

Ardfern Slip A816 – rock stabilisation and emergency by-pass scheduled to open mid-December, opening of main A816 still to be confirmed

The emergency phase of this project is still very much underway. Thousands of tonnes of material which flowed from the hillside onto the road have been moved to a disused quarry in the ownership of Forest and Land Scotland. Full SEPA consents have been obtained for this landfill/quarry restoration work. Material continues to flow down the hillside, particularly in wet conditions and the clean-up continues. Parts of the hillside have been 'scaled' of loose rocks however, many rocks have yet to be moved and more rocks are emerging following rain which washes away the slurry covering some of the rocks and exposes more with soils and silt washing down the hillside changing its shape and presenting ever new challenges. To date the largest of the rocks has been measured at 220 + tonnes.

Once the debris flow material is sufficiently cleared a bund will be formed at the side of the existing road which is designed to hold back



future debris flow material. Modelling work will be undertaken to forecast future slope flow and the bund will be built accordingly.

The likelihood of future debris flow events is so high that we are also progressing with an alternative emergency route as per the plan below. This emergency route will be used when weather conditions are such that the original road is not safe. The land agreement for the road is in place and works are underway. Archaeological

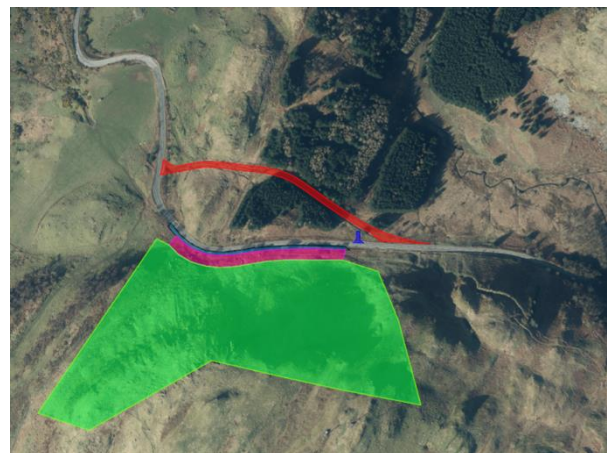
and ecology appraisals have already been carried out.

The land agreement for the emergency route has been completed and currently we are on target for the emergency route to be complete by 15 December with a caveat that extreme weather conditions may delay works on the ground. We anticipate the emergency route will be available before we are able to safely reopen the original road.

Medium to long term we will progress the emergency route to be upgraded to become a permanent route moving traffic away from the problematic hillside. A permanent road will take 2 – 5 years for the consents and permissions hence the reason for progressing with an emergency road which will have a smaller footprint and is buildable in weeks rather than years due to the emergency situation. It is expected that the emergency road will only be utilised when weather is such that there is a risk of further landslide. Similar to the process used by Transport Scotland and BEAR Scotland, we will have a risk matrix in place which uses factors such as saturation levels on the hillside, forecast rainfall with this also being supplemented by CCTV cameras which enable remote monitoring of the hillside. These safety measures will enable the original route on the A816 to be used as the normal route with the emergency road only being mobilised when there is a risk of landslide.

Top image showing the extent of the landslip and debris flow from 7 October, middle image of typical rocks which been 'falling' from the hillside - these will be used in forming the bund to help to catch material from future flows and bottom image of a large rock being broken up using a hydraulic pecker attached to a large excavator.

The image to the right shows the extent of the Ardfern slip in green (at least 3 separate slip events took place) the purple shading is the ditch/pit which would catch any future flow, the blue line is a bund to keep the majority of any future flow in the ditch and the red is the proposed emergency road which takes traffic away from the slip affected area and provides a safe alternative route during future weather events.

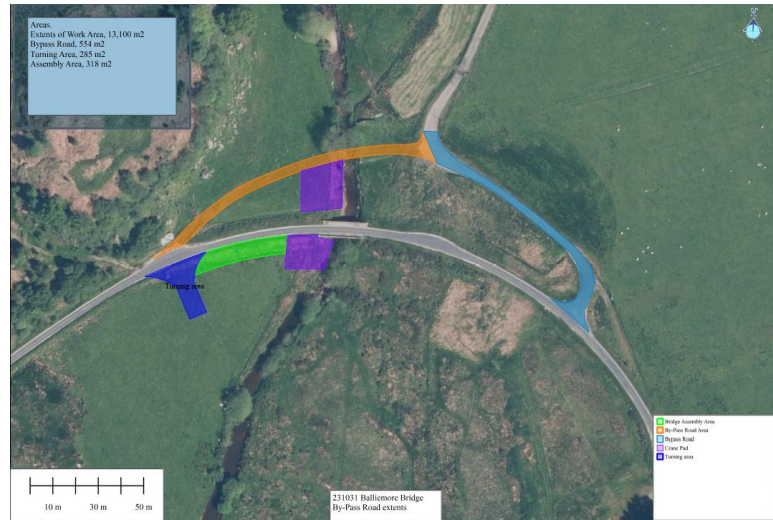


Loch Awe C30 – rock/soil nails and stabilisation

The embankment supporting the road at the C30 washed away near Kilmaha. The slope is very steep and the material forming the embankment is not particularly strong. Initial stabilisation works have been carried out including some rock infill and soil nailing (large diameter bolts which are drilled and grouted into the ground). Geological engineering design works are ongoing alongside the physical works on site. The design works will finalise the design of slope remedial work for the washed out supporting embankment.

Glen Lean – B836 – Temporary Bridge

A temporary bridge is on target to be built on the alignment of the old bridge by 24th November. This will allow the Glen Lean road to be reopened whilst the bridge damaged in the October rain event is demolished and a new bridge rebuilt. This target date is subject to reasonable weather conditions and no other issues coming to light on site.



The image above shows where the temporary bridge will go which is to the north of the storm damaged bridge.

Lochgoilhead – B828 Slope stabilisation and bridge works



Emergency bridge works to deal with scour damage (water eroding the bridge abutment/foundation) have been completed and work is currently underway stabilising the embankment, which supports the road. There are a number of locations along the B828 where rock nailing and support beams are being installed.

Image above detailing diversion of river flow and over pumping to allow concrete to be laid to support the bridge structure with the concrete replacing masonry washed away with the force of the river.

Bottom left image shows reinforced concrete edge beam being constructed to support the carriageway.



Scammadale – retaining structure and stabilisation

The damage to the Scammadale road embankment was due to exceptionally high river levels washing away the embankment. The repair to this embankment is complex and design works are nearing completion with site works commencing over the next couple of weeks. In the meantime we continue to liaise with the residents regarding vehicles over 3.5



tonnes accessing the glen. Work is due on site by the end of November.

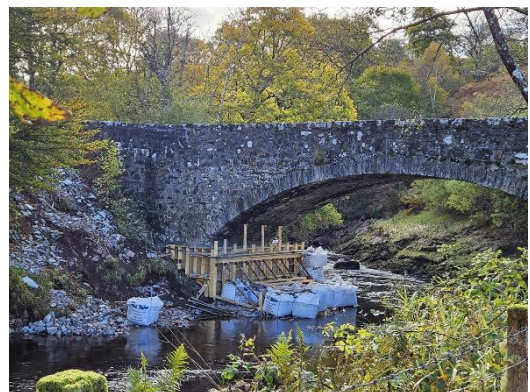


Top image of barriers to keep traffic from the weak edge and right image showing the extent of the affected banking – note the road is at the top of the embankment and this shot was taken before the barriers shown on the right were installed.

Kilninver Bridge

Kilninver Bridge is downstream from the Scammadale embankment slip, on the River Euchar, which is fed from Loch Scammadale.

The bridge suffered significant abutment scour during the rain event. Extensive emergency works have been carried out and some rock armour protection work will be carried out in due course to the upstream side of the bridge. The initial works were carried out at pace in order to save the bridge from further scour damage to the bridge's abutment. Any further damage would have very likely resulted in the bridge being lost.



Initially a weight limit reduction was applied to the bridge. This has now been lifted and the bridge is open to 44 tonne vehicles. 44 tonne being heaviest vehicle allowed on UK roads unless an abnormal load exemption is issued.

Top image showing the wooden formwork in place which supported the fibre reinforced concrete until it set. Bottom image on the right showing the formwork being erected. The carpenters in the shot help to give scale to the repair works.



Kilmelford Bridge

The initial emergency phase commenced on Thursday 19 October when a major defect was found on the bridge. The defect was so significant there was only one option – to demolish the bridge for public safety.

The initial plan was to demolish the old bridge and put in place a temporary ‘forest’ type corrugated steel pipe type bridge. However, we were very fortunate and found a number of concrete culvert/bridge sections in Highland which were the correct size and were available. This enabled a rapid construction phase which had the road open to 44 tonne vehicles in an impressive 2 weeks’ time period.



With the bridge and road now open to all traffic we have commenced work to carry out a hydrology study. This is a complex and technical piece of works which is required to design the training walls (the walls which direct the water flow into and out of the bridge structure), to satisfy SEPA in terms of retrospective consents and to ensure that the bridge will not have any adverse effect on the river. There is additional design work to carry out in terms of adding a segregated pedestrian route and finishing off the surfacing and parapet (edge of bridge) walls. So whilst the initial emergency phase of the bridge works is complete there remains much design, liaison with consenting bodies and physical works

Top image showing the damage to the bridge and the bottom picture detailing the new concrete bridge sections prior to the reinforced concrete slab and surfacing being placed.

Slope Stability – hillsides above the A815

A contract has been put in place with a geological engineering expert for ongoing monitoring of the scars left on the A815. In addition to the monitoring the contacted works include advising on future flow mitigation measures – these at their most basic will be deeper ‘climate adapted’ drainage channels to intercept small flow events. *The image to the right shows*



some of the scars on the hillside above the A815 which are being monitored.