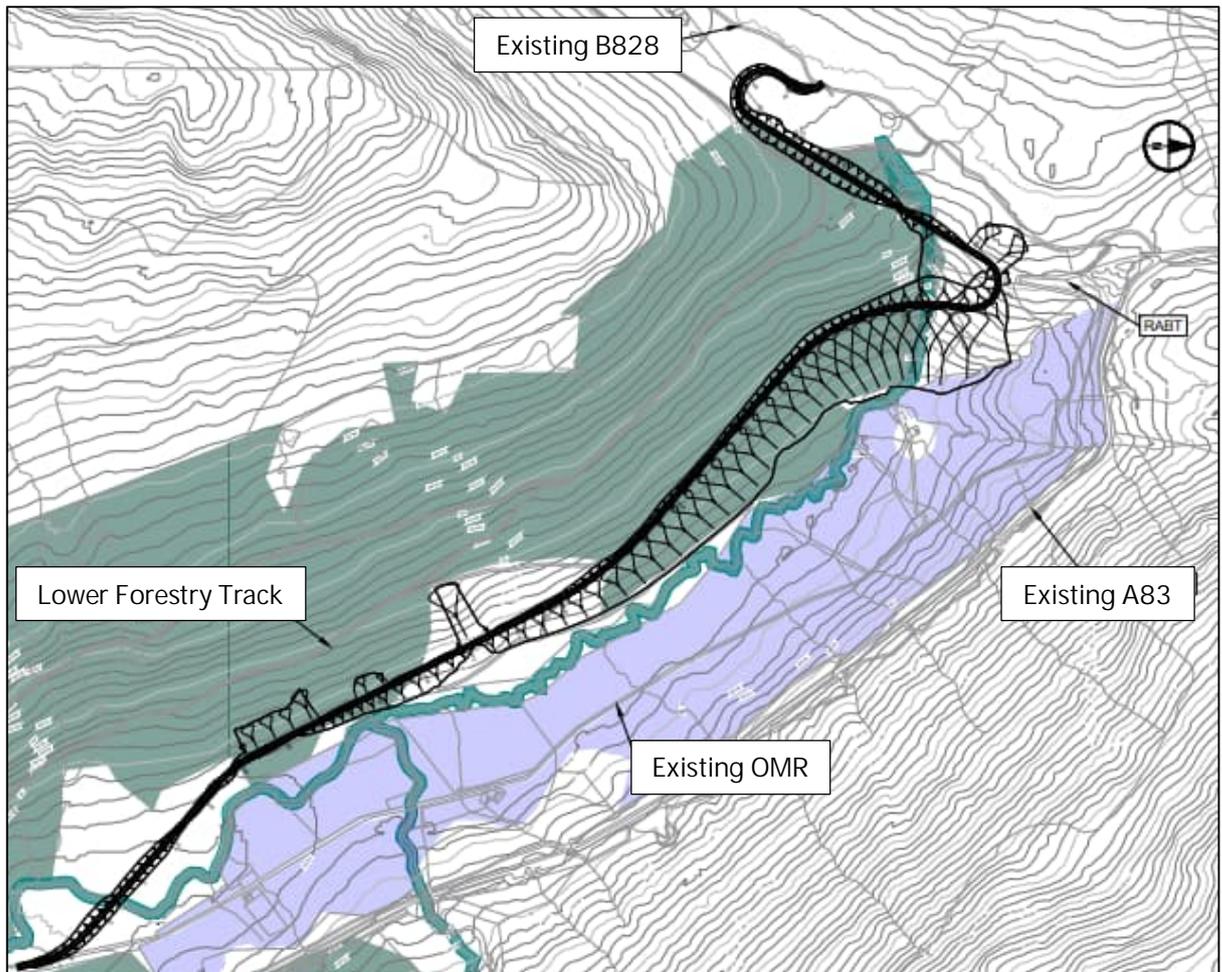
- 4.10.2 Option A was used as the basis for developing the new Option H. The main refinements from Option A to Option H were:

- reducing the minimum horizontal radii from R=127m to R=50m
- reducing the minimum sag curve from K=20 to K=9
- reducing the minimum crest curve from K=30 to K=10
- reducing the maximum gradient from 14% to 8%

- junction tie in with B828 Glen Mohr local road instead of existing OMR.

4.10.3 Option H is approximately 3.3km in length and avoids any overlap with the current OMR. The embankment present on the switchback section reaches a height of over 76m sitting on the deep slope of the Glen. Figure 12 includes a plan of Option H.

Figure 12: Option H



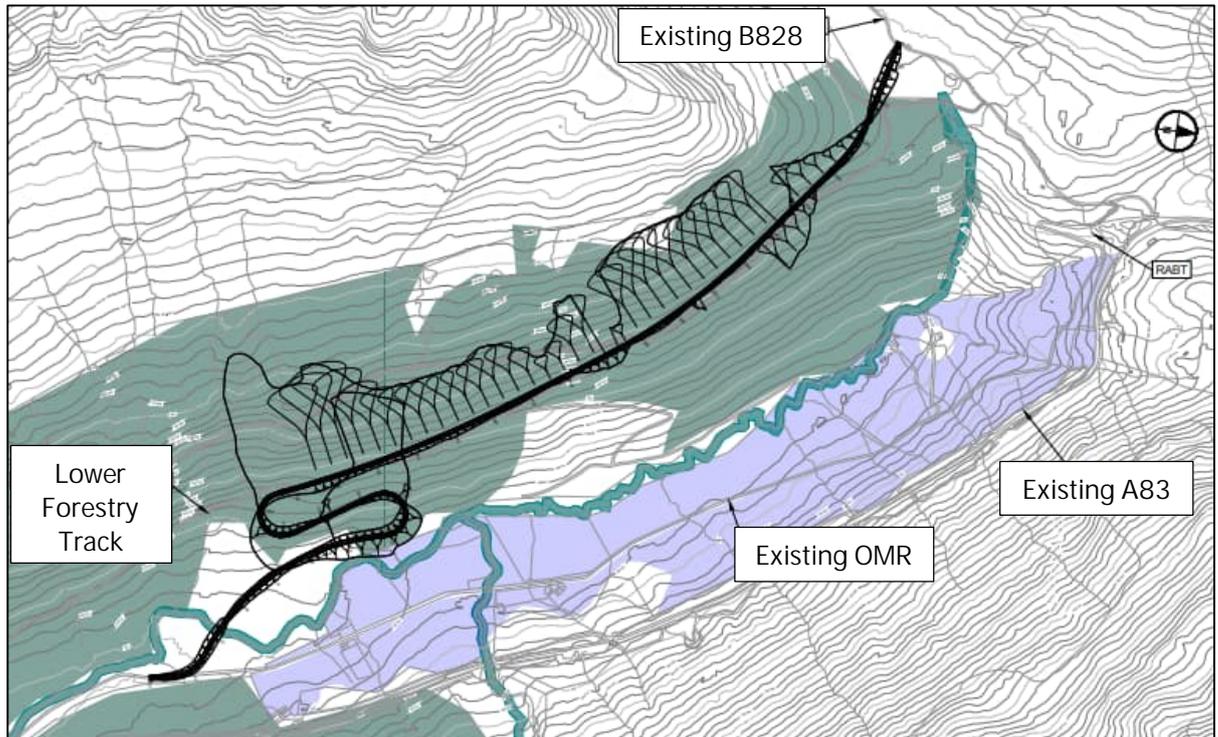
Option J

4.10.4 Option F was used as the basis for developing the new Option J. Figure 13 includes a plan of Option J. The main refinements from Option F to Option J were:

- reducing the minimum horizontal radii from R=180m to R=50m
- reducing the maximum gradient from 27% to 8%
- junction tie in with B828 Glen Mohr local road instead of existing OMR.

4.10.5 Option J is approximately 3.2km in length with the switchback provided at the south/east end to allow the scheme to follow along the western hillside. The placement of Option J on the western hillside of Glen Croe produces cuttings of over 172m in height.

Figure 13: Option J



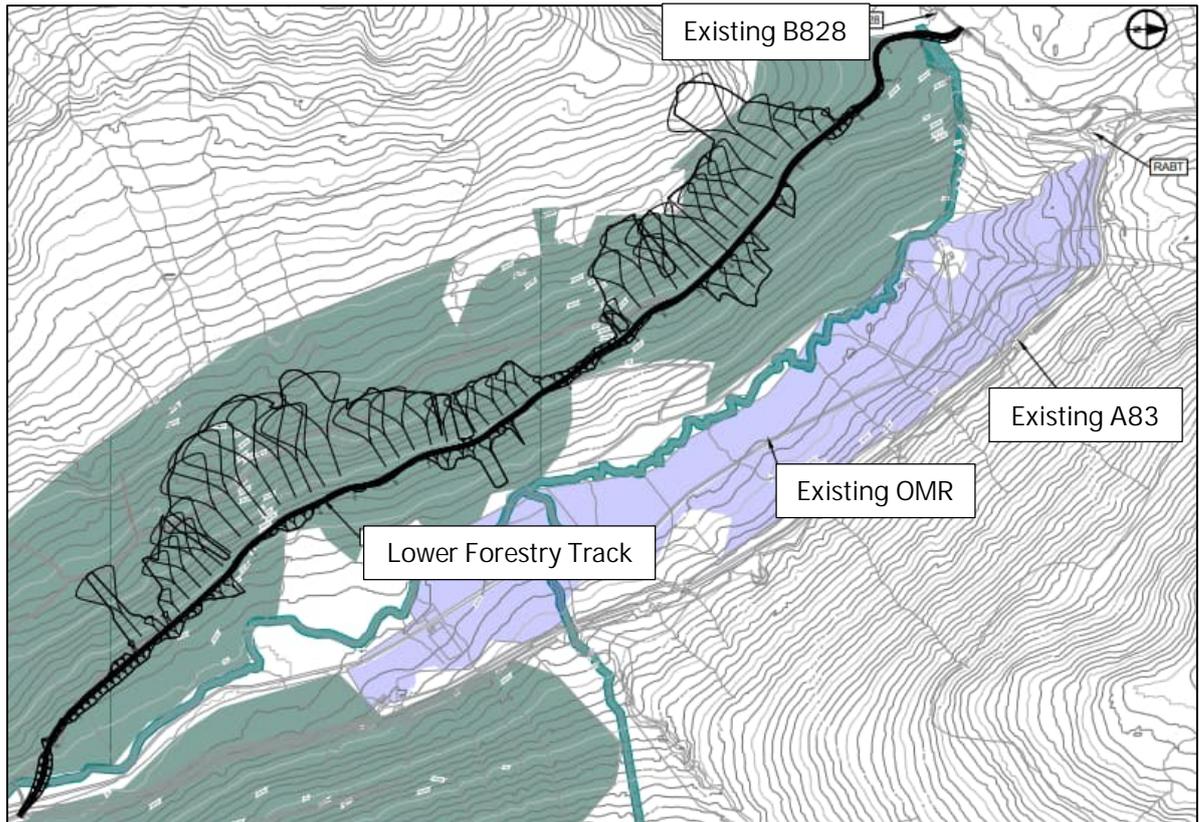
4.11 Offline Options Aligning with the Forestry Track

- 4.11.1 In addition to the above options, consideration was given to options that followed the existing forestry track alignments, where possible, but limiting the gradient to 8%, these are identified as Options L, M and N.

Option L

- 4.11.2 Option L is approximately 3.2km in length. It begins at the junction with the A83 Trunk Road and joins the lower forestry track, keeping close to the track for its full length and ending at a junction with the B828 Glen Mohr local road. Figure 14 includes a plan of Option L. Similar to Option J, its location on the western hillside with 1:2 cut slopes produced cuttings of over 169m in height along the majority of the length.

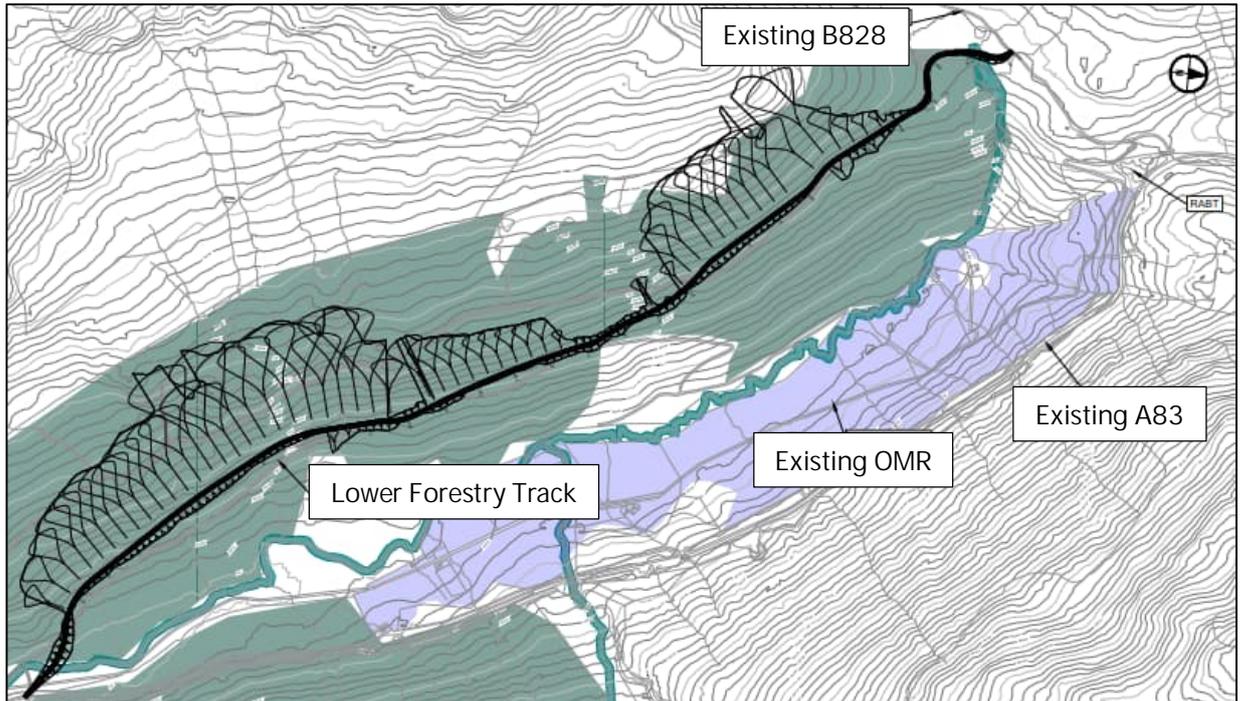
Figure 14: Option L



Option M

- 4.11.3 Option M is approximately 3.2km in length. It begins at the junction with the A83 Trunk Road and joins the lower forestry track, keeping close to the track for its full length while avoiding any overlap with the LTS Green Route currently being developed at the time, and ending at a junction with the B828 Glen Mohr local road. Figure 15 includes a plan of Option M. The positioning of Option M further up the western hillside from Option L increased the maximum height of cutting to over 177m.

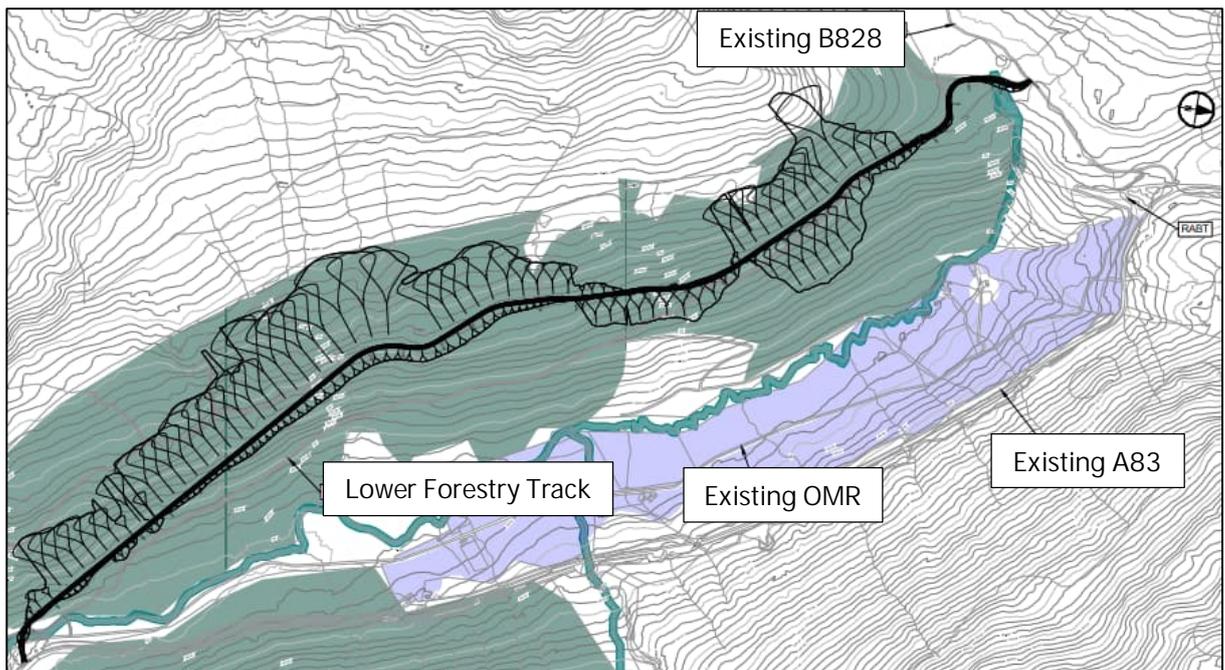
Figure 15: Option M



Option N

- 4.11.4 Option N is approximately 3.4km in length. It begins at the old junction with the A83 Trunk Road and crosses the hillside to join the upper forestry track, keeping close to the track for its full length and ending at a junction with the B828 Glen Mohr local road. Figure 16 includes a plan of Option N. The positioning of Option N and the provision of 1:2 slopes produce cuttings of over 150m in height along the majority of its length.

Figure 16: Option N



4.12 Final Options for Initial Shortlisting

- 4.12.1 The final options to be considered for shortlisting were the Existing OMR Option and Options G, H, J, K, L, M and N. Original offline OMR Options A, B, C, D, E and F were not considered for shortlisting.

5. Initial Short Listing

5.1 Initial Option Sifting

5.1.1 All remaining options were categorised into 3 groups: Online OMR Options; Glen Options; and Forestry Track Options and considered at an initial option sifting stage, as summarised below.

Online OMR Options

- Existing OMR Option
- Option G
- Option K

Offline Options within the Glen

- Option H
- Option J

Offline Options aligning with the Forestry Track

- Option L
- Option M
- Option N

5.2 Assessment Approach

5.2.1 A simple colour based (Red-Amber-Green or RAG) traffic light reporting system was developed to demonstrate how each option performed against each of the following twelve assessment criteria:

- Topography and Alignment Considerations
- Geology/Geomorphology Considerations
- Structures Considerations
- Drainage and Flooding Considerations
- Constructability Considerations
- Environmental Considerations
- Need for Third Party Land
- Safety Considerations
- Operational Considerations
- Financial Considerations
- Construction Timeline
- Programme to Procurement.

5.3 Initial Options Sifting Assessment Summary

5.3.1 The assessment for the eight options presented is summarised in Table 5.1.

Table 5.1 – Implementability Assessment

Options	Topographical & Alignment	Geology/ Geomorphology	Structures Considerations	Drainage & Flooding	Constructability Considerations	Environmental Considerations	Need for Third Party Land	Safety Considerations	Operational Considerations	Financial Considerations	Construction Timeline	Programme to Procurement
Online OMR Options												
Existing OMR	Red	Red	Green	Red	Red	Yellow	Red	Yellow	Green	Yellow	Yellow	Yellow
G	Red	Red	Green	Yellow	Red	Yellow	Red	Yellow	Green	Green	Green	Yellow
K	Red	Red	Green	Yellow	Red	Yellow	Red	Yellow	Green	Green	Green	Yellow
Offline Options within the Glen												
H	Red	Red	Green	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Yellow
J	Red	Red	Green	Green	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Yellow
Offline Options aligning with the Forestry Track												
L	Yellow	Red	Green	Red	Red	Yellow	Green	Yellow	Green	Yellow	Yellow	Yellow
M	Yellow	Red	Green	Red	Red	Red	Green	Yellow	Green	Red	Red	Yellow
N	Yellow	Red	Green	Red	Red	Red	Green	Yellow	Green	Red	Red	Yellow

5.3.2 At the initial options sifting stage there was concern on the extent, impact and cost of all the offline options due to the magnitude of the earthworks required.

5.3.3 The outcome of this stage was that in addition to targeted interventions on the existing OMR, a single optimum Glen Option and a single optimum Forestry Track Option were taken forward for further development and assessment. Option L was chosen as the Forestry Track Option to be taken forward because options M and N costs were considered prohibitive. Option H was chosen as the Glen Option to be taken forward because it was considered to be the better alignment. The remaining options, G, K, Existing OMR, J, M and N, were not taken any further.

5.4 Glen Option (H) – Further Development and Assessment

5.4.1 Various options for refining the alignment were considered in the further development of Option H, but the option has significant constraints, including:

- Steep gradients at 8% over significant lengths which will affect vehicle speeds uphill and safety for vehicles travelling downhill, particularly where the steep gradients coincide with the switchback section of the alignment at the north-western end. This means this option would potentially require a convoy, as on the current OMR diversion, as a safety measure.
- Earthwork cuttings interfacing with the Green Option currently being considered as a possible route option for the LTS which would present significant constructability challenges for the Green Option, should it be taken forward as the LTS preferred option. There are limited opportunities to realign the Green Option to avoid this effect without significant adverse effects on its alignment, earthworks, and the overall scheme footprint.
- Embankments up to over 80m high on the downslope side are required which would be extremely complex to construct and present stability issues due to the underlying ground, inevitably requiring extensive geotechnical or structural measures to reduce the risk of embankment instability.

5.4.2 Overall, it was not considered that Option H would offer any significant advantages compared to

Option L.

5.4.3 Given the impact of the option on the Glen, likely high costs and earthwork cuttings interfacing with the Green Option currently being considered as a possible route option for the LTS, Option H was therefore not recommended for further consideration.

5.5 Forestry Track Option (L) – Further Development and Assessment

5.5.1 In order to minimise the long-term impact on the Glen and minimise abortive works, the Forestry Track Option was further developed taking into account its interaction with the LTS Green Route. Two interaction scenarios were considered:

- Scenario 1 – an alignment where the MTS follows the line of the Green Option; in this case the MTS could potentially then be upgraded to become the LTS.
- Scenario 2 – an alignment that keeps the MTS independent of the Green Option; in this case the MTS could either remain as an access route through forestry land once the LTS is provided or be removed.

5.5.2 The differing scenarios relate to constructability of the Green Option, should it be selected as the preferred option for the LTS. If it is not possible for the MTS to remain open as a diversion route during the upgrade to become the LTS (Scenario 1), then an additional diversion route would be needed at that time, likely to involve upgrading the OMR. For Scenario 2, the MTS could remain as the diversion route during construction of the Green Option.

5.5.3 Whilst construction is expected to be complex, it is considered feasible to maintain a diversion route during construction of the Green Option. That being the case, in order to avoid the construction of two separate new roads on the southwestern slopes of the Glen, Scenario 2 was not recommended for further consideration.

5.5.4 Following consultation with the A83 Campaign Group, a single lane option of Scenario 1 was also taken forward and referred to as the Single Lane Forestry Track Upgrade in order to consider whether the significant earthworks and associated impacts, costs and construction implications could be reduced.

5.6 Agreed Short List

5.6.1 From the assessments undertaken, the following options were taken forward:

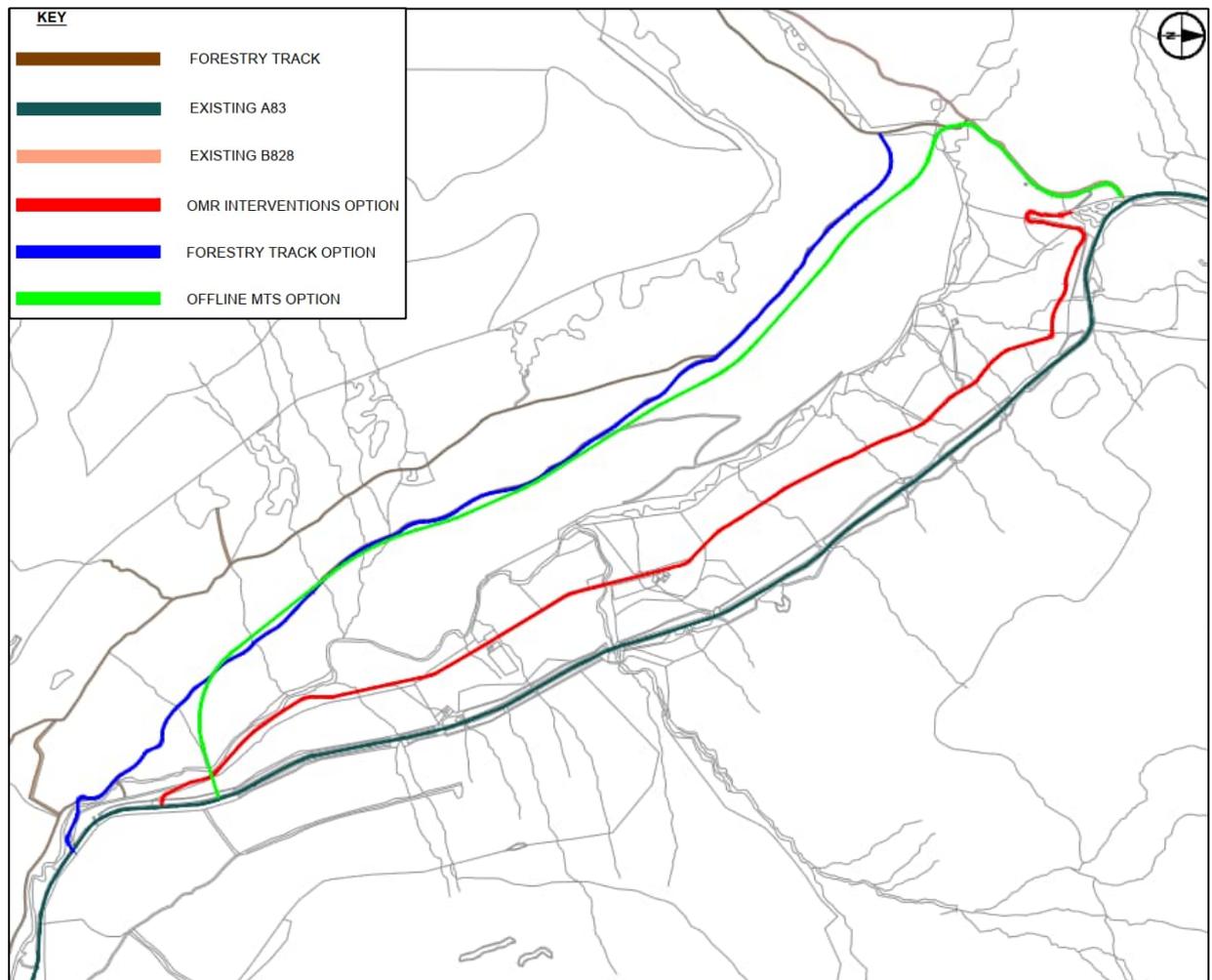
- Single Lane Forestry Track Upgrade;
- OMR Interventions; and
- Developed Option L - Two Way Offline MTS along the line of the 'Green Route'.

6. Final Shortlisted Options

6.1 Introduction

6.1.1 The final shortlisted options are described below and shown in Figure 17.

Figure 17: Final Shortlisted Options Plan



6.2 Single Lane Forestry Track Upgrade

6.2.1 The Single Lane Forestry Track Upgrade option generally follows the route of the existing Glen Croe lower forestry track as it rises up the southwest side of Glen Croe, within the lower slopes of Ben Donich.

6.2.2 This option commences at the existing, at-grade, direct access from the A83 Trunk Road into the now gated and closed original access to the OMR, and then initially follows the alignment of the OMR before turning left to cross the Croe Water approximately 135m downstream of an existing structure across the watercourse.

6.2.3 Beyond the Croe Water crossing, it turns right and then generally follows the route of the existing Glen Croe Lower Forestry Track along the western bank of Croe Water.

- 6.2.4 After a short distance it rises away from the Croe Water and then follows the general alignment of the Glen Croe Lower Forestry Track for several kilometres within the lower slopes of Ben Donich.
- 6.2.5 As it emerges from Glen Croe Forest, it follows the general alignment of another track, the Glen Mhor Forestry Track, which heads north to form an at-grade direct access with the B828 Glen Mohr local road.
- 6.2.6 This option then includes a length of the B828 Glen Mohr local road and concludes where this local road joins the A83 Trunk Road again via an at-grade junction.
- 6.2.7 It is approximately 4.1 km long, measured between the two points at which it meets the A83 Trunk Road.
- 6.2.8 The Single Lane Forestry Track Upgrade option drawings are included as Appendix A of this report.
- 6.3 OMR Interventions
- 6.3.1 The OMR Interventions option consists of a number of interventions to improve the operation and resilience of the OMR when used as a diversion route.
- 6.3.2 The proposed interventions include an increased length of two-way working; providing edge protection where there is increased risk that a vehicle leaves the carriageway and would otherwise encounter a hazardous feature, and edge markings for delineation of the road; curve widening to reduce risk of incidents on the tight bends; improved resilience of existing structures, including bridge widening and potential strengthening works; improved resilience of culverts; potential realignment of the southern A83/OMR junction to reduce flooding impacts; and geohazard mitigation measures for debris flows and boulder falls in the form of bunds and catch fences.
- 6.3.3 The OMR Interventions drawings and schedule are included as Appendix B of this report.
- 6.4 Offline MTS Option
- 6.4.1 The Offline MTS option generally follows the LTS Green Route 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.
- 6.4.2 This option commences at a junction with the A83 Trunk Road, approximately 200m north of the current junction with the 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.
- 6.4.3 Where the LTS Green Route heads across the Glen valley via a viaduct towards the RaBT 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.
- 6.4.4 The section of the B828 Glen Mohr local road from the forestry track junction to the A83 Trunk Road at the RaBT 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.
- 6.4.5 The Offline MTS option drawings are included as Appendix C of this report.

7. Assessment of Final Shortlisted Options

7.1 Option Assessment Summary Tables

7.1.1 The twelve implementability criteria used at the initial sifting stage were expanded and Option Assessment Summary Tables were developed for each of the three final options.

7.1.2 Each option was assessed against a range of Engineering, Constructability, Environment, Operational, Financial, Public Acceptability, and Reputational criteria, as well as the Estimated Time to Completion, Interface with Forestry and Land Scotland, Consenting and Phasing Considerations.

7.1.3 Commentary for each option is detailed in the Options Assessment Summary Tables included as Appendix D of this report.

8. Options Fact Sheets / Key Findings

8.1 Fact Sheets

8.1.1 In addition to the assessment of the shortlisted options described in section 7, it was recognised that any preferred option recommendation should also consider the operational benefits that are achieved and whether those benefits are significant enough to justify the cost, time and impacts of the recommended option.

8.1.2 Option fact sheets were produced which included more detail on operational benefits, costs and timescales associated with each option.

8.1.3 In addition to the three final shortlisted MTS options, the fact sheets also include combination options. These considered a range of interactions with potential LTS solutions based on the Green Route, looking at the costs, timing and operational impacts of converting an MTS option into a LTS.

8.1.4 The 11 options considered were:

- 01 – OMR Interventions
- 02 – Single Lane Lower Forestry Track Upgrade
- 03 – Offline MTS Option (Reduced Cross Section)
- 04 – Offline MTS Option (Wider Cross Section)
- 05 – Long-term Scheme with Debris Flow Shelter
- 06 – Long-term Scheme with Debris Flow Shelter and Short Viaduct
- 07 – Long-term Scheme with Viaduct
- 08 – Converted Reduced Cross Section Offline MTS Option to LTS Debris Flow Shelter
- 09 – Converted Wider Cross Section Offline MTS to LTS Debris Flow Shelter
- 10 – Phased Approach (Debris Flow Shelter)
- 11 – Phased Approach (Debris Flow Shelter and Short Viaduct)

8.1.5 The fact sheets for each of these options are included as Appendix E of this report.

8.1.6 Key findings from the Assessment Summary Tables and fact sheets relevant to the three final shortlisted MTS options are set out below.

8.2 Journey Time Comparison

Existing OMR versus Single Lane Forestry Track Upgrade under convoy

8.2.1 Journey times for the single lane forestry track operating in convoy is estimated to be up to 49 minutes: approximately 15 minutes in the convoy plus up to approximately 34 minutes waiting time.

8.2.2 The journey time for the current OMR diversion route is estimated to be up to 32 minutes: approximately 10 minutes (westbound) in convoy plus up to approximately 22 minutes waiting time.

8.2.3 The longer journey time for the single lane forestry track reflects the longer length of the track over which a convoy would be required compared to the current OMR diversion route.

8.2.4 The journey times comparison between the Existing OMR and the Single Lane Forestry Track Upgrade is summarised in Table 8.1.

Table 8.1 – Single Lane Forestry Track Upgrade Journey Time Comparison

Route	Journey Time (approx.)
Existing OMR Diversion Route	32 minutes
Single Lane Forestry Track under convoy	49 minutes

Existing OMR versus Single Lane Forestry Track Upgrade in loop with OMR

- 8.2.5 Journey times for the single lane forestry track operating in a loop with the OMR are estimated to be up to 25 minutes eastbound (on OMR) and 32 minutes westbound (on single lane forestry track), made up of 8 minutes (eastbound) in convoy plus up to 17 minutes waiting time eastbound, and 15 minutes in convoy and up to 17 minutes waiting time westbound.
- 8.2.6 Whilst this dual operation would offer a reduced journey time for eastbound traffic, compared to the existing OMR arrangement, there is no benefit for traffic travelling westbound.
- 8.2.7 The journey times comparison between the Existing OMR and the Single Lane Forestry Track Upgrade in loop with OMR is summarised in Table 8.2.

Table 8.2 – Single Lane Forestry Track Upgrade in Loop with OMR Journey Time Comparison

Route	Journey Time (approx.)
Existing OMR Diversion Route	32 minutes
Forestry Track in loop with OMR	25 minutes eastbound 32 minutes westbound

- 8.2.8 For a loop operation, two convoy vehicles and associated resources would be required, which would incur additional costs.

Existing OMR versus OMR Interventions

- 8.2.9 Due to the shorter length of convoy as a result of lengthening the section of two-way traffic, this option would result in an improvement to journey times compared to the existing OMR arrangement.
- 8.2.10 The journey times comparison between the existing OMR diversion route and the OMR Interventions is summarised in Table 8.3.

Table 8.3 – OMR Interventions Journey Time Comparison

Route	Journey Time (approx.)
Existing OMR Diversion Route	32 minutes
OMR Interventions	22 minutes

Existing OMR versus Offline MTS Option

- 8.2.11 This option would not require a convoy operation and would operate under 30mph free flow conditions. This results in an improvement in journey times compared to the existing OMR arrangement.

8.2.12 The journey times comparison between the Existing OMR and the Offline MTS Option is summarised in Table 8.4.

Table 8.4 – Offline MTS Option Journey Time Comparison

Route	Journey Time (approx.)
Existing OMR Diversion Route	32 minutes
Offline MTS Two-way Route	5 – 8 minutes

8.3 Cost Estimates

8.3.1 Cost estimates were produced for each of the 11 options presented in the fact sheets.

8.3.2 The cost estimates for the three MTS options are presented in Table 8.5.

Table 8.5 – Medium-term Solution Cost Estimates Summary

Route	Cost
OMR Interventions	£24M - £32M
Offline MTS Option	£85M - £113M
Single Lane Forestry Track	£21M - £28M

8.4 Construction Programme Estimates

8.4.1 The construction programme estimates for the MTS are presented in Table 8.6.

Table 8.6 – Medium-term Solution Construction Programme Estimates Summary

Route	Outline Construction Programme
OMR Interventions	Up to 1 year
Offline MTS Option	24 – 30 months
Single Lane Forestry Track	13 – 19 months

9. Conclusion and Recommendation

9.1 Introduction

9.1.1 There are a range of factors that must be considered when recommending a preferred option for the MTS, covering operational, technical, programme and financial factors. Ultimately, these allow consideration of the options against the scheme objectives for the MTS which are:

- Increase resilience of a temporary diversion route through Glen Croe by reducing the likelihood of it being closed during landslide, flooding and other incidents.
- 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.
- Reduce the likelihood of accidents on a temporary diversion route through Glen Croe.

9.1.2 The Option Assessment Summary Tables set out the assessment of the options under consideration against a wide range of factors that inform assessment against the objectives.

9.2 Assessment Against Scheme Objectives

Increase resilience of a temporary diversion route through Glen Croe by reducing the likelihood of it being closed during landslide, flooding and other incidents.

9.2.1 The following is noted in relation to the assessment of the options:

- The OMR Interventions will increase resilience through reducing the likelihood of geohazards impacting the OMR or flooding events closing it. The OMR improvements would still be susceptible to vehicle breakdowns occurring in the shortened section where convoys will operate and breakdown support/recovery vehicle would be recommended.
- The Offline MTS bypasses the main landslide risk area on the A83 Trunk Road but is still susceptible to geohazard threat along its route including landslides, debris flows, or other geohazard events. The position of the route on the hillside may make it difficult to protect and geohazard mitigation may be required depending on the risks. Other resilience issues affecting the OMR such as flooding, or vehicle breakdowns are unlikely to be significant for the Offline MTS.
- The Single Lane Forestry Track Option, similarly to the Offline MTS, would be affected by geohazard threat including landslides, debris flows, or other geohazard events. Geohazard mitigation is not proposed as the principle of this option is it should be quicker and less costly to implement. However, this means the potential risks could be greater than the Offline MTS. The Single Lane Forestry Track Option would be susceptible to vehicle breakdowns occurring along its length as convoys will operate and breakdown support/recovery vehicle would be recommended.

9.2.2 The OMR Interventions provide a more resilient diversion route compared to the existing OMR, although still requires convoy working.

9.2.3 The Offline MTS potentially performs better than the other options, achieving improved resilience compared to the existing OMR, although the extent of this is somewhat uncertain given the geohazard risks and the position of the route on the hillside would mean mitigation could be required which has not been assessed. Operationally, the two-lane road would be resilient to breakdowns.

9.2.4 The Single Lane Forestry Track Option would perform more poorly than the other options when considered to be operating on its own due to the longer length of single lane operation and geohazard risks that could not be mitigated. If it is operated in conjunction with, or as an alternative to the existing OMR, then it would perform better and be more certain to improve resilience.

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.

- 9.2.5 The Assessment Summary Tables contain information that considers the challenges and resulting impacts of the options across a range of factors. The assessments also consider programme and costs. Overall, the scheme objective is clear: that a balance across these is sought. This is particularly relevant as the MTS was conceived as part of the overall strategy to provide a more resilient diversion route until the Long-term Solution to the problems at the RABT is in place.
- 9.2.6 The following is noted in relation to the assessment of the options:
- The OMR Interventions are smaller scale, discrete improvements in comparison to the other options, so the technical engineering, environmental and constructability impacts of the scheme are less significant than the other options overall. The journey times expected are slightly less than the existing OMR due to the slightly longer length of two-lane operation. It is significantly less costly than the Offline MTS but slightly more costly than the Single Lane Forestry Track to implement. It would be the quickest to implement, but the need for third party land and other factors may increase this duration. It is not certain whether an Environmental Impact Assessment Report (EIAR) would be necessary, but there will be environmental considerations that need addressed.
 - The scale of the Offline MTS and its position on the hillside results in a complex engineering solution in terms of its design and construction. It also means that potentially significant environmental impacts would occur, particularly across areas such as biodiversity, fauna and flora, water environment and landscape and visual. An EIAR would likely be required to support promotion of the scheme due to the potential environmental impacts. Also, whilst predominantly within land owned by the Scottish Ministers, there may be some third-party land requirements at the north-western end where it joins the B828 Glen Mhor local road and then follows the route of the B828 Glen Mhor local road back to the A83 Trunk Road. It would create a two-lane diversion route and would therefore provide the shortest journey times of all of the options when in use, and in comparison to the existing OMR. The Offline MTS is the costliest of the options and it is expected to take the longest time to implement.
 - The Single Lane Forestry Track Option, whilst narrower in width than the Offline MTS and following to an extent the existing Glen Croe Lower Forestry Track, is still a significant upgrade of that track along the southern slopes of Glen Croe. As such, it presents similar challenges to the Offline MTS in some areas with potential impacts, particularly around the complexity of the design, logistics around construction and environmental impacts. An EIAR is considered likely to be required in order to promote the scheme due to the potential environmental impacts. The journey times on the Single Lane Forestry Track Option are generally the longest of all the options, if it is operated on its own, and also longer than the existing OMR. It is possible that certain eastbound journeys would be quicker than the OMR interventions if it operates in conjunction with the OMR in a loop arrangement as this arrangement requires additional convoy resource, which in certain times reduces the intervals between successive convoys leaving. The Single Lane Forestry Track Option would be relatively quick to complete but would take longer than the OMR Interventions if there were no barriers to the progress of the OMR Interventions.
- 9.2.7 There is some uncertainty regarding the time to implement for the OMR Interventions as it requires third party land, which may require a statutory process to secure, adding time to the period needed for its implementation. If that additional time is not necessary, then it is the quickest to implement, is of relatively lower cost and would have the least impacts overall across the range of criteria assessed.
- 9.2.8 The Offline MTS potentially has the poorest balance of time to implement, cost and impact as it is the most complex, would have greatest impacts, cost the most and take the longest to implement.
- 9.2.9 The Single Lane Forestry Track Option is the least costly overall and may provide more certainty

regarding delivery timescale given it does not involve extensive third-party land. However, environmental considerations could lead to an EIAR being required, impacting programme. The option also has numerous technical complexities and challenges that would need addressed. Journey time benefits would not be delivered unless it operated in conjunction with the OMR, and without that the journey time would be the longest of all the options.

Reduce the likelihood of accidents on a temporary diversion route through Glen Croe.

9.2.10 All options should be relatively safe for use as a temporary diversion route:

- The OMR Interventions does have steep and narrow sections at the western end but will operate under convoy, mitigating safety risks.
- The Offline MTS provides a relatively high standard of route, but the long, steep downhill nature of the route in the eastbound direction would create some safety risks in the event of excessive speed or loss of control type incidents.
- The Single Lane Forestry Track Option has similarly a long, steep downhill nature in the eastbound direction, but operating under convoy would mitigate this.
- All options will include lengths of safety barrier due to the risks associated with the options being on steep hillsides.

9.2.11 Overall, all the options would be expected to have improved levels of safety compared to the existing OMR.

9.3 Comparative Assessment

9.3.1 With regard to the Offline MTS, whilst it would provide improved resilience and the shortest journey times, its impact, cost and time to complete make it difficult to justify as a temporary diversion only intended to operate until the LTS is in place.

9.3.2 The Single Lane Forestry Track Option, without any mitigation against geohazard risks, would potentially be liable to closure due to the type of landslip events of which there is evidence on the existing forestry tracks. It would not provide improved journey times if operated on its own and the journey times are not markedly improved compared to the existing OMR, even when operating in conjunction with the OMR in a loop. It would offer a reduced journey time for eastbound traffic, compared to the existing OMR, but there would be no benefit for traffic travelling westbound. The route would provide added resilience if it operated in conjunction with the OMR, with either route providing an alternative should the other be closed for any reason. Under that situation the journey times along the Single Lane Forestry Track Option would be much longer than on the existing OMR, although less than the standard diversion route along the A82/A815/A819. Continued operation of the OMR to secure the potential benefits would require the ongoing agreement of the owner of the track.

9.3.3 When considering the potential impacts of the Single Lane Forestry Track Option along with the resilience, journey time and other factors, it is difficult to justify as a temporary diversion. If it could operate in a loop with the OMR, the benefits in journey times are not gained by all traffic. The added resilience gained in this situation by having two diversion routes, with one continuing to operate if the other is closed, already exists with the standard diversion route, although it is accepted that the standard diversion route has longer journey times than the Single Lane Forestry Track Option. Notwithstanding this, the benefit in journey times is not significant for all traffic and any potential benefits of the Single Lane Forestry Track Option do not justify the cost and impact of providing it. The main benefit of the Single Lane Forestry Track Option would be as a diversion route if the existing OMR was not available at all and then it would provide benefits over the standard diversion route in terms of journey time.

- 9.3.4 With regard to the OMR Interventions, although it cannot be guaranteed that it would never be subject to closures, as is also the case for the other options, the proposed interventions would improve the resilience of the route as a temporary diversion. The journey time reductions compared to the existing OMR are not significant, but there is some improvement. Although not the lowest cost option, it is not significantly more costly than the Single Lane Forestry Track Option. It is also the option that could potentially be delivered the most quickly, although this would depend in particular on the ability to secure the land or rights needed to construct the improvements without significant delay. On this aspect, the OMR at its eastern end is within land owned by the Scottish Ministers. Of all the options under consideration, it is considered this presents the most appropriate option for the MTS.
- 9.4 Relationship of the Medium-term Solution to the Long-term Solution
- 9.4.1 Any proposal for a MTS also must be cognisant of its relationship to the LTS. There are a range of factors that are important to consider: impacts on the ability to design and construct the LTS in a way that provides the long-term resilient alternative to the existing A83; that cumulative environmental impacts are considered and managed appropriately; and value for money overall as part of the strategy for the corridor.
- 9.4.2 The OMR Interventions would be capable of being used by traffic during construction of any of the LTS options. For those options that are along or close to the existing A83 Trunk Road, there may be a need to use the OMR as a diversion route if the A83 Trunk Road is closed due to the LTS being constructed, which can happen from time-to-time on major road projects, such as when tie-ins are being built or if there are bridgeworks ongoing. Also, there may be a need for the OMR to be used by construction traffic in some situations. Neither of these scenarios should prevent the OMR Improvements being used as a temporary diversion route when needed, either in conjunction with other traffic or taking priority.
- 9.4.3 Conversion of the Offline MTS to the Green Option for the LTS would be complex but is likely to be manageable, although it is possible that some full / lane closures would be required at times. Otherwise, the Offline MTS does not interact with the other LTS options.
- 9.4.4 Conversion of the Single Lane Forestry Track Option to the Green Option for the LTS would not be possible due to the difference in the alignments and levels between the options. Otherwise, the Single Lane Forestry Track Option does not interact with the other LTS options.
- 9.4.5 There is the potential for cumulative environmental impacts to occur due to the construction of the MTS and LTS options at different locations within Glen Croe. If the MTS Offline or Single Lane Forestry Track Options are taken forward and the Green Option is provided for the LTS, the cumulative impacts would be related to the multiple constructions occurring along the same general line, leading to a cumulation of effects. In either situation, it is preferable to avoid or reduce the potential impacts, and where this is not possible, to mitigate them. In the case of mitigation, it is expected that this would be dealt with by the LTS as the extent of any cumulative impacts would only be known once that preferred option is chosen and the design progressed and assessed.
- 9.4.6 The fact sheets within this report provide an assessment of advantages and disadvantages associated with phased implementation of the MTS and LTS, assuming the Offline MTS and Green Option for the LTS. This aimed to establish the feasibility of phased implementation of the MTS and LTS. No other MTS option would facilitate this phased approach. As indicated above, this conversion would be complex to implement. Also, the assessments found that it would be unlikely to result in any cost saving. As such, it is not considered that this would change the overall assessment that it is difficult to justify the Offline MTS as a temporary diversion only intended to operate until the LTS is in place.
- 9.4.7 There is no overall benefit in relation to the Single Lane Forestry Track Option when considering the implications of the MTS and LTS as a strategy for the corridor that would change the overall assessment that it is difficult to justify the Single Lane Forestry Track Option as a temporary diversion.

9.5 Risks

9.5.1 Key risks relating to the OMR Interventions include:

- Geohazard risks – the OMR Interventions will provide further resilience against geohazard risks. At the extreme end of the scale, in 2021 there was report of potentially up to 100,000 tonnes of material on the move on Beinn Luibhean. If there was a catastrophic failure of the hillside this would likely affect the OMR in addition to the A83 Trunk Road. There are extensive monitoring and management procedures in place to ensure the protection of road users and the workforce at the A83 Trunk Road. If such a hillside failure occurred, the standard diversion route would be available.
- Land acquisition – as the OMR is partly owned by parties other than the Scottish Ministers, acquisition of land or reaching agreement on the use of land would be necessary to implement some of the OMR Interventions. Management of any risks relating to the use of the OMR would be necessary and also for avoiding delays to the programme for completing all of the interventions, although any works within land owned by the Scottish Ministers may be able to proceed without delay.
- EIAR – the MTS design solution should aim to avoid potentially significant impacts, thereby also reducing the likelihood of an EIAR being required. Environmental considerations will still be important, but aiming to keep potential impacts to the minimum necessary and resulting considerations to appropriate and proportionate levels will avoid lengthening the programme for completion whilst still ensuring that environmental issues are given proper attention.

9.6 Overall Recommendation

- 9.6.1 Based on the assessments undertaken, and noting that the identified risks will need to be managed adequately, the OMR Interventions is recommended as the preferred option for the MTS.

Appendix A: Single Lane Forestry Track Upgrade Option Drawings

Appendix B: OMR Interventions Drawings and Schedule

Appendix C: Offline MTS Option Drawings

Appendix D: Options Assessment Summary Tables

Appendix E: Fact Sheets