

## Appendix J

### CN01 Further Investigation – Technical Note

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# 1 Introduction

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## 1.1 Background

Corridor Option CN01 is the western most corridor for Improvement Strategy C on the A96 Dualling East of Huntly to Aberdeen project. CN01 was progressed through the Corridor Options Appraisal due to its potential to:

- achieve an alignment through lower lying ground;
- follow more favourable topography through Strathbogie, similar to the existing alignments of the Aberdeen to Inverness railway and the A97;
- improve winter resilience - at the DMRB Stage 2 Meet the Team events in November 2017, some members of the public suggested that a route following the railway line could offer improved reliability during winter weather.

Four First Fix alignments were developed and at the First Fix Alignment Workshop on the 19th April 2018, it was evident that all the CN01 alignments performed poorly. It was concluded that Strathbogie Valley presents significant engineering challenges – substantial earthworks, railway crossings, the A97 and River Bogie Floodplain which resulted in major environmental impacts with four out of the nine appraisal sub topics rated major adverse.

The CN01 alignments are the longest scheme options at up to 30kms in length and are remote from the existing A96 by up to 8kms. It was therefore considered that there would be limited redistribution of both strategic and local traffic. Consequently, it was recommended that no alignment from Corridor Option CN01 should be taken forward to Second Fix.

However, it was agreed that additional work should be carried out to validate the findings of the First Fix Appraisal and decision to sift out all the alignments within this corridor, particularly in relation to winter resilience. This would include undertaking traffic modelling using available traffic models to assess how much traffic (both strategic and local) would redistribute to CN01 due to the length of route and remoteness from the existing A96.

This technical note firstly presents a summary of the First Fix Appraisal findings before presenting the findings and conclusions of the further Engineering and Traffic assessment.

## 2 First Fix Alignments Appraisal of Corridor Option CN01

### 2.1 Overview

Four First Fix Alignments were developed within Corridor Option CN01, named CN01-001, CN01-002, CN01-003 and CN01-004 (see Figure 1). All alignments commence to the south of Huntly at the A96/A97 roundabout, running south through Strathbogie, continuing south-east past Leith Hall and its Gardens and Designed Landscape (GDL) and the Moss of Kirkhill Site of Special Scientific Interest (SSSI) to Garioch, where it joins the tie-in points for Corridor Option CS02 alignments within the Bennachie Special Landscape Area. Due to the westerly tie in point, all CN01 First Fix Alignments would influence the choice of a potential bypass route at Huntly, requiring a southern bypass.

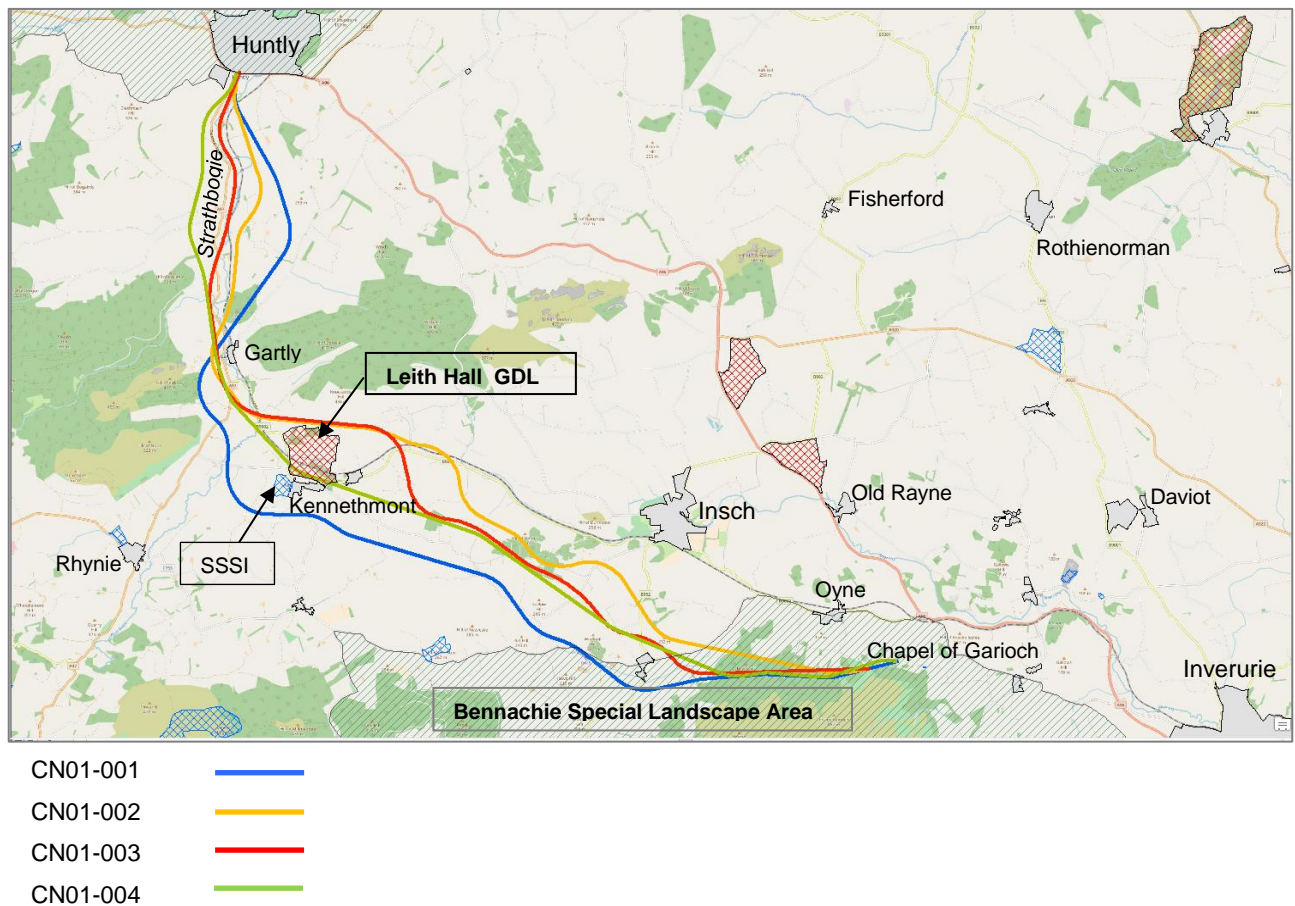


Figure 1: CN01 First Fix Alignments and Key Locations

## 2.2 First Fix Appraisal Findings

The First Fix Appraisal found that all four CN01 alignment options performed poorly in engineering and environmental terms with the key findings summarised below.

Overall Summary of Key Engineering Issues:

- Alignments are longer than the existing A96 by 6km
- Alignments are remote from the existing A96 at up to 8km
- Strathbogie valley presents significant engineering challenges with the A97, railway and the River Bogie and floodplain occupying the flatter, and lower lying ground within the valley. Either side of the A97 to the west and the railway to the east, the topography climbs steeply. This, coupled with the residential properties and farms sporadically located throughout, results in dual carriageway alignments needing to be located on the higher and steeper ground outwith the valley floor.
- An alignment to the east of the railway, commences at the A96/A97 roundabout at Huntly with the requirement to cross the Aberdeen to Inverness railway line, River Bogie and floodplain on a skewed structure potentially up to 600 metres in length. Thereafter the alignment climbs through high and steep ground with significant earthworks - cuts of up to 21 metres over lengths of approximately 500 and 600 metres and a further cut up to 40 metres over a length of 800 metres. At Gartly, the alignment then re-crosses the railway, River Bogie and floodplain and the A97 on a skewed structure approximately 400 metres in length and 16 metres in height to reach more favourable ground.
- By contrast an alignment to the west of the A97, also commences at the A96/A97 roundabout at Huntly and crosses the A97 on a skewed structure up to 300 metres in length but avoids the crossing of the Railway, River Bogie and floodplain. The alignment then climbs through higher and steeper ground with significant earthworks - embankments of up to 40 and 36 metres over lengths of 1.5 and 1.0km and cuts up to 20 and 25 metres over lengths of 500 and 800 metres. Thereafter the alignment reaches more favourable ground at Gartly.
- Avoiding Leith Hall and its GDL to the north results in a 60 metre cut for 1.5km due to high ground at Knockandy and Hill of Corskie. More favourable ground is available to the south west of Leith Hall.

Overall Summary of Key Environmental Issues:

- There are Major adverse landscape and visual impacts within the high sensitivity landscapes of Strathbogie due to the large scale of earthworks required, construction of crossings across the river, and loss of woodland. Alignments also pass through the Bennachie Special Landscape Area, require significant earthworks, loss of woodland and ancient woodland and have potential for major adverse impact on visual amenity.
- All alignments have adverse impacts on the setting of Leith Hall GDL with one following a route through the GDL. There are also moderate adverse impacts on the setting of a number of Listed Buildings including Lickleyhead Castle Category A

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Listed Building, Harthill Castle Category A Listed Building and Leslie Castle Category B Listed Building.

- All alignments, with the exception of CN01-004 (Moderate) have a Major Adverse Impact upon the water environment due to the number of watercourse crossings and the potential for active river morphology in these locations.
- All alignments have a major adverse impact upon ecological receptors due to the presence of the Wildcat Priority Area, Local Nature Conservation Sites, ancient woodland and protected species.
- There are Moderate adverse impacts on multiple cultural heritage features. The southern end of all alignments pass through an area with numerous Scheduled Monuments (SM) of prehistoric date whose settings are inter-related, meaning that this whole area is sensitive to change.
- To avoid Leith Hall GDL and a cluster of constraints that include properties, the Moss of Kirkhill SSSI and woodland, alignment CN01-001 is outwith the SEA boundary.

It was concluded that all First Fix Alignments within the CN01 Corridor Option have significant engineering and environmental challenges, particularly within the westernmost section, between Huntly and Leith Hall through the Strathbogie Valley. All alignments from Corridor Option CN01 were therefore sifted out and not taken forward to Second Fix.

## **3 Post workshop assessment**

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### **3.1 Overview**

It was recommended at the First Fix Alignment Workshop that further work should be undertaken to provide further evidence to support the decision of not taking First Fix alignments from Corridor Option CN01 forward, particularly in relation to winter resilience. This was to include traffic modelling to assess how much traffic both strategic and local would redistribute to CN01 due to the length of route and remoteness from the existing A96.

### **3.2 Engineering Review and Alignment Revisions**

An engineering review was undertaken and, based upon the First Fix findings, a single route was created for further assessment. This route was formed by, where possible, adopting the most favourable parts of the four First Fix Alignments, along with some revisions, to determine what improvement could be achieved on the impacts identified at First Fix. The revised alignment is shown in blue and the First Fix Alignments in grey in Figure 2.

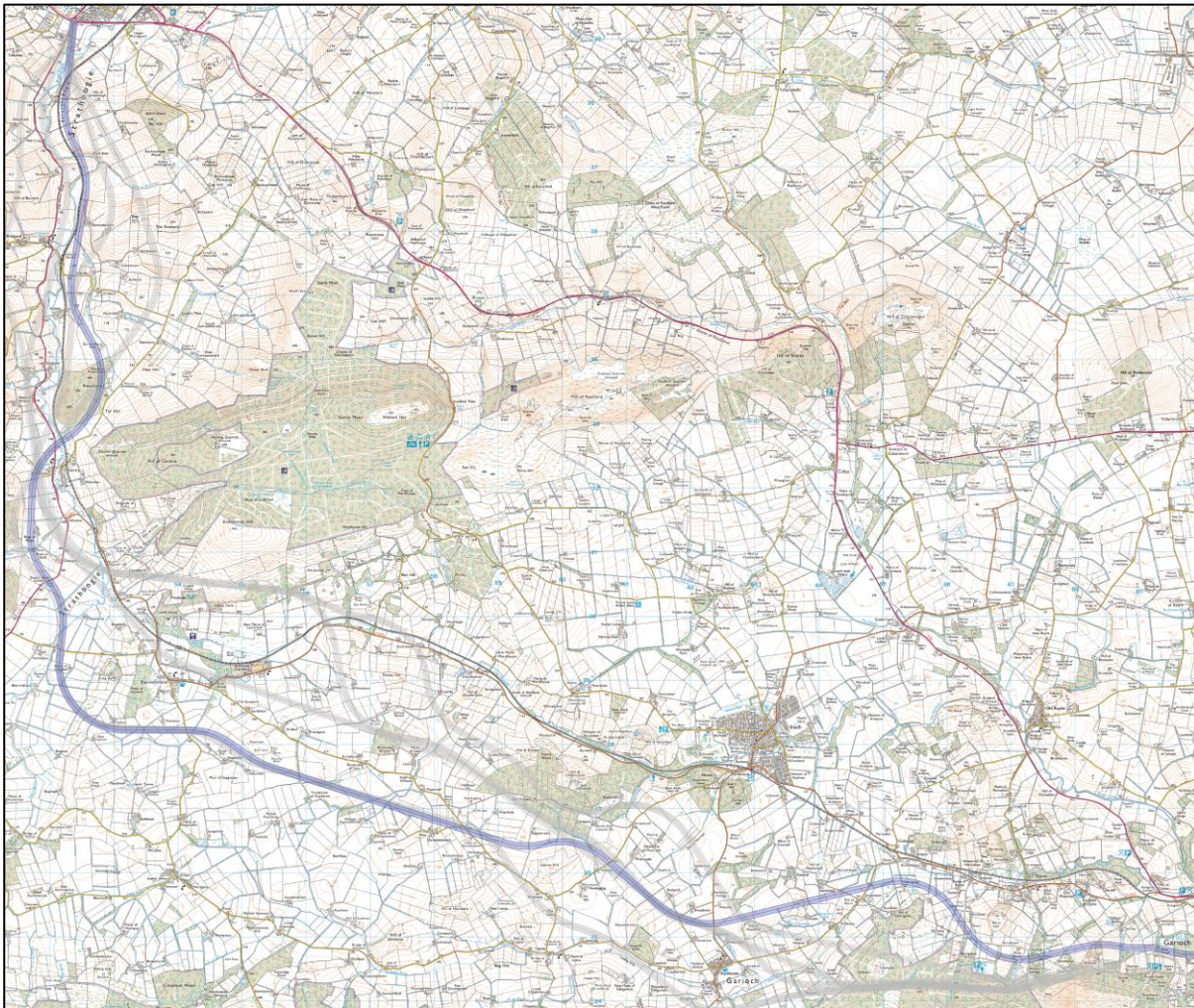


Figure 2 - CN01 Revised First Fix Alignment (Blue)

The revised alignment was found to still have significant engineering issues at a number of locations with limited improvement compared to First Fix. The key findings are summarised below. Given the length of the route at circa 30km, the summary is split into three sections from the west at Huntly via Strathbogie Valley to Gartly, centrally at Leith Hall GDL and to the east between Leith Hall and Bennachie.

Huntly via Strathbogie Valley to Gartly (western section)

- Length of section 10km
- Alignments along the valley floor presented no opportunity to further refine the design as they would directly affect the floodplain and would require multiple and large structures to cross the railway, the A97 and numerous sections of the River Bogie.
- An option was considered for an alignment following the A97, but this would require the demolition of several properties and farms located along the A97. In addition, to maintain local access, the existing A97 would have to be replaced and relocated further to the west of the dual carriageway, pushing it into the steeper and higher ground resulting in large earthworks.

- The revised alignment is shown in Figures 3 and 4 below and commences at the A96/A97 roundabout at Huntly and tracks to the immediate east of the railway line for approximately 4km. However, this requires a major skewed structure up to 1km in length to cross the River Bogie and floodplain and railway although this avoids the significant earthworks at First Fix with cuts reduced to approximately 12 metres. Thereafter the alignment heads into higher ground at Tor Hill, by following the contours to minimise earthworks around the east of the hill and back towards Gartly, along the line of the Old Military Road. From here the alignment continues south, crossing the railway, River Bogie, floodplain and A97 on a structure approximately 400 metres in length. This is shorter than the structure required at First Fix because it crosses the railway, river and floodplain and A97 on a more perpendicular alignment.

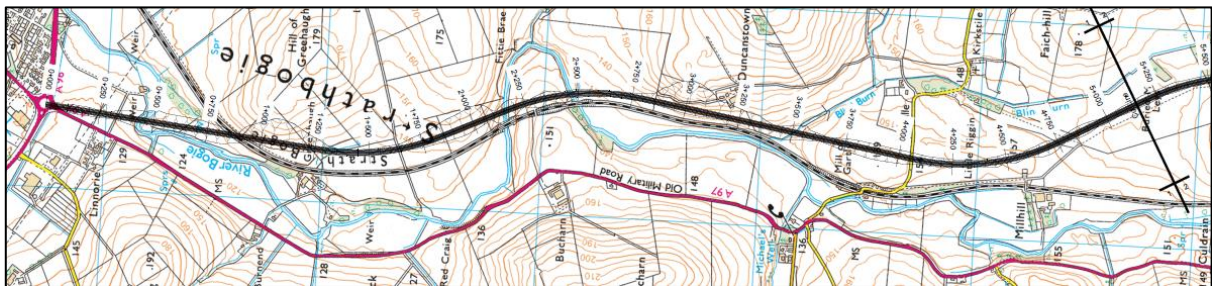


Figure 3 - Revised Alignment Strathbogie Adjacent to Railway Line

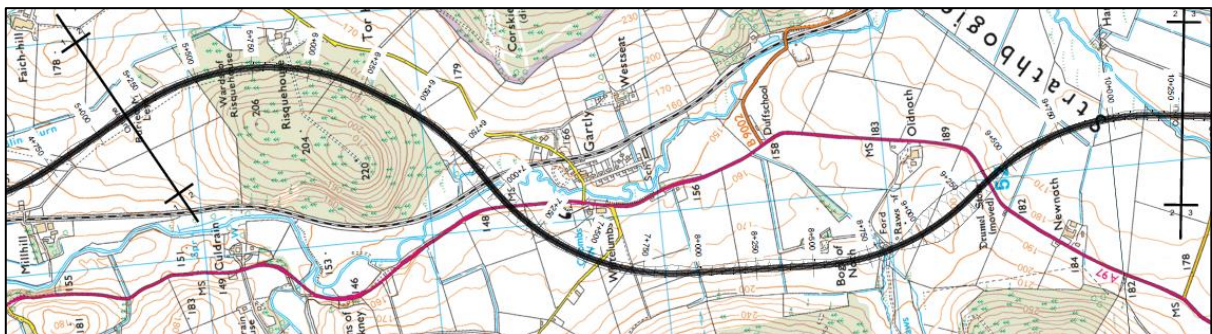


Figure 4 - Revised Alignment Strathbogie at Gartly

While this revised alignment improves the earthworks along this section, a major skewed structure will be required to cross the Aberdeen to Inverness railway line, River Bogie and floodplain at the start of the section. In addition, a further significant structure is still required to cross the railway, River Bogie and floodplain and A97 at Gartly. Therefore, it is not considered the revised alignment sufficiently addresses First Fix impacts and delivery of this alignment would still present significant engineering challenges.

Leith Hall GDL (central section)

- Length of Section 5km
- The position of the alignment through the central section is determined by the cluster of environmental constraints with the Leith Hall GDL, properties, SSSI and woodland meaning limited revisions were possible. This is shown in Figure 5 below.

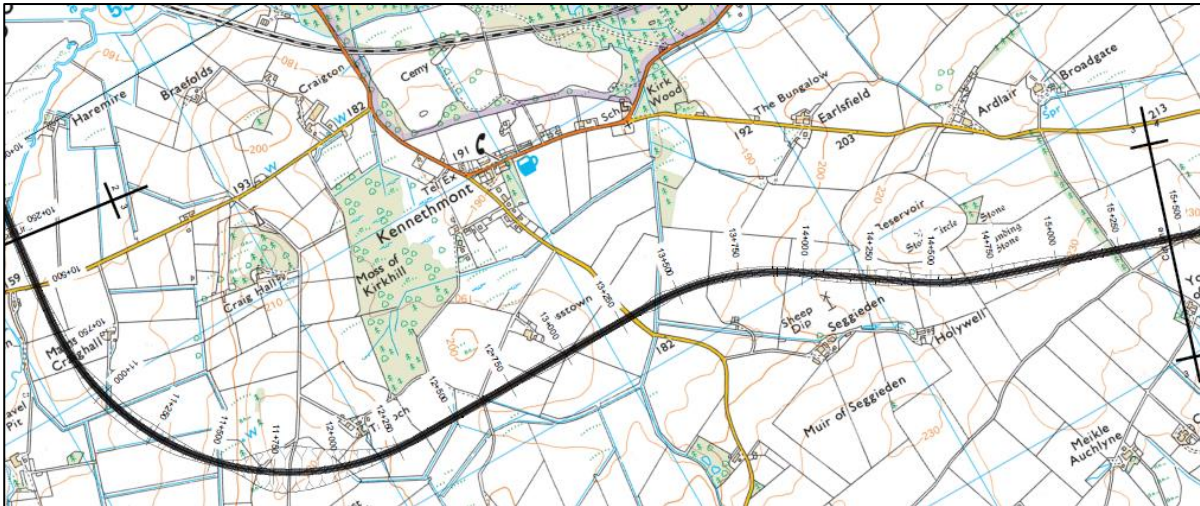


Figure 5 - Revised Alignment at Leith Hall

Overall the alignment has limited change to the First Fix and the alignment remains positioned outwith the SEA boundary.

Leith Hall to Garioch (eastern section)

- Length of section approximately 15km
- At First Fix this section has the highest road elevation of the CN01 alignments. There are limited opportunities to revise the alignment due to the extent of topography and constraints and therefore approximately 4.3km of the road has an elevation in the range of 200-230 metres. This is shown in Figure 6 below.

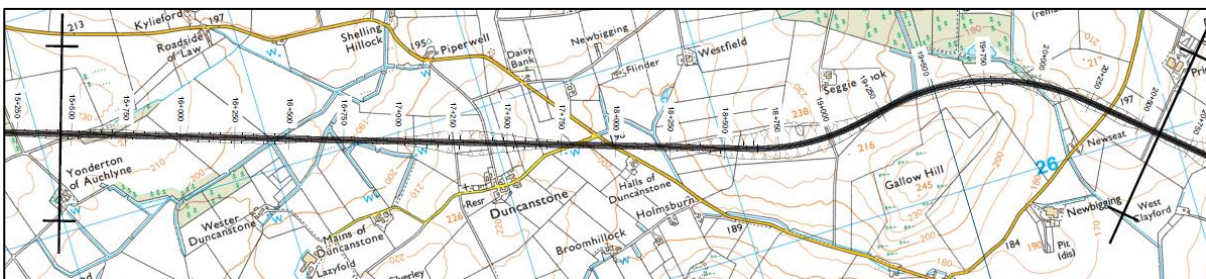


Figure 6 - Revised Alignment Leith Hall to Bennachie Highest Elevation Section

- In the remaining part of this section towards Bennachie, localised revisions were feasible to reduce earthworks on the immediate approach to Garioch and Bennachie but the alignment is still located within the SLA and passes close to the northern slopes of Bennachie.



- Alternative options were considered to provide a cross link towards the existing A96 prior to Garioch and Bennachie, to connect to alignments within CN02, CN03 or OLC. However, due to the High Impact Areas to the immediate north, predominantly high ground, the settlement of Inch and numerous properties located throughout, cross links are not feasible and therefore the only option is for the alignment to route towards and along the base of Bennachie. The revised alignment is shown in Figure 7.

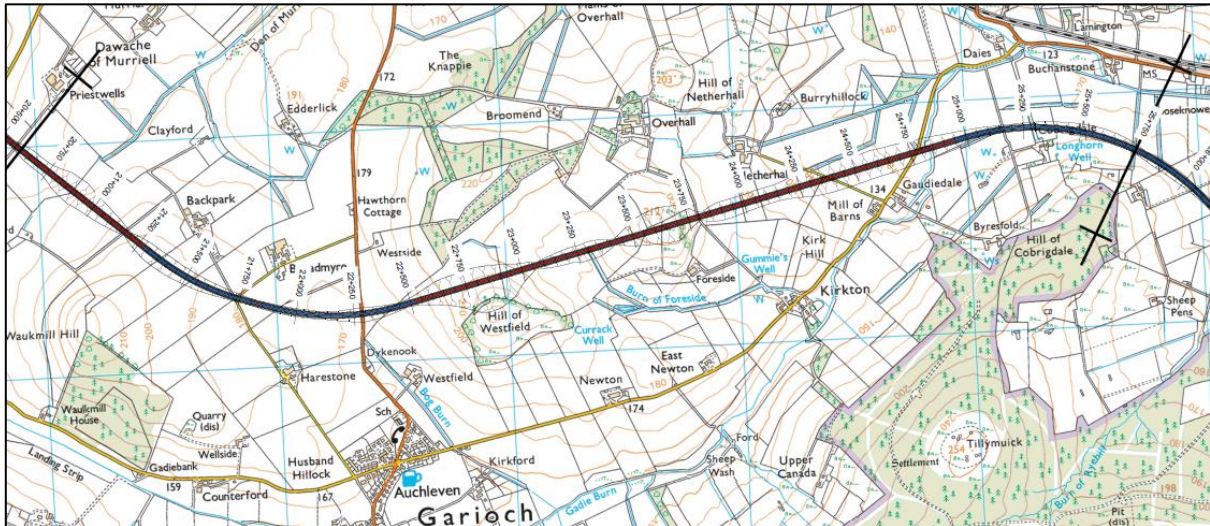


Figure 7 - Revised Alignment at Bennachie

Overall there are limited opportunities to revise the alignment sufficiently to address the First Fix Engineering issues. In particular, major challenges still exist through Strathbogie and due to the limited alignment changes feasible south of Leith Hall and towards Bennachie, the alignment does not achieve significant improvement over the First Fix alignments. Consequently, the Major adverse environmental impacts also remain.

## 4 Review of Network Resilience

### 4.1 Overview

Winter resilience and road safety were highlighted as concerns through public and stakeholder engagement during DMRB Stage 1 consultations and DMRB Stage 2 Meet the Team events, particularly through the higher elevation sections of the existing A96 at the Glens of Foudland. The feedback suggests that the existing A96 in this area suffers from poor winter resilience. It is suggested that the height of the A96 in this area leads to high levels of snow and ice during the winter, often resulting in road closures.

This section of the A96 has a higher than national average accident rate for serious accidents and is identified as an Area Requiring Special Attention (ARSA) during winter months within the North East Scottish Trunk Roads Unit.

To investigate these concerns and, where possible, quantify the extent of the resilience issues on the existing network and potential improvements that could be offered by the CN01 corridor, a review was undertaken covering:

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- A96 incident data provided by Traffic Scotland
- Transport Scotland Integrated Roads Information System (IRIS) database.
- Comparison of elevations on the existing A96 and the CN01 alignment.
- Transport Scotland Trunk Road Personal Injury Accident Database
- Comparison of accident data on areas of lower ground – A97 and B9002 to existing A96 section between Huntly and Oyne Fork.

Aberdeenshire Council, the Trunk Road Operating Company (BEAR Scotland) and Police Scotland were also consulted to discuss the existing issues and gather local knowledge on the area.

## 4.2 Winter Resilience

Poor winter resilience is attributed to a combination of elevation, low temperatures, exposure, wind direction, drifting snow, and steep gradients, which result in problematic road network conditions.

The Glens of Foudland section of the A96 is designated as an Area Requiring Special Attention (ARSA) within the 4th Generation Term Contract for Management and Maintenance of the Scottish Trunk Road Network North East Unit. This means that it has a more rigorous winter maintenance regime for managing and responding to ice and snow alerts in this area, including more frequent snow patrols and gritting.

Snowpoles are provided to define the carriageway edge through the area and, in the event of a road closure, there are virtual snow gates located at the layby to the east of the junction with the A97 on the western side of the Glens and west of the junction with the A920 at Colpy.

Information from BEAR and Aberdeenshire Council identified the following issues:

- The A96 has several areas regularly affected by winter weather and the impact of this is largely dependent on a combination of local factors such as wind direction, degree of exposure, road height and gradient.
- The main locations within this scheme are the Glens of Foudland and Tyrebagger. On the section of the A96 at Glens of Foudland, at the summit of the Newtongarry Hill between the Newtongarry and Whin Brae Crawler Lanes, the wind blows the snow onto the road and blocks it quickly. Consideration has been given to erecting snow fences in the fields above the road to limit drifting snow but, to date, this measure has not been implemented.
- There are also issues at the summit of the Newtongarry Crawler lane where drifting snow impacts on the full width of the carriageway in the location of the layby on the westbound side of the road.
- There are no recorded significant winter related issues with other local roads in the area (A97, A920, A947, B9001, B9002, B992, B993) for winter weather or flooding.

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Historic snowfall data was used to review the number of days and average depth of snowfall in the area for each month between January 2009 and January 2018. The online weather site, <http://www.worldweatheronline.com/> was used for this exercise as the MET office only had limited monthly snowfall data available. The snowfall data available was at a relatively large scale and it was not possible to differentiate between the existing A96 and CN01 corridors. Nor was it possible to pinpoint days of recorded incidents within the incident database to link them with snowfall.

However, this data confirmed that all areas along the A96 corridor between Craibstone and Huntly experience annual snowfall between December and May, with areas between Inch and Huntly receiving the greatest amount of snowfall. Figure 8 displays the snowfall data for 'Inch, Huntly and Culsalmond' compared to areas between Oyne and Kintore.

This data was cross-checked against data from Vaisala outstations provided by Transport Scotland. As a comparison, the year of 2017 was checked for both the Vaisala data and online snow data. Vaisala showed 41 days of snow within 2017. The online snow data displays 39 days, which suggests the online information is reasonably accurate.

A review of both Traffic Scotland's incident data and Transport Scotland's IRIS database revealed that a total of six snow related road closures have been recorded on the section of the A96 through the Glens of Foudland in the six-and-a-half-year period between October 2011 and March 2018. No data was available prior to 2011. According to the data, no snow related road closures occurred in 2011, 2012, 2017 or in the first three months of 2018. This equates to an average of approximately one snow road closure per year between 2011 and 2018.

BEAR is not required to notify Traffic Scotland of any incidents, or to record any closures that are less than four hours in duration. The six snow related incidents recorded could therefore be an underestimate of the snow closures that have occurred on the A96 since 2011 but no definitive record exists beyond the six closures listed in Table 1.

Date	Closure Reason	Start Time	End Time	Location Description
13 <sup>th</sup> Feb 2013	Snow	12:40	17:20	Glens of Foudland
26 <sup>th</sup> Jan 2014	Snow	12:06	Unknown	Glens of Foudland
14 <sup>th</sup> Feb 2014	Snow	21:10	Unknown	Glens of Foudland
26 <sup>th</sup> April 2015	Snow	14:00	21:00	Glens of Foudland
20 <sup>th</sup> Nov 2015	Snow	21:00	Unknown	Glens of Foudland
7 <sup>th</sup> Jan 2016	Snow	20:55	Unknown	Glens of Foudland

Table 1 – Recorded Snow Road Closures from Traffic and Transport Scotland’s incident Databases (Glens of Foudland)

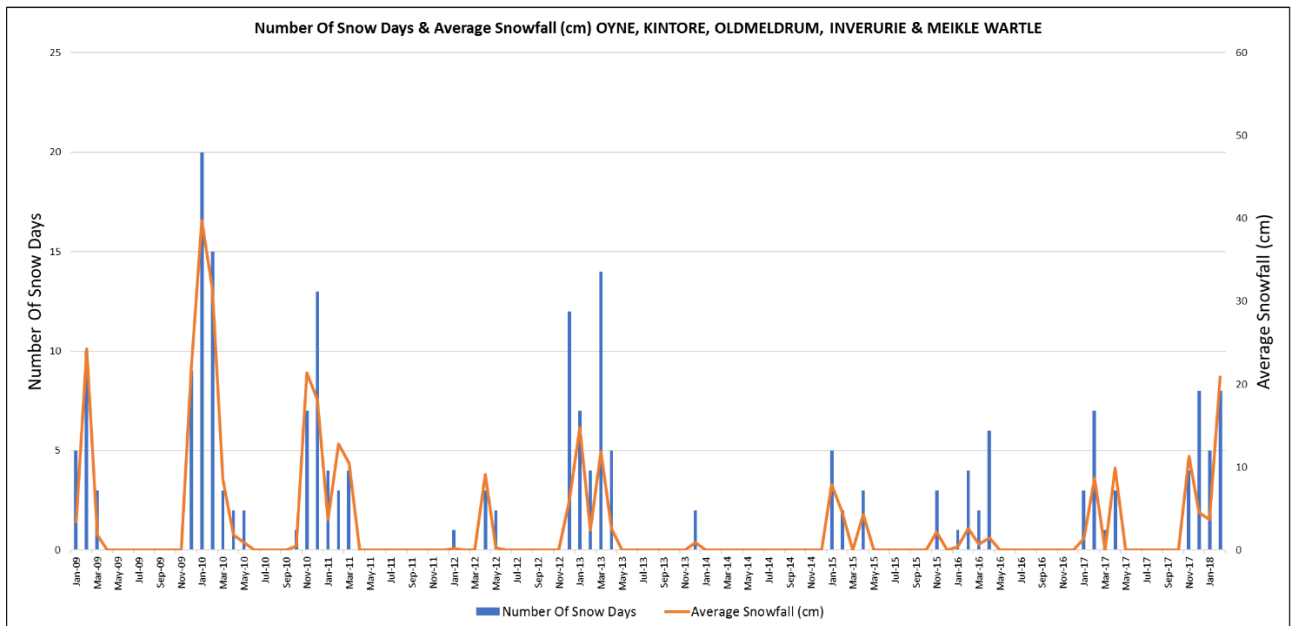
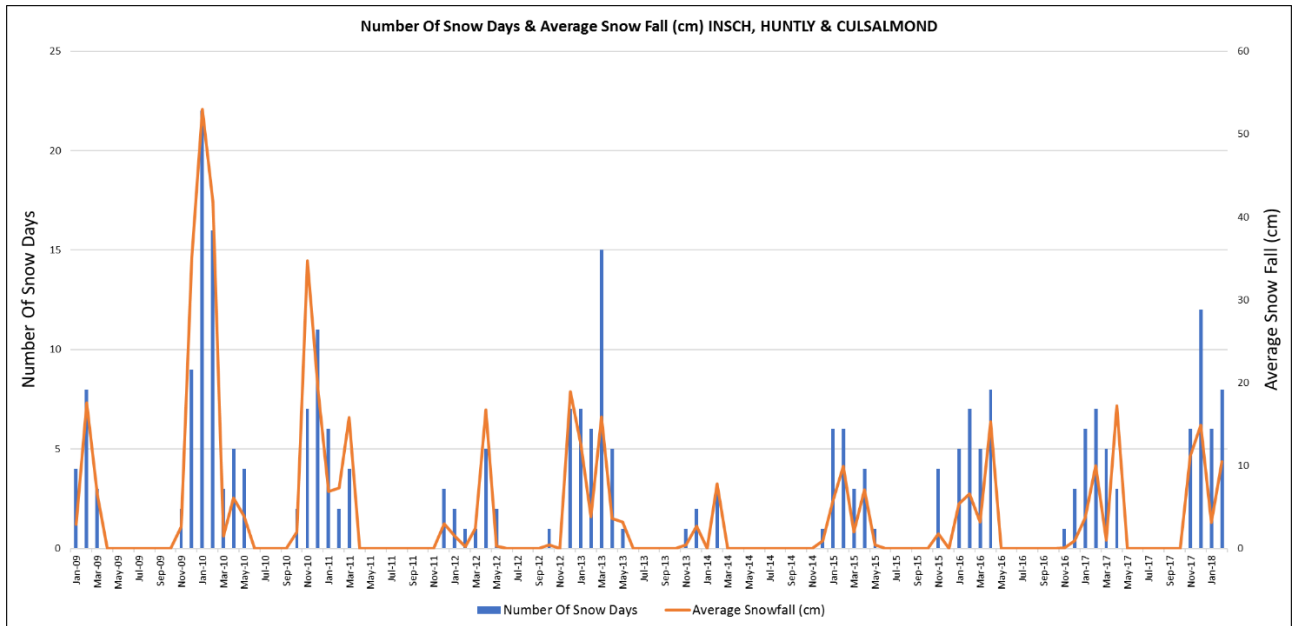


Figure 8 - Snowfall Data

### 4.3 Comparison of elevation between existing A96 and CN01

While it was not possible to compare snowfall data for the CN01 corridor and the existing A96, a comparison of elevation through the two corridors was carried out to identify the extent to which the CN01 corridor follows lower ground and may, therefore, be less susceptible to poor weather conditions.

Figure 9 displays height data for the A96, A97, B9002 and surrounding roads close to the proposed alignment. On the existing A96, the highest points between Huntly and Oyne Fork

lies just west of the Glens of Foudland area, at Hillhead. A maximum height of 275m is recorded within this area, with average heights of over 250m for approximately 2.5km. The road elevation between the virtual snow gates ranges from 150m to 275m although the location is a function of the diversion routes as well as elevation. The road elevation within the Area Requiring Special Attention for winter maintenance on the existing A96 is between 200 and 260 metres.

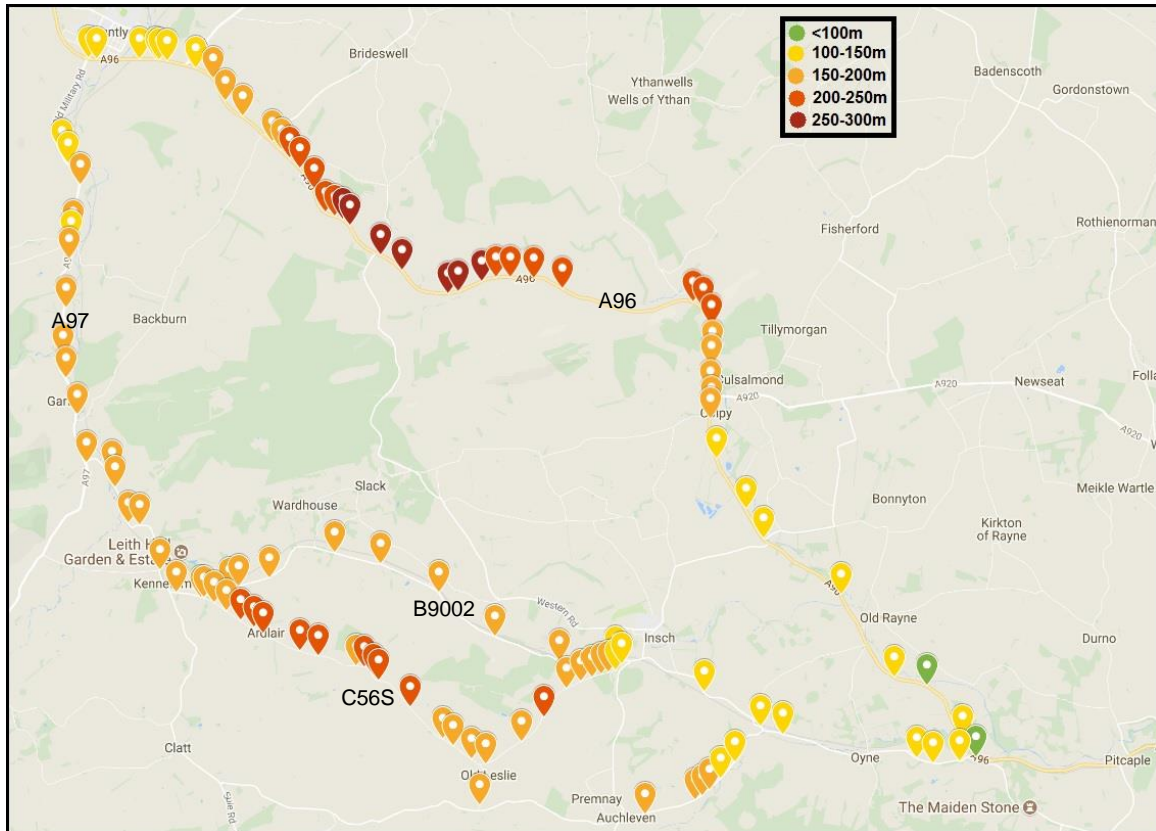


Figure 9 - Elevations Along A96, A97, B9002 and Surrounding Roads

The CN01 alignment from Huntly to Kennethmont, and along the B9002, sits at an elevation of between 150-230m for the majority of the route between Huntly and Inch. Elevations drop below 150m from Inch to Oyne Fork. Figure 10 shows more detailed elevation data of the proposed alignment through CN01 compared with the existing A96 section from Huntly to Oyne Fork, and the existing A97 and B9002 through the CN01 corridor.

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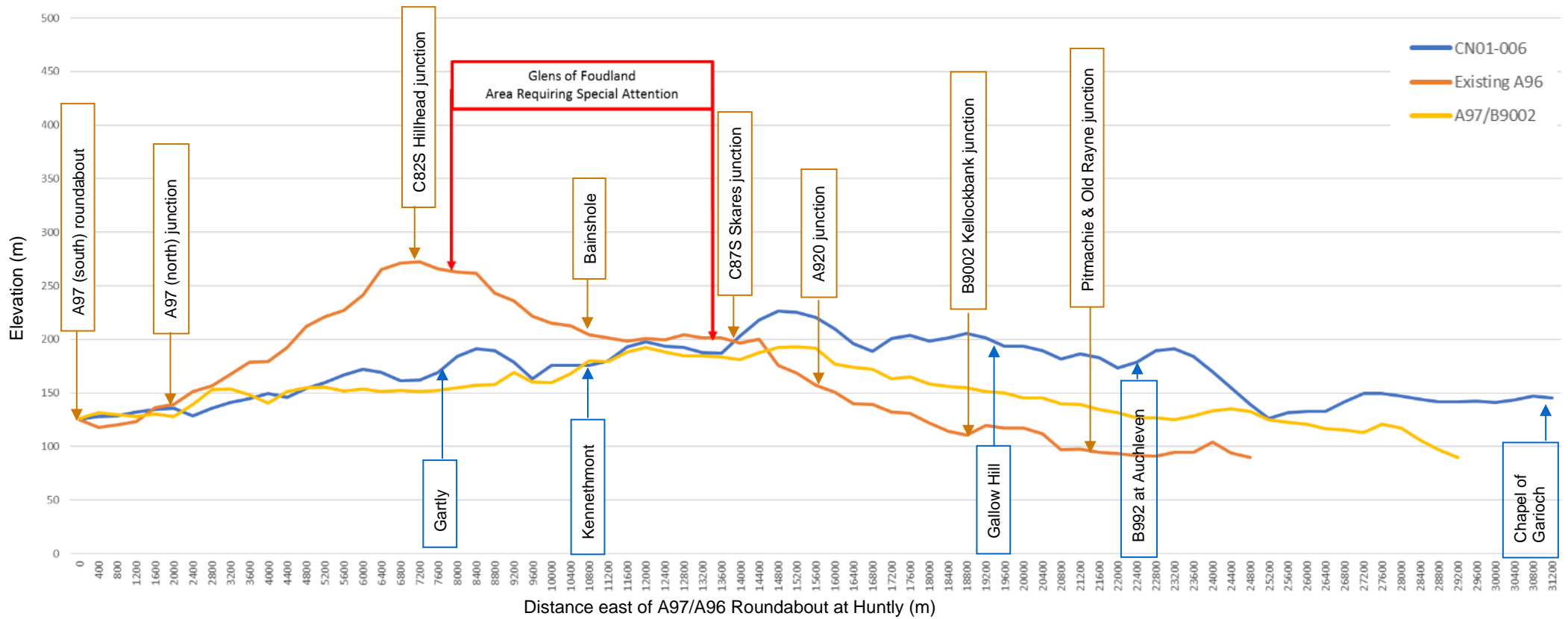


Figure 10 – Comparison of Elevations on CN01 alignment, Existing A96 and Existing A97/B9002 route through CN01 corridor

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All six reported road closures on the A96 found in the IRIS database were associated with heavy snow at the Glens of Foudland which lies at an elevation of 200-275m. CN01 offers potential to reduce the length of route above 200m compared to the existing A96.

To the west of the Glens of Foudland, the CN01 corridor generally offers lower ground than the existing A96 and therefore may be less susceptible to winter weather. It eliminates the 2.5km of existing route that is above 250 metres.

However, to the east of the Glens, CN01 is generally of a similar height to the existing A96 at Bainshole ie 200 metres, which is the threshold level above which the Area Requiring Special Attention for winter maintenance at Glens of Foundland operates. CN01 does not fully remove the risk of snow closure, with 4km above 200m elevation. This is, however, a reduction on the 8.2km of the existing route that is above that level.

#### 4.4 Incident and Accident data review

The accident rate on this section of the A96 is comparable with the national average accident rates for ‘all accidents’ and ‘Fatal’ accidents but is above the national average for ‘Serious’ accidents.

The accident rates (per 100 Million Vehicle Kilometres) along this section of the A96 are shown in Table 2.

	All	Serious	Fatal
National average	10.1	2.0	0.5
A96 between Colpy and Huntly	9.76	3.25	0.46

Table 2: Accident rates on A96 Huntly to Colpy

In addition to the six closures recorded for snow, a further 25 road closures recorded in Traffic Scotland’s incident database on the A96 between Huntly and Colpy were attributed to road traffic collisions (RTCs). These RTCs may have occurred during snow or icy conditions. A check was therefore undertaken against Transport Scotland’s personal injury accident (PIA) database to determine whether snow or ice was recorded as a contributory factor. Ten of the RTCs matched with Transport Scotland’s PIA database, however none of these RTCs occurred during snow or icy conditions.

The 15 unmatched RTCs are most likely non-injury or damage only accidents which may not have been reported to the police. Transport Scotland do not hold information on non-injury accidents and Police Scotland were unable to provide any more detailed information on



weather conditions for these unmatched RTCs. A check was therefore made against the date of the unmatched RTCs and monthly historical snowfall data for Huntly, the closest location where climate data was available. Ten of these RTCs occurred in months where snowfall was recorded at Huntly, however, as no daily snowfall data was available, it cannot be conclusively determined whether snow or ice was a contributory factor in these RTCs.

A review of 10-year Personal Injury Accident (PIA) data provided by Transport Scotland (2007-2016) revealed that 47 accidents occurred on the A96 between Huntly and Colpy. 17 of these accidents, (36%) occurred in snow or icy conditions. Approximately two-thirds of the accidents were therefore not attributed to snow or ice.

The majority of these snow and ice related accidents (15) occurred on the bendy section of the A96 single carriageway between Thomastown and Bainshole, where overtaking and loss of control on bends were identified as primary contributory factors in the accident reports. This suggests that whilst weather conditions may have a part to play in these accidents, poor road geometry and limited overtaking opportunities is a primary factor, particularly as two-thirds of the accidents were not related to snow or ice.

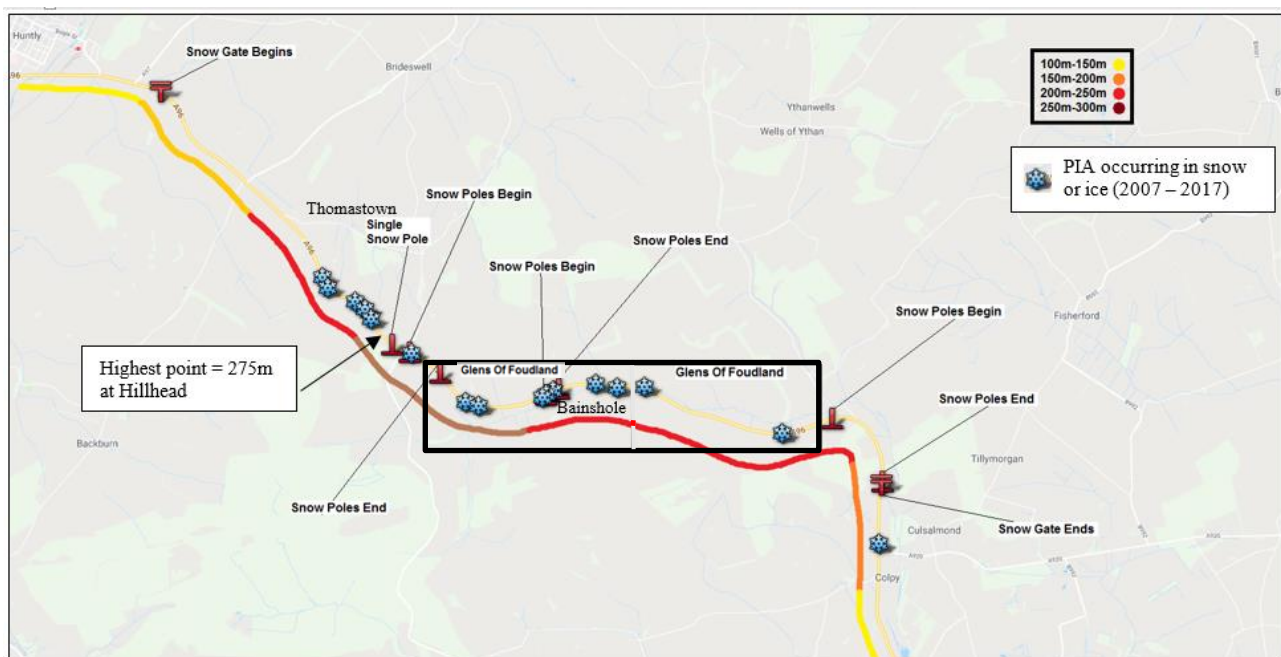


Figure 11 – Location of Personal Injury Accidents occurring in snow or icy conditions on the A96 between Huntly and Colpy in the 10-year period.

Bainshole bends is a recognised accident cluster site with 8 accidents (1 fatal, 3 serious and 4 slight), occurring in the 5-year period between 2012 and 2016. All of these accidents involved loss of control on the bends, 50% of which occurred on wet or icy road conditions. Aberdeenshire Council commented that this area has a problem with loss of control accidents associated with the tightening bend, narrowness of the road as it passes over the Glen Water, and camber of the road. Several accident remedial measures have been introduced including water jetting, resurfacing and anti-skid surfacing, bend warning signs and chevrons, double white lines, painted barrier and hazard marker posts.

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Accident data for the A96 between Huntly to Oyne Fork was compared to data provided by Aberdeenshire Council for the A97 and B9002, through the CN01 corridor for the period 2012 to 2016. The A97/B9002 route was found to have 33.3% of accidents occurring within the winter months.

Upgrading the existing A96 to a category 7A dual carriageway could resolve many of the existing safety issues along the existing A96 corridor area by improving the road geometry and drainage, removing direct access to the trunk road and providing safe overtaking opportunities.

Whilst the CN01 corridor does offer lower elevation than the highest point on the existing A96, a new dual carriageway in this corridor would still be above 200m for over 50% of its length and there is no guarantee that this route would not also be subject to inclement winter weather conditions.

In addition, a road through the CN01 would be approximately 6km longer than the existing A96 and is approximately 8km south of the existing A96. As such, CN01 may be less attractive to some road users as it is a longer and less direct route. Thus, providing a new dual carriageway along CN01 may not fully address the current winter and safety related issues experienced by trunk road users who currently use the existing A96 and may continue to use this route in preference to CN01.

## 5 Traffic Modelling

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### 5.1 Overview

The CN01 alignment was tested using the most current, available version of the A96 Corridor Route Assignment Model (CRAM v1.3) to identify the level of re-assignment and the potential journey time benefits likely to occur with this option.

The A96 CRAM is a strategic traffic model developed specifically for use on the A96 Dualling scheme.

This modelling was carried out prior to determining end-to-end alignments or junction locations and therefore the modelling reflects a dual carriageway between Huntly and Oyne Fork (the CN01 extents), with the route returning to the existing A96 east of Oyne Fork. This is commensurate with the First Fix Appraisal methodology.

Junction locations and form have not yet been determined. For the purposes of this additional traffic modelling work, it was assumed that two grade separated junctions would be required as shown in Figure 12 below.

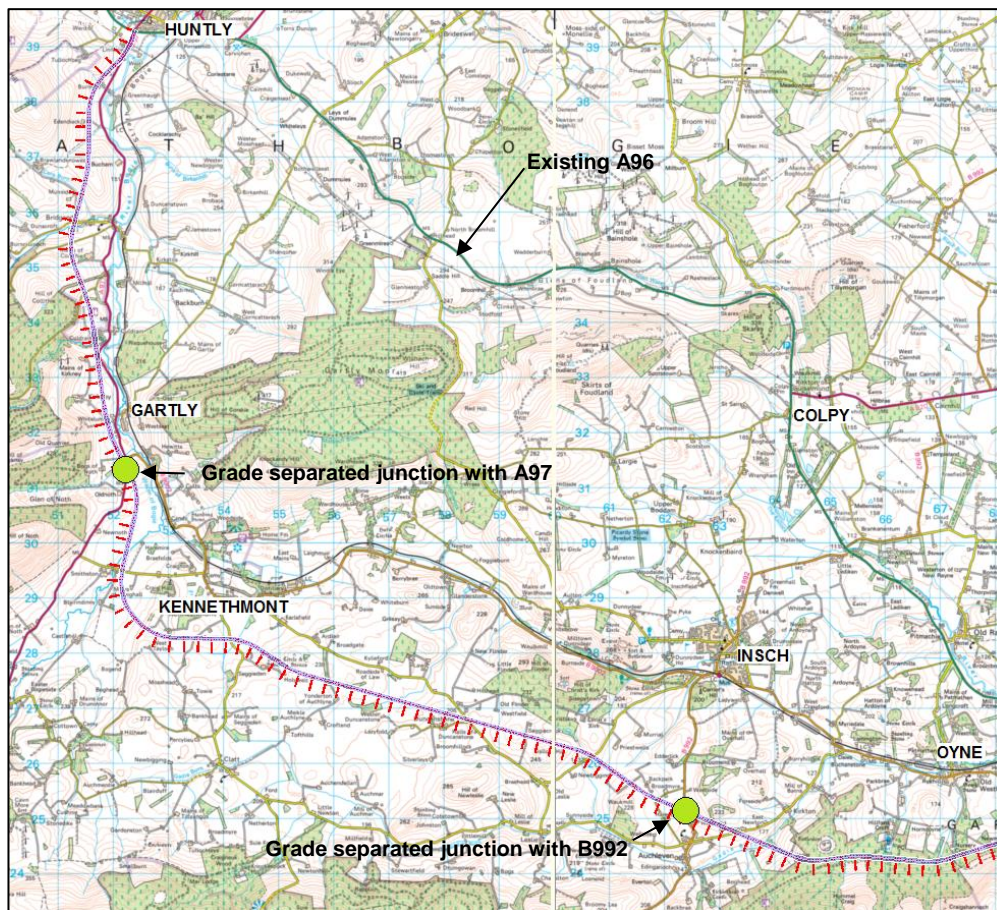


Figure 12 - CN01 First Fix Alignment Drawing Showing Modelled Grade Separated Junction Locations

## 5.2 CN01 alignment modelling results

Modelling results from the testing of the CN01 alignment suggest that the new alignment fails to attract large volumes of trunk road traffic and shows that the majority of traffic is predicted to remain on the existing route. The percentages of traffic removed from the A96 between Huntly and Pitcaple during peak hours are shown in Table 3.

Peak Period	Percentage of Traffic Removed from Existing A96, East of Huntly
AM Eastbound	37%
AM Westbound	32%
PM Eastbound	34%
PM Westbound	35%

Table 3: Predicted Re-assignment of traffic to CN01 alignment

Traffic removed from the A96 by CN01 ranges from 32-37% with a maximum recorded reduction of 322 PCU's on the A96, westbound through the Glens of Foudland during the PM peak.

The low level of trunk road re-assignment suggests that the remoteness of the CN01 route does not provide the most efficient journey for the origins and destinations of the trips using the existing trunk road.

The CN01 alignment is successful in attracting some new trips from the local road network, although, the volumes are low and do not offset the volume of traffic which remains on the existing A96.

## 6 Summary and Conclusion

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### 6.1 Summary

The findings from the work carried out following the First Fix Alignment Workshop are summarised below.

#### Engineering review

- First Fix Alignments through Strathbogie were revised, however, significant engineering challenges remain, including large scale earthworks, and crossings of the railway, A97 and River Bogie Floodplain. This includes viaducts of up to 1km to cross the River Bogie floodplain and railway line and a further 400m viaduct to re-cross the railway and river.
- The alignment through the CN01 Corridor is significantly longer, up to 6km longer, than the existing A96.
- The changes to the alignment do not significantly reduce the major environmental impacts identified during First Fix Appraisal which included Major adverse landscape and visual impacts within the high sensitivity landscapes of Strathbogie and Major adverse impacts due to river crossings and floodplain. There were also considered to be Major adverse impacts on sensitive habitats.

#### Network Resilience and Accidents

- CN01 eliminates the 2.5km of existing route that is above 250m and reduces distance above 200m from 8.2km to 4km.
- Six snow closures on the A96 were recorded by Traffic Scotland & BEAR in a six- and-a-half-year period (2011 – 2018) (no data available prior to 2011). All of them were recorded in the Glens of Foudland area.
- The available records do not support the perception of frequent closures due to snow on the existing A96, although not all such closures may have been recorded. The majority of recorded closures on this section of the A96 are related to accidents rather than snow closure.
- Accidents on the A96 through Glens of Foudland are above national average for 'Serious' accidents and poor weather may play some part in this trend. Two-thirds of the accidents in this area were however not attributed to snow and ice, with the majority of accidents being associated with overtaking and loss of control on bends. The risk of accidents would be reduced by providing a Category 7A dual carriageway which offers improved alignment, visibility and drainage.

#### Traffic Modelling:

- The CN01 alignment is remote from the existing A96 and is longer than the existing A96 by 6km (24%).

- Based on traffic modelling using the available model and comparing the dualling from Huntly to Oyne fork compared to the existing A96, the CN01 route attracts only 35% of existing A96 traffic from the Glens of Foudland (circa 2,600 vpd) while 65% of traffic will continue to use existing A96 between Huntly and Inverurie (circa 4,900vpd)

## 6.2 Conclusions

CN01 was investigated for the potential to improve network resilience by following a lower lying route with elevations potentially less susceptible to poor weather conditions compared to the existing A96. However, the CN01 corridor presented challenging topography throughout, with a significant section of up to 4km in length, south east from Leith Hall, lying at elevations between 200 to 230 metres. The Glens of Foudland section of the existing A96 route, which is designated as an Area Requiring Special Attention during winter weather, has an elevation of 200 to 275 metres. A CN01 route does therefore not definitively remove the risk of closure for snow but would reduce the likelihood given the change in maximum elevation.

Records suggest that this section of the A96 is closed for snow related incidents on average once a year but the majority of closures in the area are for accidents rather than closures for snow. There is a higher than average accident rate in this area however, only one third of the accidents occur in snow or icy conditions. The majority of the accidents in this area are associated with overtaking manoeuvres and loss of control on bends. Whilst the risk or severity of accidents may be exacerbated by poor weather conditions, the accident data indicates that poor road geometry and limited overtaking opportunities are the main contributory factors in these accidents which would be addressed by a Category 7A Dual carriageway to standard.

In traffic terms, the modelling of a dual CN01 route over the section between Huntly and Oyne fork indicates that a large proportion of traffic will not re-assign because of the significantly longer length compared to the existing A96 length.

In engineering and environmental terms, design improvements to CN01 First Fix alignment or alternative options considered do not sufficiently address the major adverse impacts identified on the original First Fix alignments.

In summary, the available records indicate that road traffic accidents are a greater source of road closures than snow in the Glens of Foundland area, two-thirds of which were not related to snow or ice. It is considered that closures would likely be addressed by improved and widened alignment to category 7A dual carriageway standard. Additionally, while CN01 removes the peak of the existing elevation and should reduce the likelihood of closures for snow, it leaves a significant length of road above the elevation at which the existing Area Requiring Special Attention for winter maintenance is currently in operation.

Accordingly, it is not considered that the CN01 route provides sufficient additional resilience to compensate for the substantial engineering challenges and Major adverse environmental impacts associated with the CN01 corridor. It is concluded that the additional assessment, design revisions and traffic modelling validate the workshop decision not to progress CN01 to Second Fix.