3. Alternatives Considered

3.1. Introduction

3.1.1. This chapter provides a summary of the alternative options considered during development of the preferred design for the Proposed Scheme. It outlines the key aspects taken into account that informed the decision making process with respect to the mainline route alignment and junction options.

3.1.2. The focus in this chapter is on the alternatives considered post DMRB Stage 1, i.e. within the defined route corridor identified in the A9 Dualling Preliminary Engineering Support Services commission and A9 Dualling Strategic Environmental Assessment.

3.1.3. As outlined in Chapter 1, the need for a Category 7A All Purpose Dual Carriageway road standard was identified from previous studies and therefore this was set as a requirement.

3.1.4. The term 'chainage' refers to the distance (in metres) of any point along the Proposed Scheme measured along the road centre line from the start point of the Scheme (this being chainage 0).

3.2. Route Corridor Options

3.2.1. In September 2012, Transport Scotland commissioned the A9 Dualling: Preliminary Engineering Support Services Report (PES)[i]. PES undertook an engineering assessment of the A9 Perth to Inverness route and produced engineering constraints mapping, route options work and other design strategies such as junction and access strategy, lay-by and rest area strategy and NMU strategies. Other activities undertaken by the PES Commission included geotechnical desk studies, topographical survey work, land referencing and stakeholder engagement. The principal output of the PES Commission was the Design Manual for Roads and Bridges (DMRB) Stage 1 Assessment.

3.2.2. Concurrent with PES, Transport Scotland also commissioned the A9 Dualling Strategic Environmental Assessment (SEA)[ii]. The SEA identified the key environmental and landscape issues along the length of the A9 route between Perth and Inverness and assessed the potential impacts associated with the proposed works.

3.2.3. The PES and the SEA together were considered equivalent to a DMRB Stage 1 assessment and recommended dualling within an online corridor, broadly 200m width (i.e. 100m either side of the existing A9 trunk road carriageway), with localised offline sections where topographical, environmental and physical constraints were present. This online corridor was identified as a 'soft' boundary for further more detailed study and DMRB Stage 2 dualling alignment options development.

3.3. Route Alignment Options

3.3.1. Following selection of a preferred route corridor, from the PES and SEA studies, a DMRB Stage 2 Assessment was undertaken to develop and assess route alignment options and to identify a preferred alignment for the Tomatin to Moy scheme.

Initial Option Development

3.3.2. During the initial stages of option development, a number of different combinations of mainline, junction locations and junction layouts were identified for the Proposed Scheme. A sifting exercise was undertaken to establish viable options to be taken forward to the DMRB Stage 2 route options assessment process. The sifting process considered engineering, environmental and cost factors as well as operational performance.

Mainline

3.3.3. Three mainline options were considered - widening to the northbound side of the existing A9, symmetrical widening on both sides of the existing A9 and widening on the southbound side of the existing A9. All options were within a 200m wide corridor (identified in the PES). The symmetrical option was sifted out at this stage due to buildability issues (i.e. difficulties in traffic management when constructing on the existing A9, in comparison to construction adjacent to the northbound or southbound where the new carriageways could be built off-line) and potentially high cost. The sifting process concluded that the first 4.6km of the mainline were fixed based upon an evaluation of engineering and environmental impacts: the first 1.7km on the southbound side and the remaining 2.9km on the northbound side. North of chainage 4600 there was no clear preference for where the cross section should be located, therefore two mainline options were included in this part of Stage 2 assessment:

- Mainline Option 1 - predominantly northbound widening
- Mainline Option 2 - predominately southbound widening

Grade Separated Junction Locations

3.3.4. Three locations for grade separated junctions (GSJ) were considered during the initial stages of option development. These were in the vicinity of the existing junction at Tomatin; in the vicinity of the existing junction with the B9154 at Moy South and around 3km north of the B9154 junction at Moy North. The combinations of these three junction locations were:

- a single GSJ at Tomatin with a connecting link to the B9154 at Moy running parallel to the A9 southbound carriageway
- a single GSJ at Moy South
- a single GSJ at Moy North
- GSJs at both Tomatin and Moy South
- GSJs at both Tomatin and Moy North
- GSJs at Tomatin, Moy North and Moy South

3.3.5. An initial assessment and sifting of the 6 possible combinations was undertaken against engineering, environmental, economic criteria. GSJs at all 3 locations were excluded at an earlier stage as being superfluous in terms of traffic volumes, and the close proximity of Moy North and South GSJs. The GSJ at Moy South was sifted out due to engineering constraints (ground conditions) at this location, significant land take required to provide a compliant arrangement within these constraints, and landscape impact because of modifications to the existing landform and the formation of large embankments. Although junction options including GSJs at Moy North and/or Tomatin North were considered to involve some engineering challenges and the potential for environmental impact, it was considered that these issues could be mitigated during the

design process. However it was envisaged that providing two GSJs would have an increased environmental impact against options which provide just one GSJ.

GSJ Layouts

3.3.6. A number of different junction layouts were also considered. Roundabouts at the GSJs were sifted out at an early stage as not being compliant with a Category 7A All Purpose Dual Carriageway road standard and the requirement for street lighting, which could result in visual intrusion. Half diamond junctions (which limit traffic movements to one direction) were also sifted out, as both junction locations were assessed to merit all movement junctions. GSJ layouts with an overbridge were also not taken forward due to engineering challenges and environmental impact. Therefore, two types of junction layout (diamond and loop arrangements) were taken forward for assessment.

DMRB Stage 2 Options

3.3.7. In summary, 12 combinations of mainline alignment, junction location and junction layout were considered as options in the DMRB Stage 2 Assessment. The key components of the Stage 2 options are shown in Figure 3.1a-l.

3.3.8. Further development of the Stage 2 options also identified potential impacts of removing direct access to Dalmagarry and Lynebeg as part of the Stage 2 options. Accordingly Left-in/Left-out (LILO) arrangements were developed at these locations as part of the Stage 2 options.

Preferred Stage 2 Route Alignment

3.3.9. The aim of the DMRB Stage 2 assessment process was to identify environmental, engineering and economic factors associated with the route options and to consider the advantages and disadvantages of each option with regard to these factors. The process included desk studies, field surveys and ongoing consultation with stakeholders. Public consultation was also undertaken via a community drop-in event in August 2015 and a public exhibition held in October 2015.

3.3.10. A Value for Money workshop and a Preferred Route workshop held with the project team and Transport Scotland in November 2015 and January 2016 respectively, also formed part of the Stage 2 assessment process. At the Preferred Route Workshop the relative impact of each option against the others was compared, based on the various engineering, environmental and economic criteria, to facilitate identification of the most favourable/lowest impact option.

3.3.11. On the basis of the DMRB Stage 2 Assessment, Option 1A(ii) consisting of primarily northbound widening, with a grade separated junction in the vicinity of Tomatin (utilising a loop arrangement) was recommended as the preferred route for the following key reasons:

- a reduced earthworks fill requirement and lower construction cost
- considered to be easier to construct with reduced traffic management during construction
- a reduced impact in terms of commercial forestry holdings, water features and the removal of less screening vegetation
- options involving construction of a second junction at Moy would have notable technical challenges associated with drainage and geotechnical considerations (including the presence of peat)

- due to the relatively low volume of traffic on the side roads the additional cost of a second junction at Moy, although addressing practical and operational access considerations, is not justified in economic terms
- options which include a Moy grade-separated junction generally have a greater environmental impact (including visual and noise intrusion on a Category A listed railway viaduct and impact on landscape)
- no grade-separated junction at Moy means one less watercourse crossing of the Allt Creag Bheithin with reduced associated drainage and hydromorphology issues and also removes the need to cross the floodplain of Allt Creag Bheithin, thereby reducing floodplain loss
- the loop junction configuration requires a smaller footprint of land resulting in less land acquisition costs and lower environmental impact

Stage 2 Preferred Route Refinement

3.3.12. Following completion of the Stage 2 Scheme Assessment Report further design refinement work was undertaken, with specific scheme constraints and technical standards considered in greater detail to ensure that the most appropriate design solutions were identified for further development as part of the Stage 3 design.

3.3.13. As part of the design refinement work for Stage 2 Preferred Option (Option 1A(ii)) it was recognised that the Dalmagarry area (typically between mainline chainage 1500 and 8000 (based upon the Stage 2 Option 1A(ii) chainages)) is one of the most constrained areas of the scheme with the dualling proposals having potentially significant impacts upon the Highland Main Line railway, Dalmagarry Farm, Dalmagarry Burn and its floodplain. Therefore five sub-options were developed from the Stage 2 Preferred Option 1A(ii) to address these constraints and to optimise the scheme design. These sub-options are summarised below.

Sub-option A

3.3.14. This Option involved moving the A9 westwards towards the Highland Main Line railway to reduce the impact on Dalmagarry Farm and flood plain. It required significant engineering works and included three retaining walls to support the railway, A9 and side road. Moving the dual carriageway to the west allowed sections of the existing A9 to be utilised as the B9154 side road. The proposed LILO at Dalmagarry was removed and there was no change to the proposed road layout at Lynebeg.

Sub Option B

3.3.15. This Option involved moving the A9 eastwards to avoid the impacts to the railway and requirement for retaining walls to support the A9 and side road. It required the diversion of the Dalmagarry Burn and increased potential impacts on the farm and flood plain. The extension of the B9154 Tomatin to Moy link road was located east of the burn diversion. The proposed LILO at Dalmagarry was removed and there was a change to the proposed road layout at Lynebeg.

Sub Option C

3.3.16. This Option involved moving the A9 eastwards to avoid the impacts to the railway and requirement for retaining walls to support the A9 and side road. It required the diversion of the Dalmagarry Burn and increased potential impacts on the farm and flood plain. However, removal of the B9154 Tomatin to Moy link reduced these impacts. With the absence of the B9154 link road it was proposed to construct a LILO junction near the

existing B9154 junction to allow traffic from Moy to access the southbound carriageway. At Lynebeg it was proposed to replace the existing railway arch to provide a 2-way carriageway with a 5.3m headroom that would accommodate most vehicle sizes and avoid re-routing right-turning vehicles to Daviot. Replacing the railway arch required lowering of the B9154, land-take from adjacent properties on the east side of the B9154, removal of trees, public utility diversions and removal of a retaining wall. Traffic from Ruthven would gain access to the A9 from the Tomatin GSJ via a single lane carriageway with passing places.

Sub Option D

3.3.17. This Option is identical to Option C, apart from the headroom of the Lynebeg rail underpass, which was reduced to 4.3m. This reduced headroom would still accommodate the vast majority of vehicle sizes, but avoided the lowering of the B9154 and hence removed the impact on adjacent properties, reduced tree removal, reduced the utility diversions and impact on the retaining wall.

Sub Option E

3.3.18. This Option involved moving the A9 eastwards to avoid the impacts to the railway and requirement for retaining walls to support the A9 and side road. It required the diversion of the Dalmagarry Burn and increased potential impacts on the farm and flood plain. However, the B9154 Tomatin to Moy link was removed thereby reducing these impacts. A new local junction to the north of Moy allowed access to the A9 and included an additional structure under the A9 that required significant earthworks and a potential negative landscape and visual impact. Traffic from Ruthven would gain access to the A9 from the Tomatin GSJ via a single lane carriageway with passing places.

Sub-Option Appraisal

3.3.19. An appraisal of the five Sub-options was undertaken, considering the advantages and disadvantages of each in engineering, environmental and economic terms.

3.3.20. The findings of the appraisal, together with stakeholder feedback received from a public exhibition in November 2016 where the Stage 2 Option 1A(ii) and the five Sub-options were presented, concluded that Sub-option D is preferable (in comparison with the other Sub-options) for the following reasons:

- Sub-option D avoids the impact on the Highland Main Line railway, specifically in the area of Dalmagarry, both in terms of construction period impacts and longer term maintenance.
- Sub-option D has a reduced impact on constraints in the Dalmagarry area, mainly by removing the B9154 link, which lessens the impact on farmland and flood plain.
- Sub-option D avoids the environmental impacts that would be incurred by providing the Moy North junction, e.g. severance of habitats, impact on groundwater and adjacent priority peatland, intrusion into the open moorland landscape and effect on the setting of the listed Aultnaslanach viaduct.
- Sub-option D has a reduced height headroom at the Lynebeg railway underpass. This removes the significant impacts in utility diversions and avoids the potential acquisition of private properties associated with Sub-option C.
- Sub-option D is comparable in cost to the other Sub-options.

3.3.21. The Option taken forward to the Stage 3 Assessment is therefore Option 1A(ii) from the Stage 2 Assessment, amended to incorporate the features of Sub-option D above.

3.4. References

[i] Jacobs (2014); A9 Dualling Preliminary Engineering Support Services – DMRB Stage 1 Assessment.
[ii] Transport Scotland (2013); A9 Dualling Programme – Strategic Environmental Assessment, Environmental Report.