

Appendix K

Online at Inverurie – Dualling
Feasibility and Appraisal

Transport Scotland

A96 Dualling East of Huntly to Aberdeen

Online at Inverurie - Dualling Feasibility and Appraisal

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Glossary of terms/Abbreviations

AWPR	Aberdeen Western Peripheral Route
BGS	British Geological Survey
DMRB	Design Manual for Roads and Bridges
GDL	Gardens and Designed Landscape
GIS	Geographic Information Systems
HES	Historic Environment Scotland
HIC	High Impact Constraints
HIA	High Impact Areas
IIP	Infrastructure Investment Plan
km	Kilometres
LDP	Local Development Plan
m	Metres
NMU	Non-Motorised User
SAC	Special Area of Conservation
SBC	Strategic Business Case
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SGN	Scottish Gas Networks
SNH	Scottish Natural Heritage
SO	Scheme Objective
SSE	Scottish and Southern Energy
STAG	Scottish Transport Analysis Guide
TEE	Transport Economic Efficiency
TS	Transport Scotland

1 Introduction

1.1 Background

This report records the decision to de-select online dualling of the A96 through Inverurie as an option for the A96 Dualling East of Huntly to Aberdeen scheme. The Online Inverurie (OLI) option was sifted out as part of the First Fix Appraisal, with a recommendation to undertake further work on the junction provision at the existing Blackhall Roundabout. This report records the First Fix Appraisal and the outcome of the further study.

2 First Fix Alignments Appraisal of Corridor Option On-Line Inverurie (OLI)

2.1 Overview

An online dualling strategy through Inverurie was considered through the DMRB Stage 2 assessment process and three First Fix Alignments were appraised qualitatively against the A96 Dualling East of Huntly to Aberdeen Scheme Objectives and STAG criteria.

2.2 Development of First Fix Alignments

The principal alignment is a widening of the existing A96 between Inveramsay Bridge and Inverurie Roundabout, approximately 6.6km.

Through the built-up area of Inverurie, the only option is an online widening of the existing A96 due to the constraints of the existing urban area of the town to the north. Routeing off the existing A96 to the south is constrained by existing properties, new development sites, scheduled monuments, ancient woodland, overhead pylons and topography challenges associated with Hill of Ardtannes and Corsman Hill to the south of Inverurie Golf Club. The widening of the existing A96 through Inverurie is part of the alignment referred to as alignment option OLI-001.

Two localised offline alternatives for sections at the western and eastern ends of the OLI alignment (referred to as OLI-002 and OLI-003, respectively) where the constraints are not as onerous were considered to provide an alternative at localised pinch points. Figure 1 shows the locations of these alignments. This report focuses on the outcome of the OLI-001 online dualling option through Inverurie

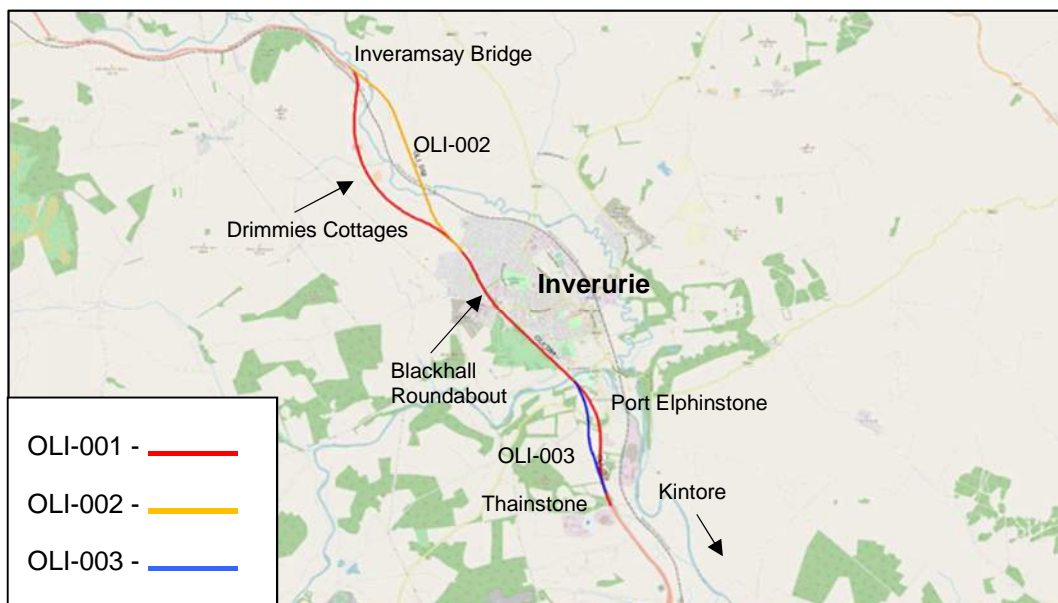


Figure 1 - Online Dualling First Fix Alignments considered for the A96 Dualling between Inveramsay Bridge and Thainstone

The principal design requirement for the A96 Dualling Route is to deliver a DMRB Category 7A All Purpose Dual Carriageway (D2AP) which requires the provision of grade-separated junctions wherever possible. The First Fix design development and appraisal did not consider junctions as the alignments were based within separate corridor areas, Online Inverurie (OLI) being one such corridor. Accordingly, at First Fix Stage there were no end to end alignments to effectively assess junction performance and although there was a recognition that junctions at Inverurie would ultimately be required, the First Fix design development was undertaken based upon dual carriageway provision only.

2.3 First Fix Appraisal Findings

The First Fix Appraisal found that although the online dualling through Inverurie had the potential to positively contribute to the A96 Dualling East of Huntly to Aberdeen Scheme Objectives, it was not possible to accommodate a dual carriageway through Inverurie without direct conflict on residential properties. For the purposes of the appraisal, residential properties are considered to mean the house and garden of a property.

2.3.1 Engineering First Fix Appraisal

The Engineering appraisal confirmed that the existing A96 through Inverurie is constrained on both sides due to the proximity of residential and commercial property boundaries. Direct conflicts with residential properties could be minimised by retaining the existing A96 as the eastbound carriageway of a dualled A96, thereby undertaking all widening of the road to the south away from the main built up area of Inverurie. However, at constrained areas, primarily around Blackhall Roundabout, there is insufficient width between residential properties to accommodate a dual carriageway without direct conflict and impingement upon residential properties. Also, throughout this area, the existing landscaping and screening bunds through Inverurie would need to be removed to accommodate a new dual carriageway.

While the basic premise was the majority of the widening for a dual carriageway could be undertaken to the south side of the existing A96 to minimise impact, there were key pinch point locations where constraints exist that meant a dual carriageway would require to be aligned through whatever gap was available. These locations are shown in Figure 2 and described in Table 1. Given the proximity of these constraints to the existing A96, they represent the areas where the scheme would have the biggest engineering impact.

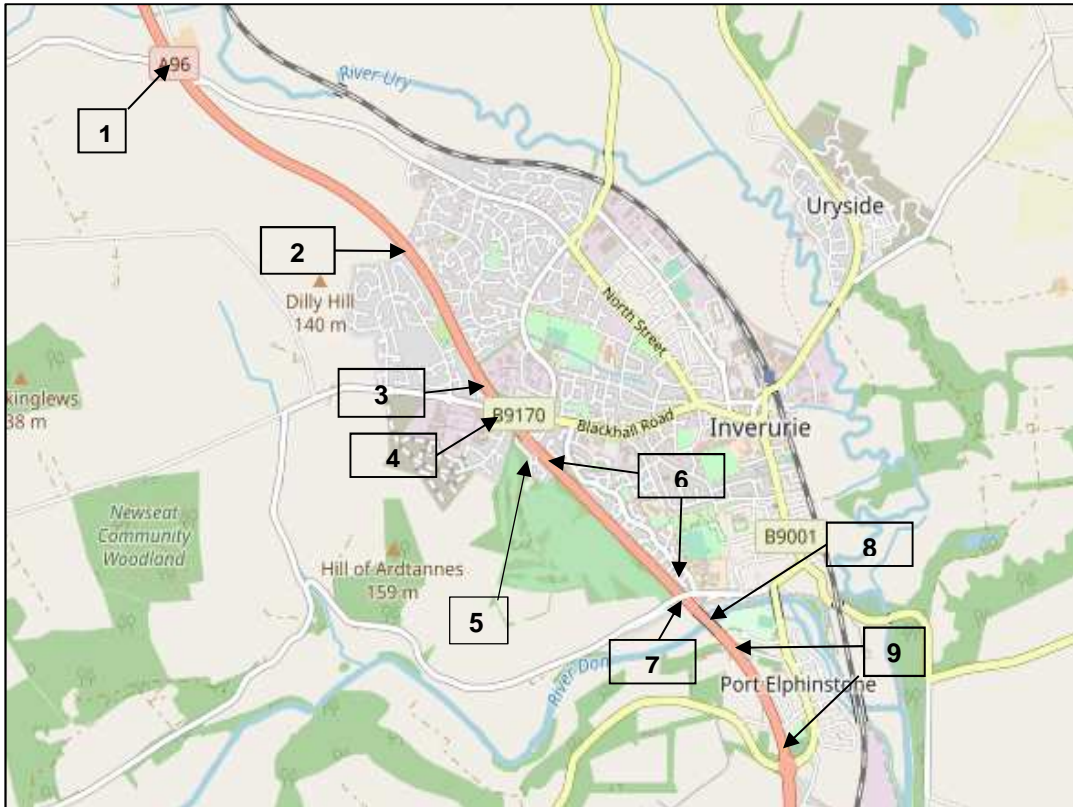


Figure 2 - Existing A96 at Inverurie, First Fix Engineering Constrained Locations

Table 1 - Engineering Feasibility Constraints for Online Dualling

Location	Existing Constraints	Comments
1- Between the properties of Drimmies Cottage and Drimmies Farm	Existing A96 on embankment 6-8m and width between toe of slopes 40-45m. Both the cottage boundary and farm access road are adjacent to the toe of slope.	The overall width of road boundary between toe of existing slopes is notionally sufficient to accommodate a dual carriageway cross-section i.e. assuming a straight and level alignment which requires a width of approximately 30m (26.1m back of verge to back of verge plus earthworks/retaining walls). To maintain the existing A96 level for ease of construction, the widened carriageway would require a retaining wall up to 7m high with a length of up to 200m at Drimmies Cottage. Additional width beyond the wall would be required for

Location	Existing Constraints	Comments
		construction and future maintenance.
2- Between the properties of Bruntwood Tap and Cairn Wynd	30-35m between existing boundary fence line. 6-8m cut to south at Cairn Wynd with screening. 2m earth (noise/screening) bund to north to Bruntwood Tap.	Width available for dualling but screening to properties at Bruntwood Tap would be affected. Potential for a retaining wall up to 7m high at a length up to 100m to Cairn Wynd if dualling is widened into the existing cut to the south.
3- Between the properties adjacent to A96, to west nos 37-53 Westburn Avenue and to east, premises in Blackhall Industrial Estate	Circa 45m wide Screening and landscaping bund to properties at Westburn Avenue to south and commercial premises to north.	Width available for dualling but screening to existing properties would be affected. Existing drainage capacity issue with requirement to provide for attenuation/storage. Limited area available within the trunk road boundary post dualling and therefore potentially to be located within land of adjoining properties immediately to the south and/or the commercial premises to the north.
4- Blackhall Roundabout	Existing at grade roundabout	In the absence of a Grade Separated Junction which was not considered at First Fix stage, a north to south link (overbridge or underbridge) would still be required across the A96 for Blackhall Road (B9170). Existing pedestrian/cycle underpass to be maintained or alternative connection provided.
5- Between the properties adjacent to A96, to west nos 2-6 Davah Wood and to east, nos 17-23 Aquorthies Circle	21m between boundary fence lines at narrowest point 2-3m cut to south at Davah Wood with access road to properties immediately outside the existing boundary. Approximately 2m embankment to rear gardens of properties at Aquorthies Circle immediately outside the existing boundary. Boundary fence positioned at top of embankment with toe of slope within property gardens.	Widening online cannot be accommodated without encroaching into adjoining properties at Aquorthies Circle and Davah Wood. This area represents the narrowest part of the existing road boundary for online dualling of the A96 in the Inverurie area. It is also adjacent to the Blackhall Roundabout which, should a grade separated junction be provided, would result in increased encroachment of the alignment into residential gardens / access road. Accordingly, this area is discussed in greater detail below.
6- Between the properties adjacent to A96, to west nos 7-11 Davah Wood and to east, nos 4-16 Golf Park and	6-8m cut at properties of Davah Wood to south Cut slope of varying height and associated landscaping to golf course	Online widening will require retaining wall at Davah Wood, up to 7m high and approximately 150m in length with localised sections at the golf course depending on the line of the dualling provided. This will remove all existing landscaping and for retaining walls additional land

Location	Existing Constraints	Comments
south to River Don	2-3m embankment to properties to north, the main built up area of Inverurie	take for construction and future maintenance access will be required.
7- Upperboat Bridge	Existing overbridge	The structural configuration of the existing overbridge cannot accommodate a dual carriageway and would therefore likely require to be demolished and rebuilt.
8- Existing Don Crossing	River Don Bridge can carry full assessment loading to DMRB standards. It is also in reasonable condition.	The existing bridge would accommodate one carriageway of the dualling scheme. It would not be able to accommodate both carriageways. The additional carriageway would be constructed on a new structure independent of the existing bridge (ie alongside the existing bridge but with a gap separating them).
9- Between Port Elphinstone and Ardennan House/Old Kemnay Road	<p>To the north, the existing A96 is on an embankment with existing properties and school in Port Elphinstone and the cemetery bounding the toe of the embankment slope.</p> <p>To the south, the existing road is in cut up to 6m at Ardennan House Hotel and Old Kemnay.</p> <p>Width at narrowest point between 35 to 40m.</p>	No widening to the north at Port Elphinstone is feasible without significant impact on properties, the school and cemetery. Therefore, all widening would be to the south with retaining walls up to 6m high and approximately 100m in length required to minimise impact on adjoining hotel and properties. Additional land-take outwith the existing trunk road boundary would be required for construction and future maintenance access.

The narrowest point identified in the above table is Location 5, east of Blackhall Roundabout between Aquorthies Circle to the north and Davah Wood to the south and this is shown in Figure 3 below.

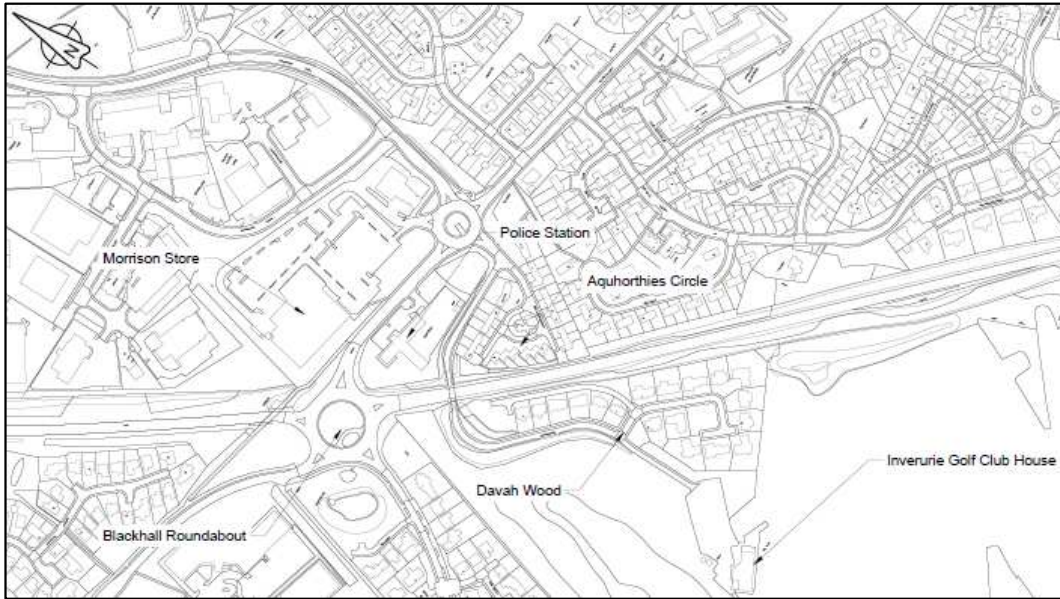


Figure 3 - Aquorthies Circle & Davah Wood, East of Blackhall Roundabout

The available width between existing trunk road boundary fence lines at this location is 21m, with private residential properties immediately behind these boundaries and this is shown in Figure 4. The minimum dual carriageway cross section assuming a straight and level alignment with no earthworks is 26.1m and this is shown in Figure 5.

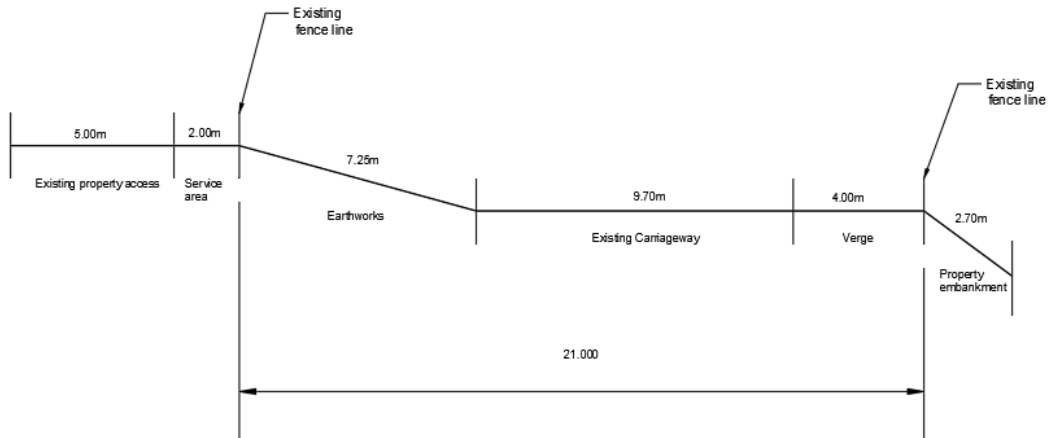


Figure 4 - Cross Section of available width between fence lines at Davah Wood and Aquorthies Circle

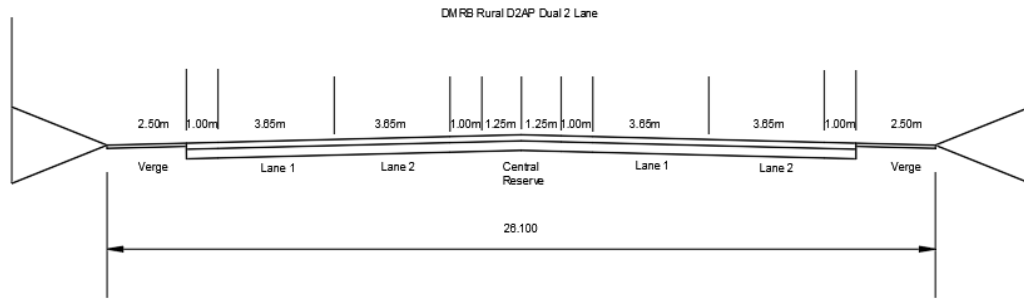


Figure 5 - Minimum Standard D2AP Cross Section

Therefore, any widening at this location, even with retaining structures will encroach and permanently impact on the properties. Depending on which side the existing A96 is widened to, this would include (nos 2-6 Davah Wood) to the south and/or (nos 17-23 Aquorthies Circle) to the north.

In addition to the difficulties in fitting the standard carriageway and verge width within the available space, there would be disruption to properties with land-take required to facilitate access and works during construction, and thereafter for maintenance, along the road boundary/retaining walls. This would typically require a maintenance strip 3m wide to the outside of the earthworks/retention measures, which adds to the width required to accommodate a dual carriageway. A width in excess of 30m would be required for a dual carriageway when only 21m exists within the current highway boundary. Figure 6 shows the footprint of a dual carriageway at this location with options for widening from the south fence line to the north, widening on both sides along existing road centreline and widening from the north fence line to the south.

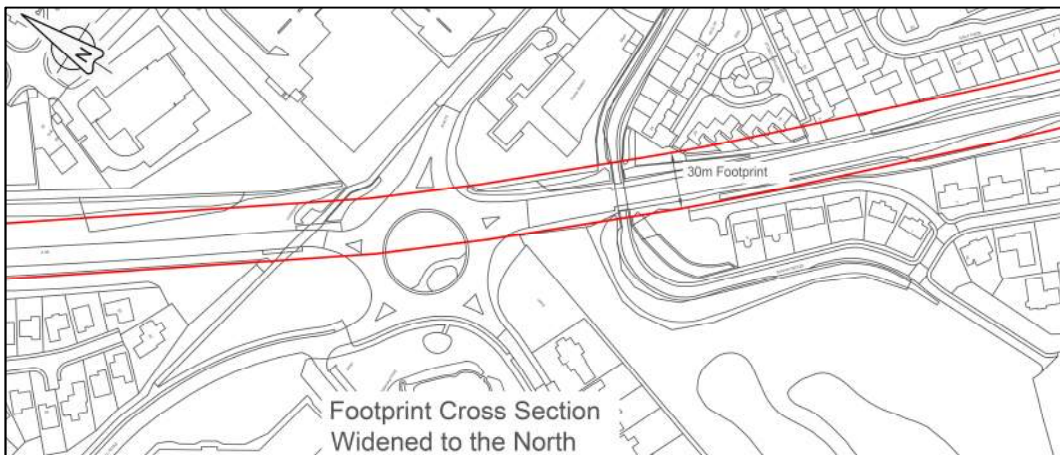




Figure 6 - Online Dualling Option Footprints

Consequently, a dual carriageway without grade separated junction provision at Blackhall Roundabout cannot be accommodated without direct conflict and encroachment onto residential properties. Even if the houses could be avoided depending on which side the road was widened to, a dual carriageway with retaining walls within land currently occupied by residential gardens and access roads to house driveways would be required. The impact on the properties will increase if a grade separated junction is required at Blackhall Roundabout and this is discussed in more detail in Section 3.2.

2.3.2 Environmental First Fix Appraisal

The Environmental appraisal confirmed that the dualling of the existing route is expected to result in major adverse impacts on noise, air quality and visual impacts on a large number of receptors within close proximity to the A96, particularly for those properties bounding the existing A96. The appraisal of the central section noted the densely populated area at Inverurie with properties directly located within the alignment footprint.

Impacts on the water environment were considered to be moderate adverse for the crossing of the River Don floodplain. Land allocated in the LDP was considered to be adversely affected where the alignment passes through the settlements of Inverurie and Port Elphinstone and the Crichie development.

2.3.3 Transportation First Fix Appraisal

A significant volume of A96 traffic is generated from areas to the north of Inverurie and must route through the town to access the existing A96. This traffic joins the A96 at Blackhall and Inverurie Roundabouts and generates peak period congestion and delay.

To maintain adequate access to and from Inverurie, grade separated junctions as required for a DMRB Category 7A dual carriageway, would be provided. A high-level consideration was that a junction strategy permitting the current level of accessibility would not significantly change traffic patterns within Inverurie, although no traffic modelling was undertaken at First Fix to assess impacts. Therefore, providing grade separated junctions at Drimmies to the west, Blackhall and Thainstone to the east were unlikely to have detrimental traffic impact on local roads within Inverurie. However, given these roads currently suffer from peak hour delay and congestion, a dual carriageway along the existing A96 was considered not to offer benefits to local roads and traffic conditions within Inverurie itself.

During construction, widening of existing A96 would result in significant disruption to both the existing A96 and local road traffic as there is no alternative high capacity diversion route available.

2.3.4 Overall First Fix Appraisal Conclusion

The First Fix alignment for an online dual carriageway option through Inverurie is not feasible without encroaching into residential properties in the Blackhall area. Addition of a grade separated junction at Blackhall is likely to have a wider impact with commercial premises in the vicinity of the junction potentially affected in addition to the residential properties. This is discussed in more detail in Section 3, Further Assessment. Throughout the remainder of the corridor it was considered there would be major negative engineering and environmental impacts due to the proximity and number of adjacent properties.

2.4 First Fix Appraisal Recommendations

It was recommended that due to the impact on existing properties, the online option through Inverurie should be sifted out and not taken forward to Second Fix.

It was acknowledged that the First Fix assessment was based primarily on alignment impacts and that junctions had not been formally assessed. As only qualitative traffic analysis was carried out, it was recommended that traffic modelling should be carried out using available local traffic models to assess the need for, and impact of junction options on traffic behaviour.

3 Further Assessment

3.1 Overview

The further work on traffic modelling assumed that the existing access points to the A96 through Inverurie would be maintained, namely grade separated junctions to the west at Drimmies, to the east at Thainstone and at Blackhall. Junction options to the east and west of Inverurie are also being considered on other dualling options, principally a southern bypass of Inverurie and are therefore not unique to the OLI option. A grade separated junction at Blackhall, which also

coincides with the narrowest part of existing trunk road boundary, is therefore the critical junction in terms of the OLI option.

The current junction at Blackhall Road is an at-grade, five-arm roundabout which provides access to Inverurie town centre via the B9170 (Blackhall Road) to the north; the residential area along Corsmanhill Drive to the south; and substantial business and residential developments to the west, which are accessed from Blackhall Road. Further west, beyond these developments, Blackhall Road provides access to the rural areas west of Inverurie.

The further assessment included outline engineering appraisal of junction options for Blackhall Roundabout and traffic modelling of each of the options using the available strategic traffic model (CRAM v1.3).

The principal design requirement for the A96 Dualling Route is to deliver a DMRB Category 7A All Purpose Dual Carriageway (D2AP) which requires the provision of grade-separated junctions wherever possible. First Fix Appraisal, and the subsequent further assessment, were therefore carried out on the premise that a grade-separated junction should be provided.

Three junction scenarios were developed and assessed in terms of traffic performance with outline engineering work undertaken to illustrate the implications of fitting the junction arrangements. These were:

- Option 1: A96 dualling with no junction connections at Blackhall to test the need for a junction
- Option 2: A96 dualling with full diamond grade separated junction at Blackhall junction.
- Option 3: A96 dualling with half diamond east facing slip roads at Blackhall junction.

3.2 Assessment Findings

3.2.1 A96 Dualling - no junction at Blackhall (Option 1)

Option 1 considered an online dualling with no junction provision at Blackhall. Access from/to the A96 and Inverurie would be provided by grade-separated junctions to the west, at Drimmies, and to the east, at Port Elphinstone/Thainstone.

The Engineering assessment of Option 1 is described in Section 2.3 of this Report. As no junction is required, this option offers the opportunity to widen the existing road close to existing road levels and thereby potentially minimises earthworks and the subsequent corridor width required. However, as described, the available space within the existing road boundary is not sufficient to accommodate a dual carriageway width.

In addition to the mainline impact, access across the dual carriageway for the existing Blackhall Road (B9170) would be required to maintain connectivity between north and south of Inverurie. The impact of the side road link would be as follows:

- Providing a side road overbridge or underbridge would impact on the surrounding properties and commercial premises. This would likely require the realignment of Blackhall Road on the line of the current cycle and footpath underpass.

- The realigned side road would be close to the properties on Westburn Avenue and lowering or raising of the road would likely require a retaining structure to minimise impact.
- Removal of the existing underpass for cyclists and pedestrians would require provision of an alternative underpass and/or overbridge.

Traffic modelling of Option 1 showed that removal of the junction at Blackhall would result in severe traffic congestion on the local road network. This junction currently provides a key point of access to and from Inverurie, accommodating almost half of the traffic travelling between the town and the A96. Junction Turning Counts carried out in March 2018 showed 46% of trunk road traffic access Inverurie via Blackhall junction, 46% via Inverurie Roundabout and 8% via Drimmies junction.

By removing Blackhall junction, traffic travelling to and from Inverurie must re-route to the new grade separated junctions at Drimmies, in the north, and Port Elphinstone/Thainstone, to the south. Modelling shows that the majority of traffic re-routes via Port Elphinstone/Thainstone, resulting in severe congestion in eastern Inverurie. Both junctions at St James's Place/Elphinstone Road and High Street/Keithhall Road would be over capacity during the PM peak period indicating that this option is likely to generate significant traffic congestion within eastern Inverurie.

This assessment confirms that a junction would be required at Blackhall Road to better distribute traffic travelling to and from Inverurie.

3.2.2 'Full Diamond' Grade separated junction (Option 2)

Provision of a grade-separated junction at the existing at-grade Blackhall Roundabout would increase the land required and the impacts identified at First Fix, particularly at the locations closest to the junction and the narrowest section at Davah Wood and Aquorthies Circle.

Outline options for a grade separated junction, incorporating retaining walls, were considered to minimise the land required. Retaining walls would be required to achieve a level difference of approximately 7m between the mainline and slip/side roads. This would be in addition to retaining walls to the properties north and south of the existing A96 to accommodate the existing level differences of 2 to 3m between the existing A96 and gardens/access roads. In total, the combined height of retaining walls could be up to 10m high. These would taper down over the slip road lengths but would be of the order of 350m in length to the east and west of the junction. The cross-sectional width required to accommodate the dual carriageway and slip roads was used to determine the likely footprint of the junction as shown in the following, Figure 7 and Figure 8.

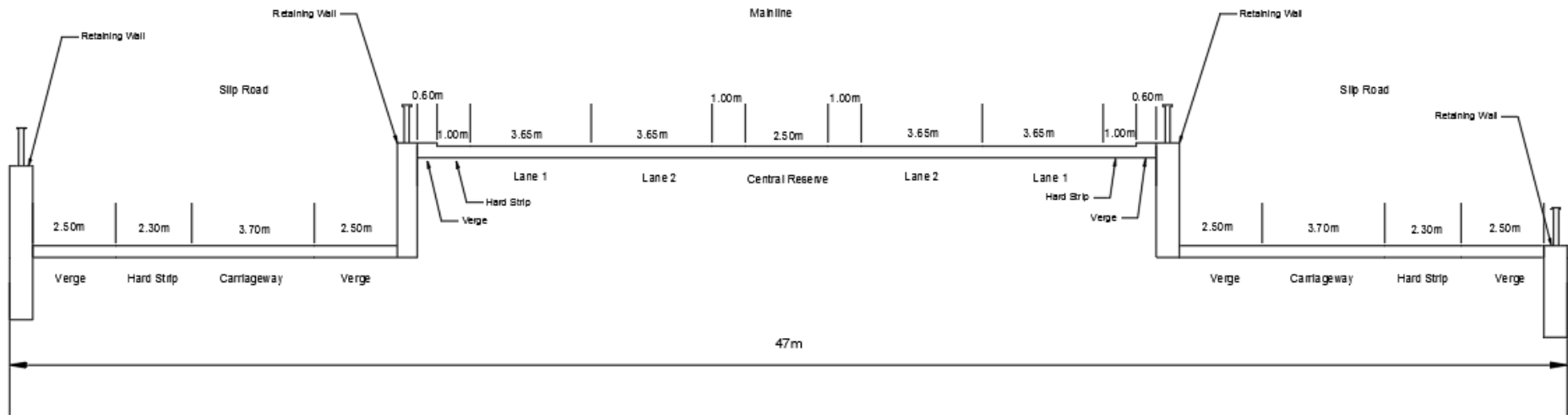


Figure 7 - Option 2 Grade Separated Junction Cross Section Width

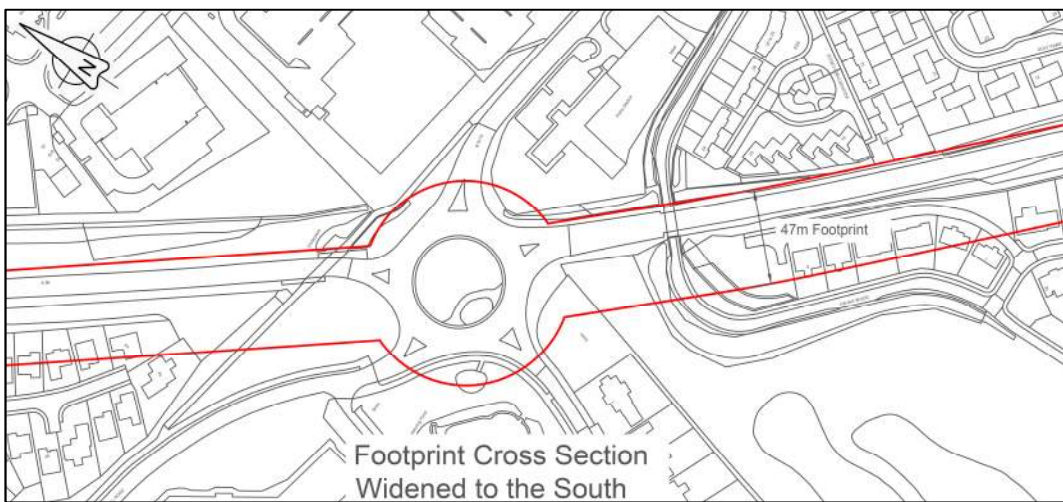
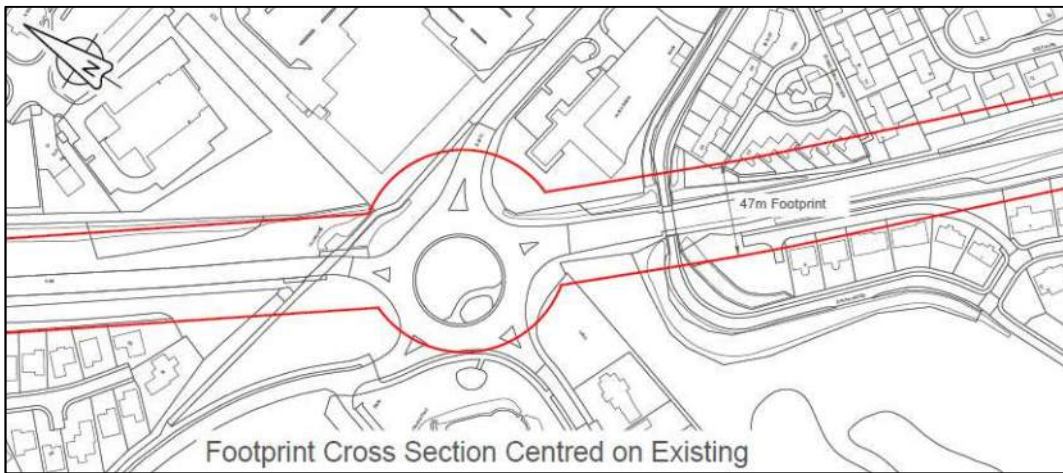
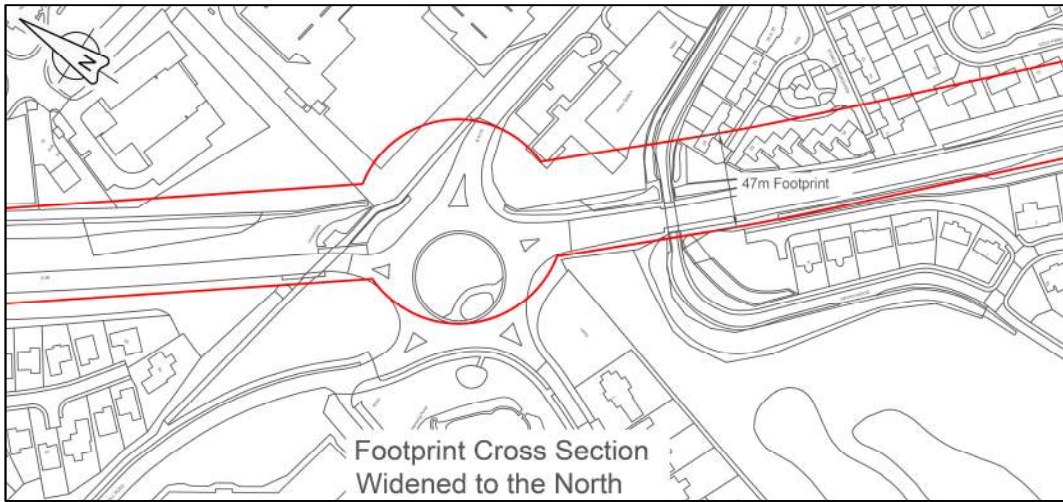


Figure 8 - Option 2 Grade Separated Junction Footprint at Blackhall

The engineering impacts of Option 2 are summarised as follows:

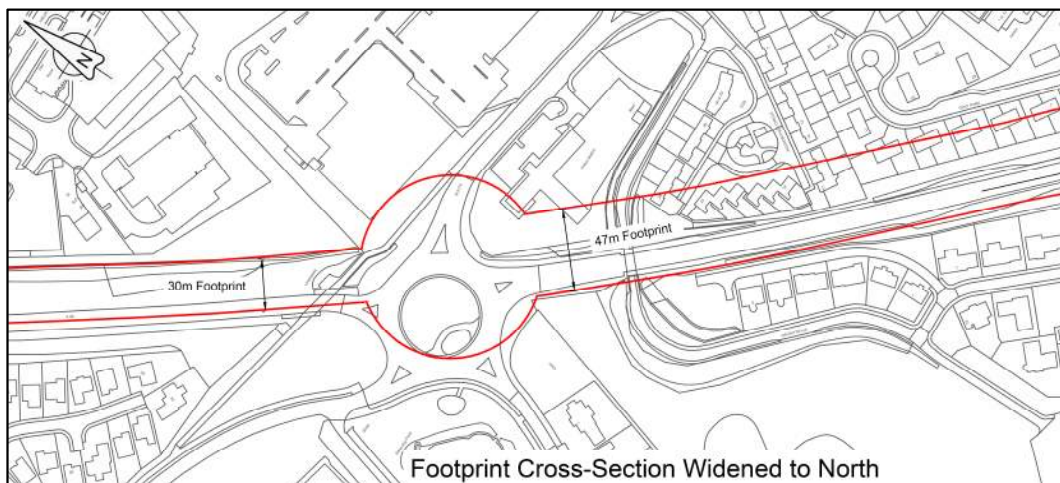
- Online construction of a grade separated junction would be challenging while maintaining traffic flows. Either the mainline or slip roads would require substantial raising or lowering by 7 to 8m to accommodate grade separation.
- There would be a corresponding increase in the impact on the properties in Aquorthies Circle and Davah Wood as a consequence of the wider road width to accommodate slip roads and height of retaining walls due to the change in road levels, which would require property demolition.

In traffic terms, providing a dual carriageway with a full diamond grade separated junction at Blackhall significantly reduces congestion on the local road network compared to no junction provision under Option 1. The modelling showed that Option 2 offers significant improvements over Option 1, as it provides access between the A96 and western Inverurie. However, Option 2 fails to fully address the local congestion issues within Inverurie as vehicles still need to travel through the town to and from the A96. Congestion would likely be exacerbated with the new and proposed development traffic on the north side of Inverurie travelling towards the new A96.

3.2.3 'Half Diamond' Grade separated junction (Option 3)

Traffic data at Blackhall Roundabout shows that the dominant movement is between Inverurie and the A96 east of Blackhall. A variation of the full diamond grade separated junction was therefore considered to reduce the impact by considering a half diamond junction at Blackhall junction with only east facing slip roads.

While this option reduces the land required to the west of the junction with the removal of the slip roads, the impact east of the junction would be the same as Option 2 to accommodate the east facing slip roads. This would impact on properties at Davah Wood, Aquorthies Circle and Police Scotland premises. The cross-sectional width required to accommodate the dual carriageway and east facing slip roads was used to determine the likely footprint of the junction, which is shown in Figure 9.



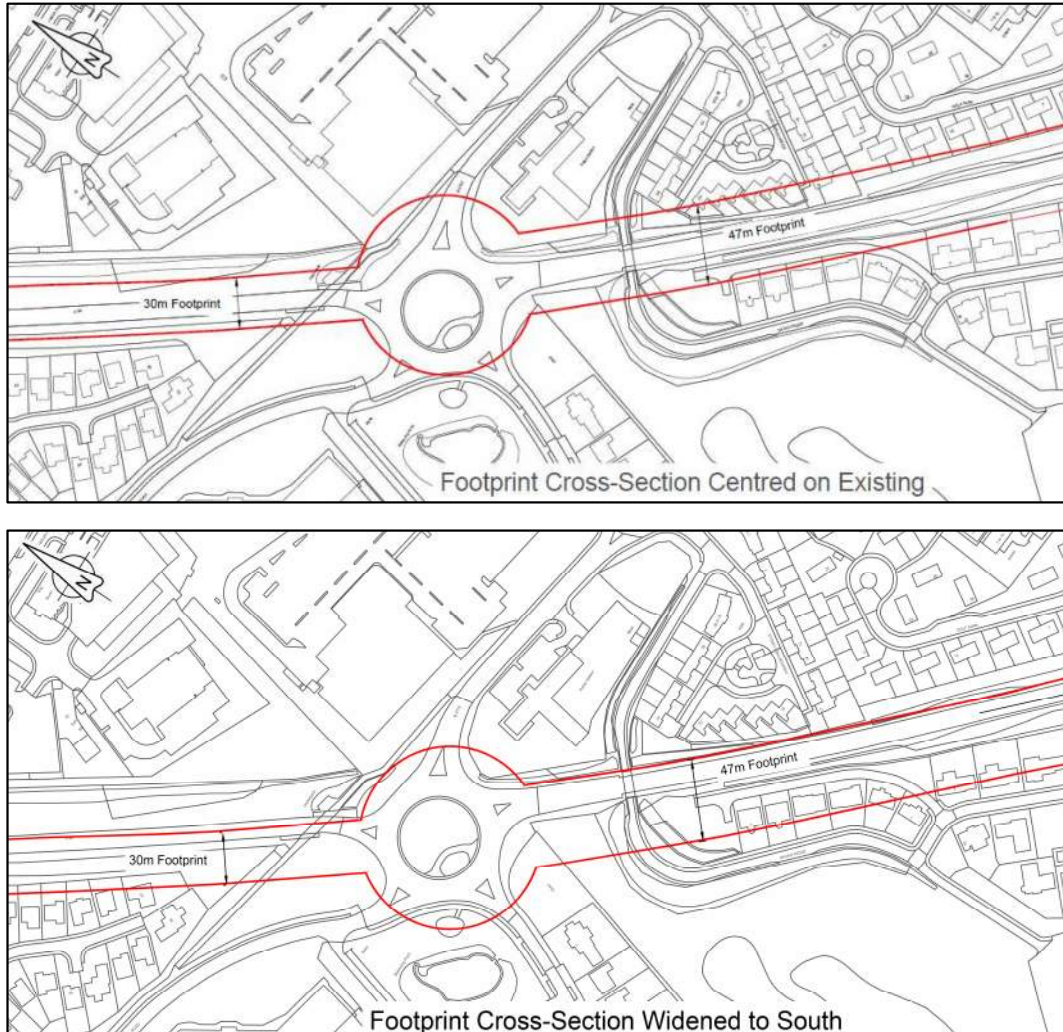


Figure 9 - Option 3 Half Diamond Junction Footprint at Blackhall

In traffic terms, Option 3 performed similarly to Option 2. However, in western Inverurie the local road junctions perform slightly better in Option 2 than in Option 3. This is because the traffic removed from Blackhall Roundabout in Option 3 instead routes via Drimmies and the North Street/Blackhall Road roundabout, given the lack of west facing slip roads at Blackhall.

4 Overall Conclusions from Appraisal of OLI

The online widening of the existing A96 between Inveramsay Bridge and Inverurie Roundabout, approximately 6.6km, was appraised against the A96 East of Huntly to Aberdeen Scheme Objectives and STAG criteria.

In consideration of this section, it was found that although the online dualling through Inverurie had in theory the potential to positively contribute to the A96 East of Huntly to Aberdeen Scheme Objectives, it performed poorly from an Environment and Engineering perspective.

The engineering appraisal confirmed that the existing A96 through Inverurie is constrained on both sides due to the proximity of residential and commercial property boundaries. Generally, the existing landscaping and screening bunds would need to be removed to accommodate a new dual carriageway with some sections potentially requiring retaining structures to prevent encroachment of earthworks into adjoining properties.

However, at the narrowest point, east of Blackhall Roundabout, the available width between trunk road boundary fence lines is 20.9m, with private properties located immediately behind these boundaries. The minimum dual carriageway cross section assuming a straight and level alignment with no earthworks is 26.1m. Therefore, any widening at this location even with retaining structures will encroach and permanently impact on the accessibility to property to the south of the A96 and/or rear garden areas of the properties located to the north.

Furthermore, the grade separation of the existing Blackhall Roundabout and its associated slip roads would have an even greater impact on these private properties than the standard dual carriageway cross section, noting that additional land would also be required at the junction location inducing further encroachment on the surrounding commercial and residential properties.

The Environmental appraisal confirmed that the dualling of the existing route would likely have significant effects on people and communities due to the proximity to existing properties, businesses and community facilities. Significant noise, air quality and visual impacts on a large number of receptors within close proximity to the A96, particularly for those properties bounding the existing A96 were also anticipated.

Finally, the outcomes of the traffic appraisal for online dualling of the existing A96 through Inverurie indicated that there would be no real benefits to local traffic within Inverurie with all traffic continuing to pass through the town to join the trunk road. Furthermore, traffic effects within the town would likely be exacerbated with the new and proposed development traffic on the north side of Inverurie travelling towards the new A96. The traffic assessment also indicated that a full grade separation, with slip road connections to the trunk road, would be required at Blackhall Roundabout to avoid severe congestion on the surrounding road network.

Based on the above, an online dual carriageway upgrade of the A96 through Inverurie was de-selected and not considered further as part of the DMRB Stage 2 Scheme Assessment process.