



A9 Dualling Programme: Tay Crossing to Ballinluig
Design Development Report
November 2016

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Contents

1.	Introduction.....	1
2.	Design Development.....	2
2.1	Flooding.....	2
2.2	Side Road and Access Options.....	5
2.3	Traffic Noise and Mitigation.....	6

1. Introduction

The purpose of this report is to provide an overview of further design development undertaken in relation to the online mainline and side road options currently under assessment as part of the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment.

The purpose of the additional design development at this stage of the assessment process is to address concerns raised from members of the public or which have emerged as part of the ongoing DMRB Stage 2 assessment. These issues include the following:

- Potential Impacts on Flooding and Mitigation;
- Side Road and Access Options; and
- Traffic Noise and Mitigation.

The Stage 2 Assessment has been undertaken in accordance with the DMRB and considers 4 online mainline route options and 4 side road options. The assessment identifies factors to be taken into account identifying the engineering, environmental and traffic & economic advantages, disadvantages and constraints associated with various competing route options. The conclusion of the Stage 2 assessment process is the identification of a Preferred Route Option which is further developed during DMRB Stage 3 assessment.

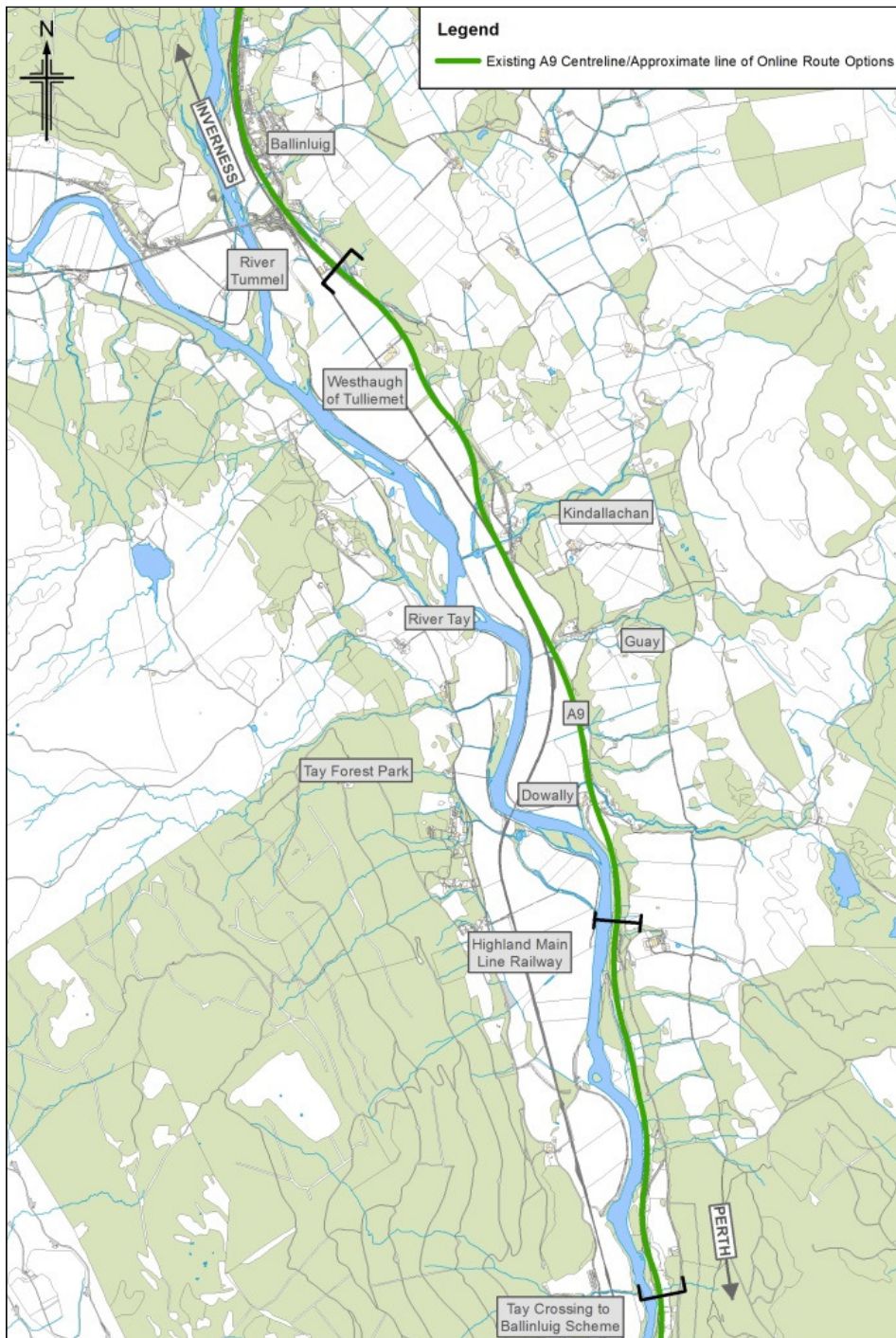
It should be noted that mitigation is not generally considered in detail during the Stage 2 process but is fully considered during future stages of design development, once a Preferred Route Option has been identified.

2. Design Development

2.1 Potential Impacts on Flooding and Mitigation

The A9 between Tay Crossing and Ballinluig runs parallel and in close proximity to the River Tay, as depicted in Figure 1.1 below.

Figure 1.1: River Tay adjacent to the existing A9 between Tay Crossing and Ballinluig



The River Tay has been identified as a major constraint to the development of the A9 dualling along this section and the potential impact on the associated floodplain has been explored. A summary of the flood assessment and key considerations undertaken during the design development are provided below.

2.1.1 DMRB Stage 2 Assessment – Flooding Assessment

The Stage 2 assessment considers flooding to determine the impact severity for each of the online mainline and side road route options under consideration in comparison to the baseline (existing situation). It is not usual to design any mitigation for flooding at Stage 2 but it is necessary to be satisfied that the options are capable of supporting mitigation for flood impacts during Stage 3.

The overall approach to flood risk management is that the scheme will be developed such that the impact on flood risk is neutral. However, while that does not mean that the A9 dualling will resolve existing flooding issues, it will not create additional overall flood risk.

In this area it was particularly important that as part of the Stage 2 work a good understanding of the existing flooding regime and how that might change under the various dualling options was developed. A project specific flood model has been built from south of Dowally to north of Ballinluig, covering the River Tay, River Tummel, and their smaller tributaries including Dowally Burn, Sloggan Burn and Kindallachan Burn. The flood model is in line with industry standard practice and is capable of developing a picture of complex flooding situations. Flood flows were developed to represent events up to the 1 in 200 year flood return period. These flows have then been increased by 20% to allow for future climate change. It should be noted that a 1 in 200 year flood return period including climate change would be an extreme weather event. The model has then been run with existing ground and road conditions to establish the baseline flood risk.

The baseline model for the existing situation identified extensive flooding during the 1 in 200 year flood event plus climate change between Tay Crossing and Ballinluig with flooding experienced to the west of the existing A9 over a large proportion of the existing route. In the northern extents, the flooding extends via existing culverts and underpasses to the east of the Highland Main Line railway in close proximity to the existing A9 and a number of properties. Localised flooding occurs in small sections to the east of the existing A9. The modelling outputs are consistent with information provided by local residents on the flooding extents during recent flood events, such as was experienced during December 2015 and as shown on Images 1.2 and 1.3 below and overleaf.



Image 1.2: River Tay flooding south of Kindallachan:

(Photo provided courtesy of J Guest (Savills) taken on 5th December 2015)



Image 1.3: River Tay flooding north of Dowally:

(Photo provided courtesy of J Guest (Savills) taken on 5th December 2015)

A further significant output of the baseline modelling undertaken was the identification of several locations of the existing A9 that will flood during the 1 in 200 year flood event plus climate change. Therefore, in the absence of any dualling works, the existing A9 is predicted to flood at these locations during this storm event. The online A9 dualling will therefore be designed to raise the alignment above this flood level to eliminate the risk of the A9 flooding under this storm event and maintain connectivity to communities along the A9.

Once the baseline was understood, the various mainline and side road options were added to the model. This involved including the changes to road levels and widths (raising the road increases embankment footprints at some locations in the floodplain), extended existing structures over Dowally Burn, Sloggan Burn and Kindallachan Burn and the potential changes in available floodplain resulting from the mainline and side road options.

The Stage 2 assessment concluded that whilst there are variations in the flood impacts between the 4 online mainline and side road options, the differences are insufficient to drive a differentiation in the DMRB assessment. The modelling work also showed how culvert locations beneath the railway and the A9 can have a large influence on the movement of flood water.

Overall, the mainline online route options, in the absence of mitigation, result in a negligible adverse impact (increase in flood level less than 10mm). At the local level there are small areas where positive or negative impacts occur and these will be addressed as part of the Stage 3 model development and mitigation work to achieve no additional overall flood risk. At this stage, absolute changes in flood level from the model indicate, that depending on the mainline and side road option, without mitigation, there are broadly a range of beneficial and adverse impacts of circa -32mm (a beneficial impact) to +8mm (an adverse impact) indicated in areas around Westhaugh of Tullimet and Haugh of Kilmorich, a range of beneficial and adverse impacts of circa -1mm (a beneficial impact) to +4mm (an adverse impact) indicated in areas around Dowally Farm and Dalguise and negative impacts of circa 0mm to +2mm (an adverse impact) at Kindallachan. Flood mitigation will be required, with such mitigation typically identified at Stage 3. However, some work has been undertaken at Stage 2 to ensure that mitigation is possible to address these localised impacts. The suite of mitigation measures to be further developed are likely to comprise:

- Compensatory flood storage;
- Side road design refinement (refer to section 2.2); and
- Consideration of culvert sizes and location to control the movement of flood water.

Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH) have been consulted throughout the Stage 2 process and will continue to be consulted during the next stages of design development.

2.1.2 Offline Route Options and Flood Risk

During ongoing consultation, members of the local community raised concerns such as the proximity of the dual carriageway and access roads, impact of road noise, pollution and vibration, risk of flooding due to impact upon the River Tay floodplain and suggested the consideration of an alternative option with an alignment located to the east of the communities of Dowally, Guay and Kindallachan. In response to this, 2 additional options were developed.

- **Offline Route Option 1:** Passes to the east of the communities of Dowally, Guay and Kindallachan however still encroaches within the floodplain to the north of Kindallachan similar to the online route options.
- **Offline Route Option 2:** This is a variant to Offline Route Option 1 and shares the same alignment as Offline Route Option 1 other than it includes an additional 1km of offline alignment at the northern extents to keep this section of the route outwith the floodplain.

In both cases the existing A9 would be used as a local access route. If an offline route option was constructed then it would not be the intention to raise the existing A9 and its local access function would on occasion be impaired by the overtopping of flood water in extreme events.

Further details on the offline route options can be found in the Online v Offline Route Option Comparative Assessment report.

2.2 Side Road and Access Options

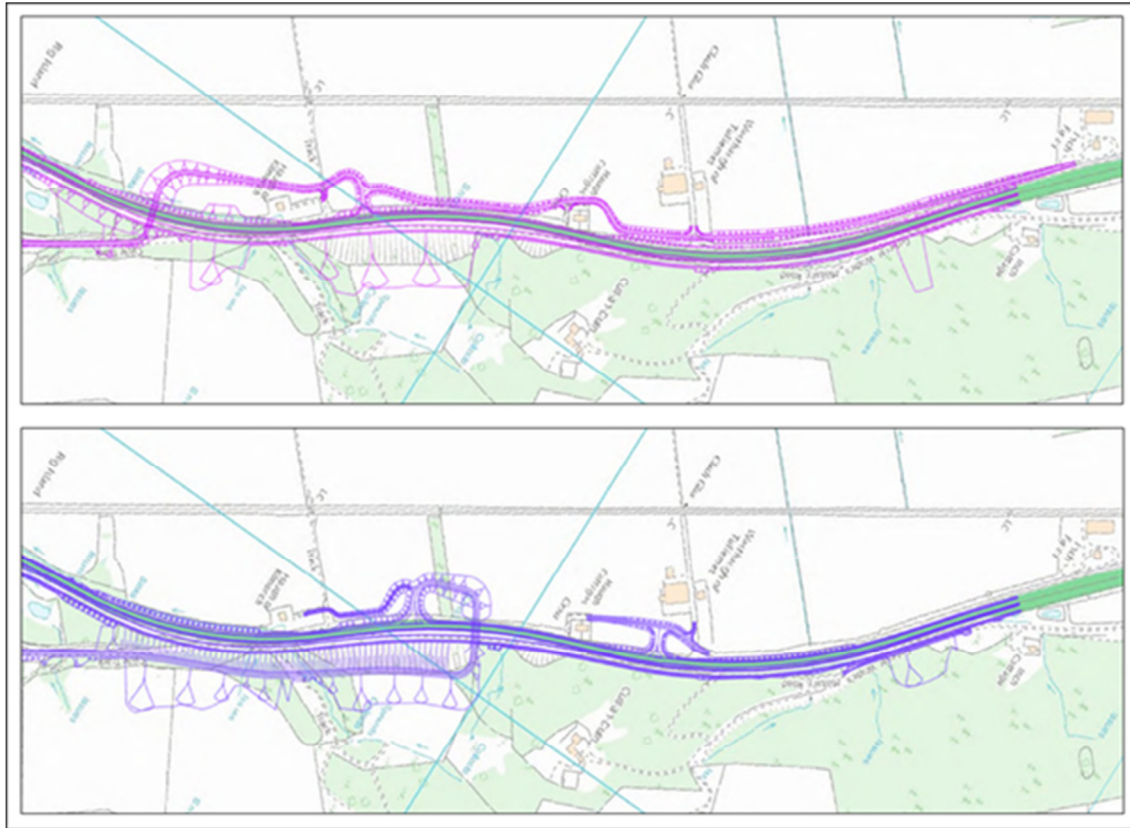
2.2.1 Side Road

Four side road options are under assessment. Two of these options include an overbridge north of Kindallachan.

One of the ways in which flooding can be mitigated is to consider refining the length of side road construction in the flood plain. This work will be fully explored at DMRB Stage 3, however in order to get an idea of the potential benefit of this at DMRB Stage 2 we considered the effect on flood impact of moving the proposed Kindallachan overbridge approximately 600m further north to reduce the encroachment into the River Tay 1 in 200 year flood return period floodplain.

In addition, a left-in, left-out junction was included with the alternative overbridge location in proximity to Westhaugh of Tulliemet which further minimises the encroachment within the floodplain due to the reduced extent of proposed new side roads. This inclusion of an additional junction allowed for the removal of the parallel road connecting Westhaugh of Tulliemet and Haugh Cottages to the overbridge. A review of mainline verge widening eliminated impacts on the existing access road connecting with Inch Farm (House of Bruar Warehouses) resulting in removal of the need to replace this existing access road. Figure 1.2 overleaf shows both the Stage 2 assessment and the alternative side road options as described.

Figure 1.2: *DMRB Stage 2 assessment Option (top image) and Alternative Side Road Option (bottom image)*



In flooding terms this side road arrangement offers the potential to mitigate some of the predicted impacts. Further work is required to assess the overall impact of this layout as a usual part of Stage 3 design development if an online option including the overbridge is preferred.

2.2.2 Access

Previous design work and side road options design did not consider isolated accesses in detail. However a number of residents raised concerns regarding access provision, in particular to Dowally Farm and St Anne's Church. A number of preliminary designs for access to these locations have been developed to demonstrate that access can be maintained to these properties. The designs developed for St Anne's Church include the provision of a replacement car park. These options will be assessed further in accordance with the A9 Junction and Access Strategy at Stage 3. Consultation with the relevant landowners impacted by these access options, and all other remaining accesses, will be undertaken during the Stage 3 assessment process. This will include considering any other alternative access options that may be developed at that time.

2.3 Traffic Noise and Mitigation

2.3.1 Overview of Noise Assessment

A road traffic noise assessment was undertaken as part of the Stage 2 assessment within the defined study area, which extends up to 600m from the proposed online route options. The study area includes 103 residential dwellings, the May Murray Memorial Camp (hostel), St Anne's Church and two fishing huts. Road traffic noise levels have been assessed at all sensitive receptors within the study area.

The noise environment is predominantly influenced by traffic on the existing A9. Road traffic noise is generated by the interaction of tyres on the road surface, from engines and exhausts, and from aerodynamic noise caused by vehicles moving through the air. Noise sources including different speeds, road gradients, acceleration, traffic composition (i.e. ratio of heavy duty vehicles to lighter vehicles) and road surface types, all contribute to the noise environment to a varying degree.

The assessment considers noise level changes at dwellings and other sensitive receptors by comparing their baseline façade noise levels for the Do-Minimum (DM) scenario (Baseline) (i.e. without route option) with the noise levels predicted for the Do-Something (DS) scenario (i.e. with route options) in the anticipated year of scheme opening. The assessment has been undertaken using noise levels estimated using industry standard modelling packages.

2.3.2 Indicative Assessment Summary

Initial assessment of the noise impacts suggests that mitigation may be required in the areas of Dowally, Guay and Kindallachan. There are likely to be different options available to mitigate noise impacts. This typically includes consideration of low noise road surfacing or screening through earth bunds or physical barriers. The form of any mitigation proposed will be determined at Stage 3 as is normal for these type of projects.

For any options taken forward as the design develops during the next stage and updated baseline information (topographical survey, traffic data, and property data) is obtained, further noise and potential mitigation assessment will be undertaken.



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