

Route Option	Key Features
	<p>an underbridge structure; and</p> <ul style="list-style-type: none"> - Dalguise Junction: Hybrid design (slip roads in the southbound direction and loop in northbound direction). Incorporates realignment of the A898, crossing the A9 on an underbridge structure. • Left-in left-out junction proposed at The Hermitage, in accordance with the DMRB (Volume 6, Section 2, Part 6, TD 42/95: Geometric Design of Major/Minor Priority Junctions).
B	<ul style="list-style-type: none"> • Lowered in the vicinity of Dunkeld & Birnam Station; • Underpass structure proposed over the A9, connecting Station Road to the station. Car parking provided on the structure; • Dunkeld & Birnam Station retained in its current position; • Three grade separated junctions proposed, in accordance with the DMRB (Volume 6, Section 2, Part 1, TD 22/06: Layout of Grade Separated Junctions): <ul style="list-style-type: none"> - Birnam Junction: As Option A. - Dunkeld Junction: Variation of diamond layout. Incorporates connection and realignment of the A923 and A822 (Old Military Road), crossing the A9 on an overbridge structure; and - Dalguise Junction: As Option A. • Left-in left-out junction proposed at The Hermitage, as Option A.
C	<ul style="list-style-type: none"> • At existing carriageway levels in the vicinity of Dunkeld & Birnam Station; • Closer to existing carriageway levels north of Dunkeld & Birnam Station, compared to Option A. However higher than current levels at Dunkeld Junction (to accommodate vehicular headroom clearance requirements at the structure) and across the River Braan; • Relocated Dunkeld & Birnam Station, to the immediate north of Inchewan Burn, with access from the A822 (Old Military Road); • Existing Category A Listed station building remains in existing location; • Three grade separated junctions proposed, in accordance with the DMRB (Volume 6, Section 2, Part 1, TD 22/06: Layout of Grade Separated Junctions): <ul style="list-style-type: none"> - Birnam Junction: As Option A. - Dunkeld Junction: Variation of diamond layout. Incorporates connection and realignment of the A923 and A822 (Old Military Road), crossing the A9 on an underbridge structure; and - Dalguise Junction: As Option A. • Left-in left-out junction proposed at The Hermitage, as Option A.

DMRB STAGE 2 ASSESSMENT

The Stage 2 Assessment has been undertaken in accordance with the DMRB (Volume 5, Section 1, Part 2, TD 37/93: Scheme Assessment Reporting). The aim of the assessment is to identify factors to be taken in to account in choosing alternative options and to identify the engineering, environmental and traffic and economic advantages, disadvantages and constraints associated with the route options. The conclusion of the DMRB Stage 2 Assessment

process is identification of a Preferred Route Option, which is further developed during DMRB Stage 3 Assessment.

This note focusses on sections of the DMRB Stage 2 Assessment that show:

- A significant difference between the current route options; and
- Were highlighted by the public at recent consultation events.

Other sections of the assessment that do not indicate a significant difference between route options are not detailed but will be included in the final DMRB Stage 2 Assessment.

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

Constructability

To accommodate the proposed widened carriageway and slip roads for Dunkeld Junction, while avoiding encroachment towards the Highland Main Line railway to the west and residential properties to the east, Options A, B and C incorporate retaining wall structures north of Dunkeld & Birnam Station of varying heights. Option A is raised above the existing carriageway level and substantial works to construct the embankment will be necessary, which will likely involve temporary works to ensure traffic can be maintained on the existing A9 during construction. The resultant A9 will be at a similar level to the adjacent railway and properties, however retaining wall structures of approximately 3.5 metres on the east side and 5 metres on the west side will be required. Retaining walls, constructed with bored piles (a concrete pile cast on site), could be utilised. As the walls have a relatively low height, there would be no requirement for ground anchors.

Option A is raised above existing levels at the River Braan crossing. As a result, a retaining wall structure around 10 metres in height is required to the south of the river to avoid encroachment towards Dunkeld Bowling Club and Dunkeld & Birnam Tennis Club. While the structure is significant in size, construction will be undertaken in stages and is not deemed overly complex.

Option B is lower than existing ground levels and therefore the retaining walls required are significant in height. To the east, the walls will be approximately 14 metres and to the west approximately 18 metres. A retaining wall, constructed with bored piles, could be constructed, however the overturning movements in the piled wall will be significant, affecting its stability. To overcome these forces, ground anchors would be required. The length of anchors required would extend beyond the road boundary in to Network Rail's land to the west and privately owned land to the east.

To eliminate the need for ground anchors a piled barrette wall (consisting of a series of reinforced concrete columns cast on site) could be constructed. However, such a system will incur significantly greater costs and will lengthen the construction period considerably. Furthermore, it will also involve extensive construction work in close proximity to the Highland Main Line railway.

Option B incorporates an underpass structure at Dunkeld & Birnam Station that will require construction of retaining walls in the northbound and southbound verges and central reserve of the proposed dual carriageway. The most likely method of construction, due to space constraints and ground conditions, is bored piles. The bored pile walls will have a retained height of around 8 metres to satisfy headroom clearance requirements on the A9. Installation of the bored pile walls will require heavy plant. Safe operation of such plant, while maintaining vehicle movements on the A9 will be challenging. Construction of the structure is further complicated by the Inchewan Burn, a tributary of the River Tay Special Area of Conservation

(SAC), which must be lowered by approximately 3 metres. It should be noted that the roof of the underpass serves to stabilise the structure, eliminating the need for ground anchors at the rear of the bored pile walls to overcome overturning forces.

The edge of the proposed A9 dual carriageway is approximately 5 metres from the front of the Category A Listed building at Dunkeld & Birnam Station.

As the Ground Investigation (GI) already completed has identified large boulders in the ground, vibration may be significant during the piling operations and excavation for Option B. Careful monitoring will be carried out to ensure the structural integrity of the Listed Building is maintained and is not adversely affected by vibration, soil movement and the operation of heavy plant nearby. At the same time, the possible impacts of the GI work on residential and commercial properties to the immediate east must also be considered.

Option C is closer to the existing ground level north of Dunkeld & Birnam Station and therefore also requires retaining wall structures in excess of 10 metres. As a result, it is likely that ground anchors will be required, extending into adjacent land. Like Option B, a piled barrette wall could be constructed to remove the need for ground anchors.

It should be noted that there is currently an earthwork bund alongside the Highland Main Line railway approximately 5 metres high. The boundary of Network Rail's land ownership is at the top of the bund. The proposed height of retaining walls could therefore be reduced if this bund was removed, possibly simplifying construction. Further discussions will be undertaken with Network Rail at DMRB Stage 3 to determine the feasibility of removing the bund.

Construction of retaining wall structures for all route options, while maintaining traffic flows and ensuring adequate working and safety zones, within the narrow corridor north of Dunkeld & Birnam Station, will be particularly complex, particularly for Option B. The plant required to install the bored piles will be sizeable, requiring a significant working platform alongside the Highland Main Line railway and residential properties. This will further restrict the space available to maintain an operational carriageway. The installation process to construct lengths of up to 400 metres of bored piles will be extensive, generating noise and vibration. This may have an adverse impact on local residential and commercial properties, some of which reported noise and vibration issues during the recent GI works. Excavation through the large boulders identified by the GI works will also prolong construction and potentially generate further noise and vibration. It should be noted that mitigation will be put in place during construction to reduce noise and vibration impacts. This may include:

- Setting maximum permissible noise and vibration levels;
- Limits on working hours; and
- Controlled movement of construction traffic.

Suitable measures will be agreed with Perth & Kinross Council and included in to the contract to ensure compliance as is normal practice during such works.

The works will be immediately adjacent to the Highland Main Line railway and while some of the work can be completed with the railway operational, subject to suitable mitigation and monitoring being implemented, some work will be necessary under railway closures, affecting rail users.

Noise & Vibration

The road traffic noise assessment has been undertaken over a zone extending 600 metres from the proposed route options. This zone includes 835 dwellings and 48 other sensitive receptors. The majority of these dwellings are located within the settlements of Birnam (approximately 426 dwellings), Dunkeld (Approximately 167 dwellings) and Little Dunkeld (Approximately 56

dwellings). The other receptors include 6 hotels, 1 guest house, 3 caravan parks, the Royal School of Dunkeld, 5 parks, 3 play areas and 3 churches.

Road traffic noise levels have been assessed at all of the sensitive receptors, however a sub-set of sample receptors has also been selected for reporting purposes, which includes:

- Rose Cottage, Inver;
- The Old Bakehouse, Birnam Terrace, Birnam;
- 35 Stell Park Road, Birnam;
- Telford Gardens, Birnam;
- Braeknowe, Birnam; and
- Braan Cottage, Little Dunkeld.

These sample receptors have been selected where it has been anticipated that receptors are most likely to experience perceptible changes in noise level.

The noise environment is influenced predominantly 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 the aerodynamic noise caused by vehicles moving through the air. For different speeds, gradients, acceleration, traffic composition (i.e. ratio of heavy duty vehicles to lighter vehicles) and road surface types, each of these noise sources contributes to a varying degree.

The assessment has been undertaken using calculated noise levels estimated using industry standard modelling packages. The baseline year used in the assessment is the anticipated year of the scheme opening. The classification of noise impact magnitude is as detailed in Table 2 and defined in the DMRB (Volume 11, Section 3, Part 7, HD 213/11: Noise and Vibration).

Table 2: Classification of Noise Impact Magnitude

Noise Change ($L_{A10, 18hr}$) (dB)	Magnitude of Impact
>-5.0	Major Beneficial
-3.0 to -4.9	Moderate Beneficial
-1.0 to -2.9	Minor Beneficial
-0.1 to -0.9	Negligible Beneficial
0	No Change
+0.1 to +0.9	Negligible Adverse
+1.0 to +2.9	Minor Adverse
+3.0 to +4.9	Moderate Adverse
>+5.0	Major Adverse

Table Notes:

1. While the DMRB states that benefits or disbenefits should be reported for traffic noise changes as small as 1dB, significant effects at residential properties are not generally experienced for changes less than 3dB.

The potential noise impacts for the proposed route options are shown in Tables 3 and 4.

A noise mitigation strategy will be developed at DMRB Stage 3 and suitable noise mitigation measures recommended as necessary. Noise may be mitigated by provision of earthwork bunds and sound adsorbing acoustic barriers/fences and the use of low noise road surfacing.

Given the sensitivity of the area to noise, further assessment has been undertaken at this stage to determine the likely impacts on receptors with a suitable acoustic barrier/fence in place alongside the proposed A9 dual carriageway adjacent to Stell Park Road, Telford Gardens and King Duncan's Place. The results of this assessment are given in Tables 3 and 4. It should be noted that these results are for information purposes only at this stage and will not be included in the DMRB Stage 2 Assessment. Further assessment will be undertaken at DMRB Stage 3 and mitigation provided as appropriate.

Table 3: Potential Noise Impacts at Receptors/Dwellings (with and without mitigation)

Magnitude of Impact	Option A		Option B		Option C	
	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation
Major Beneficial	0	0	22	23	1	1
Moderate Beneficial	4	4	30	29	5	5
Minor Beneficial	13	14	102	123	10	10
Negligible Beneficial	57	56	225	205	61	61
No Change	26	26	38	39	22	22
Negligible Adverse	201	209	288	294	230	236
Minor Adverse	441	477	113	116	447	463
Moderate Adverse	84	47	17	6	46	35
Major Adverse	9	2	0	0	13	2

Table 4: Potential Noise Impacts at Sample Receptors (with and without mitigation)

Sample Receptor	Option A		Option B		Option C	
	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation
Rose Cottage, Inver	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial	Negligible Beneficial
The Old Bakehouse, Birnam Terrace, Birnam	Minor Adverse	Minor Adverse	Moderate Beneficial	Moderate Beneficial	Minor Adverse	Minor Adverse
35 Stell Park Road, Birnam	Moderate Adverse	Moderate Adverse	Moderate Adverse	Minor Adverse	Moderate Adverse	Minor Adverse

Sample Receptor	Option A		Option B		Option C	
	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation	Noise Impact	Noise Impact with Mitigation
Telford Gardens, Birnam	Moderate Adverse	Minor Adverse	Minor Adverse	Negligible Adverse	Major Adverse	Negligible Adverse
Braeknowe, Birnam	Major Adverse	Major Adverse	Minor Adverse	Minor Adverse	Major Adverse	Major Adverse
Braan Cottage, Little Dunkeld	Minor Beneficial	Minor Beneficial	Minor Beneficial	Minor Beneficial	Negligible Adverse	Negligible Adverse

Drainage

A preliminary drainage design has been undertaken to confirm a technically feasible drainage solution exists for the three options that provides suitable attenuation and treatment of run-off. The drainage design has been developed taking due consideration of constraints, such as topography and flood risk, and in accordance with relevant guidance notes and legislative documents related to trunk road drainage. The design for the A9 will include Sustainable Drainage Systems (SuDS), which aim to replicate the natural catchment processes as closely as possible by treating and controlling run-off.

For all three options, there are locations, particularly around the proposed Dunkeld Junction, River Braan and proposed Dalguise Junction, where the level difference to outfalls and land constraints limit the choice of SuDS treatments that can be utilised. As Option B and C are at a lower level than Option A in the vicinity of Dunkeld & Birnam Station and Dunkeld Junction provision of a suitable drainage network is more difficult. This may introduce additional maintenance requirements, particularly for Option B.

Landscape

The study area is heavily wooded, which adds to the experience along the A9, helping to create the gateway to the highlands and is a special quality of the River Tay (Dunkeld) National Scenic Area (NSA). The current route options will result in the loss of woodland alongside the road, adversely impacting the landscape character and NSA. The most significant landscape impacts will be over relatively short sections of the route, which includes the area around Dunkeld & Birnam Station and the proposed Dunkeld Junction.

In this locality, Option A is above existing carriageway levels, closer to the pre-existing ground level prior to construction of the existing A9. This will potentially improve the fit with the natural topography, however it will increase the prominence of the road and its influence on the neighbouring areas. Option B is lower and is therefore less prominent, however it is considered to have a greater impact on the landscape character, largely due to the large scale retaining walls and new associated underpass structure at the station, which generates a more urban environment. At the proposed Dunkeld Junction, Option C incorporates significant works to the A822 (Old Military Road), significantly altering the character of the existing open agricultural landscape.

Mitigation may be implemented if appropriate to limit the impacts of the proposed dual carriageway. This may include screening using earthwork bunds or screens. Screens could be designed and painted to be inconspicuous and in keeping with their surroundings. Mitigation during construction will also be considered.

Visual

The most significant impacts on visual receptors alongside the proposed dual carriageway occur in the locality of Dunkeld & Birnam Station and the proposed Dunkeld Junction. These impacts are caused by the increased visibility of the road due to the loss of existing screening vegetation, carriageway widening and the varied carriageway levels.

Option A raises the level of the A9, therefore adjacent residential properties, including those on Telford Gardens, will have increased visibility of vehicles on the proposed dual carriageway. Option B however, lowers the A9, concealing it from view. Option C is closer to existing ground levels north of Dunkeld & Birnam Station and therefore does not introduce a visual impact as significant as Option A. However Option C includes realignment of the A822 (Old Military Road) and the large scale cuttings associated with the works will open up views to the A9 from a number of roadside receptors.

At DMRB Stage 3, further visual assessment will be undertaken and mitigation proposals confirmed. Mitigation works will be similar to that detailed for landscape. A detailed visual impact assessment will be completed to take account of detailed mitigation proposals.

Air Quality

The assessment undertaken to date has identified the likely potential air quality impacts associated with the proposed route options. While there are slight differences between the route options in terms of number and type of air quality impacts, these are not considered to be significant.

The assessment has shown that existing pollutant concentrations in the vicinity of the existing A9 are well below threshold levels set by UK air quality regulations.

View from the Road

The view from the road for road users will differ significantly between the route options. As Option A raises the A9 north of Dunkeld & Birnam Station, more open views will be available in all directions, creating views to the River Tay and Little Dunkeld. Distant views to the hills and crags of Craig a Barns will also be improved.

Views from the road in Option B would be heavily compromised as a result of the road being enclosed on both sides by high retaining walls. In the vicinity of Dunkeld & Birnam Station, where the widened carriageway would incorporate retaining walls in the verges and central reserve and a new underpass structure, views would be heavily restricted. Mitigation with high quality design and finishing is unlikely to improve the view from the road in Option B and presents a very urban setting.

For Option C, the impacts on the view from the road will be similar to that for Option A. However, as the A9 is not elevated to the same extent, views would be less open. Furthermore, Option C incorporates retaining walls and although not as significant as those included in Option B, they will adversely impact the view from the road.