A890 Stromeferry Bypass

Annual Slope Inspection 2024

The Highland Council

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Quality information

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Revision History

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1. Introduction

1.1 General

AECOM Limited (AECOM) was appointed by The Highland Council (THC) on 29th April 2022 (THC letter ref. YEHAS6098) to undertake annual inspections of rock faces along part of the A890 in Wester Ross in the Scottish Highlands. The site forming the subject of this report extends between the properties of Attadale and Ardnarff, known locally as the Stromeferry Bypass. The scope of work also included the inspection of rock slopes to the north of Attadale at Maman Hill, which is reported under separate cover. The works were commissioned under the Scotland Excel Framework for Engineering and Technical Consultancy Services: Ref. 0820 – A890 Stromeferry Bypass Rockworks, Job No: YEHAS6098 which runs until 2026.

AECOM (formerly URS) first undertook a detailed inspection of the slopes between Ardnarff and Attadale in May 2012 under the Highlands and Islands Consultancy Services Term Commission (Lot 3, Rock slope), which expired in April 2015. It was recommended that ongoing annual inspections were undertaken by suitably qualified engineering geologists using a combination of roadside and targeted roped access inspections.

Since 2012, AECOM has undertaken and reported the following annual inspections:

- May 2012 – 'Stromeferry Bypass, The Scottish Highlands - A890 Slope Inspection Report,' September 2012;
- April 2013 - 'Stromeferry Bypass, The Scottish Highlands - A890 Annual Slope Inspection Report for 2013', July 2013);
- June 2014 – 'Stromeferry Bypass, The Scottish Highlands - A890 Annual Slope Inspection Report for 2014', August 2014);
- (No inspection was undertaken in 2015);
- April 2016 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2016', May 2016;
- April/May 2017 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2017', August 2017;
- April 2018 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2018', July 2018;
- April 2019 - 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2019', July 2019;
- November 2020 (interim road level inspection during COVID-19 pandemic, reported on within the 2021 inspection report);
- May 2021 – 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2021', August 2021;
- June 2022 – 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2022', September 2022; and
- April 2023 – 'A890 Stromeferry Bypass, Annual Slope Inspection Report 2023', May 2023.

AECOM has also been involved in the design, specification and supervision of several phases of planned maintenance / remedial works since 2012. Planned maintenance / remedial works are carried out approximately every one to two years, with the Phase 6 works completed in 2012, Phase 7 works in 2013, Phase 8 works in 2015, Phase 9 works in 2017, Phase 10 works in 2018, Phase 11 works in 2019 and Phase 12 works in 2021.

Additionally, since 2012, AECOM has been involved in several emergency call outs following rock falls or other slope instabilities, and the design, specification and supervision of associated remedial works.

1.2 Background

The A890 serves as the main link-road along the west coast of Scotland and is also a significant transit for east to west traffic travelling between the Isle of Skye and Inverness. It is mainly single carriageway but frequently reduces to single track with passing places along the stretch between Attadale and Ardnarff. This section of the A890 is a national speed limit road.

The road was opened in 1970 following the formation of a number of rock slopes along the road alignment on the landward side of the Inverness to Kyle railway line, which was completed in 1870. Previous inspections have identified that over-blasting during construction resulted in the rock cuttings being left in a fractured state prone to rock falls. These conditions have also left the exposed rock mass susceptible to weathering, frost and root action.

There has been a history of rock falls at the site since the road was opened. In 1996 TRL Scotland undertook a risk assessment of the rock faces and a risk based maintenance management strategy was developed. Two phases of remedial works were completed in 2002 to bring the slopes into a manageable condition. Following the completion of these remedial works, the slopes were managed by monthly and annual inspections. It was noted that ongoing maintenance would be required along with remedial works for rock falls that develop due to deterioration of the rock slopes (Nettleton, 2003).

Rock falls have continued to occur and pose a risk to the road and users of the road. Additionally, on several occasions rock and soil has impacted the road from debris-flows originating from the adjacent slopes.

Further details on the site setting and geology are included in the 2012 A890 Slope Inspection Report (Ref. 46400079/GLRP0001, September 2012) and have not been discussed further in this report.

An approximately 500m length of the site, roughly centred on the 'avalanche shelter' is designated as a Site of Special Scientific Interest (SSSI) associated with exposures of structural and metamorphic geology. The site has no other environmental or historical designations. Whilst AECOM is not aware of any ecological constraints affecting the site it should be noted that AECOM personnel have observed white-tailed eagles flying above the hillside above the road in recent years. This presence of ecological constraints should be confirmed during the planning of any physical works.

1.3 Scope of Works

In line with the recommendations of the 2012 inspection report the following inspection regime was implemented between 2012 and 2016:

- Detailed roadside and rope access inspections every 5 years (to include examination of the condition of all the rock faces at the site and examination of the existing remedial works);
- Supplemented with annual lower resolution inspections using a combination of road-side and targeted rope access inspections of the higher risk rock faces and less accessible upper rock faces, which are not visible from the road.

Following the 2017 inspection, which comprised a 'detailed inspection', it was recommended that an annual inspection regime should continue but that reference to 'detailed' and 'lower resolution' inspections be dropped. It was recommended that each annual inspection should involve the roadside inspection of all slopes and targeted rope access inspections of selected higher risk slopes, particularly where potential hazards have been identified during previous inspections, and less accessible 'upper' rock faces that are not visible from the road.

The following provides a summary of the works undertaken during the preparation of this report:

- Review of any maintenance and rock fall protection works carried out since the 2023 annual inspection;
- Review of the drone survey carried out at the site in April 2024;
- Review of any significant events that have occurred at the site since the 2023 annual inspection (with reference to THC inspection records);
- Road level inspections of the rock slopes along the A890 between Attadale and Ardnarff (including update of the rock slope geotechnical assessment sheets where necessary);
- Targeted rope access inspections of selected higher risk slopes and less accessible 'upper' rock slopes;
- Identification of areas of potential risk (updated risk assessment) and provision of recommendations for maintenance / remedial works (including recommended timescales).

Whilst the annual inspections of the roadside and upper hillside slopes are carried out to identify and quantify risks to road users from falling materials, it should be recognised that given the size and terrain of the area that only limited locations and areas can be examined in detail. Furthermore the types of falls and wide range of contributing factors means that block falls and debris flows could occur at almost any location. The specific hazards and risks identified for the various slope sub-divisions should therefore be considered as indicative of the global risks associated with the site as a whole.

2. Rock Fall Risk Assessment Methodology

2.1 Background

The site has historically been divided into a number of sections based on slope geometry and natural features (such as watercourses or gullies) to allow assessment and a relative risk level to be assigned to each section with regard to rock slope stability. AECOM has continued to use the historical slope reference numbers, which have been linked to a local chainage system that begins with chainage (Ch.) 0m and at the road closure gates at Ardnarff (NGR NG 89063 35689) and ends with Ch. 3892 at the road closure gates towards the Attadale end of the site (NGR NG 91807 38166). Where new slopes have been identified and assessed these have been given a suffix, typically either 'A' or 'Upper' to provide them with a unique reference.

The locations of the various slopes and their reference numbers are shown on the drawings included in Appendix A. THC installed permanent roadside chainage markers at approximately 100m intervals in early 2017 and the start and end chainages of each slope were revised to tie in with these. Chainages for specific locations have been measured from the nearest permanent chainage marker. During the April 2023 inspection it was observed that many of the chainage markers were either obscured by vegetation, had a missing number plate or had been damaged by grass cutting equipment. This remained the case during the 2024 inspection.

A risk assessment approach has been adopted to rank the relative rock fall risk presented by each slope to the road and its users. The risk assessment used is bespoke to this site and gives a risk level relative to the rest of the slopes at the site. The assessment considers the size of a potential rock fall (the hazard), the potential likelihood of debris from the rock fall reaching the carriageway (the pathway) and the available sighting distance on the carriageway (the receptor). The ratings assigned to each of these criteria are multiplied together to give a risk rating. Further details are provided in Sections 2.2 to 2.5.

The potential consequence of a rock fall will clearly vary depending on the presence/absence of road users beneath or approaching the slope at the specific time. It must be appreciated that due to the number or variables involved this is impossible to predict. It should be recognised that the assigned level of risk takes a conservative approach and assumes the potential presence of road users beneath or approaching the slope at the time of a rock fall. A more likely scenario is that a rock fall occurs when no road users are directly beneath and fallen blocks which have come to rest on the road present a hazard to road users after the event. To differentiate and risk rank the slopes, (e.g. to prioritise remedial works) sightlines and stopping distances are also factored into the assessment to recognise the higher potential for road users to interact with rock fall debris on the road at locations with poorer sightlines as opposed to straight sections of road (see section 2.4).

Following the initial risk assessment the inspecting geologists reviewed the relative risk rankings and, where necessary, adjusted the scoring to reflect the overall setting (including history and frequency of rock falls) and their professional judgement.

2.2 Hazard Rating

Four categories of hazard rating have been selected based on the main sizes of rock falls (and potential rock falls) identified at the site, as detailed in Table 2-1. During the risk assessment the hazard rating representative of the scale of observed or potential rock falls at each slope was selected.

Table 2-1: Hazard Rating

Hazard Rating	Description
1	Small ravelling type rock falls (typically up to 0.02m^3).
2	Moderate rock falls (typically between 0.02m^3 and 1m^3).
3	Large rock falls (typically between 1m^3 and 10m^3).
4	Very large rock falls (typically greater than 10m^3)

2.3 Pathway Rating

Each slope has been assigned a pathway rating (Table 2-2) based upon a qualitative inspection of the slope form (height, angle, profile/roughness, vegetation cover and presence or absence and suitability of existing remedial measures) between the position of a potential rock fall and the road. The rating also considers the estimated termination location of failed material. If debris from previous rock falls was evident, the location of this was considered during this assessment.

The design rock fall volume for the passive rock fall 'drape' netting systems installed across many of the rock slopes prior to AECOM's involvement at the site is unknown, however, based on the materials used and current design practices it would be estimated to be <1m^3. During the risk assessment it has therefore been assumed that potential rock falls in excess of this volume that have not already been remediated by other means (e.g. rock dowels) could breach the drape netting systems.

Table 2-2: Pathway Rating

Pathway Rating	Description
1	No falling blocks are expected to reach the road (e.g. effective remedial measures and/or a wide verge or rock trap ditch).
2	Most falling blocks are not expected to reach the road (e.g. largely effective remedial measures/verge/rock trap ditch).
3	Approximately half of the falling blocks are expected to reach the road (e.g. partially effective remedial measures/verge/rock trap ditch).
4	Most falling blocks are expected to reach the road (e.g. no or ineffective remedial measures and/or narrow verge/shallow rock trap ditch).
5	All falling blocks are expected to reach the road (e.g. no or ineffective remedial measures and no verge or rock trap ditch - fallen blocks are likely to free fall or bounce directly onto the road).

2.4 Receptor Rating

For slopes with pathway ratings of ≥2 (i.e. where at least some blocks are expected to reach the road), a receptor rating is included in the assessment to reflect the potential of a vehicle coming into contact with, or having to take action to avoid, rock fall debris. The minimum sighting distance that a driver would have when driving adjacent to each of the slopes (in good weather conditions and during daylight hours) was estimated based on stopping distances from the Highway Code for cars travelling at 40mph and 60mph (36m and 73m respectively).

Table 2-3: Receptor Rating

Receptor Rating	Description
1	Sighting distance > 73m
1.2	Sighting distance 36 to 73m
1.4	Sighting distance < 36m

2.5 Risk Rating

The ratings assigned to the hazard, pathway and receptor were multiplied to give a risk rating for each of the slopes. The relative risk levels are described in Table 2-4, along with the colour coding used to depict these.

Table 2-4: Risk Rating

Risk Rating	Relative Risk Level	Description
<5	Low	Small to moderate sized rock falls with a low probability of causing damage to or closure of the road and/or injuries to road users. Risk normally tolerable.
5 to <10	Moderate	Moderate sized rock falls with potential to cause moderate damage to road and short term road closures (a few hours) but a low probability of causing injuries to road users. Risk likely to be tolerable but client needs to be made aware of hazards and monitor these.
10 to <15	High	Moderate to large sized rock falls with a higher probability of causing major damage to the road and/or road closures of a few days to a few weeks and potential of causing major injury or loss of life should road users be present beneath (or approaching) slope at time of rock fall. Risk likely to require remedial measures / risk management actions.

Risk Rating	Relative Risk Level	Description
>15	Very High	Large to very large rock falls which have a high probability of causing significant damage to road and/or long term road closures (weeks to months) and the potential of resulting in major injury or loss of life should road users be present beneath (or approaching) slope at time of rock fall. Risk likely to require remedial measures.

3. Works Since 2023 Inspection

3.1 THC Inspections

The ongoing management of the slopes alongside the A890 involves the completion of daily 'drive through' inspections and more detailed monthly 'walk through' inspections by local THC personnel familiar with the site and the inspection procedure. Any new rock falls or other slope instability hazards are reported directly to AECOM.

Between the completion of AECOM's last annual inspection on 21st April 2023 and the commencement of the 2024 annual inspection on 15th April 2024, THC's routine inspections recorded one rock fall at the site, details of which are provided in Table 3-1.

Table 3-1: Summary of events since last AECOM Inspection

Date	Location	Event	Comments
24th January 2024	AA7 – Ch. 1770	Rock fall	A 0.08m^3 block was observed in the ditch, having burst through the roadside deer fence. The source of the block was not apparent, with the THC inspector indicating they suspected it came 'from quite high up'.

AECOM has not carried out any emergency inspections at the site since the April 2023 inspection.

3.2 Scheduled Maintenance

No maintenance or remedial works were carried out between the 2023 and 2024 inspections.

3.2.1 2024 Drone Survey

A high-resolution photographic drone survey of the eastern half of the site (east of Frenchman's Burn) was completed by Geo-rope Ltd. on Wednesday 17th April 2024 (delayed due to poor weather). The purpose of the drone survey was to enable potential hazards not readily visible from the road to be identified and, where appropriate, targeted during the annual inspection. The intention is that the photographic record can be compared to past and future surveys to provide an indication of what has changed and/or the rate at which conditions are changing e.g. tree falls. A review of the findings of the drone survey is presented in Section 4.

4. Drone Survey Review

The following drone surveys have been carried out at the site:

- March/April 2019, Geo-rope Ltd: high resolution photographic and topographic survey of the entire site and hillsides above;
- April 2020, Geo-rope Ltd: high resolution photographic survey of highest risk slopes (located to the east of Frenchman's Burn);
- March 2023, Geo-rope Ltd: high resolution photographic survey of highest risk slopes (located to the east of Frenchman's Burn); and
- April 2024, Geo-rope Ltd: high resolution photographic survey of highest risk slopes (located to the east of Frenchman's Burn).

One of the purposes of the drone surveys was to enable potential hazards not readily visible from the road to be identified.

Another aim of the repeated drone surveys was to allow for the comparison of photographic records to better quantify the risk associated with time-dependent hazards such as tree falls. During previous inspections it has been observed that a high percentage of the trees within the conifer plantation above slopes AA12 to AA22A had fallen, a consequence of mature trees on thin superficial deposits providing poor anchoring for the tree roots. Tree falls within the steeper upper slopes (i.e. AA13-14 Upper, AA15 Upper and AA16-17 Upper) are considered a high risk event due to the potential for soil and pieces of rock to be dislodged from within exposed root balls, with the potential for them and the trees themselves to move downslope. With this in mind, drone survey images for these upper slopes have been reviewed to determine the number of trees that have fallen between surveys. This report provides a review of the 2024 drone survey to identify changes since the 2023 survey with findings presented in Appendix B and summarised in Table 4-1 below. The 2023 annual inspection report provides a review on the time between the 2020 and 2023 drone surveys.

Table 4-1 Tree Fall Review

Slope ref.	Approximate No. of Trees Standing		Difference	
	2023	2024	No.	%
AA13-14 Upper	112	111	1	0.9%
AA15 Upper	111	111	0	0%
AA16-17 Upper	175	175	0	0%

The results presented above suggest a very low rate of tree falls in the time period of March 2023 and April 2024. Observed tree fall rates were <1%. This is slightly lower than the observed annual tree fall rate between 2019-2023 which ranged from 2-3%.

This difference is not significant as tree falls will be largely weather dependant and a single storm event could fell many trees. Additionally, it should be noted that the 2023 survey was undertaken when snow was on the slopes limiting the accuracy of the comparison between the 2023 and 2024 surveys.

No areas of rock slope or boulders showing pronounced evidence of immediate failure were identified on the 2024 drone survey.

This drone survey has completed the initial 5 year period of repeat photographic drone surveys (i.e. 2019 to 2024) of the slopes to the east of Frenchman's Burn, which was primarily recommended to allow for better quantification of the risk associated with tree falls.

5. 2024 Annual Inspection

5.1 Methodology

The 2024 annual inspection of the roadside rock faces and selected upper slopes was carried out by a team of four AECOM engineering geologists between the 15th and 19th April 2024. The weather was varied, but generally cool and overcast with rain showers and more prolonged spells of heavy rain.

All of the roadside rock slopes were inspected from road level with the aim of identifying significant changes and/or potential hazards and areas that would benefit from more detailed rope access inspections. The inspection of the upper slopes was generally restricted by the prevailing wet weather conditions, which made access to the steepest areas of the site unsafe. Inspection was therefore limited to the targeted inspection of high-risk features / localities identified during previous inspections.

Traffic management was provided by Alba Traffic Management Ltd. (a sub-contractor of Geo-rope Ltd.) for the duration of the inspection.

The inspections undertaken provide an indication of the stability / risk but are not considered definitive. Limitations included:

- Due to the extent of the slopes it was not practical for the inspectors to undertake a systematic inspection of the full extent of each rock face / slope. Assumptions have been made based on the area observed on foot. However, additional hazards that were not identified during the inspections may be present;
- Slopes covered or obscured by vegetation or soil could not be fully inspected; and,
- Rock faces which are covered by netting can be difficult to assess due to restricted vision.

5.2 Summary of Findings: Geotechnical Assessment Sheets

A Geotechnical Assessment Sheet for each slope reference is provided within the following sections of this report. These include the inspection findings and a summary of the slopes risk rating. Photos references are provided for key observations, with each photo given a unique reference number relating to the slope reference (for example, photos of features from slope reference AA1 have been referenced as ‘AA1-1, AA1-2, AA1-3’ etc.). The photographs are provided after each Geotechnical Assessment Sheet.

5.2.1 Slope Ref. AA1

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA1	**Chainage:**	0000 - 0170	**Start Grid Ref:**	NG 89063 35689	**End Grid Ref:**	NG 89166 35810	**Elevation:**	17m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:								
Dip (°): 85	Azimuth (°): 302	Height (m): 7	Length (m): 170	Vegetation Cover:	Ch. 0 to Ch. 100: 50-90% Ch. 100 to Ch. 146: 30-50% Ch. 146 to Ch. 163: 10% Ch. 163 to Ch. 170: 90% Grass, moss, saplings and ferns.	Ditch Details:	Typically 0.5-1m deep, 1m wide. Reduces to 0.15m deep, 0.3m wide from Ch. 60 to 65 No ditch between Ch. 53 to 68	Roughness: Rough	Verge Width (m): 1.5

Engineering Description of Rock:
Very strong thinly foliated dark bluish grey fine to medium grained micaceous SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2021	Ch. 146 to 163	To check condition of TECCO netting – specifically in waterfall area.

THC Monthly Reports:		
Date	**Location**	**Comments**
September 2018	Ch. 125	Timber in catch pit area of burn
September 2018	Ch. 160	New rock on verge

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	TECCO mesh installed between Ch. 146 to 163.	**2017 Inspection**: Surface corrosion noted on length of bottom anchor cable and eastern terminal cable noted. **2019 Inspection**: Surface corrosion / discolouration of bottom cable and spike plates noted within waterfall noted. **2020 Inspection**: 3 No. spike plates in waterfall showing surface corrosion noted. Very top and bottom of TECCO discoloured and lower cable has surface corrosion. TECCO in waterfall area appears to be in	No significant changes to netting and components observed from road level during 2024 inspection.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
		reasonable condition. Accumulation of organic debris behind netting in waterfall. **2021 Inspection:** TECCO netting generally in good condition. Rope access inspection was carried out to allow condition of netting system to be fully assessed. The following observations were made: - Surface corrosion noted on length of bottom anchor cable and eastern terminal cable - 1.5m wide x 8m high area of netting within waterfall is discoloured; - Boundary cables locally exhibit surface corrosion (most evident at base of waterfall) - 3 No. spike plates in waterfall exhibit surface corrosion - Within the vicinity of the waterfall the rock mass is locally fractured / loose.		
2015 – Phase 8 works	Works included: - Tree stump removed at April 2014 failure area. - Ditch and bund improved. - 2 No. dowels installed at Ch.60.	Anticipated that the ditch and bund will serve as an adequate rock trap for ravelling / small block falls.	No significant changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Throughout AA1	**2012 Inspection:** Upper 2-3m of rock face prone to ravelling (block size typically 0.2m x 0.2m x 0.2m).	No change observed during 2024 inspection, ditch remains effective.	
Throughout AA1	**2018 Inspection:** Evidence of ongoing ravelling of small blocks but retained by ditch. Few small blocks retained by TECCO mesh - not currently loading system.	No change observed during 2024 inspection, ditch remains effective.	
Ch. 0	N/A	Road closure gate post has fallen. Possibly been struck by a vehicle. Maintenance required.	AA1-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 31	N/A	A small tree growing from the rock face, 4m above the toe, has fallen. At the same location a large block has fallen into the ditch. Dimensions are 1.0x0.5x0.4m and the source location was just above the fallen tree. There are no additional hazards on the slope but the ditch capacity is reduced due to the presence of the block.	AA1-2 AA1-3
Ch. 70	**2023 Inspection:** A 0.3m x 0.2m x 0.2m block in ditch, fallen from 3m above toe of slope. Area of high water flow, heavily fractured. Smaller size blocks up to 0.1m also in ditch.	No change observed during 2024 inspection.	
Ch. 100 & 138	N/A	Numerous small blocks have fallen and been retained in the ditch. Evidence of ditch being effective and reducing the risk of minor rock falls affecting the road.	AA1-4
Ch. 150	**2021 Inspection:** Small accumulation of blocks on ledge behind TECCO netting ca. 8m above toe of slope. <0.1m³ total volume. Not straining or deforming netting so no maintenance requirements at this time.	No change observed during 2024 inspection.	AA1-5
Eastern end of AA1	**2016 Inspection:** Small amount of debris accumulating behind TECCO mesh due to ongoing ravelling failures (blocks up to 0.1m³). Not currently loading the mesh but this should be monitored during monthly and annual inspections.	No change observed during 2024 inspection.	
Above AA1	**2023 Inspection:** Old forest road above AA1 (disused/overgrown) c.20-25m above road level. Findings include: - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89408 36019. - Downslope of forest road is steeply inclined with small waterfalls and localised accumulations of debris against branches and trees forming debris dams. - Across slope are branches/fallen trees.	No change observed during 2024 inspection.	

RISK RATING		Comments
Overall Hazard Rating =	2	Generally small scale ravelling only. Targeted remedial works were undertaken within AA1 in 2013 and 2015. Isolated 0.2m^3 rock fall observed during 2024 inspection. Hazard rating increased from 1 to 2.
Pathway Rating =	2	1.5m verge, with ditch and bund along length of section. Most blocks not expected to reach the road.
Receptor Rating =	1.2	
Risk Value =	**4.8**	2024 rating increased from 2.4 to 4.8.
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Monitor build-up of debris in ditch during monthly and annual inspections and undertake clearance works when required to maintain its capacity. - Monitor condition of dowels and netting system during annual inspections – recommended that a rope access inspection be carried out in 2026 to monitor corrosion. - Monitor build-up of debris (i.e. debris dams) in channels above AA1 and undertake clearance works when required. - Carry out repairs to re-instate road closure gate post.

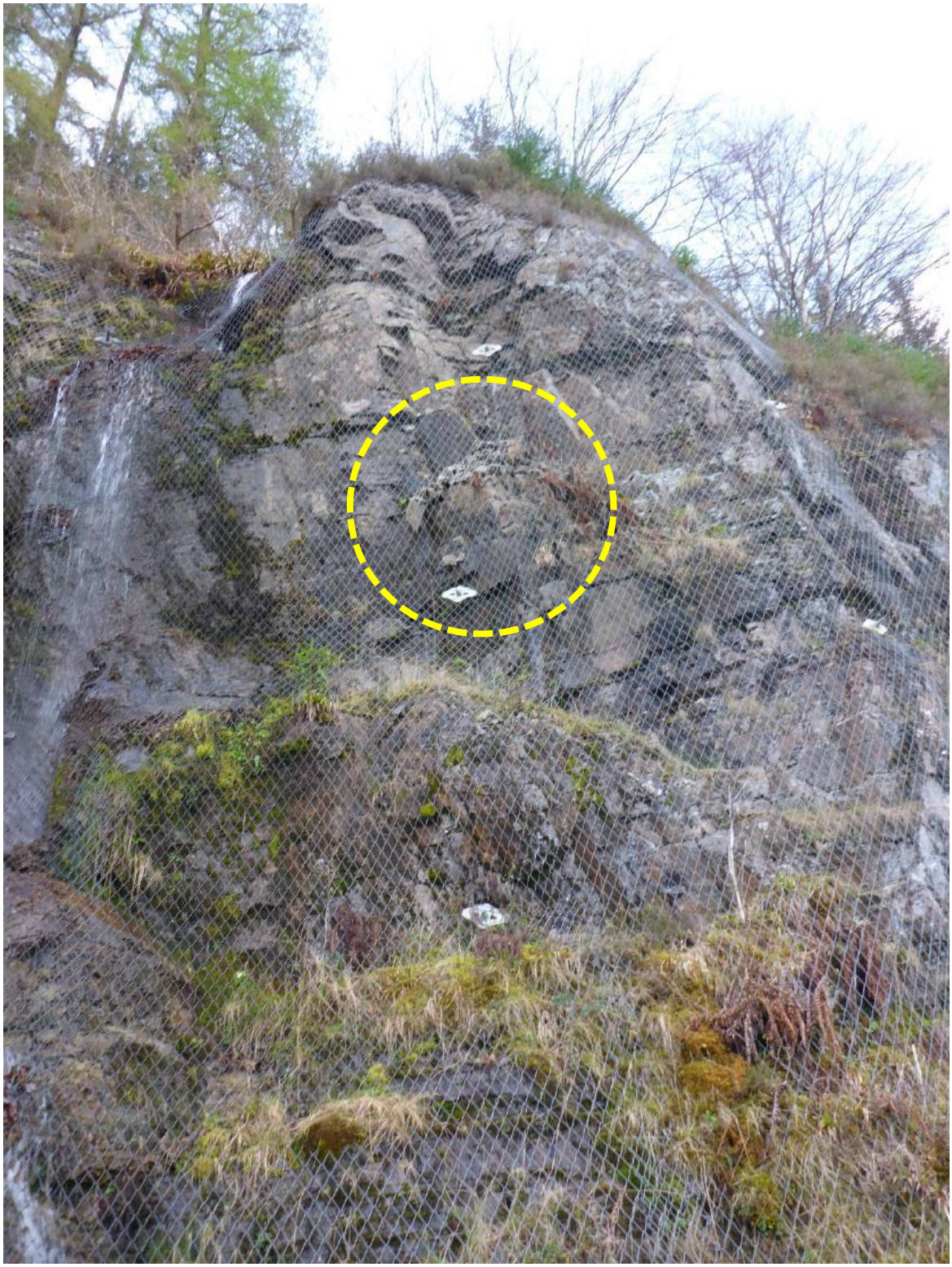
Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA1-1	Ch. 0 – Road closure gate post has been struck and knocked over. Feature circled.	Year observation first noted: 2024

Photograph: AA1-2	Ch. 31 – Small tree growing from rock race face has fallen. Large block in ditch below (feature circled).	Year observation first noted: 2024

Photograph: AA1-3	Ch. 31 – Large block (1.0m x 0.5m x 0.4m) in ditch.	Year observation first noted: 2024

Photograph: AA1-4	Ch. 100 – Accumulation of numerous small blocks in ditch.	Year observation first noted: 2024



Photograph: AA1-5	Ch. 150 – Small accumulation of blocks on ledge.	Year observation first noted: 2021

5.2.2 Slope Ref. AA2

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA2	**Chainage:**	0170 - 0335	**Start Grid Ref:**	NG 89166 35810	**End Grid Ref:**	NG 89213 35 870	**Elevation:**	9m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:								
Dip (°): 74	Azimuth (°): 319	Height (m): 20	Length (m): 165	Vegetation Cover:	Ranges between 10-100% across the slope comprising of moss, heather and occasional fern. Small saplings becoming established. Trees along crest.	Ditch Details: 0.5m to 1.0m wide, 0.4m deep	Roughness: Rough	Verge Width (m): 0.8

Engineering Description of Rock:
Very strong thinly foliated dark grey fine to medium grained SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2019	Throughout AA2	To inspect the top cable anchors of the drape netting systems.

THC Monthly Reports:		
Date	**Location**	**Comments**
October 2018	Ch. 300	2 new stones in ditch.
March 2019	Ch. 190	Stone found on road in morning inspection. Cleared away to verge;

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Netting system between Ch.170 to 202 and Ch. 230 to 292.	Details of netting system include: - PVC coated double twist - Top cable 16mm galvanised - c.5m anchor spacing (bottom anchor spacing typically 9m) and 25mm galvanised bars - Cable-anchor connection: galvanised eye nuts - 4 cable clamps - Netting lap connections using Spenax rings - No laps on anchors or vertical reinforcing	No significant changes to netting and components observed from road level during 2024 inspection.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
		2016 Inspection: Bottom cable noted to be corroded within up chainage section of passive rock fall netting **2019 Rope Access Inspection:** North-eastern terminal anchor exposed and noted to be in good condition. Top rope also in good condition with minor surface corrosion only. One mid-rope eyelet is stainless steel but insulated to avoid bi-metallic corrosion. Note: plastic mesh extends much higher than the Maccaferri netting and is largely buried beneath moss and grass. **2021 Inspection:** slight surface corrosion of bottom cable around Ch. 273.		
2013 – Phase 7 works	Trees felled and scaling undertaken at NG 89294 35905.			
2015 – Phase 8 works	Works include: - Damaged mesh replaced with Maccaferri double twist netting at Ch. 180. - Trees felled and light scaling undertaken.	**2021 Inspection:** Slight corrosion of Maccaferri netting and bottom cable around small waterfall.	No significant changes observed during 2024 inspection.	
2021 – Phase 12 works	Works include: - Clearance of roadside ditch between Ch. 200 to 230, Ch. 256 and Ch. 310 to 335. - Drainage gully at Ch. 335 cleaned out at roadside.	**2022 Inspection:** Culvert at Ch. 335 would benefit from clearance again. **2023 Inspection:** Culvert at Ch. 335 is c.50% full.	No changes observed during 2024 inspection. Culvert was clear.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 190	N/A	There is an accumulation of blocks behind the netting. Blocks are small and originate from 5m above the toe of the slope. The total	AA2-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
		dimensions of the rock fall debris accumulation is approximately 1.0x0.5x0.3m (0.15m^3).	
Ch. 205	**2016 Inspection:** Trees at eastern edge of gully at crest of rock face are overhanging and at risk of falling and dislodging blocks. Whilst the trees themselves are unlikely to reach the road they may dislodge soil/rock as they fall.	No changes observed during 2024 inspection. Less visible than in previous years due to increased vegetation growth on slope below.	AA2-2
Ch. 205 to 230	**2019 Inspection:** No remedial measures over rock face in this area. Almost 70% vegetation cover including small coniferous saplings. Root jacking may become an issue - potential for small block fall <0.1m3. Keep under observation.	No changes observed during 2024 inspection.	AA2-3
Ch. 232 to 237	**2023 Inspection:** Ditch width reduced due to vehicle over-run. Not significant issue due to drape netting in this area.	No changes observed during 2024 inspection.	
Ch. 235 to 250	**2019 Inspection:** ca. 0.3m x 0.3m x 0.3m debris caught behind drape 1-2m above ditch demonstrating effectiveness of drape netting system.	No changes observed during 2024 inspection.	
Ch. 273	**2017 Inspection:** Debris continues to build up behind netting. Not currently loading system significantly. In 2021, it was noted that some of the material had fallen out of base of netting and into ditch below.	No changes observed during 2024 inspection.	AA2-4
Ch. 300 to 335	**2019 Inspection:** Vegetated rock slope with no remedial measures. No significant hazards observed.	No changes observed during 2024 inspection.	
Above AA2	**2023 Inspection:** Old Forest road above AA2 (disused/overgrown) c.20-25m above road level. Findings include: - Upslope box culvert/bridge spanning across small watercourse, slight debris accumulation under bridge (granular cobble/boulder size) at NG 89199 35816. - Downslope of forest road is steeply inclined with small waterfalls and localised accumulations of debris against branches and trees forming debris dams in water course.	No changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
	- Across slope are branches/fallen trees and there are some leaning trees in watercourse side walls.		

RISK RATING		Comments
Overall Hazard Rating =	2	Decreased from 3 in 2023 due to changing end chainage of section.
Pathway Rating =	2	Decreased from 4 in 2023 due to changing end chainage of section.
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Coppice trees at crest of slope at Ch. 205. - Monitor build-up of debris (i.e. debris dams) in channels above AA2 and undertake clearance works when required.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA2-1	Ch. 190 – Accumulation of small blocks behind netting. (Feature circled).	Year observation first noted: 2024

Photograph: AA2-2	Ch. 205 – 2016 observation was that trees at eastern edge of gully at crest of rock face are overhanging and at risk of falling and dislodging blocks. Additional vegetation growth made this hard to distinguish in 2024.	Year observation first noted: 2016

Photograph: AA2-3	Ch. 205 to 230 – No remedial measures over rock face in this area. Frequent coniferous saplings present. Root jacking may become an issue.	Year observation first noted: 2019

Photograph: AA2-4	Ch. 273 – Debris previously caught behind netting in 2017 was observed to have fallen out of base of netting and into ditch in 2021. No significant changes observed 2024.	Year observation first noted: 2017

5.2.3 Slope Ref. AA2A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA2A	**Chainage:**	0335-0555	**Start Grid Ref:**	NG 89213 35870	**End Grid Ref:**	NG 89393 36104	**Elevation:**	9m AOD

Photo at Start Chainage (looking east)	Photo at End Chainage (looking west)
	

Rock Slope Characteristics:									
Dip (°):	Between Ch. 335 to 477: 50-55 Between Ch. 477 to 555: 84	Azimuth (°):	290	Height (m):	25 (crags)	Length (m):	220	Vegetation Cover:	100% cover. Generally, comprises moss, grass, saplings and bushes. Many tree stumps. Localised crags.
Ditch Details:	Between Ch. 335 to 477: 0.5m to 1m wide, 0.5m deep Between Ch. 477 to 555: 1.5m wide, 0.5 – 1m deep.	Roughness:	Rough	Verge Width (m):	Between Ch. 335 to 477: 0.5-0.8m Between Ch. 477 to 555: 3.5m				

Engineering Description of Rock:
Strong thinly foliated dark grey fine to medium grained SCHIST (PSAMMITE)

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
February 2019	Ch. 350 and 400	A 0.3m x 0.2m block at Ch. 350 and a 0.1m x 0.1m block at Ch. 400.	
March 2019	Ch. 420	A 0.2m x 0.3m stone on verge.	
February 2023	Ch. 425	Small debris flow. A minor watercourse in this area – ditch has been cleared out.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
2015 – Phase 8 works	Rock trap ditch cleared out and bund created.			
2021 – Phase 12 works	Clearance of roadside ditch between Ch. 335 to 447.		No significant changes observed during 2024 inspection, ditch remains effective.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Throughout AA2A	**2012 Inspection:** Potential for small scale ravelling/block falls up to 0.125m^3.	No changes observed during 2024 inspection.	
Ch. 335	N/A	Roadside ditch filled with small granular debris. Culvert is also blocked at this location. There is evidence of previous significant water flow (flattened vegetation) beyond the extents of the downslope channel. Recommend for ditch and culvert to be cleared.	AA2A-1
Ch. 340 to 447	**2016 Inspection:** Potential for root jacking identified (trees on outcrops adjacent to road). Recommend coppicing trees within 10m of road.	No changes observed during 2024 inspection.	
Ch. 350 to 370	**2019 Inspection:** ca. six 0.1m x 0.1m x 0.1m blocks in roadside ditch. These were not all recent, with spray paint noted on some blocks indicating they had been previously identified during THC monthly inspections (Feb 2019?). Source of blocks likely to be crags 20 to 25m upslope in forest (see Ch. 360 notes from 2018 inspection). Upslope crags re-inspected and no major stability issues were identified. Minor ravelling from root jacking was apparent and small blocks may continue to fail, however, ditch is currently considered effective	No changes observed during 2024 inspection.	AA2A-2
Ch. 360	**2018 Inspection:** Root jacking in crags ca. 25m above road level with the potential for dislodging of blocks.	No changes observed during 2024 inspection.	
Ch. 390	**2023 Inspection:** Several blocks up to 0.4m x 0.3m x 0.2m in ditch. Source not obvious, crags c.20-25m upslope.	No changes observed during 2024 inspection.	
Ch. 395	**2018 Inspection:** Large blocks with fallen trees in front in a crevasse at ca. 15-20m above road level where the main discontinuity is at a 65 degree angle. Blocks currently keyed in.	No changes observed during 2024 inspection.	
Ch. 400	**2016 Inspection:** Large overhanging boulder 5m above road level. Weaker / more fractured material near the base of the boulder has preferentially weathered, leaving a 2.5m overhang. Dilated discontinuities within upper part of boulder form a distinct block (approx. 1.5m x 1.5m x 2.0m) above the overhang, which is at risk of failure due to loss of support and root jacking	No changes observed during 2024 inspection.	AA2A-3

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
	(trees growing on boulder have been coppiced in the past but were noted to be re-growing). Passing place beneath potential rock fall. If this block were to fail it would reach the road. In 2020 Inspection, it was noted that a few small blocks have spalled / ravelled from the southern side of the boulder.		
Ch.415	**2021 Inspection:** Two small blocks observed in the roadside ditch. No pre-existing paint marks so assumed to be recent. No obvious upslope source but within area where tree falls / root jacking poses a risk.	No changes observed during 2024 inspection.	
Ch. 428	N/A	Roadside location of soil washout. Ditch is filled with small granular debris. Recommend for ditch and feeder pipe to be cleared. No flow observed at road level but water was observed in channel at forest track above. Appears to be ephemeral flow.	AA2A-4 AA2A-5
Ch. 476	N/A	Small downslope watercourse over rockface. Vegetation and small blocks have been stripped and gathered at toe of slope.	AA2A-6
Above AA2A	**2023 Inspection:** Old Forest road above AA2A (disused/overgrown) c.20-25m above road level. To inspect source area of soil washout which occurred in Feb 2022. Findings include: - Source area at NG 89385 35998 c.40-50m above road level. At the crest of the slippage there remains a lobe of soil sitting on rock (c.4-5m length x 2m wide x 0.5m deep) that could wash out in the future. - Downslope of source area, the channel has been stripped down to bedrock which has a stepped profile. - A possible shallow soil slip was observed at NG 89324 35942.	Old Forest road above AA2A (disused/overgrown) c.20-25m above road level. To inspect source area of soil washout which occurred in Feb 2022. Findings include: - Last watercourse ca. 40m from end of track (upslope of Ch 476). Appears to have been dug out beneath track a long time ago with bund on east side. Only concern is that debris dams starting to form on down slope side. Keep under observation and ideally clear out channel. - Road surface waterlogged at second culvert (NG 89399 35932); sitting above steep ground. Recommend creating upslope roadside ditch to divert water into culvert along 50m length to west of culvert. Also same for creating ditch 30m to east of culvert. Also recommended cleaning out water course for 10m beneath track. - Watercourse that was source of 2022 washout. No change from 2023. However, loose scree and soil	AA2A-7 AA2A-8 AA2A-9

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
		remains in watercourse at track and above that could mobilise in greater flow (NG 89400 35963). Recommend keeping roadside ditch clear as a minimum (NG 89369 35995). Could clear out at track level	

RISK RATING		**Comments**
Overall Hazard Rating =	3	Increased from 2 in 2023 due to change in chainage marker boundary – identification of 4.5m³ failure at Ch.400. Elsewhere within AA2A the hazard rating is lower.
Pathway Rating =	4	Increased from 1 in 2023 due to change in chainage marker boundary. Presence of passing place beneath potential failure at Ch.400. Elsewhere within AA2A the pathway rating is lower.
Receptor Rating =	1.2	
Risk Value =	**14.4**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Heavy scaling / controlled removal of overhang on boulder at Ch. 400. Likely to require stitch drilling.	- Coppice trees within 10m of road between Ch. 340 to 447. - The build-up of debris within ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity. - Monitor build-up of debris (i.e. debris dams) in channels above AA2A and undertake clearance works when required. (Post-inspection update - THC has committed to contacting Forestry and Land Scotland to alert them to the issues identified in the water courses and under-track culverts beneath forest tracks). - Ch. 335 recommend for ditch and culvert to be cleared. - Ch. 428 recommend for ditch and feeder pipe to be cleared. - Above AA2A it is recommended to clean out watercourse at track and above to mobilise greater flow. Drainage improvements also recommended.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA2A-1	Ch. 335 – Roadside ditch filled with small granular debris and culvert blocked.	Year observation first noted: 2024

Photograph: AA2A-2	Between Ch. 350 to 370 – Ca. six 0.1x0.1x0.1m blocks in roadside ditch.	Year observation first noted: 2012

Photograph: AA2A-3	Ch. 400 – Large overhanging boulder 5m above road level.	Year observation first noted: 2016

Photograph: AA2A-4	Ch. 428 – Roadside location of 2022 soil washout. No water flow observed at road level.	Year observation first noted: 2024

Photograph: AA2A-5	Ch. 428 – Ditch filled with small granular debris at toe of ephemeral watercourse.	Year observation first noted: 2024

Photograph: AA2A-6	Ch. 476 – Small downslope watercourse over rockface. Vegetation and small blocks have been stripped and gathered at toe of slope.	Year observation first noted: 2024

Photograph: AA2A-7	Upslope of Ch. 476 - Debris dams starting to form on down slope side of forest road.	Year observation first noted: 2022

Photograph: AA2A-8	Above AA2A - Road surface waterlogged at NG 89399 35932; sitting above steep ground.	Year observation first noted: 2023

Photograph: AA2A-9	Above AA2A - Loose scree and soil remains in watercourse at track and above that could mobilise in greater flow (NG 89400 35963).	Year observation first noted: 2023

5.2.4 Slope Ref. AA3

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA3	**Chainage:**	0560 - 0660	**Start Grid Ref:**	NG 89397 39107	**End Grid Ref:**	NG 89454 36200	**Elevation:**	14m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	317	Height (m):	16	Length (m):	100	Vegetation Cover:	20-30% cover. Moss and ground cover with occasional trees. Trees on ditch edge forming barrier partially obscuring view of rockface. Some trees overhanging at crest.
Ditch Details:	Ch. 605 to Ch. 660: 2.2m wide, 1.2m deep	Roughness:	Smooth	Verge Width (m):	Ch. 560 to Ch. 605 - 3.5m Ch. 605 to Ch. 660 -13m				

Engineering Description of Rock:
Medium strong thinly to narrowly foliated light pinkish grey schist (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
N/A		

THC Monthly Reports:

Date	Location	Comments
N/A		

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2024 Inspection Observations	Photo Reference
N/A				

Hazards Observed:

Location	Description of Hazard (s) from Previous Inspections	2024 Inspection Observations	Photo Reference
Ch. 560 to 605	**2016 Inspection:** Potential for toppling/block fall up to 2m^3 originating from 5-8m above road level. There is a relatively flat 3.5m wide verge between the toe of the rock face and the edge of the road and blocks from previous failures (none recent) were located between the rock face and a deer fence	No changes observed during 2024 inspection.	AA3-1

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
	approx. 2m from the rock face. It is considered unlikely that blocks will reach road in event of a failure.		
Ch. 600	**2021 Inspection:** Large block / slab of rock with dilated fractures and potential for root jacking at crest of rock slope. No significant change since last inspection. Set well back from road with adequate rock trap so low risk to road.	No changes observed during 2024 inspection.	AA3-2
Ch. 605 to 660	**2012 Inspection:** Potential for very large toppling/block fall failures although presence of large ditch and very mean these do not pose a risk to the road.	No changes observed during 2024 inspection.	
NG 89467 36164 (Ch. 612)	**2016 Inspection:** Series of sub-parallel curved tension cracks in upper slope. Considered to represent ancient slope movements prior to road construction. Cracks vary from 1m to 3m wide and 1m to 3m deep and are located in a side-long slope length of approximately 30m to 40m. NE end terminates in area of historic failure (topographic 'bowl'-shape') above NG 89467 36164. **2017 Inspection:** Tension cracks were noted around 50m below main tree line, around 100 to 150m NE of watercourse and immediately above the AA3 rock face. No signs of recent movement were observed. Note that Ch. 612 places this above slope AA3, Ca. 20-30m above road level.	No changes observed during 2024 inspection.	AA3-3
Ch. 662	N/A	Loose granular material forming roadside slope. Blocks occasionally moving downslope and coming to rest in ditch.	AA3-4

RISK RATING		Comments
Overall Hazard Rating =	4	
Pathway Rating =	1	Presence of wide ditch/verge mean potential failures do not pose a risk to the road.
Receptor Rating =	N/A	Receptor rating only applicable when pathway rating is ≥2.
Risk Value =	**4.0**	**Re-assessed during the 2022 inspection following changes to receptor rating. Risk value reduced from 4.8.**
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Build-up of debris in rock trap ditch should be monitored during monthly and annual inspections and clearance works undertaken as required to maintain its capacity. - Tension cracks on slope above rock face at Ch. 612 to be kept under observation during annual inspection.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA3-1	Between Ch. 560 to 605 - Potential for toppling/block fall up to 2m^3 originating from 5-8m above road level.	Year observation first noted: 2016

Photograph: AA3-2	Ch. 600 - Large block / slab of rock with dilated fractures and potential for root jacking at crest of rock slope (feature circled).	Year observation first noted: 2021

Photograph: AA3-3	NG 89467 36164 (Ch. 612) – Series of sub-parallel curved tension cracks in upper slope.	Year observation first noted: 2016

Photograph: AA3-4	Ch. 622 – Area of Loose granular fill at roadside with blocks in ditch.	Year observation first noted: 2024

5.2.5 Slope Ref. AA3A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA3A	**Chainage:**	0660 - 0745	**Start Grid Ref:**	NG 89454 36200	**End Grid Ref:**	NG 89508 36254	**Elevation:**	14m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	35 to 45	Azimuth (°):	315	Height (m):	N/A (vegetated slope with isolated rock outcrops)	Length (m):	85	Vegetation Cover:	100%. Fully vegetated slopes (trees, grass and moss ground cover).
Ditch Details:	0.5m wide, 0.3m deep.	Roughness:	Smooth	Verge Width (m):	0				

Engineering Description of Rock:
Medium strong thinly to narrowly foliated light pinkish grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:		
Date	**Location**	**Comments**
N/A		

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 690	**2019 Inspection:** Isolated rock outcrop ca. 30m above road level with ongoing ravelling / root jacking. Some blocks have reached deer fence 1-2m above road level.	No changes observed during 2024 roadside inspection.	AA3A-1
Ch. 690	**2019 Inspection:** Accumulation of small blocks on the upslope side of the deer fence. Fence post has fallen down here but appears to have rotted rather than been struck by a block. Debris not recent but scree present	No changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
	upslope with an isolated rock outcrop ~30m above road level. Failed blocks typically ca. 0.1m x 0.1m x 0.1m. Outcrop inspected to be flat bedded with failures a consequence of ravelling associated with ongoing root jacking. Evidence of roadside deer fence effectively arresting small blocks, however, potential for blocks to reach verge/edge of road exists.		
Ch. 705 to 710	N/A	Accumulation of small blocks behind deer fence.	
Ch. 726	N/A	Evidence of water flow down slope. Flow has not stripped vegetation or soil but it has washed out an accumulation of gravel and silt. Material retained at deer fence and roadside ditch. Clearance recommended.	AA3A-2

RISK RATING		**Comments**
Overall Hazard Rating =	1	Small scale ravelling / root jacking from isolated outcrops.
Pathway Rating =	2	Most of the failure debris is expected to come to rest on the slope between the outcrop and the road but there is potential for occasional blocks to reach road level.
Receptor Rating =	2.0	
Risk Value =	**2.0**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- Build-up of debris at deer fence to be monitored. At Ch. 726 material behind the deer fence and in road side ditch has built up. Clearence is recommended.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA3A-1	Ch. 690 - Isolated rock outcrop ca. 30m above road level with ongoing ravelling / root jacking. Some blocks have reached deer fence 1-2m above road level.	Year observation first noted: 2019

Photograph: AA3A-2	Ch. 726 – an area of waterflow down slope which has resulted in accumulation of gravel and silt in ditch.	Year observation first noted: 2024

5.2.6 Slope Ref. AA4

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA4	**Chainage:**	0745–0855	**Start Grid Ref:**	NG 89508 36254	**End Grid Ref:**	NG 89572 36332	**Elevation:**	21m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	80	Azimuth (°):	310	Height (m):	20	Length (m):	110	Vegetation Cover:	75-80% cover. Lots of ivy, grass/small shrubs and small saplings.
Ditch Details:	1.0m wide, 0.6m deep	Roughness:	Rough	Verge Width (m):	1m				

Engineering Description of Rock:
Very strong thinly foliated grey fine grained schist (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
2016	Ch. 776	To inspect wedge of rock beneath overhang at crest. Findings - wedge noted as not loose and appears to be reasonably well-bedded in and is no longer a hazard.
2016	Ch. 788	To inspect overhanging block at crest of slope. Findings - it was apparent that a release joint was present and the block was only held in place by a partial overlap on the left hand side. Block marked with orange paint. A holly bush was located immediately to the left, obscuring the rock mass behind. Recommended works: scale / dowel overhanging block, coppice adjacent holly tree and inspect rock mass behind.
2019	Ch. 802	To inspect a block noted at crest of slope with potential pathway to road. Findings - there is not a block at crest of slope at this location. The feature observed from road level was a cut birch tree stump that has started to regrow. Overhanging portion was very rotten and was removed during the inspection and therefore, is no longer a hazard.
2021	Ch. 764	To inspect rock mass c.6 to 8m above road level with dilated fractures. Recommended works: Scaling was recommended and completed in 2021 Phase 12 works.
2021	Ch. 766	To determine source area of a recent failure. Findings - source was found to be located c.4 to 5m below crest of slope. Rock fall deemed as a chimney/wedge type failure. No other loose rocks in source area but indicative of the type / volume of failure that may occur in this section.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
June 2018	Ch. 830	New stone in drain (x2).	
August 2018	Ch. 830	More stone in ditch from same location.	
April 2021	Ch. 810	Minor soil slip occurred and was contained by verge/drain. Originated from c.8m upslope. Slight overhang of vegetation at crest of failure slope remains.	

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**
2015 – Phase 8 works	2No. dowels installed at Ch. 775 and Ch. 790.		No significant changes to netting and components observed from road level during 2024 inspection.
2021 – Phase 12 works	Scaling of rock mass at Ch. 764.	Block c.1.5m x 0.5m x 0.4m was scaled. **2023 Inspection:** Note that there is an accumulation of blocks from these scaling works in the roadside ditch (total 0.5m³).	No significant changes to netting and components observed from road level during 2024 inspection.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Whole slope	**2018 Inspection:** Vegetation is quite well established and trees which were previously coppiced are growing again. Keep under observation during future inspections as root jacking may become an issue.	Sapling regrowth beginning to obscure and prevent visual inspection. Recommend vegetation clearance.	
Whole slope	**2019 Inspection:** Minor ravelling / root jacking potential. Ditch generally considered to be effective although occasional small block may reach edge of carriageway.	No changes observed during 2024 inspection.	
Ch. 745	**2018 Inspection:** Root jacking and fractured rock mass 8m above road level. Potential failure volume 1m³. Although most debris would rest on slope or in ditch there is potential for a small volume to reach the road. Scaling recommended to minimise risk.	No changes observed during 2024 inspection. Less visible due to vegetation growth.	AA4-1
Ch. 765	**2018 Inspection:** Evidence of minor ravelling with debris in ditch c.0.1m³ (max block size 0.2m x 0.2m x 0.1m).	No changes observed during 2024 inspection.	
Ch. 766	**2021 Inspection:** Recent failure observed as accumulation of blocks in ditch and on road verge. Total volume c.1m³. Block size c.0.3m x 0.2m x 0.1m and ditch c.1.5m wide x 0.5m deep. Rope access inspection was required to determine source which was found to be located c.4 to 5m below crest of slope. Rock fall deemed as a chimney/wedge type failure. No other loose rocks in source area but indicative of the type / volume of failure that may occur in this section.	No changes observed during 2024 inspection from road level.	AA4-2
Ch. 788	**2016 Inspection:** Overhanging block at crest of slope with release joint and only partial overlap keying block in place. Holly bush immediately to the left obscuring rock mass.	No change noted during 2024 inspection	AA4-3
Ch. 800	**2016 Inspection:** Small soil slip noted approximately 5m above road level (below tree stump). Debris from scar not likely to reach road.	No changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 810	**2021 Inspection:** Soil wedge slipped and landed in roadside ditch in April 2021, leaving slight overhang of vegetation at crest of failure that could fail in future.	No changes observed during 2024 inspection.	
Ch. 817	N/A	Large block present in ditch. Source of block not obvious and rock type does not appear to be native to the site – may have fallen off lorry / trailer and been moved to ditch. Dimensions are 0.5x0.4x0.2m.	AA4-4
Ch. 830	**2023 Inspection:** A block 0.5m x 0.3m x 0.2m in ditch. Fallen from 1m above toe in area of high water flow. Ditch effective.	No changes observed during 2024 inspection.	
Ch. 842	**2023 Inspection:** Ditch would benefit from clearance	No changes observed during 2024 inspection. Recommendation from 2023 remains.	AA4-5

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**9.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Scale fractured rock mass at Ch. 745. - Scale / dowel overhanging block at Ch. 788, coppice adjacent holly tree and inspect rock mass behind.	- Clear out ditch at base of small watercourse at Ch. 842. - Vegetation clearance is recommended across the whole slope.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA4-1	Ch. 745 – Root jacking and fractured rock mass 8m above road level. Becoming increasingly obscured by vegetation.	Year observation first noted: 2018

Photograph: AA4-2	Ch. 766 – Location of 2021 rock fall. Rope access inspection found the source ca. 4 to 6m below crest of slope.	Year observation first noted: 2021

Photograph: AA4-3	Ch. 788 – Overhanging block at crest of slope.	Year observation first noted: 2016

Photograph: AA4-4	Ch. 817 – Large block in ditch. Source location not obvious. Possibly not native to location.	Year observation first noted: 2024

Photograph: AA4-5	Ch. 842 – Ditch full of debris at base of watercourse. Recommended to be cleared.	Year observation first noted: 2023

5.2.7 Slope Ref. AA4 Upper

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA4 Upper	**Chainage:**	0855–0952	**Start Grid Ref:**	NG 89586 36352	**End Grid Ref:**	NG 89626 36422	**Elevation:**	m AOD

General Photo of Slope	**General Photo of Slope**
	

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
March 2021	Ch. 858	Three blocks have come to rest at deer fence. Appear to have originated from waterlogged slope ca. 8m above road. No imminent risk of further failures. **During 2023 Inspection:** c.25 to 30m upslope there are several uprooted trees with boulders in root balls – considered to be most likely source of blocks at fence.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
2013 – Phase 7 works	Boulder removed at NG 89631 36342.			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
NG 89640 36335	**2016 Inspection:** Boulder 3.2m high x 1.6m wide x 1.3m deep sitting partially embedded in slope. No sign of imminent movement but should be monitored during future inspections.	No changes observed during 2024 inspection.	
NG 89616 36364	N/A	An example of a relatively recent block movement on slope. Situated 20m above road level. Source not obvious. Block dimensions 0.2x0.2x0.2m and 0.5x.3x0.3m.	AA4U-1
Boulder field above tree line	**2018 Inspection:** Boulder field above treeline inspected for first time. Approx. 75m wide and 200m high. Slope angles up to approx. 40 degrees. Numerous angular boulders, including some stacked boulders, of varying size (max. 2m³) and with isolated trees. Vast majority have a good covering of moss / lichen suggesting they have been in situ for hundreds of years, however, occasional fresher blocks were noted. Currently at angle of repose but should destabilising mechanism (e.g. deer, additional rock falls, root jacking) occur there is a risk of boulders impacting the road.	No changes observed during 2024 inspection.	AA4U-2
Crags above boulder field	**2018 Inspection:** Crags above boulder field inspected for first time. Dilated joints and evidence of root jacking from sporadic trees. Spalling of small blocks from toe of crags was observed.	Not inspected during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 858	**2019 Inspection:** Block ca. 0.75m x 0.25m x 0.2m at edge of deer fence. Spray paint present, indicating it has been previously identified during THC monthly inspections. Source not obvious. **2023 Inspection:** c.25 to 30m upslope there are several uprooted trees with boulders in root balls – considered to be most likely source of blocks at fence. Similar events could happen periodically.	No changes observed during 2024 inspection.	
NE of Ch. 925	**2020 Inspection:** Steep slope is well set back from road. 6m increasing to 20m. Steeper slope back to deer fence at large stream at Ch. 1035 but no observed hazards.	No changes observed during 2024 inspection.	
Ch. 930	N/A	Evidence of water flow over slope surface. No sign of debris accumulation. Toe of slope is set back from road by ca. 6m.	AA4U-3
NG 8982 3633	**2021 Inspection:** Soil/rock wash out c.10m below grid reference. Evidence of channelised spring line upslope. Area below springs showing signs of instability. Hummocky ground surface with saturated tension cracks. Around 300mm soil cover creeping downslope. Around 20m below spring line there is a vegetated lobe on slope that may represent previous failure at this location. No immediate risk to road. Potential for further failure/debris flow exists in high rainfall events but debris likely to come to rest on slope before reaching treeline.	No changes observed during 2024 inspection.	
Roadside slope	**2021 Inspection:** Roadside slope is fully vegetated with trees. Steep slope (typically ca. 40 degrees, locally steeper) was often observed to be waterlogged with numerous fallen trees. Specific observations: - NG 8970 3641: Spring located at top of treeline. Steep slope (ca. 40 degrees) below is waterlogged and hummocky with numerous trees down on slope. - NG 8967 3640: Gravel and cobble sized rock debris on slope adjacent to surface water flow. Risk of downslope movement in high rainfall, however, toe of slope is set back from road so not a significant risk. - NG 8963 3630: Numerous fallen trees on slope.	No changes observed during 2024 inspection.	
NG 89535 36201	N/A	Crest of semicircular historic landslide. 60m above road level. No evidence of major upslope movement but numerous trees with curvature. Ground is very saturated. Landslide scar has numerous fallen trees within it.	AA4U-4

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	3	
Receptor Rating =	1	
Risk Value =	**9.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence along toe of slope.	N/A	N/A

Assessed in field by:	MT/SB	**Date:**	18/04/2023	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA4U-1	NG 89616 36364 – an example of recent boulder movement on slope.	Year observation first noted: 2024

Photograph: AA4U-2	Boulder field above tree line.	Year observation first noted: 2018

Photograph: AA4U-3	Ch. 930 – Evidence of water flow over slope surface.	Year observation first noted: 2024

Photograph: AA4U-4	NG 89535 36201 - Crest of semicircular historic landslide shown by dashed line. Looking downslope towards road.	Year observation first noted: 2024

5.2.8 Slope Ref. AA5

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA5	**Chainage:**	1275–1383	**Start Grid Ref:**	NG 89799 36709	**End Grid Ref:**	NG 89864 36775	**Elevation:**	19m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	320	Height (m):	70	Length (m):	98	Vegetation Cover:	90% cover lower lope, 60% cover upper slope. Moss and bracken. Moss is up to 0.15 to 2.0m thick. Numerous deciduous trees upslope with large saplings down slope.
Ditch Details:	1m wide, 0.5m deep	Roughness:	Rough	Verge Width (m):	2m				

Engineering Description of Rock:
Strong to very strong thinly foliated pinkish grey medium grained schist (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
2021	Ch. 1370	To inspect a fallen tree c.10m above road level. Findings - the fallen tree and rock mass above do not pose a significant risk to the road.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
February 2019	Ch. 1330	A 0.4m x 0.3m block 10m above deer fence.	
November 2019	Ch. 1350	A 0.5m x 0.3m rock has pierced fence and is in the roadside drain. This could have happened previously but only now visible due to vegetation die back.	

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
2021 – Phase 12 works	Works include: - Drainage pipe between AA5/AA5A was repaired and debris cleared out from sump. - Debris cleared from ditch at base of gully between Ch. 1378 and 1382. - Scaling and coppicing carried out between Ch. 1365 to 1370.	**2023 Inspection:** Ch. 1360 - There is an accumulation of blocks from the scaling works behind the deer fence.	No changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Throughout section	**2012 Inspection:** Large number of small scale potential block falls identified approximately 25-45m above road (typically <0.1m3).	No changes observed during 2024 inspection.	
Throughout section	**2016 Inspection:** Presence of trees on/adjacent to isolated rock outcrops may lead to root jacking.	No changes observed during 2024 inspection.	
NG 89808 36661	**2016 Inspection:** Outcrop of fractured rock approximately 40m above road level	Not observed during 2024 inspection.	
NG 89828 36663	**2016 Inspection:** Outcrop with detached block (~1m^3) with potential for additional blocks to fail.	Not observed during 2024 inspection.	
Ch. 1285	**2020 Inspection:** Large (0.75m x 0.5m x 0.4m) and smaller block in ditch where it has burst through fence	No changes observed during 2024 inspection.	
Ch. 1300	**2018 Inspection:** Numerous small blocks on slope and resting against deer fence (largest 0.4m x 0.3m x 0.2m).	No changes observed during 2024 inspection.	
Ch. 1323	**2016 Inspection:** Several small blocks (max. 0.2m x 0.2m x 0.2m) had accumulated at the edge of the deer fence, approx. 1m above road level. Numerous blocks of a similar size noted on slope above. The source of the blocks was investigated and identified as fractured rock within the root balls of upturned trees.	No changes observed during 2024 inspection.	AA5-1
Ch. 1328	**2018 Inspection:** Several large blocks in roadside ditch (largest 0.4m x 0.3m x 0.25m). One block has burst through deer fence and landed in ditch, but other blocks may have landed on road before being moved. Total failure volume is 0.25 - 0.5m³ . Source is not immediately obvious from road level but following inspection of upper slope crags were identified at ca. 50m above road level. The slope below has an overall angle of 55 degrees and comprises a broad gully containing lots of scree (numerous blocks of up to 0.4m diameter) and fallen trees (possible debris flow type failure).	No changes observed during 2024 inspection.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 1360	**2017 Inspection:** Small accumulation of blocks behind deer fence originating from outcrop 5-6m above road level. Seepage and root jacking noted on rock slope with small blocks being washed out. **2023 Inspection:** Greater accumulation of blocks behind fence as a result of 2021 scaling.	At location NG 89856 36771 (10-15m above road level). To east of area previously scaled a 2m high; 1.5m wide; 1m deep area of fractured rock mass requires scaling. Material has already fallen onto ledge at base and scree visible at deer fence at roadside 10-15m below.	AA5-2 AA5-3

RISK RATING		**Comments**
Overall Hazard Rating =	3	Reduced from 4 in 2018 following re-assessment of potential failure size.
Pathway Rating =	4	Increased from 2 in 2018 to reflect probability of a failure impacting the road.
Receptor Rating =	1	
Risk Value =	**12.0**	
Risk Level =	**High**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install rock fall catch fence along toe of slope.	- Light scale outcrops at NG 89808 36661 and NG 89828 36663. (Only required if catch fence not installed.) - Scaling of fractured outcrop at NG 89856 36771 (10-15m above Ch. 1360).	N/A

Assessed in field by:	MT/SB/PM	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA5-1	Ch. 1323 – Several small rocks accumulated at deer fence or burst through and landed in ditch.	Year observation first noted: 2018

Photograph: AA5-2	Ch. 1360 - small accumulation of blocks behind deer fence.	Year observation first noted: 2017

Photograph: AA5-3	Ch. 1360 – Area of fractured rock mass upslope of road.	Year observation first noted: 2021

5.2.9 Slope Ref. AA5A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA5A	**Chainage:**	1383 - 1446	**Start Grid Ref:**	NG 89864 36775	**End Grid Ref:**	NG 89902 36818	**Elevation:**	19m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:								
Dip (°): 70	Azimuth (°): 320	Height (m): 70 – almost completely vegetated slope with isolated outcrops.	Length (m): 83	Vegetation Cover: 90% cover lower lope, 70% cover upper slope. Moss and bracken. Numerous deciduous trees upslope with large saplings down slope.	Ditch Details: 0.5m wide, 0.3 deep	Roughness: Rough	Verge Width (m): 0.8m	

Engineering Description of Rock:
Strong to very strong thinly foliated pinkish grey medium grained schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2018	Ch. 1388 to 1450	To refine risk assessment and requirement for remedial works.

		Findings - There were numerous fallen trees with lots of dilated root-jacked moss covered on slope. Scree may be upturned and there is the potential for some to reach road.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2024 Inspection Observations
N/A			

Hazards Observed:

Location	Description of Hazard (s) from Previous Inspections	2024 Inspection Observations	Photo Reference
Across slope	**2017 Inspection:** Numerous fallen and leaning silver birch trees with lots of dilated root-jacked rocks on slope. Scree may be upturned and there is the potential for some to reach road.	No changes observed during 2024 inspection.	
Ch. 1432	**2017 Inspection:** Fractured rock in upper section of slope with potential root jacking.	No changes observed during 2024 inspection. Difficult to examine due to dense vegetation and trees.	
Ch. 1440	**2017 Inspection:** Fractured rock with potential root jacking 20m above road level.	No changes observed during 2024 inspection. Difficult to examine due to dense vegetation and trees.	

RISK RATING		Comments
Overall Hazard Rating =	3	
Pathway Rating =	2	
Receptor Rating =	1	
Risk Value =	**6.0**	
Risk Level =	**Moderate**	

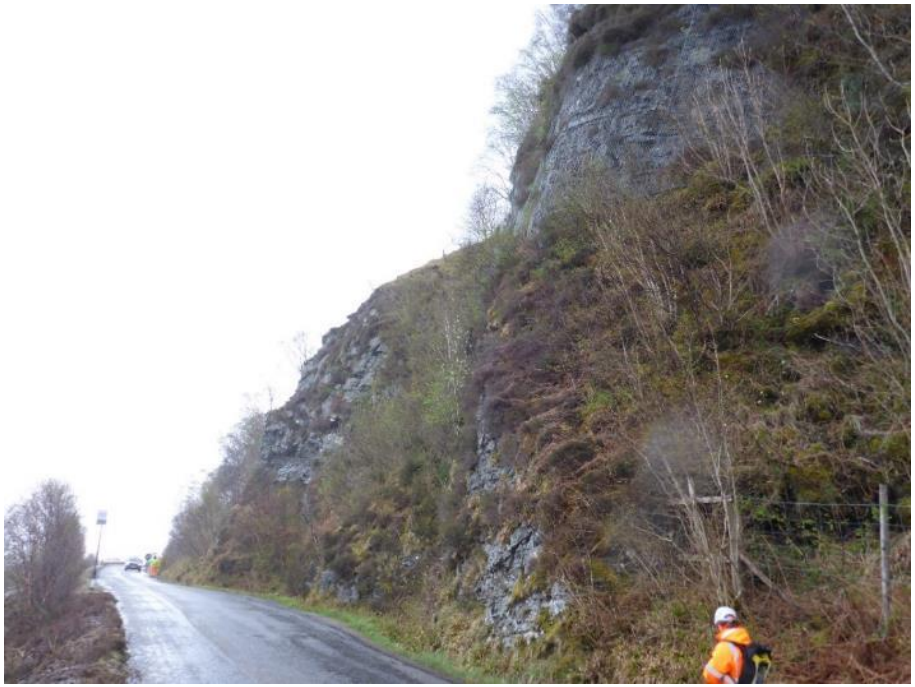
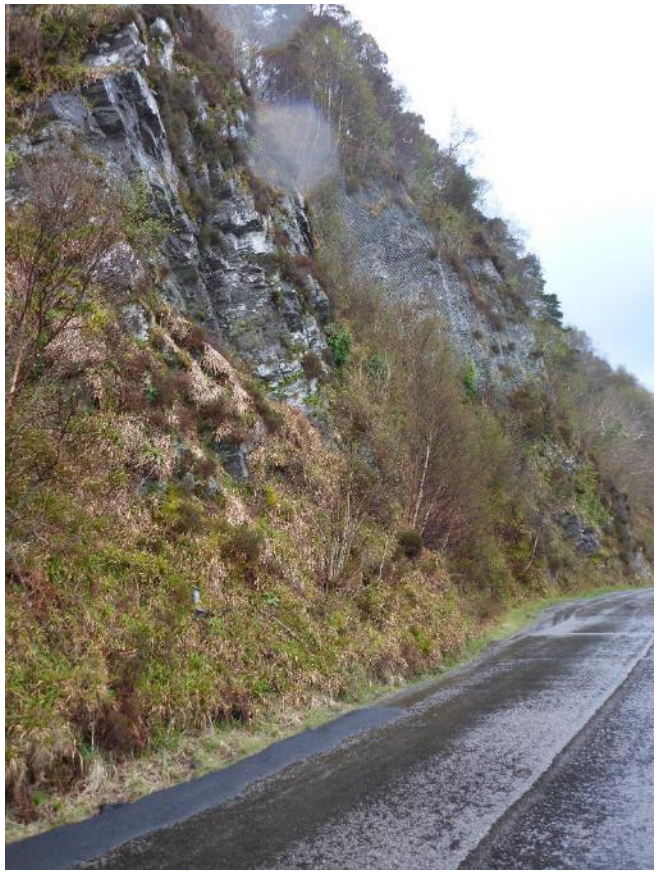
Recommended Remedial Works / Actions

Large Scale Rock Fall Protection Works (Category 3)	Localised Targeted Rock Fall Protection Works (Category 2)	Ongoing Maintenance (Category 1)
- Install roadside rock fall catch fence.	N/A	N/A

Assessed in field by:	MT/SB	Date:	16/04/2024	Reviewed by:	PLM	Date:	19/07/24

5.2.10 Slope Ref. AA6

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6	**Chainage:**	1446 – 1503	**Start Grid Ref:**	NG 89902 36818	**End Grid Ref:**	NG 89936 36862	**Elevation:**	10m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	71	Azimuth (°):	310	Height (m):	35	Length (m):	57	Vegetation Cover:	Ranges between 40-100%. Generally comprises ground cover and saplings.
Ditch Details:	Widest section 0.8m deep, 2.3m wide (no ditch where rock slope close to road between Ch. 1446 to 1452).	Roughness:	Rough	Verge Width (m):	0.8 – 1.5				

Engineering Description of Rock:
Very strong thinly foliated dark grey fine to medium grained schist (PSAMMITE).

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose	Photo Reference
2023	Ch. 1485	To inspect the potential for planar failure and root jacking. Findings - Steep planes dipping into slope are dominant. No signification planar failure risk. There are overhangs of up to 2m but basal plane is dominant and these are 'keyed in' to slope. Potential for occasional small blocks to weather out of slope and this will be accelerated by root jacking (locally dilated fractures with heather growth), but presence of vegetated slope at base of rock sloped reduces risk of these reaching road.	

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:

Year of Works	Description of Works	Comments	2024 Inspection Observations
Before AECOM involvement (i.e. pre 2012)	Netting system on upper part of slope.	Details of netting system include: - Double twist netting - Top cable 16mm galvanised - c.5m anchor spacing and 25mm galvanised bars	No significant changes to netting observed during 2024 inspection.

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**
		- Cable-anchor connection: galvanised eye nuts - 3 cable clamps - Netting lap connections using Spenax rings - No laps on anchors or vertical reinforcing Note: in 2015, bottom anchors were installed. **2022 Inspection**: netting in good condition	
2015 – Phase 8 works	Bottom anchors installed to pre-existing netting system		No significant changes observed during 2024 inspection.

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Entire slope	**2019 Inspection:** No significant hazards observed. Potential failures limited to minor ravelling / root jacking. e.g. in May 2021 a small failure was observed at Ch. 1502, with debris in roadside ditch.	No changes observed during 2024 inspection.	
Ch. 1470 – 1500	**2020 Inspection:** Potential for Planar failure and root jacking. Targeted inspection at height recommended.	No changes observed during 2024 inspection.	
Ch. 1502	**2021 Inspection:** ca. 0.25m³ of vegetation, soil and blocks in roadside ditch. Appear to originate from minor slip ca. 6m above road level. Potential for similar minor soil / rock slippages in this area but unlikely to pose a significant risk to road.	No changes observed during 2024 inspection.	

RISK RATING		Comments
Overall Hazard Rating =	1	
Pathway Rating =	2	Pathway rating reduced in 2019 following reassessment of potential failure pathways.
Receptor Rating =	1	
Risk Value =	**2.0**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	- The build-up of debris should be monitored and clearance works undertaken as required to maintain its capacity.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

5.2.11 Slope Ref. AA6A

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6A	**Chainage:**	1503 – 1606	**Start Grid Ref:**	NG 89936 36862	**End Grid Ref:**	NG 89995 36943	**Elevation:**	76m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:									
Dip (°):	70	Azimuth (°):	300	Height (m):	35	Length (m):	103	Vegetation Cover:	Fully vegetated slope (trees and ground cover) with occasional rock outcrops.
Ditch Details:	Ch.1503-1530 0.8m wide, 0.3m deep. Ch. 1530-1606 2m wide, 0.75m deep with bund 1m wide, 0.45m high	Roughness:	Rough	Verge Width (m):	Ch. 1503-1530 0.5m wide Ch.1530-1606 0.8m wide				

Engineering Description of Rock:
Strong very narrowly banded dark grey crystalline medium grained schist (PSAMMITE/SCHIST). Well defined foliation with schistosity.

Rope Access Inspections:

Year of Rope Access Inspection	Location	Purpose
2018	Upper crags	To inspect conditions of upper crags. Findings - Large buttress (1.5m x 1.5m x 7m) at ca. 50-60m above road level with large, dilated fracture behind. The rock is thinly bedded and lightly folded with beds also dilated. To the left of this is a broken, dilated, rock mass siting on a daylighting discontinuity, which is only keyed in at left hand side of the base. Down slope from this there is another buttress which has moved historically of ca. 7m x 2m x 1.5m size, where the key stone in the rock mass is observed to have been pushed out. Potential for significant failure, with buttress breaking up and falling down gully. Recommendations - Catch fences in gully below have retained debris in past but have been damaged. Uppermost catch fence should be replaced with a higher capacity catch fence. Risk mitigated by installation of catch fence during Phase 12 (2021) works.

THC Monthly Reports:

Date	Location	Comments	Photo Reference
N/A			

Existing Netting Details or other remedial work details:				
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**	**Photo Reference**
Before AECOM involvement (i.e. pre 2012)	Catch fences in gully and rock buttress at Ch. 1511.	Note: in 2021 new catch fences were installed.		
2021 – Phase 12 works	Installation of new upslope debris flow catch fence at Ch. 1511.	Catch Fence is 6m wide x 6m height situated in gull c.25m above road level. **2023 Inspection:** New catch fence in gully assessed and noted to be in good condition. Three blocks (up to 0.4m x 0.4m x 0.3m) thought to be recent failures were retained by older upslope catch fence which has punctures in it.	No significant changes observed.	

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 1505	**2023 Inspection:** Accumulation of blocks at roadside deer fence ca.3m above road level, along 5m length of slope. Debris height ca. 0.4m. Generally, 0.1 x 0.1 x 0.1m blocks but maximum 0.3 x 0.3 x 0.3m. Directly downslope of catch fence but there is a scree slope between catch fence and deer fence so scree has possibly washed down slope. Clearance recommended as the deer fence is not designed to retain material.	No further changes observed during 2024 inspection.	AA6A-1 AA6A-2
Ch. 1510	**2019 Inspection:** Two small 0.15m x 0.1m x 0.1m blocks in ditch. To have landed in ditch they possibly cleared the deer fence though, perhaps reaching the road.	No changes observed during 2024 inspection.	
Ch. 1579	**2017 Inspection:** Accumulation of blocks behind deer fence (approx. 0.3m x 0.3m x 0.3m)	No changes observed during 2024 inspection.	
NG 90013 36911	**2016 Inspection:** Crags exhibit naturally dilated joints, with signs of historical movement. However, rock mass structure is favourable (foliation dipping into slope) and only minor issues associated with small overhangs and root jacking were observed.	No changes observed during 2024 inspection.	

RISK RATING		Comments
Overall Hazard Rating =	4	Increased from 2 in 2018 due to identification of buttresses which have the potential to break out and fall down gully.
Pathway Rating =	2	Decreased from 4.5 in 2022 due to construction of catch fence in gully.
Receptor Rating =	1	Reduce from 1.2 in 2018 following confirmation of sightline beneath potential failures.
Risk Value =	**8.0**	
Risk Level =	**Moderate**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
- Install roadside rock fall catch fence.	N/A	- Clearance of blocks retained behind deer fence (Ch.1505).

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA6A-1	Ch. 1505 - Small accumulation of blocks at roadside deer fence.	Year observation first noted: 2023

5.2.12 Slope Ref. AA6B

GEOTECHNICAL ASSESSMENT SHEET													
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA6B	**Chainage:**	1606-1752	**Start Grid Ref:**	NG 89995 36943	**End Grid Ref:**	NG 90124 36990	**Elevation:**	100m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:							
Dip (°): 70	Azimuth (°): 300	Height (m): 35	Length (m): 146	Vegetation Cover: 100% - No rock outcrops noted and slope is covered in vegetation	Ditch Details: N/A	Roughness: N/A	Verge Width (m): N/A

Engineering Description of Rock:
Isolated outcrops only. Very strong thinly foliated dark grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
N/A		

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
N/A			

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**
N/A			

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Whole slope	**2014 Inspection:** No significant hazards observed. Boulders present on slope and in drainage gulley. No destabilising mechanism identified but likely to be from upturned root balls.	No changes observed during 2024 inspection.	
Ch.1654	**2022 Inspection:** Fallen tree. Does not present risk to road.	Tree has been cut down. No other changes observed during 2024 inspection.	
Ch.1708	**2020 Inspection:** Two trees down c.10m upslope. Loose rock behind root ball on slope but not posing risk to road.	Trees have been cut down. No other changes observed during 2024 inspection.	AA6B-1

RISK RATING		Comments
Overall Hazard Rating =	2	Increased from 1 in 2018 following identification of failed blocks at roadside.
Pathway Rating =	2	
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	N/A	N/A

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA6B-1	Ch. 1708 – Fallen trees were noted in 2020. Trees have now been cut back.	Year observation first noted: 2024

5.2.13 Slope Ref. AA7

GEOTECHNICAL ASSESSMENT SHEET											
Site:	A890 Stromeferry Bypass	**Slope Ref:**	AA7	**Chainage:**	1752 - 1880	**Start Grid Ref:**	NG 90124 36990	**End Grid Ref:**	NG 90213 37019	**Elevation:**	13m AOD

Photo at Start Chainage (looking east)	**Photo at End Chainage (looking west)**
	

Rock Slope Characteristics:											
Dip (°):	75 - 80	Azimuth (°):	336	Height (m):	30	Length (m):	128	Vegetation Cover:	60-70% cover. Lots of saplings established on slope.	Ditch Details:	1m wide, 0.75 deep. Bund 0.6m wide, 0.3m high	Roughness:	Rough	Verge Width (m):	None

Engineering Description of Rock:
Very strong thinly foliated dark grey schist (PSAMMITE).

Rope Access Inspections:		
Year of Rope Access Inspection	**Location**	**Purpose**
2021	Ch. 1770	To inspect dilated block towards crest of crag c.30m above road level. Findings - Block is keyed in and not at risk of failure.
2021	Ch. 1775	To inspect gully between AA6B and AA7. Findings - Material at failure scar noted to be very loose and fractured with potential for blocks to weather out / become dislodged and move downslope. Recommendations - Although set well back from road there is a risk some blocks could roll downslope for a significant distance so light scaling of the failure scar is recommended (Completed during 2021 Phase 12 works).

THC Monthly Reports:			
Date	**Location**	**Comments**	**Photo Reference**
February 2019	Ch. 1775	Four 0.3m x 0.3m blocks in culvert catch pit area.	
March 2019	Ch. 1800	A 0.5m x 0.4m block 7m up.	
September 2020	Ch. 1825	After prolonged heavy rain a slip occurred on 13/09/20. A root ball came down, bringing with it detritus, rocks and mud. The slip was some 2-3 tonnes and mostly came to rest in ditch verge, with slight overspill to road. Slip originated from ca. 5m above road and came down watercourse. Ditch and culvert cleared 14/09/20.	
January 2024	Ch. 1770	0.08m^3 block present in the verge which has burst through deer fence. AECOM inspections notes: The blocks lithology is gneiss, and it is covered by moss on three sides. Block has possibly been resting on slope and been moved by heavy rainfall, tree fall or animal movements. It is at the base of a drainage channel. No clear source.	AA7-1

Existing Netting Details or other remedial work details:			
Year of Works	**Description of Works**	**Comments**	**2024 Inspection Observations**
2015 – Phase 8 works	Block at Ch. 1780 c.20m above road level removed by heavy scaling		

2021 – Phase 12 works	- Scaling of loose / fractured rock between Ch. 1770 to 1775. - Gully cleared of debris at Ch. 1828		

Hazards Observed:			
Location	**Description of Hazard (s) from Previous Inspections**	**2024 Inspection Observations**	**Photo Reference**
Ch. 1775	**2018 Inspection:** Two blocks in drainage gully which had passed beneath deer fence above. Additional block resting against deer fence. Source not obvious but given 2014 observation of no rock outcrops likely to be from upturned root ball. Drain not currently blocked but keep under observation.	No changes observed during 2024 inspection.	
Ch. 1803	**2018 Inspection:** Dilated fractures observed c. 15m above road level but no obvious fractures at base of block and chances of reaching road level if it does failure are low due to large ditch.	No changes observed during 2024 inspection.	
Ch. 1820	**2019 Inspection:** Fractured rock on right hand side of previous washout, low risk due to verge and ditch	No changes observed during 2024 inspection.	
Ch. 1820 to 1826	**2018 Inspection:** Washout of soil from gulley around a third of the way up slope (mixture of angular blocks and topsoil). Overhanging soil/rock mass above failure but unlikely to reach road in event of failure.	More washout present at same location. 10m above road level accumulations of debris on the slope. Small to medium sized blocks. A slope inspection found the area to have been affected by a small debris flow, with a 3m wide x 5m long fan of debris formed of blocks up to 0.5m. A tree is supporting the toe of the debris. It is recommended the debris be cleared from the slope. There is a potentially hazardous area of rock mass 8m up from the debris accumulation, on the right-hand edge of the gully. Scaling recommended.	AA7-2 AA7-3 AA7-4
Ch. 1825	N/A	Debris in drainage gully is nearly at full capacity and would benefit from being cleared.	AA7-5
Ch. 1832	N/A	Drainage gully is blocked. Recommend gully is cleared.	AA7-6

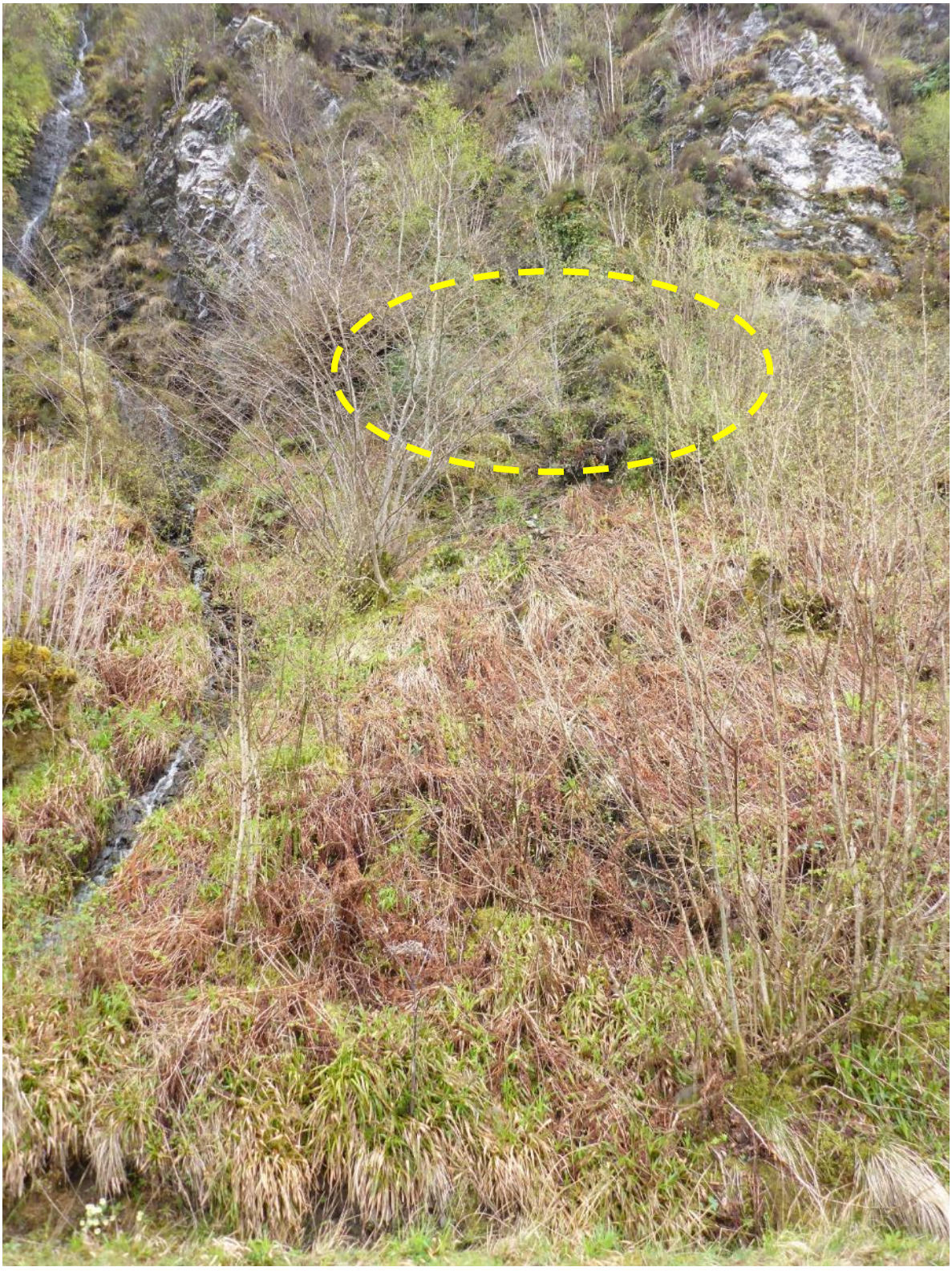
RISK RATING		**Comments**
Overall Hazard Rating =	2	Increased from 1 in 2018 to reflect potential failure volume.

Pathway Rating =	2	Reduced from 3 in 2018 due to decreased likelihood of failure reaching road.
Receptor Rating =	1.2	
Risk Value =	**4.8**	
Risk Level =	**Low**	

Recommended Remedial Works / Actions		
Large Scale Rock Fall Protection Works (Category 3)	**Localised Targeted Rock Fall Protection Works (Category 2)**	**Ongoing Maintenance (Category 1)**
N/A	- Scaling of rock mass ca. 18m above road level at Ch. 1820-1826.	- Recommend for debris resting on slope between chainage Ch. 1820 to 1826 to be cleared. - At Ch. 1825 and 1832 drainage gullies are recommended to be cleared.

Assessed in field by:	MT/SB	**Date:**	16/04/2024	**Reviewed by:**	PLM	**Date:**	19/07/24

Photograph: AA7-1	Ch. 1770 – block present in verge. Reported by THC monthly inspections in January 2024.	Year observation first noted: 2024



Photograph: AA7-2	Ch. 1820- 1826 – washout of soil and debris from gully. Accumulation of debris on slope 10m above road level (circled on image).	Year observation first noted: 2018

Photograph: AA7-3	Ch. 1820 - 1826 – washout of soil in gully. Fractured / overhanging rock mass ca. 18m above road level (area circled above).	Year observation first noted: 2018

Photograph: AA7-4	Ch. 1820 - 1826 – accumulation of debris on slope from gully washout.	Year observation first noted: 2018

Photograph: AA7-5	Ch. 1825 – Debris in drainage gully nearly at gully capacity.	Year observation first noted: 2024

Photograph: AA7-6	Ch. 1832 – Drainage gully blocked.	Year observation first noted: 2024