A9 Dualling Programme: Pass of Birnam to Tay Crossing

DMRB Stage 2 Scheme Assessment Report

Volume 1: Main Report and Appendices

Part 6 - Appendices

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List of Abbreviations

A9DTM	-	A9 Dualling Traffic Model
AADT	-	Annual Average Daily Traffic
AOD	-	Above Ordnance Datum
AQO	-	Air Quality Objectives
ATC	-	Automatic Traffic Counts
AWI	-	Ancient Woodland Inventory
BLTM	-	Birnam Local Traffic Model
BGS	-	British Geological Survey
CAR	-	Controlled Activities Regulations
CD&E	-	Construction, Demolition and Excavation
DfRE	-	Designing for Resource Efficient
DMRB	-	Design Manual for Roads and Bridges
D2AP	-	Dual 2-lane All-purpose
EIA	-	Environmental Impact Assessment
GDL	-	Gardens and Designed Landscape
GI	-	Ground Investigation
HEWRAT	-	Highways England Water Risk Assessment Tool
HES	-	Historic Environment Scotland
HGV	-	Heavy Goods Vehicle
kph	-	kilometres per hour
LLCA	-	Local Landscape Character Area
NCN	-	National Cycle Network
NSA	-	National Scenic Area
PES	-	Preliminary Engineering Services
PKC	-	Perth & Kinross Council
PSSR	-	Preliminary Sources Study Reports
SAC	-	Special Area of Conservation
SEPA	-	Scottish Environment Protection Agency
SGN	-	Scottish Gas Networks
SRTDb	-	Scottish Road Traffic Database
SSD	-	Stopping Sight Distance
SuDS	-	Sustainable Drainage System
SWMP	-	Site Waste Management Plan
UK	-	United Kingdom
WFD	-	Water Framework Directive
WCH	-	Walkers, Cyclists and Horse Riders

1. Scheme Background

1.1 General

1.1.1 A detailed narrative of the background to dualling the Pass of Birnam to Tay Crossing section of the A9 Dualling Programme, including the scheme development since 2004 and the A9 Co-Creative Process, is included in the '*Design Manual for Roads and Bridges (DMRB) Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 1 - The Scheme*'.

1.1.2 On completion of the A9 Co-Creative Process, further assessment work was undertaken on the Community's Preferred Route Option. This initial assessment work considered the environmental, engineering and traffic impacts of the Community's Preferred Route Option and included consultation with key stakeholders and residents that live in close proximity to the A9 that may be directly impacted. A number of challenges were identified with the Community's Preferred Route Option, which are detailed in the '*A9 Dualling Programme: Pass of Birnam to Tay Crossing, Identification of DMRB Stage 2 Whole Route Options Report (October 2019)*'.

1.1.3 As dualling the A9 will require the Scottish Government to compulsory purchase land from private individuals, and as good practice dictates that a range of options should be considered, additional options for each constituent section of the scheme were identified. For the Murthly/Birnam Junction, two additional options were identified for consideration against the community's preference for a junction in the locality. A summary of the three junction options considered is given below.

- The Community's Preferred Route Option (Option 1):
  - Grade separated junction in the locality of the existing private access to Murthly Castle;
  - Diamond layout, facilitating all vehicle movements. Overbridge provided across the A9, connecting to the B867 to the west; and
  - Includes a connection of the B867 and Perth Road in the locality of the existing Birnam Junction, crossing the A9 via an underbridge.
- Additional Option 1 (Option 2):
  - Grade separated junction in the locality of the existing Birnam Junction;
  - Merge/diverge loops in the northbound direction and a merge slip road in the southbound direction, with no southbound diverge slip road;
  - B867 and Perth Road connected, crossing the A9 via an underbridge; and
  - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
- Additional Option 2 (Option 3):
  - Grade separated junction in the locality of the existing Birnam Junction;
  - Merge/diverge loops in the northbound and southbound directions, facilitating all vehicle movements with the southbound loop placed on a viaduct structure;
  - B867 and Perth Road connected, crossing the A9 via an underbridge; and
  - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.

1.1.4 The additional options considered for Murthly/Birnam Junction were subject to initial assessment, as detailed in the '*A9 Dualling Programme: Pass of Birnam to Tay Crossing, Identification of DMRB Stage 2 Whole Route Options Report (October 2019)*'. The level of assessment undertaken did not identify significant differences that would eliminate options from further assessment. As such, the Murthly/Birnam Junction options were subject to a DMRB Stage 2 level assessment.

1.2 Report Layout

1.2.1 This appendix includes the DMRB Stage 2 assessment for the Murthly/Birnam Junction options, which has been prepared in accordance with the DMRB (TD 37/93: Scheme Assessment Reporting). The purpose of this report is to assess the options for Murthly/Birnam Junction, identifying the environmental, engineering, traffic and economic advantages, disadvantages and constraints associated with each route option. The preferred junction layout is selected taking account of these assessments.

1.2.2 It should be noted that for the purposes of the assessment of Murthly/Birnam Junction options, a section of proposed A9 dual carriageway, between Ch. 0 and Ch. 2,400, has been included.

1.2.3 A summary of the assessment is included in the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 1 - The Scheme*'.

1.3 Existing Conditions

1.3.1 A review has been undertaken in relation to the existing engineering, environmental and traffic conditions within the locality of the junction options. These existing conditions are considered to provide a background and understanding of how the proposed junction options may impact, be influenced by, or improve these conditions. The existing constraints are summarised in Figure 1.1 and shown on drawing A9P02-JAC-GEN-X_ZZZZZ_ZZ-FG-RD-0003, included in Annex A.

1.3.2 A more detailed description of existing conditions is included in the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 1 - The Scheme*'.

Location

1.3.3 The Pass of Birnam to Tay Crossing section of A9 dualling commences at the northern extent of the current short section of existing dual carriageway at the Pass of Birnam. It extends approximately 8.4 kilometres, bypassing the towns of Birnam, Little Dunkeld and Dunkeld to the east, and Inver and The Hermitage to the west. The tie-in point with the following scheme, Tay Crossing to Ballinluig, is approximately 0.75 kilometres north of the current River Tay crossing.

1.3.4 The proposed Murthly/Birnam Junction is at the southern extent of the Pass of Birnam to Tay Crossing section of A9 dualling. The existing left/right staggered priority junction with the B867 and Perth Road is approximately 2.1 kilometres from the southern extent of the scheme.

Topography

1.3.5 To the south of the existing left/right staggered priority junction with the B867 and Perth Road, the A9 is surrounded by ancient woodland that forms part of the Murthly Castle Gardens and Designed Landscape (GDL) with the undulating topography of Birnam Wood, Rochanroy Wood and Ring Wood to the immediate west. Birnam Hill is northwest of Birnam Wood and is approximately 400 metres Above Ordnance Datum (AOD). To the east of the A9, the floodplain opens out and the settlements of Little Dunkeld and Birnam are located on the west bank of the River Tay, which is a Special Area of Conservation (SAC)

Land-Use

1.3.6 Land use in the locality of the junction options is generally commercial agricultural, forestry and sporting land interests (e.g., shooting/stalking or fishing for commercial purposes). The community of Birnam is to the immediate north of the existing left/right staggered priority junction with the B867 and Perth Road.

Environmental Constraints

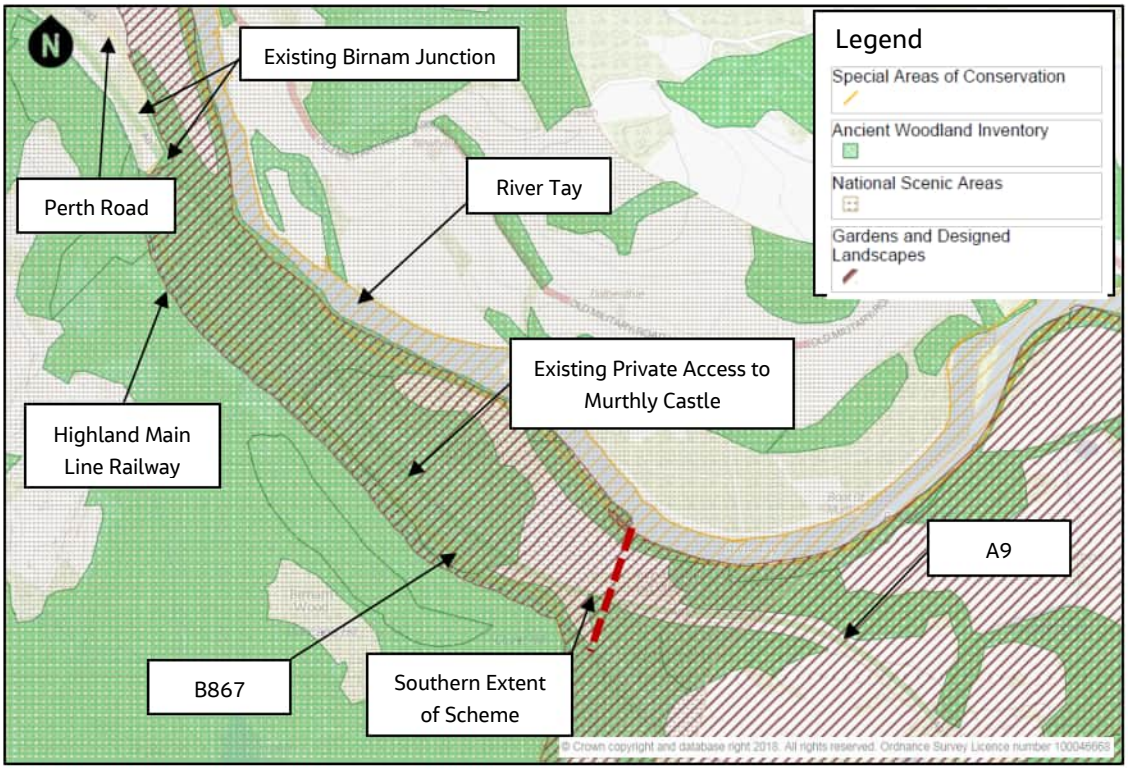
1.3.7 There are a number of environmental constraints within the locality of the junction options, including:

- Ancient Woodland Inventory (AWI);
- Murthly Castle GDL;
- River Tay (Dunkeld) National Scenic Area (NSA); and
- River Tay SAC.

1.3.8 A number of man-made constraints exist in the locality of the junction options. Existing man-made features include:

- The route of the current A9;
- Public utility apparatus;
- The Sewage Works;
- The B867, which is parallel to the A9 to the west, and Perth Road, which form part of the existing staggered priority junction and provides access to Birnam, Little Dunkeld and Dunkeld;
- The Highland Main Line railway, which is to the west of the A9, immediately alongside the B867; and
- Isolated residential properties, including West Ringwood Cottage, Ringwood Cottage and Inkpot Cottage, which are located between the A9 and B867.

Figure 1.1: Existing Constraints



Existing Road Network

1.3.9 The existing A9 between the Pass of Birnam and Tay Crossing was constructed in the 1970s as two separate bypass projects. The section is 8.4-kilometres-long and as-built drawings from the original construction confirm the single carriageway cross-section is 7.3 metres wide with 0.7 metre wide nearside hardstrips. However, the carriageway is wider at places to provide ghost islands, diverge tapers and lay-bys. Verge widths vary throughout to accommodate forward visibility, traffic signs, safety barriers and speed cameras where appropriate. The current carriageway is kerbed.

1.3.10 Travelling north, the section of the A9 within the junction extents commences at the end of the existing dual carriageway section at the Pass of Birnam on a right-hand horizontal curve. There is a priority junction on the southbound carriageway on the inside of the right-hand curve, which provides access to Murthly Estate. The junction incorporates a short length of left-hand diverging lane loop for right turns and a nearside auxiliary lane on the southbound approach. A Type B lay-by, in accordance with the DMRB (CD169: The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms), is located on the northbound carriageway towards the northern extent of the right-hand horizontal curve.

1.3.11 Continuing north, the alignment transitions to a left-hand bend, which includes a Type B lay-by in the southbound carriageway, and then on to a straight section where there is a left/right staggered priority junction. This junction links to the B867 to Bankfoot on the west and Perth Road, which leads to Birnam, Little Dunkeld and Dunkeld, to the east. The junctions incorporate diverge tapers and ghost islands to facilitate turning traffic. Merge tapers are not provided.

1.3.12 The B867 is a single carriageway road generally 7.3 metres wide and commences at the junction with the A9 at Birnam. The B867 rises steeply from the A9 heading south-east, parallel to the A9, before turning south towards the villages of Waterloo and Bankfoot. South of Bankfoot the B867 re-joins the A9 via a left-in left-out junction on the northbound carriageway. Access is available from the B867 to the northbound carriageway of the A9 also, via an underbridge and a left-in left-out junction.

1.3.13 The edge of the carriageway is kerbed in the vicinity of the junction with the A9 and the width of the grass verges is variable. The southern section of the route from its junction with the A9 to a point just north of the village of Waterloo has a footway along at least one side of the road. There is no lighting present in the vicinity of the junction with the A9. A restricted speed limit of 30 miles per hour is signed through Bankfoot but the remainder of the route is to the national speed limit of 60 miles per hour.

1.3.14 Perth Road is a single carriageway road generally 7.3 metres wide and commences at the at-grade major/minor junction with the A9 at Birnam. Perth Road descends east from the A9 heading into Birnam, parallel to the A9, and continues in this direction until its junction with the A923 at Dunkeld.

Traffic

1.3.15 Relevant existing traffic flows are shown in Table 1.1. Annual Average Daily Traffic (AADT) data on the A9 has been taken from the permanent Automatic Traffic Counter (ATC) sites maintained by Transport Scotland for the 24-hour period. For the local road network, where no ATC data is available, the flows have been estimated by factoring the 12-hour junction turning counts, undertaken in November 2012, March 2013 and March 2015, using the average ratio of AADT to 12-hour weekday flows, derived from analysis of ATC data along the A9 between Perth and Inverness.

Table 1.1: Existing AADT Flows

Location (including location reference)	AADT
A9 Mainline (south of the junction with the B898)[1]	13,000
Perth Road (Birnam)[2]	1,400
B*^& (Bankfoot Road Junction)[3]	700
[1] Based on ATC data from Transport Scotland's Scottish Road Traffic Database (SRTDb) [2] Based on Junction Turning Count (March 2013) [3] Based on Junction Turning Count (November 2012)	

Public Utilities

1.3.16 Public Utilities within the locality have been identified by C2 Preliminary Inquiries information requested from utility companies in accordance with the New Roads and Street Works Act 1991, Code of Practice. A summary of the public utility apparatus in the locality is given below.

- Telecommunications - Underground cables cross the A9 in the vicinity of the left/right staggered priority junction with the B867 and Perth Road.

  Overhead cables cross the A9 immediately north of the tie-in point at the scheme's southern extent.
- Gas - A high pressure gas main crosses the A9 twice to the south of the left/right staggered priority junction with the B867 and Perth Road.
- Electricity - Overhead cables cross the A9 carriageway immediately north of the existing private access to Murthly Castle.

  Underground cables cross the A9 dual carriageway immediately north of the southern tie-in of the scheme, north of the existing private access to Murthly Castle and south of the existing left/right staggered priority junction with the B867 and Perth Road.
- Water Supply and Sewerage - Scottish Water distribution water mains cross the A9 carriageway at the existing left/right staggered priority junction with the B867 and Perth Road.

Walkers, Cyclists and Horse Riders (WCH)

1.3.17 At the southern extent of the scheme, National Cycle Network (NCN) Route 77 travels along the B867 to the existing junction with the A9. The route then follows a segregated footpath immediately west of the existing A9 to Dunkeld & Birnam Station.

1.3.18 There are several Core Paths to the west of the B867 and Highland Main Line railway. DUNK/142 is located in the locality of the existing right/left staggered priority junction with the B867 and Perth Road. The path follows NCN Route 77 to Dunkeld & Birnam Station. There is a further Core Path (DUNK/10) on the east of the A9, providing a link between Perth Road and the River Tay.

1.3.19 Right of Way (TP102) follows the route of the Core Paths (DUNK/10/4 and DUNK/10/5) in the locality, linking Perth Road and the River Tay.

1.4 Development of Options

1.4.1 The development of the three Murthly/Birnam Junction options are described below, as well as their justification for inclusion.

The Community's Preferred Route Option (Option 1)

1.4.2 The junction in the locality of the existing private access to Murthly Castle, incorporated within the Community's Preferred Route Option, was suggested by a member of the public at Stage 1 of the A9 Co-Creative Process. The submitted idea only showed an approximate location for the junction and did not identify a favoured layout. Instead, the idea simply stated that a grade separated junction, facilitating all movements, should be provided. At the following stages of the A9 Co-Creative Process, the junction option was modelled, considering the most suitable layout and location in terms of geometric standards and minimising environmental impacts.

1.4.3 The existing constraints dictate the most suitable layout and location of the grade separated junction. Two types of grade separated junction were considered, a diamond layout and a half-cloverleaf, incorporating loops, in accordance with the DMRB (CD122: Geometric design of grade separated junctions). On the northbound carriageway there is insufficient space to incorporate a loop without significantly impacting the adjacent B867 and Highland Main Line railway. As such, on the northbound carriageway, slip roads are the only viable option. On the southbound carriageway, a loop arrangement, with a radius of 50 metres, could be provided, however it would involve greater land-take from the River Tay (Dunkeld) NSA and Murthly GDL and would have further impact on ancient woodland. Slip roads, in a diamond layout, have the advantage that land-take is minimised, reducing the impact on adjacent environmental constraints. As a result, a diamond layout, with northbound and southbound slip roads, is considered the most suitable layout. An overbridge is provided across the A9, connecting to the B867 to the west via an at-grade junction. A connection to Murthly Estate is also included to the east.

1.4.4 While the DMRB (CD109: highway link design) states that compact grade separated junctions should not be used on Dual 2-lane All-Purpose (D2AP) Road (sub-category c) (formerly Category 7A), consideration was given to the use of such a junction in the locality of the existing private access to Murthly Castle. As detailed above however, there is insufficient space on the northbound carriageway to provide a compact loop due to the close proximity of the B867 and Highland Main Line railway. While a compact loop, with a radius of 40 metres, could be provided on the southbound carriageway, the DMRB recommends that individual junctions should not involve different layout types. In addition, this would have a greater impact on adjacent environmental constraints. As such, the use of a compact loop was not considered further.

1.4.5 The proposed junction is sited in the immediate locality of the existing private access to Murthly Castle, which provides a suitable connection with the B867 and maintains access to Murthly Castle. Moving the junction to the immediate north would position the northbound slip roads and junction overbridge closer to residential properties on the west side of the proposed A9 dual carriageway, with an increased adverse impact. On the southbound carriageway in this location the River Tay, which is an SAC, meanders towards the A9. As a result, moving the junction north would likely have an adverse impact on the River Tay SAC, as well as the NSA, GDL and ancient woodland. Given the constraints, the only viable alternative location for a grade separated junction to the north is in the locality of the existing left/right staggered priority junction with the B867 and Perth Road at Birnam.

1.4.6 Moving the junction to the south would involve siting the junction within the existing dual carriageway section of the A9 through the Pass of Birnam, south of the current tie-in point, lengthening the scheme extents. Immediately south of the existing tie-in point the A9 is largely on a 735-metre radius horizontal curve, which is one step below Desirable Minimum standards for the proposed Design Speed. While the existing dual carriageway incorporates approximately 10 metres of central reserve widening, and verge widening, to accommodate forward visibility, this may need to be extended to

ensure driver safety, increasing the land-take associated with the scheme and the impact on the surrounding environment.

1.4.7 Furthermore, lengthening the scheme to the south would impact two existing lay-bys. Lay-bys are important as they provide an opportunity for drivers to stop for a short time. Given the number of junctions on the scheme and the required weaving distance between junctions and lay-bys, it is unlikely that lay-bys can be provided within the Pass of Birnam to Tay Crossing scheme. The scheme to the immediate north, Tay Crossing to Ballinluig, also does not contain lay-bys. As such, impacting the existing lay-bys beyond the southern extent of the Pass of Birnam to Tay Crossing section of A9 dualling may result in a length of approximately 20 kilometres without a lay-by. The DMRB (CD169: The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms) recommends on a dual carriageway that lay-bys are provided at 2.5 kilometre intervals.

1.4.8 The Community's Preferred Route Option incorporates a 50 miles per hour speed limit between its southern extent and the proposed Dunkeld Junction due to forward visibility constraints within the 1.5 kilometre cut and cover tunnel. However, for the purposes of this assessment, and to ensure a robust comparison between options, Option 1, which is the Community's Preferred Route Option at Murthly/Birnam Junction, has been considered for a 70 miles per hour speed limit. As such, some design parameters, such as length of slip roads and forward visibility, which will impact the degree of central reserve and verge widening applied on the A9, have been amended in accordance with the DMRB (CD122: Geometric design of grade separated junctions). The proposed slip roads are slightly longer and to accommodate an increased forward visibility, additional verge and central reserve widening is required on the A9, increasing land-take and further impacting the NSA, GDL and ancient woodland. To accommodate the widening, the southern extent of the scheme would be extended by approximately 270 metres, which would impact the existing lay-bys on the existing dual carriageway section.

Additional Option 1 (Option 2)

1.4.9 Option 2 is a grade separated junction in the locality of the existing left/right staggered priority junction with the B867 and Perth Road at Birnam. The option is similar to the community's second preference at Stage 4 of the A9 Co-Creative Process, which was a grade separated, restricted movements junction, with a northbound diverge slip road and a southbound merge slip road only. However, this junction layout is predicted to increase traffic on Perth Road by approximately 500 vehicles per day, which contradicts the community's objective to reduce current levels of noise and pollution in the villages of Dunkeld and Birnam. To reduce the increase in traffic on Perth Road, a northbound merge slip road has been added to form Option 2.

Additional Option 2 (Option 3)

1.4.10 Option 3 is a grade separated junction in the locality of the existing left/right staggered priority junction with the B867 and Perth Road at Birnam. The option is under consideration as an alternative to the Community's Preferred Route Option as it facilitates all vehicle movements, meeting the community's objective to provide better, safer access on and off the A9 from both sides of the road. In addition, this option does not increase traffic on Perth Road, meeting the community's objective to reduce current levels of noise and pollution in the villages of Dunkeld and Birnam.

1.4.11 It should be noted that a number of alternative junction layouts, in accordance with the DMRB (CD122: Geometric design of grade separated junctions), were considered at Birnam and are detailed in the *'A9 Dualling Programme: Pass of Birnam to Tay Crossing, Stage 2 Preliminary Options Review Report (November 2016)'*. At Birnam, five grade separated junction layouts were considered and assessed in terms of environmental, engineering and economic criteria, as well as integration, accessibility and social inclusion. Those options identified as significantly disadvantageous were suspended from further consideration.

1.4.12 Based on the assessment undertaken in the *'A9 Dualling Programme: Pass of Birnam to Tay Crossing, Stage 2 Preliminary Options Review Report (November 2016)'* it was recommended that Option 3 be taken forward. While this option does have impacts on adjacent constraints, most notably the Highland Main Line railway and ancient woodland, its environmental impact is considered less significant than other options and retained earthworks solutions can be employed to address impacts on the Highland Main Line railway. Impacts on adjacent residential properties are also avoided.

1.5 Cost Estimates

1.5.1 Initial cost estimates have been prepared for each junction option under consideration. The quantifiable items of the works have been measured and a cost per unit has been applied based on rates from similar projects and published data. Other works elements have been assessed as a percentage of the total construction costs, as is standard practise at this stage of assessment.

1.5.2 It should be noted however, that the costs have been prepared for comparison purposes only. Overall scheme costs are dependent on a range of factors, most notably earthworks balance throughout the entire scheme. The costs quoted are for construction only, and therefore omit the following:

- Historic costs to date;
- Pre-construction phase costs;
- Risk, opportunity and uncertainty;
- Optimism Bias; and
- Inflation (through to the end of the construction phase).

1.5.3 The construction costs of the three options under consideration are shown in Table 1.2.

Table 1.2: Construction Costs

Option	Construction Cost
Option 1	£33 million
Option 2	£23 million
Option 3	£44 million

2. Engineering Assessment

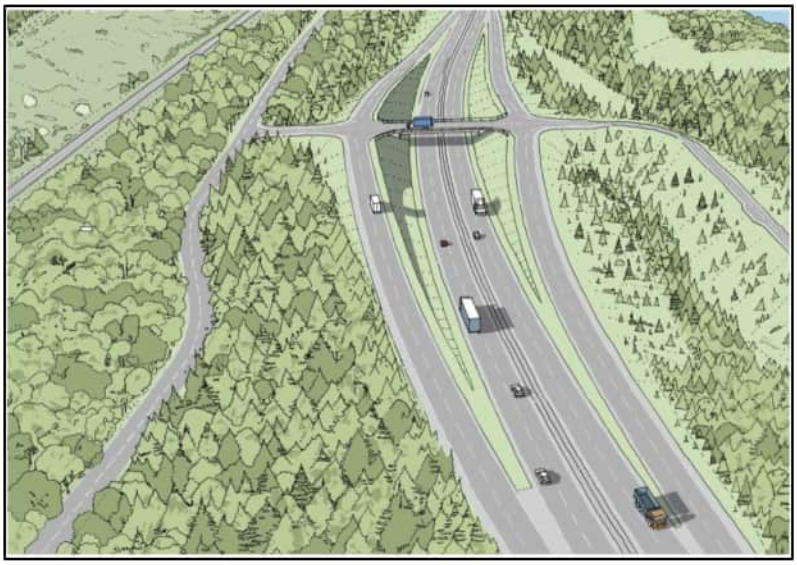
2.1 Engineering Description of Options

2.1.1 The three junction options under consideration for the Murthly/Birnam Junction are shown on Drawings A9P02-JAC-HML-Z_JC01A_JC-FG-RD-0001, A9P02-JAC-HML-Z_JC01B_JC-FG-RD-0001 and A9P02-JAC-HML-Z_JC01C_JC-FG-RD-0001, included in the *'DMRB Stage 2 Scheme Assessment Report, Volume 2 - Engineering Drawings'*.

Option 1

2.1.2 The proposed junction, shown in Figure 2.1, is in the locality of the existing private access to Murthly Castle, approximately 1.3 kilometres south of the existing Birnam Junction. The junction is a diamond layout, with slip roads, incorporating merge and diverge taper arrangements, in both directions, facilitating all vehicle movements. An overbridge is provided across the A9, connecting to the B867 to the west via a priority junction. The overbridge also provides access into Murthly Estate on the east.

Figure 2.1: Murthly/Birnam Junction Option 1



2.1.3 Due to space constraints, the northbound slip roads and the southbound slip roads form priority junctions with no stagger distance. While crossroads are considered suitable at simple junctions where traffic flows are low, staggered junctions are considered safer. In accordance with the DMRB (CD123: Geometric design of at-grade priority and signal-controlled junctions), priority junctions should have a minimum stagger distance of 50 metres.

2.1.4 As the ground to the east falls towards the River Tay, the southbound slip roads are on embankment, up to a maximum height of 20 metres in places.

2.1.5 The proposed A9 is on a right-hand horizontal curve of radius 1,357 metres to tie-in with the existing carriageway. The vertical alignment is generally at-grade with widening on the northbound side. Beyond the horizontal curve, the alignment transitions to a straight and is slightly off-line to the west, to improve the alignment by removing reverse curves on approach to the existing Birnam Junction. As a result of the side-long ground, falling towards the River Tay to the east, cutting slopes are generally introduced on the northbound carriageway.

2.1.6 It should be noted that the proposed Murthly Junction is close to the southern extent of the scheme. Therefore, to accommodate the appropriate forward visibility for a 70 miles per hour speed limit

(120kph Design Speed), further central reserve and verge widening is required on the A9 through the 1,357 metre radius horizontal curve. To accommodate the widening, ensuring a smooth alignment, the southern extent of the scheme must be extended by approximately 270 metres.

2.1.7 Option 1 requires a connection of the B867 and Perth Road in the locality of the existing Birnam Junction. If this junction option is combined with a cut and cover tunnel, the realigned B867/Perth Road would be placed on top of the tunnel, crossing over the proposed A9 dual carriageway. If the junction option is combined with an at-grade A9 option, the realigned B867/Perth Road would traverse the proposed A9 dual carriageway via an underbridge.

Option 2

2.1.8 The proposed junction, shown in Figure 2.2, is in the locality of the existing left/right staggered priority junction with the B867 and Perth Road. It is a grade separated junction incorporating a loop in the northbound direction and a southbound merge slip road. The junction does not include a southbound diverge slip road. The junction connects the B867 and Perth Road, crossing the A9 on an underbridge structure. To avoid encroachment towards the Highland Main Line railway, reinforced earthworks slopes are included in the realigned side road to the immediate west of the A9.

Figure 2.2: Murthly/Birnam Junction, Option 2

2.1.9 The northbound loop has a radius of 50 metres and is a basic merge plus hook diverge layout. Merge and diverge tapers are included to provide safe access and egress from the A9 dual carriageway. A southbound slip road, incorporating a merge taper arrangement is included in the junction. The slip roads connect to the realigned B867/Perth Road via priority junctions, in accordance with the DMRB (CD123: Geometric design of at-grade priority and signal-controlled junctions).

2.1.10 The northbound loop occupies a low-lying area of ground to the immediate west of the A9, therefore the alignment is on embankment. Verge widening is necessary to provide the required Stopping Sight Distance (SSD) through the loop. The southbound merge slip road is in cutting immediately south of the priority junction with the B867/Perth Road, up to a maximum 10 metres deep, before transitioning to embankment, up to 10 metres high, largely due to the existing topography.

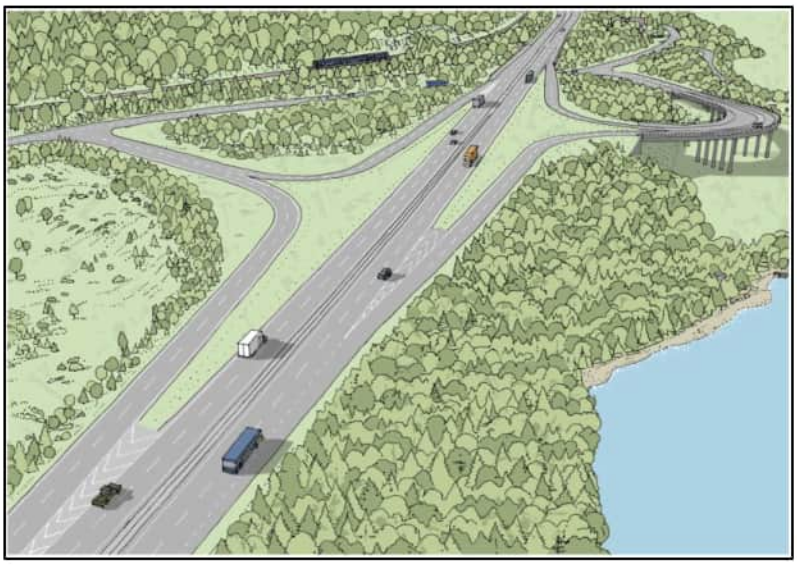
2.1.11 The proposed A9 follows the same alignment as that detailed for Option 1. However, as the junction is further to the north, and on a straight section of alignment, central reserve and verge widening is not required on the right-hand 1,357 metre horizontal curve. The southern scheme extent, therefore, does not require to be extended.

2.1.12 To maintain access, Option 2 includes a new underbridge, which links to the B867, in the locality of the existing access to Murthly Castle.

Option 3

2.1.13 The proposed junction, shown in Figure 2.3, is in the locality of the existing left/right staggered priority junction with the B867 and Perth Road. It is a grade separated junction incorporating loops in the northbound and southbound directions, facilitating all vehicle movements. The junction connects the B867 and Perth Road, crossing the A9 on an underbridge structure. To avoid encroachment towards the Highland Main Line railway, reinforced earthworks slopes are included in the realigned side road to the immediate west of the A9.

Figure 2.3: Murthly/Birnam Junction, Option 3



2.1.14 The northbound and southbound loops have a radius of 50 metres with a basic merge plus hook diverge layout. Merge and diverge tapers are included to provide safe access and egress from the A9 dual carriageway. The loops connect to the realigned B867/Perth Road via priority junctions, in accordance with the DMRB (CD123: Geometric design of at-grade priority and signal-controlled junctions).

2.1.15 The northbound loop occupies a low-lying area of ground to the immediate west of the A9, therefore the alignment is on embankment. Verge widening is necessary to provide the required SSD through the loop. The southbound merge is on embankment with a maximum height of up to 14.5 metres. A 240 metre long viaduct structure, up to 17 metres high, is incorporated on the southbound loop to minimise the impacts on the River Tay floodplain.

2.1.16 The proposed A9 follows the same alignment as that detailed for Option 2.

2.1.17 To maintain access, Option 2 includes a new underbridge, which links to the B867, in the locality of the existing access to Murthly Castle.

2.2 Walkers, Cyclists and Horse Riders

2.2.1 NCN Route 77, which currently links the B867 to Dunkeld & Birnam Station via a segregated route between the Highland Main Line railway and the A9 will be impacted by all options, however it is noted this is largely as a result of A9 widening. The route will be diverted along Perth Road. To mitigate replacement of a segregated route with an unsegregated route it may be necessary to undertake work on Perth Road, however this will be considered further as part of the DMRB Stage 3 assessment. Core

Path (DUNK/142), which largely follows the route of NCN Route 77 will also be impacted. This will therefore also be diverted onto Perth Road.

2.2.2 Core Path (DUNK/10), which is on the east side of the A9, providing a link between Perth Road and the River Tay, will be impacted by Option 3, due to the southbound loop. However, as this section of the loop will be on a viaduct structure, it could be reinstated post construction, subject to further design and assessment work that will be undertaken as part of the DMRB Stage 3 assessment. Right of Way (TP102), which follows the alignment of Core Path (DUNK/10) will also be impacted, with opportunity for re-instatement.

2.2.3 Table 2.1 identifies the WCH routes relevant to the three junction options and provides details of possible impacts and mitigation. To highlight any differentiators between junction options, the following colour coding has been adopted for this table.

	All options affect WCH route to the same extent;
	A particular junction option has a lesser engineering impact on an WCH route than a competing option; and
	A particular junction option has a greater engineering impact on an WCH route than a competing option.

Table 2.1: Impacted WCH Routes

WCH Reference	WCH Location	Impact / Possible Mitigation Measures		
		Option 1	Option 2	Option 3
NCN Routes				
NCN Route 77	NCN Route 77 is in close proximity to the northbound carriageway between the current left/right staggered priority junction with the B867 and Perth Road and Dunkeld & Birnam Station. It is segregated through this section.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.
Perth & Kinross Council (PKC) Core Paths				
DUNK/142	Core Path follows the route of NCN Route 77.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.	Section of route closed due to mainline widening. NCN Route 77 diverted on to Perth Road (unsegregated), re-joining existing route at Birnam Glen.
DUNK/10	Core Path takes access from Perth Road passing the sewage works before turning north and following the River Tay to Dunkeld.	No anticipated impact.	No anticipated impact.	Section of route impacted by the southbound loop. As the loop is on a viaduct structure there may be an opportunity to reinstate post construction.

2.3 Relaxations and Departures from Standards

2.3.1 In accordance with the DMRB (CD109: Highway Link Design), Relaxations and Departures from Standards have been considered in the design. This is predominantly to reduce impacts on adjacent environmental and physical constraints and to lessen construction complexity and costs.

2.3.2 Relaxations from Standards may be introduced in difficult circumstances at the discretion of the Designer, although the Designer has to give careful consideration to benefits and disbenefits, including safety, environmental impacts and costs. There are limits prescribed for Relaxations defined in the DMRB. When applying Relaxations from Standards careful consideration must be given to the safety implications and any requirements for mitigation measures, such as additional signage or road markings, to reduce or eliminate potential hazards.

2.3.3 In exceptionally difficult circumstances, which cannot be overcome by permitted Relaxations from Standards, Departures from Standards may be considered. Departures from Standards cover a range of geometric parameters, such as SSD, horizontal curvature, vertical curvature, superelevation, weaving distance (distance between junctions) and other junction parameters. Applications for Departures from Standards must carefully consider the safety aspects of the reduced standard and provide detailed justification. Departures from Standards must be approved by the Overseeing Organisation (Transport Scotland, Standards Branch).

A9 Dual Carriageway

2.3.4 For comparison purposes Relaxations and Departures for the proposed A9 dual carriageway in the locality of the junction have been considered. The Relaxations and Departures do not consider any other junctions to the north, which may impact the weaving distance between junctions. It should be noted that Option 1 is the only junction that could be used with a 1.5 kilometre cut and cover tunnel. Current design standards recommend that junctions are not located in close proximity to tunnel entrances as this can introduce a safety issue, particularly as most accidents occur at junctions.

2.3.5 The A9 dual carriageway alignments under consideration do not incorporate any Relaxations from Standards. However, Options 2 and 3 include one Departure from Standards, as detailed in Table 2.2.

Table 2.2: A9 Dual Carriageway, Departures from Standards

Reference	Location & Chainage	Departure Type	DMRB Reference	Required Standard	Standard Provided
Option 1					
No Departures from Standards					
Option 2					
DEP201	Ch. 2,260 to 2,300, Northbound Carriageway, Lanes 1 & 2	SSD (on approach to and through Birnam Junction)	CD109: Highway link design, Table 2.10, Clause 2.13	SSD = 295 metres	Lane 1: SSD = 268 metres Lane 2: SSD = 279 metres
Option 3					
DEP301	Ch. 2,260 to 2,300, Northbound Carriageway, Lanes 1 & 2	SSD (on approach to and through Birnam Junction)	CD109: Highway link design, Table 2.10, Clause 2.13	SSD = 295 metres	Lane 1: SSD = 268 metres Lane 2: SSD = 279 metres

2.3.6 The Departure from Standards for Options 2 and 3 is for SSD through Birnam Junction. The SSD in this locality is dictated by the vertical alignment and the change in superelevation. Verge widening, to provide the necessary SSD, would encroach towards the Highland Main Line railway.

Murthly/Birnam Junction

2.3.7 The three junctions under consideration at Murthly/Birnam incorporate Relaxations and Departures from Standards, which are detailed in Tables 2.3 and 2.4. It should be noted that for the purposes of this assessment, suitable Design Speeds, which the Relaxations and Departures from Standards have been evaluated from, have been assumed, considering side road layout and existing speed limits. Further assessment of side road Design Speeds will be undertaken as part of the DMRB Stage 3 assessment.

Table 2.3: Murthly/Birnam Junction, Relaxations from Standards

Reference	Location & Chainage	Relaxation Type	DMRB Reference	Required Standard	Standard Provided
Option 1					
No Relaxations from Standards					
Option 2					
RLXJ201	Junction of realigned B867/Perth Road and Northbound Diverge/Merge Slip Road	Gradient at Priority Junction	CD123: Geometric design of at-grade priority and signal- controlled junctions, Clause 5.3.1	Gradient = 2% (maximum)	Gradient = 4%
Option 3					
RLXJ301	Junction of realigned B867/Perth Road and Northbound Diverge/Merge Slip Road	Gradient at Priority Junction	CD123: Geometric design of at-grade priority and signal- controlled junctions, Clause 5.3.1	Gradient = 2% (maximum)	Gradient = 4%

Table 2.4: Departures from Standards - Murthly/Birnam Junction

Reference	Location & Chainage	Departure Type	DMRB Reference	Required Standard	Standard Provided
Option 1					
DEPJ101	Right/Left Staggered Priority Junction on the realigned Murthly Estate Access Track with the Southbound Diverge Slip Road and the Southbound Merge Slip Road	Stagger Distance	CD123: Geometric design of at-grade priority and signal-controlled junctions, Clause 2.23	50 metres	4.5 metres
DEPJ102	Right/Left Staggered Priority Junction on the realigned Murthly	Stagger Distance	CD123: Geometric design of at-grade priority and	50 metres	5 metres

Reference	Location & Chainage	Departure Type	DMRB Reference	Required Standard	Standard Provided
	Estate Access Track with the Northbound Diverge Slip Road and the Northbound Merge Slip Road		signal-controlled junctions, Clause 2.23		
Option 2					
DEPJ201	Northbound Diverge Loop, Ch. 0 to Ch. 277	SSD	CD109: Highway link design, Table 2.10 CD122: Geometric Design of grade separated junctions, Clause 3.33, Figure 3.33b	SSD = 295 metres	SSD = 155 metres
Option 3					
DEPJ301	Northbound Diverge Loop, Ch. 0 to Ch. 277	SSD	CD109: Highway link design, Table 2.10 CD122: Geometric Design of Grade Separated Junctions, Clause 3.33 Figure 3.33b	SSD = 295 metres	SSD = 155 metres
DEPJ302	Southbound Diverge Loop, Ch. 0 to Ch. 330	SSD	CD109: Highway link design, Table 2.10 CD122: Geometric Design of Grade Separated Junctions, Clause 3.33 Figure 3.33b	SSD = 295 metres	SSD = 70 metres
DEPJ303	Southbound Merge Loop, Ch. 70 to Ch. 450	SSD	CD109: Highway link design, Table 2.10 CD122: Geometric Design of Grade Separated Junctions, Clause 3.23	SSD = 120 metres	SSD = 70 metres

2.3.8 Option 1 is not in the location of an existing junction and therefore does not comply with the A9 Junctions & Accesses Strategy. This junction incorporates two Departures from Standards due to the stagger distance between the slip roads. It should be noted that whilst there is limited distance between the A9 and the B867, which means that the appropriate stagger distance cannot be accommodated for the northbound slip roads, the southbound slip roads could be amended to remove

this Departure. This would, however, likely result in a greater constructability, cost and environmental impact.

2.3.9 Option 2 is in the locality of the existing left/right staggered priority junction with the B867 and Perth Road at Birnam and is therefore in accordance with the A9 Junctions & Accesses Strategy. However, the omission of a southbound diverge slip road would restrict connectivity to the B867 towards Bankfoot. This junction incorporates one Departure from Standards due to the appropriate forward visibility not being achieved on the A9 on approach to the northbound diverge slip road. However, these Departures from Standards are not considered significant.

2.3.10 Option 3 is in the locality of the existing left/right staggered priority junction with the B867 and Perth Road at Birnam and is therefore in accordance with the A9 Junctions & Accesses Strategy. This junction incorporates three Departures from Standards. Two Departures relate to the appropriate SSD not being achieved on the A9 on approach to the southbound and northbound diverge slip roads, largely due to the loop layout. A further Departure from Standards for forward visibility is required on the southbound loop (120 metres required, 70 metres achieved). Increasing the verge widening could remove this Departure, however, this would increase the size of the viaduct structure resulting in a greater constructability, cost and environmental impact.

2.4 Geotechnics & Earthworks

2.4.1 An assessment of the likely ground conditions affecting the various options has been determined from the 1:10,560 and 1:50,000 British Geological Survey (BGS) maps. Reference has also been made during the study to the Preliminary Sources Study Reports (PSSR) prepared by AECOM in 2011. A detailed Ground Investigation (GI) was completed for the Pass of Birnam to Tay Crossing section of the A9 in February 2015 with additional exploratory holes undertaken in 2016. Further, supplementary GI was completed in May 2019, which consisted of four boreholes. Information obtained from these investigations have been utilised where appropriate.

2.4.2 The GI shows that Alluvium is encountered within the valley of the River Tay. Alluvium is generally underlain by Glaciofluvial deposits comprising sand and gravel with cobbles and boulders. The GI noted rockhead at depths of between 7 metres and 23 metres and generally comprised conglomerates, basalt, tillite and unidentified metamorphic rocks. The Highland Boundary Fault Zone (approximately 800 metres north of the southern tie-in point) forms the boundary between the Dalradian metasedimentary rocks and the Lower Devonian sedimentary and igneous rocks. This zone comprises several major north-east to south-west trending faults which down-throw the solid strata to the south-east. The BGS states that the faulting has not been measured although a fault was locally recorded at approximately 45° within the Birnam Slate and Grit Formation.

2.4.3 Two disused quarries (including Birnam Quarry) are present in the locality of the proposed junction options. Both are approximately 250 metres from the A9.

2.4.4 Full details of the ground conditions is provided in the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 2 - Engineering Assessment*'. A summary is provided below.

2.4.5 Based on the detailed GI undertaken for the Pass of Birnam to Tay Crossing section of A9 dualling, it has been assumed that 90% of material excavated will be acceptable for re-use as general fill, with the remaining 10% unacceptable, and requiring disposal off-site.

2.4.6 Table 2.5 shows a comparison of earthworks for all three options between Ch. 0 and Ch. 2,400 on the proposed A9 dual carriageway, and includes the A9, junctions and associated side roads. It should be noted that the earthworks quantities have been considered for this section in isolation. The quantities, particularly that quoted for *'Total Import Fill Required'* will be influenced by the layout throughout the whole scheme. As such, the quantities quoted in Table 2.5 are for comparison purposes only.

Table 2.5: Earthworks Option Summary

Ch. 0 to Ch. 2,400	Option 1 (m^3)	Option 2 (m^3)	Option 3 (m^3)
Total Cut Excavation	187,000	215,000	200,000
Cut Excavation Available for Re-use	168,000	193,000	180,000
Total Fill Required	354,000	203,000	219,000
Total Import Fill Required	186,000	10,000	39,000
Total Topsoil Excavation	47,000	25,000	40,000
Total Topsoil Required	48,000	21,000	21,000
Disposal of Acceptable Cut	0	0	0
Disposal of Acceptable Topsoil	0	1,500	15,000
Disposal of Unacceptable Cut	18,700	21,500	20,000
Disposal of Unacceptable Topsoil	4,700	2,500	4,000

Option 1

2.4.7 The junction incorporates an overbridge structure and comprises.

- The northbound merge slip road is in cutting between Ch. 0 and Ch. 150, with a maximum depth of up to 6 metres. Th slip road then transitions onto embankment beyond Ch. 150, up to 6 metres high;
- The northbound diverge slip road is generally at-grade before Ch. 100. Beyond Ch. 100, the slip road is on embankment up to 4.5 metres in height;
- The southbound merge slip road is on embankment throughout with a maximum height of up to 21 metres; and
- The southbound diverge slip road is in cutting, up to 3 metres high, between Ch. 0 and Ch. 135. It then transitions to embankment beyond Ch. 135, with a maximum height of up to 13 metres.

Option 2

2.4.8 The junction incorporates an underbridge structure and comprises:

- The realigned B867/Perth Road is in a cutting slope with a maximum depth of up to 12.5 metres. Reinforced earthwork slopes are required between Ch. 75 and Ch. 360 to avoid encroachment towards the Highland Main Line railway where the side road is lower than existing ground level to satisfy headroom clearance requirements at the underbridge structure;
- The northbound loop is proposed on an embankment with a maximum height of up to 10 metres; and
- The southbound merge slip road is on embankment between Ch. 0 and Ch. 135, with a maximum height of up to 10 metres. The southbound merge transitions into a cutting slope beyond Ch. 135 on the immediate approach to the priority junction with the realigned B867/Perth Road.

Option 3

2.4.9 The junction incorporates an underbridge structure and comprises:

- The realigned B867/Perth Road is in a cutting slope with a maximum depth of up to 12.5 metres. Reinforced earthwork slopes are required between Ch. 75 and Ch. 360 to avoid encroachment towards the Highland Main Line railway where the side road is lower than existing ground level to satisfy headroom clearance requirements at the underbridge structure;

- The northbound loop is proposed on an embankment with a maximum height of up to 10 metres;
- The southbound merge slip road is on embankment between Ch. 0 and Ch. 180, with a maximum height of up to 10.8 metres. A viaduct structure is proposed on the southbound loop to limit encroachment towards the floodplain at the River Tay. The loop transitions to a cutting slope beyond Ch. 360 on the immediate approach to the priority junction with the realigned B867/Perth Road; and
- The viaduct structure in Option 3 would require significant piled foundations in close proximity in close proximity to the River Tay floodplain and high-pressure gas pipeline, presenting added construction complexity and cost.

2.5 Hydrology, Hydrogeology and Drainage

2.5.1 The effects of the three junction options on the water environment are considered further in Section 3.4 (Road Drainage and the Water Environment). This section provides a summary of the engineering issues related to watercourse crossings and road drainage.

2.5.2 All junction options have the same number of minor watercourse crossings with the exception of Option 1, which extends over Birnam Burn at its southern extent, due to the lengthened A9 alignment. However, it is envisaged that no additional works will be required to the Birnam Burn culvert with this option.

2.5.3 Option 1 requires to attenuate a volume of approximately 13,240 cubic metres, split into two Sustainable Drainage System (SuDS) ponds between Ch. 0 and Ch. 2,400. Filter drains and detention basins, which provide the necessary two levels of treatment are proposed for the A9 dual carriageway and the junction. Detention basins are proposed on the east side of the A9 at the proposed Murthly Junction and in the locality of the access to the sewage works, to attenuate and treat surface run-off.

2.5.4 Option 2 requires to attenuate a volume of approximately 7,880 cubic metres, split into two SuDS ponds. Filter drains and detention basins are proposed to provide the necessary two levels of treatment. Detention basins are proposed at the proposed underbridge providing access to Murthly Estate, on the east side of the proposed A9 dual carriageway, and in the locality of the access to the sewage works, to attenuate and treat surface run-off from the A9 dual carriageway and junction.

2.5.5 Option 3 requires to attenuate a volume of approximately 15,780 cubic metres, in two SuDS ponds. Filter drains and detention basins, which provide the necessary two levels of treatment are proposed for the A9 dual carriageway and the majority of the Birnam Junction. However, as the southbound loop is on a viaduct structure, a combined kerb and drainage system is required to convey run-off across the structure to an appropriate outfall location. It should be noted that a combined kerb and drainage system is not considered a level of treatment. Detention basins would be provided in the locality of the Murthly Estate access and in the locality of the realigned B867/Perth Road, on the east side of the proposed A9.

2.6 Structures

2.6.1 This section provides a general overview of the requirements for structures for the three junction options under consideration. The proposals below are based on adopting concrete construction, either cast in-situ or precast, where spans permit, as this is generally the most cost-effective type of construction. However, where larger spans cannot be avoided, steel concrete composite construction is proposed.

Murthly Junction Overbridge (Option 1)

2.6.1 This structure will carry the Murthly Estate Access Track, which forms part of the grade separated junction, over the A9 dual carriageway. The new structure will be a single span integral bridge with a

clear square span of approximately 50 metres and no skew. The width of the new bridge will be approximately 15 metres.

2.6.2 This option is based on widening the existing carriageway on both sides at this location.

2.6.3 The structure will have a composite deck of three braced pairs of steel plate girders with a transversely spanning reinforced concrete slab. The substructure will be reinforced concrete bank seat abutments. It is likely that the new structure will be able to adopt spread footings.

Birnam Underbridge (Option 1)

2.6.4 This structure will carry the A9 dual carriageway over the realigned B867/Perth Road. The cross-section of the dual carriageway remains constant over the length of the structure. It will be a skewed three-span structure with a skew of approximately 55°. The skewed central span length will be approximately 31 metres and the side span lengths will be approximately 19 metres. The square width of the deck will be approximately 27 metres.

2.6.5 This option is based on widening the existing carriageway to the southbound side.

2.6.6 The new structure will be continuous over the piers and simply supported at the abutments, as the skew is in excess of 30°. The deck will comprise precast prestressed concrete beams composite with an in-situ reinforced concrete slab. The substructure will be reinforced concrete bank seat abutments and piers comprising circular reinforced concrete columns. It is likely that the new structure will be able to adopt spread footings. Abutment galleries will be provided to allow the future inspection and maintenance of bearings and expansion joints.

2.6.7 If this junction option is combined with a cut and cover tunnel, the realigned B867/Perth Road would be placed on top of the tunnel, crossing over the proposed A9 dual carriageway.

Murthly Estate Underbridge (Options 2 & 3)

2.6.8 This new structure will carry the A9 dual carriageway over a new road providing access to Murthly Estate. It will be a single span structure with a clear square span of approximately 9 metres and no skew. The structure width will be approximately 27 metres.

2.6.9 Options 2 and 3 are identical at this location and are based on widening the existing carriageway on both sides.

2.6.10 The new structure will be integral. The dual carriageway alignment remains at existing carriageway level and the access road is in cutting below. The structure will comprise precast concrete arch units on concrete abutments. It is likely that the new structure will be able to adopt spread footings. Stone masonry cladding will be applied to the exposed concrete surfaces to improve the structure's aesthetics.

Birnam Junction Underbridge (Option 2)

2.6.11 This structure will carry the A9 dual carriageway over the realigned B867/Perth Road. The cross-section of the dual carriageway tapers over the length of the structure to accommodate the northbound merge slip road. It will be a skewed three-span structure with the skew varying from approximately 54.8° to 57°. The skewed central span length varies from approximately 31 metres to 32.5 metres and the side span lengths vary from approximately 19 metres to 21 metres. The square width of the deck varies between approximately 29 metres and 31 metres.

2.6.12 This option is based on widening the existing carriageway to the southbound side.

2.6.13 The new structure will be continuous over the piers and simply supported at the abutments, as the skew is in excess of 30°. The deck will comprise precast prestressed concrete beams composite with an in-situ reinforced concrete slab. The substructure will be reinforced concrete bank seat abutments and piers comprising circular reinforced concrete columns. It is likely that the new structure will be able to adopt spread footings. Abutment galleries will be provided to allow the future inspection and maintenance of bearings and expansion joints.

Birnam Junction Underbridge (Option 3)

2.6.14 This structure will carry the A9 dual carriageway over the realigned B867/Perth Road. The cross section of the dual carriageway tapers over the length of the structure to accommodate the northbound merge and southbound diverge slip roads. It will be a skewed three-span structure with the skew varying from approximately 49° to 56°. The skewed central span length varies from approximately 31 metres to 35 metres and the side span lengths vary from approximately 16 metres to 17.5 metres. The square width of the deck varies between approximately 33.5 metres and 39 metres.

2.6.15 This option is based on widening the existing carriageway to the southbound side.

2.6.16 The new structure will be continuous over the piers and simply supported at the abutments, as the skew is in excess of 30°. The superstructure will comprise a composite deck of six braced pairs of steel plate girders with a transversely spanning reinforced concrete slab. The substructure will be reinforced concrete bank seat abutments and piers comprising circular reinforced concrete columns. It is likely that the new structure will be able to adopt spread footings. Abutment galleries will be provided to allow the future inspection and maintenance of bearings and expansion joints.

Birnam Junction Southbound Slip Viaduct (Option 3)

2.6.17 This structure will carry the new Birnam Junction southbound slip roads over the River Tay flood plain. It will be a continuous four span structure that will curve in plan. Each span will be unique in terms of length, width and skew angle.

2.6.18 The new structure will be simply supported at the abutments and continuous over the intermediate piers. The deck will comprise five rectangular steel box girders of uniform depth, composite with an in-situ reinforced concrete deck slab. The substructure will comprise intermediate supports consisting of circular reinforced concrete columns and full height reinforced concrete abutments. Abutment galleries will be provided to allow the future inspection and maintenance of the bearings and expansion joints. It is likely that the new structure will be able to adopt spread footings.

2.7 Public Utilities

2.7.1 This section identifies the existing utility apparatus from Ch. 0 to Ch. 2,400 within each option, based on information provided by each supplier. Existing public utility infrastructure within the A9 corridor is shown on the drawings listed below that are included in the *'DMRB Stage 2 Scheme Assessment Report, Volume 2 - Engineering Drawings*'.

- A9P02-JAC-VUT-X_ZZZZZ_ZZ-FG-RD-0001; and
- A9P02-JAC-VUT-X_ZZZZZ_ZZ-FG-RD-0001.

2.7.2 The total number of utility interfaces for each option has been identified and is highlighted in Table 2.6 to provide an indication of the potential impact on the existing public utility infrastructure. Utility diversions at the interface locations identified have not been designed, however this will be undertaken as part of the DMRB Stage 3 assessment.

Table 2.6: Public Utilities Interface

Route Options	No. of Impacts				Total
	Telecoms	Gas	Electricity	Water & Sewage	
Option 1	6	1	6	2	15
Option 2	6	1	6	2	15
Option 3	6	1	6	2	15

2.7.3 As summary of the utility interactions is given below.

- Telecommunications - All options include the same number of impacts on telecommunication apparatus. An existing underground cable that is immediately adjacent to the existing A9 on the west side is impacted due to A9 widening. The impact is increased for Option 1 as a result of the Murthly Junction. An overhead cable that adjoins the underground cable and links to residential properties (Ringwood and West Ringwood Cottages) is also impacted.

  Further underground cables following the alignment of the B867 and the access road to the sewage works would be impacted.

  All options impact overhead cables that cross the A9 near the southern extent of the scheme and on the east, conflicting with the access into Murthly Estate.

- Gas - All options will impact an existing local high pressure main that crosses the A9 twice south of the existing Birnam Junction. Between the crossing points, the high pressure main is immediately adjacent to the existing A9 on the west.

  The impact is more significant for Option 3, due to the southbound loop, which crosses the high pressure main. While the loop will be on a viaduct structure, which will lessen the impacts, significant construction works will be required in the locality of the gas infrastructure.

  It should be noted that Scottish Gas Networks (SGN) intend to divert the gas pipeline prior to construction of this section of A9 dualling, however this has not been confirmed.

- Electricity - An existing high voltage overhead cable will be impacted by all options. This cable is located on the east side of the A9 and generally follows the proposed route of the access to Murthly Estate, crossing the A9 in the locality of Ringwood Cottage. Further overhead and underground apparatus is present in this vicinity that will also be impacted.

  A high voltage underground cable crosses the A9 in the locality of the southern tie-in point, which will be impacted by all options.

- Water Supply and Sewerage - All options conflict with an existing water main that follows the route of the B867 and crosses the A9 at the existing left/right priority junction with the B867 and Perth Road.

  An existing combined sewer outfall, that follows the alignment of the existing B867 is also impacted.

2.8 Constructability

2.8.1 The junction options under consideration as part of the DMRB Stage 2 assessment involve construction works within a constrained corridor, impacting physical and environmental constraints. Works for all options would require to be undertaken during a continuous Traffic Management system, with a temporary speed restriction and likely reduced lane widths to maintain two-way traffic on the A9. It is likely that temporary priority junctions, in a similar location to the existing Birnam Junction will be provided during construction to maintain access.

2.8.2 Key constructability issues for each option is given below.

Option 1

2.8.3 The slip roads associated with Option 1 are generally outwith the extent of the existing A9 and can therefore be constructed while traffic remains operational on the A9. The slip roads can then be utilised to accommodate traffic movements along the route while works are being undertaken to the main carriageway.

2.8.4 The option includes an overbridge and a night-time closure may be required to construct the structure, with suitable diversions put in place. Option 1 also requires an additional significant structure in the locality of the existing Birnam Junction to facilitate the realigned B867/Perth Road.

2.8.5 It should be noted that Option 1 requires an additional 270 metres of dual carriageway to be constructed beyond the proposed southern tie-in point to facilitate the necessary central reserve and verge widening and maintain a smooth alignment.

Option 2

2.8.6 The slip roads associated with Option 2 are generally outwith the extent of the existing A9. As such, they can be constructed while traffic remains operational on the A9. The slip roads can then be utilised to accommodate temporary traffic movements. The southbound merge slip road is outwith the extents of the River Tay designated floodplain, however given its close proximity, this would need to be considered during construction.

2.8.7 The B867 requires to be lowered to link to Perth Road and steepened earthworks would be required to avoid encroachment towards the Highland Main Line railway. Monitoring may therefore be required given the close proximity to the railway tracks.

2.8.8 Option 2 includes an underbridge structure at the junction and some A9 carriageway closures may be required to form the structure. The proposed underbridge structure providing access to Murthly Estate may also require temporary A9 closures. Any closures would be programmed to occur during off-peak periods.

Option 3

2.8.9 To minimise impact on the River Tay designated floodplain, Option 3 includes a viaduct structure. This structure is significant in size and will therefore introduce a degree of complexity to construct. The structure is within the floodplain, which adds to the complexity and is in close proximity to a high pressure gas main, which would need to be fully considered. Additional measures may be required to protect the pipeline during construction. However, as the southbound loop is off-line, construction is unlikely to have a significant impact on A9 and local traffic.

2.8.10 Similarly, to Option 2, Option 3 requires the B867 to be lowered and steepened earthworks erected to avoid encroachment towards the railway. Temporary A9 carriageway closures may be necessary to form the underbridge structures at the junction and for the access to Murthly Estate to the south.

2.9 Engineering Assessment Summary

2.9.1 The engineering assessment for the Murthly/Birnam Junction options is summarised below.

WCH

2.9.2 All junction options impact NCN Route 77 and Core Path (DUNK/142), however this is common to all and is largely a result of A9 widening. The route will be diverted on to Perth Road, re-joining the existing route at Birnam Glen. Core Path (DUNK/10) will be impacted by Option 3 only. However, post construction, this link could be reinstated.

2.9.3 The variation between junction options is not considered to be a differentiator.

Relaxations and Departures from Standards

2.9.4 Table 2.7 provides a summary of the Relaxations and Departures from Standards for the proposed A9 dual carriageway for each option.

Table 2.7: A9 Dual Carriageway Relaxations and Departures from Standards

Option	Number of Relaxations from Standards		Number of Departures	
	A9 Dual Carriageway	Junction Options	A9 Dual Carriageway	Junction Options
Option 1	0	0	0	2
Option 2	0	1	1	2
Option 3	0	1	1	3

2.9.5 While the number of Relaxations and Departures from Standards are comparable for all options, Option 1 is not in the location of an existing junction and therefore does not comply with the A9 Junctions & Accesses Strategy. Option 2 omits a southbound diverge slip road, which would restrict connectivity to the B867 towards Bankfoot and increase traffic flows on Perth Road, however this increase is not considered significant.

2.9.6 The variation between junction options is not considered to be a differentiator.

Geotechnics & Earthworks

2.9.7 It has been assumed that 90% of material excavated will be acceptable for re-use as general fill, with the remaining 10% unacceptable, requiring disposal off-site. As a result, Option 2 requires the least amount of imported fill material, with Option 1 the most. Options 1 and 2 are comparable in terms of total disposal, while Option 3 requires the highest volume of disposal.

2.9.8 Options 2 and 3 involve realignment of the B867 and Perth Road, introducing a reinforced cutting slope alongside the Highland Main Line railway. Option 1 includes embankments up to 21 metres high on the southbound merge slip road. A viaduct structure is required for Option 3, which would require significant piled foundations in close proximity to the River Tay floodplain and high-pressure gas pipeline.

2.9.9 The variation between route options is considered to be a differentiator, with Option 3 the least favourable.

Hydrology, Hydrogeology and Drainage

2.9.10 All route options have the same number of named watercourse crossing with the exception of Option 1, which extends over Birnam Burn at its southern extent. However, it is envisaged that no additional works will be required to the Birnam Burn culvert with this option. The SuDS ponds across all options are comparable in terms of volumes.

2.9.11 Options 1 and 3 are required to attenuate a comparable volume of surface run-off, however Option 2, largely as it does not include a southbound diverge slip road, is less. Option 3, as a result of the proposed viaduct structure, includes a section of combined kerb and drainage, which does not provide any treatment.

2.9.12 The variation between junction options is not considered to be a differentiator.

Structures

2.9.13 In total, Options 1 and 2 include two bridge structures. Option 1 incorporates an overbridge at the grade separated junction along with a further structure for the realigned B867/Perth Road to cross the A9 at the existing Birnam Junction. Option 2 includes two underbridge structures, providing access to Murthly Estate and at the proposed grade separated junction. Option 3 includes the same two structures as Option 2, however it also includes a 240 metre long viaduct structure. While the associated structures costs for Options 1 and 2 are broadly comparable, the structures costs for Option 3 would be significantly higher, primarily as a result of the viaduct structure.

2.9.14 The variation between junction options is considered to be a differentiator, with Option 3 the least favourable.

Public Utilities

2.9.15 While the number of interfaces with public utility apparatus for each option is generally similar, the southbound loop incorporated within Option 3 crosses a high-pressure gas pipeline. To lessen the impacts, the loop will be on a viaduct structure, which will lessen the impacts. However, significant construction works will be necessary in the locality of the gas infrastructure.

2.9.16 The variation between junction options is considered to be a differentiator, with Option 3 the least favourable.

Constructability

2.9.17 All options are generally off-line and can therefore be constructed with minimal impacts to A9 traffic. For Option 1, an overbridge structure is required, which would likely incur night-time closures on the A9 to construct. Option 1 also includes an additional 270 metre length of new dual carriageway at the southern extent, which the other options do not.

2.9.18 To minimise impact on the River Tay floodplain, a viaduct structure is included for the southbound loop for Option 3. The structure is significant in size and will therefore introduce a degree of construction complexity and increased cost, particularly as it is in close proximity to a high-pressure gas pipeline.

2.9.19 Construction complexity is reduced for Option 2 as the southbound merge slip road is outwith the River Tay floodplain and conventional construction techniques can be implemented.

2.9.20 The variation between junction options is considered to be a differentiator, with Option 2 the most favourable and Option 3 the least favourable.

3. Environmental Assessment

3.1 Overview of Environmental Assessment

DMRB Environmental Assessment

3.1.1 The DMRB sets out United Kingdom (UK) wide guidance on the development of trunk road schemes. The Sustainability & Environment section of the DMRB specifically provides guidance on environmental assessment, including Environmental Impact Assessment (EIA). Full details of the guidance used in the assessment is included in the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

Design Refinement

3.1.2 The proposed junction options assessed in this report have been developed to a level of detail appropriate to enable robust comparative assessment. It should be noted that these are indicative designs, and the preferred junction option would be subject to ongoing design development as part of the DMRB Stage 3 process which is iteratively informed by environmental considerations.

Scope of DMRB Stage 2 Environmental Assessment

3.1.3 This environmental assessment has been conducted as part of the DMRB Stage 2 assessment of Whole Route Options for the A9 Dualling Programme: Pass of Birnam to Tay Crossing scheme and covers the section between Ch. 0 and Ch. 2,400, as detailed in *Paragraph 1.2.2*. This environmental assessment was undertaken as an initial stage of the DMRB Stage 2 Whole Route Options assessment and the assessment approach, methodology and baseline information for the two assessments are aligned. Where there are differences, these have been explained in the relevant sections of this report.

3.1.4 This is a comparative assessment, intended to illustrate where the differences of the impacts and effects between the proposed junction options are sufficient to be differentiators that would contribute to the decision on a preferred junction option.

3.1.5 The proposed junction options have been subject to environmental assessment for the following environmental factors, which are the same as those assessed in the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*.':

- Population - Land Use;
- Geology, Soils and Groundwater;
- Road Drainage and the Water Environment;
- Biodiversity;
- Landscape;
- Visual;
- Cultural Heritage;
- Air Quality;
- Noise and Vibration;
- Population - Accessibility;
- Material Assets and Waste;
- Climate;
- Human Health; and

- Policies and Plans.

Environmental Reporting

Baseline Conditions

3.1.6 The assessment of potential impacts and effects on each environmental factor is undertaken in comparison to baseline conditions, which were determined through a combination of field survey, desk-based review and consultation. Baseline conditions describe the existing environmental conditions in the study area and in the wider area as pertinent to the particular environmental factor.

3.1.7 Details of baseline data collection are presented in each environmental chapter within the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*'. Further verification and additional data collection would be undertaken as part of the DMRB Stage 3 assessment.

Potential Impacts and Effects

3.1.8 The general approach to assessment is based on the determination of significance of effects from a combination of the sensitivity or importance of the baseline conditions and the magnitude of potential impacts. This process is described in the respective environmental chapters within the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*'.

3.1.9 It should be noted that the magnitude of impacts and significance of effects reported within the 'Potential Impacts and Effects' section of each chapter has been considered in the absence of mitigation, unless stated otherwise.

3.1.10 For the purposes of this DMRB Stage 2 assessment, construction impacts are considered to be temporary. Impacts may begin during construction but if they persist during operation, they are considered operational impacts. Any exceptions to this are noted. Operational impacts and effects are considered long-term or permanent, again with any exceptions being noted.

Potential Mitigation

3.1.11 As reported within the environmental chapters in the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment', DMRB Stage 2 designs are not developed in enough detail to allow mitigation proposals to be confirmed. Therefore, the assessment largely identifies 'standard' or anticipated mitigation taking into account best practice, legislation and appropriate guidance, which would be further developed and refined during the DMRB Stage 3 assessment. Early 'embedded' mitigation such as use of a viaduct structure (Option 3) and low noise road surfacing (all proposed junction options) is also incorporated within the DMRB Stage 2 design. Generally, potential 'Moderate' or greater significant effects would be identified as priorities for mitigation. However, the need for mitigation would be confirmed as part of the DMRB Stage 3 assessment.

3.1.12 Details of potential mitigation for each environmental factor can be found in Section 5 of each chapter in the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'. A summary of potential mitigation items relevant to this assessment is reported under 'Potential Mitigation' in each environmental section.

Summary of Assessment

3.1.13 In this section, two aspects are considered; whether any potential effects would be considered significant in the context of the EIA Regulations, and whether any of the potential impacts or effects identified differ sufficiently between proposed junction options that they need to be considered as part of the overall identification of a preferred junction option (which takes into account environmental, engineering, economic and traffic considerations). This section takes into account potential mitigation where possible and presents residual effects.

Consultation

3.1.14 The proposed junction options have formed a part of the wider consultation on the DMRB Stage 2 assessment and further details on consultation regarding the environmental assessment can be found in *Chapter 7: Overview of Environmental Assessment* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.2 Population - Land Use

Approach and Methods

3.2.1 The approach and methods used to assess Population - Land Use is included in *Section 8.2: Approach and Methods* of *Chapter 8: Population - Land Use* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.2.2 The assessment approach for the proposed route options includes consideration of the potential impacts and effects on private property, housing and businesses, community assets, community land, development land and agricultural holdings. The potential impacts and effects relating to land-take (e.g., demolition of a building, and loss and/or severance of land), change in accessibility (vehicles and walkers, cyclists and horse riders), introduction or removal of severance, viability of land use and potential for indirect impacts on businesses are assessed. In comparatively assessing the proposed junction options, not all of the aforementioned environmental factors can or need to be assessed as these are not considered to be relevant to the assessment. The assessment does not assess potential construction effects as these are anticipated to be similar to operational effects. For the purposes of this assessment, the comparative assessment focusses on potential operational effects arising from land-take and change in accessibility for vehicles.

Baseline Conditions

3.2.3 The baseline conditions were identified through a desk-based assessment and review of information as reported in *Section 8.2 (Paragraphs 8.2.6 to 8.2.17) and Section 8.3: Baseline Conditions* of *Chapter 8: Population - Land Use* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.2.4 Receptors that would be affected by the proposed junction options include:

- Murthly Castle Estate;
- Network Rail;
- Prime and non-prime agricultural land;
- Woodland and other land serving a range of functions;
- Commercial and residential property; and
- Vehicle travellers whose accessibility, with regard to journey length, between the dualled A9 and Birnam and Dunkeld would change depending on the proposed junction option.

Potential Impacts and Effects

3.2.5 The potential impacts and effects on the receptors listed in Paragraph 3.2.4 have been assessed for all proposed junction options. The potential impacts and effects on Population - Land Use for each of the proposed junction options under consideration are provided in Table 3.1. There are no potential impacts and effects that are common to all proposed junction options.

Table 3.1: Impacts on Population – Land Use

	Option 1	Option 2	Option 3
Land-take	Total land-take is approximately 12.52 hectares, affecting two land interests (Murthly Castle and Estate and Network Rail). Land-take includes: ▪ 0.46 hectares of prime agricultural land; ▪ 2.78 hectares of non-prime agricultural land; ▪ 9.03 hectares of woodland; and ▪ 0.22 hectares of other land. No demolitions.	Total land-take is approximately 10.45 hectares, affecting two land interests (Murthly Castle and Estate and Network Rail). Land-take includes: ▪ 0.50 hectares of prime agricultural land; ▪ 1.96 hectares of non-prime agricultural land; ▪ 7.61 hectares of woodland; and ▪ 0.38 hectares of other land. No demolitions.	Total land-take is approximately 11.70 hectares, affecting two land interests (Murthly Castle and Estate and Network Rail). Land-take includes: ▪ 0.97 hectares of prime agricultural land; ▪ 1.96 hectares of non-prime agricultural land; ▪ 8.38 hectares of woodland; and ▪ 0.39 hectares of other land. No demolitions.
Access	No significant changes in vehicle access for journeys travelling to the north; One significant beneficial change in vehicle access for journeys travelling to the south (properties at Byres of Murthly); No significant changes in vehicle access for journeys travelling from the north; One significant beneficial change in vehicle access for journeys travelling from the south (properties at Byres of Murthly); and Vehicle access to Birnam provided for journeys from the north and south.	No significant changes in vehicle access for journeys travelling to the north; One significant adverse change in vehicle access for journeys travelling to the south (Murthly Castle and Estate); No significant changes in vehicle access for journeys travelling from the north; One significant adverse change in vehicle access for journeys travelling from the south (Murthly Castle and Estate); and Vehicle access to Birnam provided for journeys from the south.	No significant changes in vehicle access for journeys travelling to the north; One significant adverse change in vehicle access for journeys travelling to the south (Murthly Castle and Estate); No significant changes in vehicle access for journeys travelling from the north; One significant adverse change in vehicle access for journeys travelling from the south (Murthly Castle and Estate); and Vehicle access to Birnam provided for journeys from the north and south.

Potential Mitigation

3.2.6 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation taking into account best practice, legislation and guidance has been included in *Section 8.5: Potential Mitigation* of *Chapter 8: Population - Land Use* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'* and has been taken into account in this assessment.

3.2.7 Potential mitigation, in addition to standard construction best practices would include, but is not limited to, further refinement of the design to reduce the land-take at DMRB Stage 3.

Summary of Assessment

3.2.8 All proposed junction options would result in land-take, predominantly from woodland. Overall, Option 2 would have the least land-take and Option 1 the greatest. All proposed junction options would also result in changes to vehicle access. Option 2 would only allow vehicle access to properties and businesses in Birnam for journeys from the south. Option 1 and Option 3 would facilitate all vehicle movements at the proposed junction.

3.2.9 Whilst differences between the proposed junction options have been identified in terms of land-take and change in access, they are not considered sufficient to be a differentiator.

Compliance Against Plans and Policies

3.2.10 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Population - Land Use assessment undertaken, in accordance with DMRB guidance.

3.2.11 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability*, *Placemaking*, *Supporting Business & Employment*, *Valuing the Natural Environment* and *Maximising the Benefits of Green Infrastructure*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1 (Assessment of Policy Compliance)* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.2.12 There is potential for non-compliance with policy objectives for all proposed junction options as they would each result in land-take affecting commercial land interests, prime agricultural land and areas of woodland. In relation to accessibility, Option 2 and Option 3 are also assessed to result in policy non-compliance due to significant adverse changes in vehicular access for journeys travelling to and from the south (Murthly Castle and Estate). However, Option 1 is expected to comply with policy objectives on transport and accessibility due to beneficial changes in vehicle access for those travelling to and from the South (Properties at Byres of Murthly).

3.2.13 However, at this stage, mitigation measures are not defined. Further assessment at DMRB Stage 3, would consider design development and environmental mitigation, which may reduce impacts and effects and improve the likelihood of policy compliance.

3.3 Geology, Soils and Groundwater

Approach and Methods

3.3.1 This assessment considers the proposed junction options in relation to the impacts on geology, soils and groundwater. The approach and methods used to assess Geology, Soils and Groundwater, the baseline conditions and information as to how the impacts are assessed is included in *Section 9.2: Approach and Methods* of *Chapter 9: Geology, Soils and Groundwater* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

Baseline Conditions

3.3.2 Baseline conditions were determined through a desk-based data review and assessment and consultation with statutory and non-statutory bodies as described in *Section 9.3: Baseline Conditions* of *Chapter 9: Geology, Soils and Groundwater* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.3.3 Receptors that would be impacted due to the proposed junction options include:

- Geology, including soils, superficial geology, bedrock geology, and made-ground;
- Land Contamination;
- Surface water features; and
- Groundwater.

Potential Impacts and Effects

3.3.4 Geological impacts can occur due to excavating or masking exposures of rocks or superficial geological deposits of particular scientific interest, particularly if the features of interest are not reproduced elsewhere in the area. Impacts can also include restrictions on existing or potential commercial exploitation of resources, and conversely previous exploitation of resources can impose constraints on proposed junction options; for example, where land has become unstable due to mining or has been contaminated by previous land uses. It is also recognised that rock exposures can deliver environmental benefit, such as improved access to, and exposure of, new areas of geological interest.

3.3.5 During construction, there is an inherent risk of spillage or leakage of fuel or oil from storage tanks or construction plant. Without suitable mitigation measures, these pollutants could enter aquifers and degrade water quality. Construction work can lead to dewatering and to contamination of superficial and bedrock aquifers.

3.3.6 Similarly, once a new road/junction is opened, run-off from the road surface may contain elevated concentrations of pollutants, such as oils, suspended solids, metals and, in winter, salt and engine coolants (e.g., ethylene glycol), which may find their way into the groundwater system. Groundwater flows can also be intercepted or altered by new cuttings and other significant changes to landform.

3.3.7 All proposed junction options would have the potential for a Slight significance of effect on prime agricultural land, peat soils, superficial and bedrock geology, groundwater levels and groundwater baseflow to surface water features such as the River Tay. For all proposed junction options there would be Moderate significance of effect on non-prime agricultural land based on the estimated land-take required for each option and on groundwater quality from potential accidental spillages. The significance of effect on human health and the water environment from direct and indirect disturbance of potential land contamination sources ranges from Very Large to Slight for all proposed junction options.

Potential Mitigation

3.3.8 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 9.5: Potential Mitigation* of *Chapter 9: Geology, Soils and Groundwater* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'* and is relevant to this assessment.

3.3.9 Specific mitigation measures with respect to the potential for significant effects on agricultural soils would be developed during the DMRB Stage 3 assessment with the aim of protecting, where practicable, the agricultural capability of land and soils. Generic mitigation measures could include:

- Development of a Soil Management Plan prior to construction, for implementation during construction. This would include consideration of the selection of appropriate construction methodologies to limit the areas and volumes of agricultural soils to be disturbed and/or excavated to a minimum during construction.

- Management of soil resources in accordance with the Construction Code of Practise for the Sustainable Use of Soils on Construction Sites (Defra, 2009). This would include the careful excavation, storage and replacement of topsoil and subsoil.
- A record of condition survey of any land to be returned to agriculture, to ensure all land is restored as near to its original condition as is reasonably practicable.

3.3.10 *Section 3.4 Road Drainage and the Water Environment* and *Section 10.5: Potential Mitigation* of *Chapter 10: Road Drainage and the Water Environment* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provide details on anticipated mitigation to address potential effects on surface waters, including adherence to SEPA Guidance for Pollution Prevention (GPP) series during construction. These measures would also mitigate against risks to groundwater quality by reducing the potential for accidental spillages and pollutant release.

3.3.11 In addition to standard construction best practices, potential mitigation in relation to the significant effects associated with land contamination would likely include:

- Storage of excavated made ground material using bunded facilities and re-use of material where suitable (following the development of suitable re-use criteria).
- Removal of contaminated soils from site.
- Consolidation of contaminated soils and/or water for treatment in-situ and/or ex-situ if required.

3.3.12 Where significant contamination is confirmed, a risk assessment would be undertaken as part of the DMRB Stage 3 assessment; and mitigation, if required, would be specified on a site-specific basis. The Scottish Environment Protection Agency's (SEPA) Land Remediation and Waste Management Guidelines (SEPA, 2016) would be referred to where appropriate.

Summary of Assessment

3.3.13 All proposed junction options would result in the potential for significant effects on agricultural soils, groundwater quality and land contamination prior to the implementation of mitigation. Following mitigation, no significant effects are predicted.

3.3.14 No residual significant effects are expected and the differences in impact between the proposed junction options are not considered sufficient to be a differentiator.

Compliance Against Plans and Policies

3.3.15 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Geology, Soils and Groundwater assessment undertaken, in accordance with DMRB guidance.

3.3.16 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) theme *Valuing the Natural Environment*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.3.17 It is assessed that although there is potential for significant effects upon agricultural soils, groundwater quality and land contamination, after mitigation is developed as part of the DMRB Stage 3 assessment, no significant effects are predicted. As such, policy compliance is expected for all proposed junction options.

3.4 Road Drainage and the Water Environment

Approach and Methods

3.4.1 This assessment considers the proposed junction options in relation to the impacts on the surface water environment, including flood risk, hydromorphology and surface water quality.

3.4.2 This assessment also considers road drainage insofar as is feasible at this stage of assessment. Roads are designed to drain freely to prevent build-up of standing water on the carriageway whilst avoiding exposure to, or causing, flooding. Contaminants deposited on the road surface are washed off during rainfall events and can be collected through the drainage system and discharged to the receiving water environment.

3.4.3 The approach and methods used to assess Road Drainage and the Water Environment, the baseline conditions and information as to how the impacts are assessed is included in *Section 10.2: Approach and Methods* of *Chapter 10: Road Drainage and the Water Environment* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

Baseline Conditions

3.4.4 Baseline conditions were identified through a combination of consultation with relevant stakeholders, desk-based assessment and site walkovers as reported in *Section 10.3: Baseline Conditions* of *Chapter 10: Road Drainage and the Water Environment* and *Appendix A10.1: Baseline Conditions* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.4.5 Within the study area of the proposed junction options there are water features, which range from large waterbodies with European-level ecological designations (River Tay) to minor straightened road and field drains, which provide only a functional land drainage benefit. A description of each of these watercourses is reported in *Section 10.3: Baseline Conditions* of *Chapter 10: Road Drainage and the Water Environment and Appendix A10.1: Baseline Conditions* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*. The key water features that would be impacted due to the proposed junction options comprise:

- W1 (Birnam Burn – small/medium water feature);
- WF2 (small water feature);
- WF5 (small water feature);
- WF5A (drainage channel);
- WF6 (River Tay – large WFD waterbody); and
- WF7 (drainage channel).

Potential Impacts and Effects

3.4.6 Impacts on flood risk, hydromorphology and surface water quality have been assessed for each proposed junction option. Impacts may occur through, for example, alteration of water features and flooding and/or contamination from surface run-off into the water environment.

3.4.7 Potential impacts that are common to all proposed junction options are presented in the following paragraphs and all relate to impacts on WF6 (River Tay), which has a very high importance for flood risk and water quality and high importance for hydromorphology.

3.4.8 For flood risk, potential construction impacts (pre-mitigation) include embankment works in the River Tay (WF6) floodplain for the construction of the sewage works access road. This could result in loss of

floodplain storage, which could potentially increase flood risk upstream in Dunkeld as a result of reduced conveyance of flood flows as well as changes to flow dynamics. This is anticipated to result in a potential impact of moderate magnitude and the potential for an effect of Very Large significance on the River Tay (WF6).

3.4.9 For hydromorphology, potential construction impacts (pre-mitigation) include; installation of two new road drainage outfalls; major earthworks within 35 metres of the riverbank and; the potential for these works to cause disturbance to the banks, altering morphological features and releasing fine sediment. Additionally, removal of the riparian zone during construction may alter the lateral connectivity of the water feature. This is anticipated to result in a potential impact of moderate magnitude and the potential for an effect of Very Large significance on the River Tay (WF6). During operation (pre-mitigation), the encroachment of embankments would also result in a potential impact of moderate magnitude and the potential for an effect of Large significance on the River Tay.

3.4.10 For surface water quality, potential construction impacts (pre-mitigation) include: the installation of two new drainage outfalls; major earthworks within 35 metres of the riverbank and; cumulative sediment/pollutant inputs from works on WF6 (River Tay) tributaries. This is anticipated to result in a potential impact of moderate magnitude and the potential for an effect of Very Large significance on the River Tay (WF6). For operation, two SuDS outfalls would discharge road run-off to the River Tay (WF6). These outfalls are associated with the proposed junction options, mainline carriageway and realigned B867. The Highways England Water Risk Assessment Tool (HEWRAT) calculations result in a 'Pass' at Step 2 Tier 1 (i.e., after mixing but prior to any SuDS mitigation in place). Soluble pollutants are well within the published thresholds. Therefore, no significant effects associated with drainage have been identified pre-mitigation during the impact assessment.

3.4.11 All proposed junction options require the extension or replacement of the following existing culverts:

- Birnam Burn (secondary channel) (WF2)
  - At the southern extent of the scheme.

    Considered to be of low importance for flood risk and medium importance for hydromorphology and surface water quality.
- Small Water Feature (WF5)
  - Approximately 425 metres south of the existing junction with the B867.

    Considered to be of low importance for flood risk, and medium importance for hydromorphology and surface water quality.
- Drainage Channel (WF5A)
  - Approximately 125 metres south of the existing junction with the B867.

    Considered to be of low importance for flood risk and hydromorphology and medium importance for surface water quality.
- Drainage Channel (WF7)
  - Approximately 135 metres north of the existing junction with Perth Road.

    Considered to be high importance for flood risk, low importance for hydromorphology and medium importance for surface water quality.

3.4.12 Pre-mitigation, the above culvert extension or replacement works would result in potential impacts ranging from negligible adverse to major adverse magnitude and potential effects ranging from Neutral to Moderate significance.

3.4.13 Impacts and effects that differ between proposed junction options are presented in Table 3.2.

Table 3.2: Impacts and Effects Specific to Particular Proposed Junction Options for Road Drainage and the Water Environment

	Option 1	Option 2	Option 3
Water Features	Junction option crosses existing culvert of WF1 (Birnam Burn) which is considered to be of low importance for flood risk and medium importance for hydromorphology and surface water quality. This potential impact is of minor magnitude and potential for an effect of slight significance.	No additional impacts identified.	Construction of the southbound merge/diverge would encroach into the functional floodplain of the River Tay (within 30 metres of riverbank). However, as the design of the merge/diverge incorporates a viaduct structure (embedded mitigation), modelling indicates a negligible magnitude of impact and an effect of slight significance on flood risk from the River Tay during operation.

Potential Mitigation

3.4.14 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 10.5: Potential Mitigation* of *Chapter 10: Road Drainage and the Water Environment* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*' and is relevant to this assessment.

3.4.15 Potential mitigation in addition to standard construction best practices, would include, but not be limited to the following:

- To mitigate impacts on flood risk and water quality, in Scotland, SuDS is a legal requirement under Controlled Activities Regulations (CAR) to treat and attenuate run-off. A minimum of two levels of SuDS is intended to be included for all mainline outfalls, where practical in agreement with SEPA and NatureScot. Design development of drainage systems is typically undertaken as part of the DMRB Stage 3 assessment.
- Further detailed mitigation in the form of both standard measures applicable across the A9 dualling projects and project-specific measures would be developed at DMRB Stage 3.

Summary of Assessment

3.4.16 All proposed junction options would require SuDS outfalls to the River Tay and its tributaries, and extension or replacement of culverts. Assuming embedded mitigation within the scheme design and mitigation accounting for best practice legislation and guidance is developed, no significant residual effects are anticipated.

3.4.17 The differences in impacts and significance of effects between the proposed junction options are not considered sufficient to be a differentiator.

Compliance Against Plans and Policies

3.4.18 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Road Drainage and the Water Environment assessment undertaken, in accordance with DMRB guidance.

3.4.19 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability, Placemaking, Supporting Business & Employment, Valuing the Natural*

Environment and *Maximising the Benefits of Green Infrastructure*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.4.20 All proposed junction options involve works within the flood plain and have the potential for Very Large impacts upon the River Tay pre-mitigation. As such, there is potential for non-compliance with policy objectives in relation to flooding and avoiding areas of high flood risk; although it can be noted that SPP does provide an exception for essential transport infrastructure within areas of high risk subject to being designed to maintain operational capability. However, it is assumed that suitable mitigation, when developed at DMRB Stage 3, may result in compliance with policy objectives on RDWE for all proposed junction options.

3.5 Biodiversity

Approach and Methods

3.5.1 The assessment for Biodiversity was informed by a desk-based review of available information, which was augmented by information obtained through consultation, and ground-truthed by additional extended Phase 1 habitat surveys in 2019. The results of targeted ecological surveys for species of conservation interest were also used to assess the proposed junction options.

3.5.2 The approach and methods used to assess Biodiversity is included in *Section 11.2: Approach and Methods* of *Chapter 11: Biodiversity* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.5.3 The DMRB Stage 2 Phase 1 habitat survey data used for this assessment is not sufficiently detailed to determine differences in woodland habitat importance, including woodland habitat listed on the Ancient Woodland Inventory (AWI). Habitat type within AWI sites was therefore not categorised by its importance. Further survey data, including National Vegetation Classification, would be used to inform the DMRB Stage 3 assessment. For this assessment, the combined area of habitat listed on the AWI due to be lost to each of the proposed junction options was used as a differentiator. Areas of confirmed hard standing and urban development (such as the existing A9) were removed from the total area of AWI calculated, as these no longer constituted valuable habitat (for further details, see *Section 11.2: Approach and Methods* of *Chapter 11: Biodiversity* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*). Ancient woodland provides valuable habitat for a variety of species; therefore, areas of AWI loss also provides an indication of additional impacts to bats, birds, red squirrel and pine marten.

Baseline Conditions

3.5.4 The baseline conditions were identified through a desk-based assessment for designated sites, and through site surveys for terrestrial and aquatic habitats, and protected species. The baseline conditions are reported in Section 11.3: Baseline Conditions of Chapter 11: Biodiversity of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.5.5 For this assessment, AWI sites, listed as category 1a (ancient woodland of semi-natural origin) and category 2b (long-established of plantation origin) and associated habitats were identified as a biodiversity resource within the zone of influence; the loss of which could be a potential differentiator between the proposed junction options.

3.5.6 Other biodiversity resources within the zone of influence are either common to all proposed junction options or the DMRB Stage 2 data currently available are not considered sufficient for this assessment.

Evaluation

3.5.7 For a more detailed evaluation of the baseline biodiversity resources, refer to Section 11.2: Approach and Methods and Section 11.3: Baseline Conditions of Chapter 11: Biodiversity of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'. For this assessment, the biodiversity resource of AWI sites is evaluated as nationally important.

Potential Impacts and Effects

3.5.8 The main biodiversity resources and associated potential impacts/effects which are common to all proposed junction options are considered to comprise:

- The River Tay SAC, located north-east of the existing A9 and within 40 metres of all proposed junction options, which could be impacted by run-off from construction works including sediment release;
- Otter, which are recorded along the River Tay and a qualifying interest of the River Tay SAC, which could be impacted by noise and vibration during construction; and
- Roosting potential habitat for bat species (not directly underneath the footprint of the proposed junction options) which could be impacted by permanent increased disturbance due to operational lighting.

3.5.9 Further details on the potential impacts and effects on biodiversity resources and subsequent mitigation measures common to all proposed junction options are provided within *Chapter 11: Biodiversity* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'.

3.5.10 Construction related impacts common to Option 1 and Option 2 are detailed within Section 11.4: Potential Impacts of Chapter 11: Biodiversity of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'. While the construction of Option 3 is complicated by the viaduct structure, impacts and effects on biodiversity resources are expected to be similar.

3.5.11 Significant operation related effects that are specific to each proposed junction option are identified in Table 3.3.

Table 3.3: Impacts and Effects on Biodiversity

	Option 1	Option 2	Option 3
AWI Sites	Replacement of habitat listed on the AWI with structures that form the footprint of Option 1 would result in the permanent loss of 16.36 hectares of this habitat and associated plant communities; and a permanent reduction in availability of this habitat to species that rely on it for food, shelter and breeding. This effect would be permanent and would alter the integrity and key characteristics of the biodiversity resource. It is predicted to be a Major level of impact on a nationally important biodiversity resource, leading to an effect of Large significance.	Replacement of habitat listed on the AWI with structures that form the footprint of Option 2 would result in the permanent loss of 12.72 hectares of this habitat and associated plant communities; and a permanent reduction in availability of this habitat to species that rely on it for food, shelter and breeding. This effect would be permanent and would alter the integrity and key characteristics of the biodiversity resource. It is predicted to be a Major level of impact on a nationally important biodiversity resource, leading to an effect of Large significance.	Replacement of habitat listed on the AWI with structures that form the footprint of Option 3 would result in the permanent loss of 13.60 hectares of this habitat and associated plant communities; and a permanent reduction in availability of this habitat to species that rely on it for food, shelter and breeding. This effect would be permanent and would alter the integrity and key characteristics of the biodiversity resource. It is predicted to be a Major level of impact on a nationally important biodiversity resource, leading to an effect of Large significance.

Potential Mitigation

3.5.12 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation for both construction and operation phases in cognisance of best practice, legislation and guidance has been included in *Section 11.5: Potential Mitigation* of *Chapter 11: Biodiversity* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.5.13 Potential mitigation to address the significant operation related effects listed in Table 3.3 would include, but not be limited to, compensatory habitat for the loss of habitat listed on the AWI under the design footprint of the proposed junction options.

Summary of Assessment

3.5.14 All proposed junction options would have adverse operation related residual significant effects on AWI sites as a result of the loss of habitat listed on the AWI. Although compensation planting would be provided as part of the proposed scheme, it would not mitigate for the permanent loss of the biodiversity and intrinsic importance of ancient woodland habitats.

3.5.15 For this assessment of proposed junction options, the differences in terms of loss of AWI sites is considered sufficient to be a differentiator, with a loss of 16.36 hectares of habitat listed on the AWI for Option 1, a loss of 12.72ha for Option 2 and a loss of 13.60ha for Option 3. Therefore, Option 1 is considered to have the highest overall effect and Option 2 the lowest overall effect with regards to Biodiversity.

Compliance Against Plans and Policies

3.5.16 Appendix A21.1: Assessment of Policy Compliance of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*' provides a review of national and local policy documents which are of relevance to this Biodiversity assessment undertaken, in accordance with DMRB guidance.

3.5.17 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government,

2014b) theme Valuing the Natural Environment. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in Appendix A21.1: Assessment of Policy Compliance of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment*'.

3.5.18 It is assessed that all proposed junction options would result in non-compliance with policy of relevance to Biodiversity due to the significant effects, after implementation of potential mitigation, on AWI sites and the consequential permanent loss of biodiversity and intrinsic importance of ancient woodland habitats.

3.6 Landscape

Approach and Methods

3.6.1 The landscape assessment considers the proposed junction options in relation to the potential impacts and effects on the landscape resource, including the constituent elements of the landscape, its specific aesthetic and perceptual qualities, landscape and other landscape related designations, and its character.

3.6.2 A separate but inter-related visual assessment, which considers the effects of the proposed junction options on specific views and the general visual amenity experienced by people, is reported in Section 3.7: Visual of this appendix. An assessment of the proposed junction options upon the views experienced by vehicle travellers as they pass through the landscape is included in Section 3.7: Visual of this appendix. Section 3.7: Visual should therefore also be referred to regarding effects on the landscape resource.

3.6.3 The approach and methods used to assess potential impacts and effects on the Landscape are described in Section 12.2: Approach and Methods of Chapter 12: Landscape of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

Baseline Conditions

3.6.4 The baseline conditions were identified through a desk-based assessment and review of information from sources as listed in Section 12.2: Approach and Methods of Chapter 12: Landscape of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.6.5 Landscape receptors that would be impacted due to the proposed junction options include:

- River Tay (Dunkeld) National Scenic Area (NSA);
- Lowland River Corridor: Strath Tay Local Landscape Character Area (LLCA);
- Strath Tay: Lower Glen LLCA;
- Strath Tay: Dunkeld and Birnam LLCA (Settlement); and
- Murthly Castle Gardens and Designed Landscape (GDL).

Potential Impacts and Effects

3.6.6 Potential impacts reported are those in the absence of landscape planting mitigation but do include consideration of some aspects that influence the landscape such as the grading out of embankments or alignment of the option to reduce woodland loss.

3.6.7 All the proposed junction options are likely to result in impacts on the landscape resource as a result of typical construction activities, for example, removal of roadside vegetation and the construction of major structures such as bridges, retaining walls and the associated earthworks. These would include the following (which would remain as new features in the landscape throughout operation):

- the proposed junction, slip roads and associated earthworks in the vicinity of the western entrance to Murthly Castle, south-east of Birnam (Option 1);
- the realigned B867/Perth Road; and
- the proposed junctions, underpasses/overpasses and associated retaining walls and earthworks south of Birnam in the vicinity of the existing junction of the B867 with the A9 (Option 2 and Option 3).

3.6.8 All of the proposed junction options would have a Minor impact on the Strath Tay: Dunkeld and Birnam LLCA (Settlement) as a result of the increased prominence of road infrastructure and earthworks and associated loss of roadside woodland. This impact would result in a Slight effect on the LLCA.

3.6.9 All of the proposed junction options are predicted to have a potential impact on the NSA's Special Qualities. The Special Qualities that would be potentially affected include the 'Exceptionally Rich, Varied and Beautiful Woodlands' Special Quality and the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality. Effects on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' and the 'Gateway to the Highlands' Special Qualities of the River Tay (Dunkeld) (NSA) would differ between the proposed junction options. These differences in effects are described in Table 3.4.

3.6.10 Effects on the Special Qualities would be due to the impacts the proposed junction options would have on the woodlands and changes to the balance of natural and man-made features in this area as a result of the increased prominence of new road infrastructure, and how these changes would be experienced by people.

3.6.11 Effects that differ between proposed junction options are presented in Table 3.4.

Table 3.4: Landscape Effects Specific to the Proposed Junction Options

	Option 1	Option 2	Option 3
LLCA	Option 1 is predicted to have a Minor impact as a result of the opening up of the enclosed, heavily wooded character of the existing A9 corridor and increasing the prominence of road infrastructure and earthworks within the Lowland River Corridor: Strath Tay LLCA. This impact would result in a Slight effect on the LLCA. Within the Strath Tay: Lower Glen LLCA, the option would have a Minor impact as a result of the road widening and associated loss of roadside woodland. This impact would result in a Slight effect on the LLCA.	Option 2 is predicted to have a Minor impact as a result of the road widening and the associated loss of roadside woodland within the Lowland River Corridor: Strath Tay LLCA. This impact would result in a Slight effect on the LLCA. Within the Strath Tay: Lower Glen LLCA, the option is predicted to have a Minor impact as a result of the increased prominence of road infrastructure and earthworks in addition to the opening up of wooded areas. This impact would result in a Slight effect on the LLCA.	Option 3 is predicted to have a Minor impact as a result of the road widening and the associated loss of roadside woodland within the Lowland River Corridor: Strath Tay LLCA. This impact would result in a Slight effect on the LLCA. Within the Strath Tay: Lower Glen LLCA, the option is predicted to have a Moderate impact as a result of the increased prominence of road infrastructure (including the junction loop elevated on structure) and earthworks in addition to the opening up of wooded areas. This impact would result in a Moderate significance of effect on the LLCA.
NSA Special Qualities	Option 1 is predicted to have a Minor impact on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur Special Quality as a result of the loss woodland and a	Option 2 is predicted to have a Minor impact on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur Special Quality as a result of the loss woodland and a minor	Option 3 is predicted to have a Moderate impact on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur Special Quality as a result of changes to the balance of

	Option 1	Option 2	Option 3
	minor change to the balance of landscape features. This would result in a Slight effect on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality of the River Tay (Dunkeld) NSA.	change to the balance of landscape features. This would result in a Slight effect on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality of the River Tay (Dunkeld) NSA.	landscape features due to the loss of woodland, the loss of open farmland and the presence of the Birnam Junction southbound slip viaduct. This would result in a Moderate significance of effect on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality of the River Tay (Dunkeld) NSA.
	Option 1 is predicted to have a major impact on the experience of the 'Gateway to the Highlands' Special Quality This impact would be a result of the proposed overbridge at ch800 interrupting the initial views of Strath Tay and the Highland hills beyond as travellers descend the Pass of Birnam. This impact would result in a Large significance of effect on the 'Gateway to the Highlands' Special Quality of the River Tay (Dunkeld) NSA.	Option 2 and Option 3 would result in northbound travellers experiencing more open views of the surrounding landscape, with the sense of enclosure reduced between Ch.270 and Ch.2400. Northbound travellers would experience a slight change in the 'Gateway to the Highlands' Special Quality. Option 2 and Option 3 would incur a minor impact resulting in a Slight effect on the 'Gateway to the Highlands' Special Quality of the River Tay (Dunkeld) NSA.	
GDL	Option 1 would have a Minor impact as a result of the proposed overbridge and associated slip roads and earthworks. These elements would result in the locally increased prominence of road infrastructure and earthworks within the Murthly Castle GDL at this location in addition to the loss of woodland. This impact would result in a Slight effect on the Murthly Castle GDL.	Option 2 would have a Minor impact as a result of the loss of woodland associated with the widening of the A9 and the junction arrangement. This impact would result in a Slight effect on the Murthly Castle GDL.	Option 3 would have a Minor impact as a result of the loss of woodland associated with the widening of the A9 and the junction arrangement (including the junction loop on elevated structure). This impact would result in a Slight effect on the Murthly Castle GDL.

Potential Mitigation

3.6.12 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 12.5: Potential Mitigation* of *Chapter 12: Landscape* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.6.13 Potential mitigation for landscape (and visual) effects, in addition to standard construction best practices, would include, but is not limited to:

- Sensitive design of mitigation proposals in order to integrate the Murthly Junction (Option 1) into the landscape including potential consideration of non-native tree species similar to reflect those found within Murthly Castle GDL.
- Sensitive design of the mitigation proposals in order to integrate the Birnam Junction (Option 2 and Option 3) into the landscape, including potential consideration of non-native tree species to reflect those found within Murthly Castle GDL.

- Planting of woodland to control views experienced by vehicle travellers, grading out of cutting and embankment slopes and treatment of any new rock cuttings to create a naturalistic appearance.

Summary of Assessment

3.6.14 All of the proposed junction options would impact the Lowland River Corridor: Strath Tay LLCA, Strath Tay: Lower Glen LLCA, Strath Tay: Dunkeld and Birnam LLCA (Settlement), River Tay (Dunkeld) NSA and Murthly Castle GDL. The effects on the Lowland River Corridor: Strath Tay and the Strath Tay: Dunkeld and Birnam LLCAs would be similar (Slight). Option 3 would result in a Moderate significance of effect on the Strath Tay: Lower Glen LLCA, whereas Option 1 and Option 2 would both result in a Slight significance of effect. This difference between the proposed junction options on the LLCA is considered sufficient to be a differentiator.

3.6.15 All of the proposed junction options are predicted to have effects on the Special Qualities of the River Tay (Dunkeld) NSA. Effects on the 'Exceptionally Rich, Varied and Beautiful Woodlands' Special Quality of the NSA would be similar between all proposed junction options. Option 1 and Option 2 would be likely to result in a Slight significance of effect on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality of the River Tay (Dunkeld) NSA whereas Option 3 would be likely to result in a Moderate significance of effect. All of the proposed junction options would result in a change in the experience of the 'Gateway to the Highlands' Special Quality. Option 1 would be likely to result in a Large significance of effect on this Special Quality, whereas Option 2 and Option 3 are predicted to have a Slight effect.

3.6.16 All of the proposed junction options are predicted to have effects of a similar significance on the Murthly Castle GDL.

3.6.17 The differences in effects between the options are considered sufficient to be a differentiator, with Option 3 resulting, on balance, in the highest overall effect on the landscape resource, and Option 2 resulting in the lowest overall effect.

Compliance Against Plans and Policies

3.6.18 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Landscape assessment undertaken, in accordance with DMRB guidance.

3.6.19 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Valuing the Natural Environment, Placemaking, Valuing the Historic Environment* and *Maximising the Benefits of Green Infrastructure*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.6.20 All of the proposed junction options would result in impacts to Lowland River Corridor: Strath Tay LLCA, Strath Tay: Lower Glen LLCA, Strath Tay: Dunkeld and Birnam LLCA (Settlement), River Tay (Dunkeld) NSA and Murthly Castle GDL, all with varying levels of significance as reported in *Paragraphs 3.6.14 to 3.6.17*. Policy compliance would be dependent upon whether mitigation proposed at DMRB Stage 3 can reduce these impacts and effects.

3.7 Visual

Approach and Methods

3.7.1 The assessment considers the potential impacts and likely resultant effects on the visual amenity and views experienced by people from publicly accessible viewpoints and nearby buildings, including nearby residential properties. A separate, but related assessment of the effects of the proposed route options on the views experienced by vehicle travellers on the A9 is also included in this section. A landscape assessment, which considers the potential impacts and effects on the landscape resource is reported in *Section 3.6: Landscape.*

3.7.2 The approach and methods used to assess potential impacts and effects on visual amenity are described in *Section 13.2: Approach and Methods of Chapter 13: Visual of the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'.*

3.7.3 The approach and methods used to assess potential impacts and effects on the views experienced by vehicle travellers on the A9 are described in *Section 1.2: Approach and Methods of Appendix A13.2: View from the Road of the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'.*

Baseline Conditions

3.7.4 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 13.2: Approach and Methods of Chapter 13: Visual* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.7.5 Visual receptors considered in the assessment of the proposed junction options include:

- residential receptors;
- outdoor receptors (road users, WCHs, cultural and recreational receptors); and
- vehicle travellers (View from the Road).

Potential Impacts and Effects

Visual Amenity of Built and Outdoor Receptors

3.7.6 All of the proposed junction options are likely to result in impacts on visual amenity as a result of typical construction activities, for example, removal of roadside vegetation and the construction of major structures such as bridges, retaining walls and/or junctions and the associated earthworks. These would include the following (which would remain as new features in the landscape throughout operation):

- the proposed junction, slip roads and associated earthworks in the vicinity of the western entrance to Murthly Castle, south-east of Birnam (Option 1);
- the realigned B867/Perth Road; and
- the proposed junctions, underpasses/overpasses and associated retaining walls and earthworks south of Birnam in the vicinity of the existing junction of the B867 with the A9 (Option 2 and Option 3).

3.7.7 Potential impacts on visual amenity during operation would include, for example:

- introduction of increased road surface and associated infrastructure, lighting, barriers, fencing, signage etc;

- addition of two more lanes of traffic which would potentially increase traffic visibility;
- loss of screening vegetation for residential properties; and
- changed appearance of the landform along the road corridor as a result of large-scale earthworks and/or rock cuttings and the potential requirement for reinforced slopes and/or retaining structures within the landscape.

3.7.8 All proposed junction options would be likely to result in a Slight effect on the visual amenity of residents at West Ringwood Cottage and Ringwood Cottage as it is predicted that views would be largely screened by retained, existing woodland. Effects that differ between proposed junction options are presented in Table 3.5.

Table 3.5: Effects on Visual Amenity Specific to the Proposed Junction Options

	Option 1	Option 2	Option 3
Visual Amenity – Residential Receptors	For Ink Pot Cottage and users of the entrance to Murthly Estate, a Major impact is predicted as a result of the proximity of the locations to the proposed junction and for Ink Pot Cottage, the loss of existing woodland which largely screens views of the existing A9. This impact would result in a Large effect on the visual amenity of residents at Ink Pot Cottage and users of the entrance to Murthly Estate.	At Ink Pot Cottage a Moderate impact is predicted as a result of the location's proximity to the realigned and widened A9 and the partial loss of existing woodland which screens views of the existing A9. This impact would result in a Moderate effect on visual amenity. For users of the entrance to Murthly Estate a Moderate impact is predicted as a result of the loss of woodland and increased influence of the road on visual amenity. This impact would result in a Moderate effect on visual amenity.	
	For residential receptors in the south eastern part of Birnam, a Minor impact is predicted as a result of the loss of woodland and implementation of the new B867/Perth Road underbridge, earthworks and SuDS. This impact would result in a Slight effect on the visual amenity of residents in the south eastern part of Birnam.	For residential receptors in the south eastern part of Birnam, a Minor impact is predicted as a result of the loss of woodland which currently screens views of the existing A9. This impact would result in a Slight effect on visual amenity.	
Visual Amenity – Outdoor Receptors	Option 1 would likely have a Moderate impact as a result of the realignment of the B867 and associated works. This impact would result in a Moderate effect on the visual amenity of users of NCN Route 77. Increased visibility to Option 1 would occur from some elevated locations to the north of the Tay due to the increased road footprint and the loss of screening woodland. For receptors on Newtyle Hill, Option 1 would have a Minor impact, resulting in a Slight effect on visual amenity.	For outdoor receptors, Option 2 would have a Major impact as a result of the proposed junction arrangement, loss of woodland and earthworks. This impact would result in a Large effect on the visual amenity of users of NCN Route 77. From elevated locations north of the River Tay, such as the footpaths on Newtyle Hill, Moderate impacts resulting in Moderate effects on visual amenity are predicted.	For outdoor receptors, Option 3 would have a Major impact as a result of the proposed junction arrangement including the proposed junction loop elevated on structure, loss of roadside woodland, and earthworks. This impact would result in a Large effect on the visual amenity of users of NCN Route 77. From elevated locations such as the footpaths on Newtyle Hill to the north of the River Tay, Major impacts on visual amenity are predicted as a result of the loss of woodland resulting from the proposed new junction loop elevated on structure, in addition to changes to views as a result of the structure in itself. These impacts would have Large effects on visual amenity.

View from the Road

3.7.9 Potential adverse impacts on drivers' views from the road are predicted due to the visual impact of construction works, including the works themselves and the associated traffic management and temporary signage. Views may become more open where there is a loss of established planting due to construction, or they may become more enclosed where new earthworks or retaining structures are created. Traffic that is diverted during the construction period would experience a temporary alternative view from that of the proposed junction options. Some changes would be permanent, and those impacts would continue though the operational phase.

3.7.10 Effects that differ between proposed junction options are presented in Table 3.6.

Table 3.6: Effects Specific to Particular Proposed Junction Options for Vehicle Travellers (View from the Road)

	Option 1	Option 2	Option 3
View from the Road	The proposed overbridge at Ch. 800 (and associated slip roads and earthworks) would interrupt the views experienced by both northbound and southbound travellers. Northbound travellers would experience a substantial change in the View from the Road, the structure interrupting initial views of Strath Tay and the Highland hills beyond as travellers descend the Pass of Birnam. Option 1 would incur a Major impact as a result of the proposed junction option resulting in a Large effect on the View from the Road.	Option 2 and Option 3 would result in northbound and southbound travellers experiencing more open views of the surrounding landscape, with the sense of enclosure reduced between Ch.270 and Ch.2,400. Northbound travellers would experience a slight change in the View from the Road. Option 2 and Option 3 would incur a minor impact resulting in a Slight effect on the View from the Road.	

Potential Mitigation

3.7.11 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 12.5: Potential Mitigation* of *Chapter 12: Landscape* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.7.12 Potential mitigation is described in *Paragraph 3.6.13*.

Summary of Assessment

3.7.13 The proposed junction options would result in visual effects at residential properties including West Ringwood Cottage, Ringwood Cottage, Ink Pot Cottage and at the south eastern part of Birnam. Option 1 would result in a greater visual effect on residential receptors than Option 2 and Option 3, as there would be greater effects at Ink Pot Cottage.

3.7.14 In terms of outdoor receptors, Option 1 is predicted to result in effects of a lower significance on visual amenity than Option 2 and Option 3. Option 3 would result in effects of greater significance than Option 2.

3.7.15 On balance, the overall differences in effects between the proposed junction options, taking account of the visual amenity of both residential and outdoor receptors and mitigation potential are not considered sufficient to be a differentiator.

3.7.16 All of the proposed junction options would result in a change in the View from the Road for northbound and southbound travellers, the effect on northbound travellers being more pronounced. Option 1 would be likely to result in a Large effect on the View from the Road, Option 2 and Option 3 are predicted to have a Slight effect. Option 1 would result in effects of a greater significance than Option 2 and Option 3. The differences in effects between the options in terms of view from the road are considered sufficient to be differentiators, with Option 1 resulting in the highest overall effect. Option 2 and Option 3 would result in effects of a similar significance.

Compliance Against Plans and Policies

3.7.17 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Visual assessment undertaken, in accordance with DMRB guidance.

3.7.18 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Valuing the Natural Environment, Placemaking, Valuing the Historic Environment* and *Maximising the Benefits of Green Infrastructure*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'.*

3.7.19 It is assessed that all of the proposed junction options would result in visual effects at residential properties in the locality, and for outdoor receptors and vehicle travellers, all with varying levels of significance as reported in Tables 3.5 and 3.6. Policy compliance would be dependent upon whether mitigation proposed at DMRB Stage 3 can reduce those effects considered as significant.

3.8 Cultural Heritage

Approach and Methods

3.8.1 The approach and methods used to assess Cultural Heritage, including baseline conditions and information on how the impacts are assessed is presented in *Chapter 14: Cultural Heritage* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.8.2 The assessment considers potential impacts of the proposed junction options on cultural heritage, which has been considered under the three sub-topics of archaeological remains, historic buildings and the historic landscape

Baseline Conditions

3.8.3 The cultural heritage baseline was established through a review of desk-based sources of information and site inspections identified in *Paragraphs 14.2.6 and 14.2.7* of *Chapter 14: Cultural Heritage* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

Potential Impacts and Effects

3.8.4 Construction of Option 1, including the new access road to Murthly Castle, the proposed grade separated junction itself and two SuDS ponds, would result in land-take from Murthly Castle (HLT 14) Inventory GDL. Construction of Option 2 and Option 3, including the new access road connecting to the western drive of Murthly Castle, the grade separated junction and two SuDS ponds, would also result in

land-take from HLT 14. Construction of all proposed junction options would also change the alignment of the western drive, a special feature of HLT 14, and reinforce the existing severance of the western end of HLT 14 and Birnam from the majority of the designed landscape to the east. For all the proposed junction options the significance of effect during construction has been assessed to be Large.

3.8.5 During operation, for Option 1, the presence of the new access road to Murthly Castle, the proposed grade separated junction and two SuDS ponds would result in permanent land-take from Murthly Castle (HLT 14) Inventory GDL. During operation for Option 2 and Option 3, the new access road connecting to the western drive of Murthly Castle, the proposed grade separated junction and two SuDS ponds, would similarly result in permanent land-take from HLT 14. Operation of all proposed junction options would also change the alignment of the western drive, identified as a special feature of HLT 14, and reinforce the existing severance of the western end of HLT 14 and Birnam from the majority of the designed landscape to the east. For all the proposed junction options the significance of effect during operation has been assessed to be Large.

3.8.6 During construction and operation of all proposed junction options the physical connection to Birnam and the route of the former riverside drive, a special feature of HLT 14, would be maintained. In addition, the key landscape features and the majority of the special features identified in the Inventory of Gardens and Designed Landscapes and presented in *Paragraphs 14.3.48 and 14.3.49* of *Chapter 14: Cultural Heritage of the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'* would not be affected.

3.8.7 Construction of Option 1 would remove physical remains of the ancillary buildings and gardens associated with Dalpowie Lodge (site of) (Asset 5), the key characteristic of Asset 5. Where it is not possible to develop a design to avoid physical impacts on Asset 5, mitigation in the form of recording works (refer to *Paragraph 3.8.9*) could be undertaken. In the absence of mitigation, the significance of this effect during construction has been assessed to be Moderate.

Potential Mitigation

3.8.8 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 14.5* of *Chapter 14: Cultural Heritage* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.8.9 Potential mitigation, in addition to standard construction best practices, is likely to include:

- Development of the horizontal and/or vertical alignments to avoid or minimise impacts on cultural heritage resources.
- Where it is not possible to avoid or reduce impacts on cultural heritage resources, it may be possible to reduce the magnitude of impact through recording works in advance of or during construction, for example, archaeological excavation, watching brief, historic building recording and historic landscape recording, and the dissemination of the results of these works. This could include readily accessible archives to provide a permanent record of the affected cultural heritage resource. In this way recording can reduce the magnitude of impact that would otherwise occur if a site were to be damaged or destroyed unrecorded.

Summary of Assessment

3.8.10 While mitigation could reduce the magnitude of impact, it is unlikely that the residual significance of effect could be reduced through mitigation, and the significance of the residual effect for construction and operation of all proposed junction options on Murthly Castle (HLT 14) has been assessed to be Large.

3.8.11 Construction of Option 1 would remove physical remains associated with Dalpowie Lodge (site of) (Asset 5). Where it is not possible to develop a design to avoid physical impacts on Asset 5, mitigation in the form of recording works could be undertaken. Given the physical remains are unlikely to be complex, the impact of the residual effect after mitigation for all proposed options is not predicted to be significant.

3.8.12 The residual significance of effect for construction and operation is the same for each proposed junction option and is not considered to be a differentiator between proposed junction options.

Compliance Against Plans and Policies

3.8.13 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Cultural Heritage assessment undertaken, in accordance with DMRB guidance.

3.8.14 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) theme *Valuing the Historic Environment*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.8.15 It is assessed that all of the proposed junction options would result in policy non-compliance due to the potentially significant residual effects of construction and operation on Murthly Castle GDL (HLT 14). Further assessment would be undertaken at DMRB Stage 3, including the development of mitigation.

3.9 Air Quality

Approach and Methods

3.9.1 The approach and methods used to assess Air Quality is included in *Section 15.2: Approach and Methods* of *Chapter 15: Air Quality* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.9.2 For the assessment of the proposed junction options, the predicted concentrations from the assessment of the Community's Preferred Route Option, which is reported in *Chapter 15: Air Quality* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'* and professional judgement have been used to assess the likely impact on air quality at sensitive receptors in close proximity to the proposed junction options. Additional air quality modelling was not undertaken.

Baseline Conditions

3.9.3 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 15.3: Baseline Conditions* of *Chapter 15: Air Quality* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.9.4 Air Quality is a term used to describe concentrations of specific pollutants in ambient air, taking into account their effects on sensitive receptors, which consist of human health receptors and designated habitat receptors. The main pollutants of concern in the UK are associated with combustion emissions

typically arising from vehicle traffic and industry, and are primarily oxides of nitrogen (NO_X), nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

3.9.5 This assessment considers these pollutants in terms of concentrations, nutrient nitrogen deposition rates and dust deposition associated with the construction phase of the project. Dust deposition occurs when particulate matter generated and/or dispersed into the atmosphere from construction activities and traffic associated with construction works, settles onto a surface.

3.9.6 Receptors affected are those closest to the proposed junction options (and likely to experience the largest impacts) and within 200m of chainages Ch. 0 and Ch. 2,400 (the extent of the proposed junction options). These receptors comprise:

- Human health receptors (residential properties) as shown in Figures 15.1 to 15.4 of *Chapter 15: Air Quality of the 'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'. The nearest receptors to the proposed junction options are:
  - R1: Roman Bridge Cottage;
  - R2: Ringwood Cottage; and
  - R22: Ballincreiff House.
- Designated habitats (ancient woodland on the Ancient Woodland Inventory (AWI)) represented by transect lines, which comprise point locations set at 10m intervals away from the road source and start at the habitat boundary. These are shown in Figures 15.5 to 15.8 of *Chapter 15: Air Quality* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*. The transects applicable to the proposed junction options are Transects V, I, J1, J2, W and L.

Potential Impacts and Effects

Human Health

3.9.7 Air quality modelling undertaken for the Community's Preferred Route Option (CPRO) predicted that there are no exceedances of the Air Quality Objectives (AQOs) for key pollutants (NO_2, PM_{10} and $PM_{2.5}$) with the CPRO in place at sensitive receptors closest to the chainages considered (receptors R1, R2 and R22). The highest predicted NO_2 concentrations equated to 24% of the annual mean AQO and the highest predicted PM_{10} and $PM_{2.5}$ concentrations were below 50% of the respective AQOs. This indicates that there is considerable headroom between the highest concentrations and the AQOs at the closest receptors to the A9 and the proposed junction for the CPRO. A similar modelling outcome would be expected for any of the proposed junction options.

3.9.8 When compared with the modelling results for the CPRO, there could be an increase in vehicle emissions associated with the proposed junction options, due to differences in vehicle speeds and junction capacity/vehicle movements. However, these potential emissions increases would unlikely result in materially different effects at the closest receptors or lead to exceedances of the AQOs. This is based on the low background pollutant concentrations as well as the modelling outcome for the CPRO where no exceedances are predicted and from which a similar outcome would be expected for all proposed junction options (as in *Paragraph 3.9.7*). Further modelling would be undertaken at DMRB Stage 3.

3.9.9 The construction phase of the proposed junction options has the potential to give rise to nuisance dust impacts through dust soiling. Option 1 would include more extensive construction works in the vicinity of receptors R1 and R2 compared to Option 2 and Option 3. However, with best practice techniques and appropriate mitigation in place, dust effects should not be significant for any of the proposed junction options.

Designated Habitats

3.9.10 Changes in NO_x concentrations are predicted to be of large magnitude with the CPRO at the transects identified in *Paragraph 3.9.6* and therefore, likely to be of large magnitude for all proposed junction options.

3.9.11 Predicted changes in nutrient nitrogen deposition rates for the CPRO indicate the potential for significant effects at each of the closest transects considered. It is likely that this is the same for all proposed junction options. At DMRB Stage 2, detailed ecological survey information is not available to establish the conditions at each of the designated habitat sites to allow a full determination of significance. Further modelling would be undertaken at DMRB Stage 3. It is noted that existing deposition rates at all transects assessed are above the Critical Loads for their respective habitat.

3.9.12 The construction phase of the proposed junction options has the potential to give rise to nuisance dust impacts through dust soiling. Option 1 would include more extensive construction works in the vicinity of Transects I and V compared to Option 2 and Option 3. Conversely, Option 2 and Option 3 would include more extensive construction works in the vicinity of Transects W and L compared to Option 1. However, with best practice techniques and appropriate mitigation in place, dust effects are not predicted to be significant for any of the proposed junction options.

Potential Mitigation

3.9.13 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 15.5: Potential Mitigation* of *Chapter 15: Air Quality* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.9.14 With standard best practice and site-specific construction dust mitigation measures in place during construction for the proposed scheme, additional mitigation is unlikely to be required for any of the proposed junction options. However, this would be reviewed as part of the DMRB Stage 3 assessment.

Summary of Assessment

3.9.15 No significant effects are predicted for air quality at sensitive human health locations for any of the proposed junction options and the differences in air quality impacts between the options are not considered sufficient to be a differentiator. Potential significant effects for nutrient nitrogen deposition at local designated habitats are predicted for all proposed junction options.

Compliance Against Plans and Policies

3.9.16 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Air Quality assessment undertaken, in accordance with DMRB guidance.

3.9.17 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability, A Low Carbon Place, A Natural Resilient Place* and *Valuing the Natural Environment*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.9.18 It is assessed that the proposed junction options comply with policy in relation to protecting human health from amenity effects due to air quality. However, there is potential for non-compliance with policy objectives on valuing the natural environment, due to potential significant effects on local habitat designations (AWI) as a result of nutrient nitrogen deposition. However, as detailed survey information is not available at DMRB Stage 2, further assessment would be undertaken at DMRB Stage 3 to fully determine policy compliance.

3.10 Noise and Vibration

Approach and Methods

3.10.1 The approach and methods used to assess Noise and Vibration, the baseline conditions and information as to how the impacts are assessed is included in *Section 16.2: Approach and Methods* of *Chapter 16: Noise and Vibration* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*. For the purposes of the proposed junction option noise assessment, summaries of the predicted operational noise impacts at all 827 noise sensitive receptors within the defined whole route study area are not reported. Instead, predicted noise impacts at noise sensitive receptors with the potential to be significantly affected by the proposed junction options are presented and discussed.

Baseline Conditions

3.10.2 The baseline conditions were identified through a review of the baseline noise survey results presented in *Section 16.3: Baseline Conditions* and *Appendix A16.1: Detailed Baseline Noise Survey Results and Notes* of *Chapter 16: Noise and Vibration* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*. The baseline survey locations of most relevance to the proposed junction options noise assessment are R2.01 (West Ringwood Cottage) and R2.02 (Hollybank, Perth Road).

3.10.3 Noise sensitive receptors with the potential to be significantly affected by the proposed junction options include:

- Ringwood Cottage;
- West Ringwood Cottage;
- Inkpot Cottage; and
- Residential properties on Perth Road.

Potential Impacts and Effects

3.10.4 For construction noise and vibration impacts, the differences in potential significant effects between the proposed junction options are not considered sufficient to be a differentiator.

3.10.5 For operational noise, the impacts and potential significant effects specific to each option are reported in the following paragraphs.

Option 1

3.10.6 In the short-term and long-term, a negligible adverse magnitude of noise impact is predicted at West Ringwood Cottage, Ringwood Cottage and Inkpot Cottage. Adverse impacts are predicted due to changes in topography arising from the works, which reduces the level of acoustic screening. These potential adverse noise impacts are not considered to be significant.

3.10.7 Option 1 is not predicted to increase traffic flows on Perth Road to a level which would cause potential significant adverse noise effects.

Option 2

3.10.8 At Inkpot Cottage, a negligible beneficial magnitude of noise impact is predicted in the short and long-term. Beneficial impacts are predicted due to the low noise surfacing that would be included as embedded mitigation within the scheme and no change in topography arising from the proposed junction option design in the vicinity of the property. The beneficial magnitude of impact is not considered to have a potentially significant effect.

3.10.9 At Ringwood Cottage and West Ringwood Cottage, minor adverse and negligible adverse magnitudes of impact are predicted in the short and long-term, respectively. Adverse impacts are predicted due to changes in topography arising from the works, which reduces the level of acoustic screening. These adverse magnitudes of impact are not considered to have potentially significant effects.

3.10.10 Option 2, which omits a southbound diverge slip road, increases traffic on Perth Road by between 200 and 400 vehicles per day. This is predicted to result in potentially significant adverse noise effects at six noise sensitive receptors in the vicinity of Perth Road, between Station Road and Woodville.

Option 3

3.10.11 At Inkpot Cottage, a negligible beneficial magnitude of noise impact is predicted in the short and long-term. Beneficial impacts are predicted due to the low noise surfacing that would be included as embedded mitigation within the scheme and no change in topography arising from the proposed junction option design in the vicinity of the property. The beneficial magnitude of impact is not considered to have a potentially significant effect.

3.10.12 At Ringwood Cottage and West Ringwood Cottage, minor adverse and negligible adverse magnitudes of impact are predicted in the short and long-term, respectively. Adverse impacts are predicted due to changes in topography arising from the works, which reduces the level of acoustic screening. These adverse magnitudes of impact are not considered to have potentially significant effects.

3.10.13 Option 3 is not predicted to increase traffic flows on Perth Road to a level which would cause potential significant adverse noise effects.

Potential Mitigation

3.10.14 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 16.5: Potential Mitigation* of *Chapter 16: Noise and Vibration* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.10.15 For potential significant effects identified on Perth Road for Option 2, consideration has been given to reducing the speed limit on Perth Road to 20 miles per hour. While noise modelling suggests the noise impact may be reduced, further discussions would be necessary with PKC as part of the DMRB Stage 3 assessment to determine the viability of such a proposal.

Summary of Assessment

3.10.16 Option 1 and Option 3 are not predicted to result in potential significant adverse noise effects on noise sensitive receptors.

3.10.17 Without mitigation, Option 2 is predicted to result in six potential significant adverse noise effects due to increased traffic flows on Perth Road. A reduction in the speed limit on Perth Road may be considered as part of the DMRB Stage 3 assessment, in consultation with PKC, to mitigate the potential significant adverse noise effects.

3.10.18 After mitigation, construction noise and vibration impacts for all proposed junction options are unlikely to result in significant effects.

3.10.19 The differences in potential significant effects between the options during operation are considered sufficient to be differentiators, with Option 2 assessed to have the highest overall effect.

Compliance Against Plans and Policies

3.10.20 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Noise and Vibration assessment undertaken, in accordance with DMRB guidance.

3.10.21 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) theme *Placemaking.* Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'.*

3.10.22 It is assessed that Option 1 and Option 3 comply with policy of relevance to Noise and Vibration as they are unlikely to result in significant adverse noise effects upon sensitive receptors. At this stage Option 2 is assessed to result in policy non-compliance due to potential significant noise effects at six noise sensitive receptors. However, upon further assessment and development of mitigation at DMRB Stage 3, including a possible reduction in speed limit on Perth Road, this option may also be able to comply with policy objectives in relation to safeguarding amenity from noise and vibration nuisance.

3.11 Population - Accessibility

Approach and Methods

3.11.1 The approach and methods used to assess Population - Accessibility, the baseline conditions and information as to how the impacts are assessed is included in *Chapter 17: Population - Accessibility* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

Baseline Conditions

3.11.2 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 17.2* of *Chapter 17: Population - Accessibility* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

Potential Impacts and Effects

3.11.3 Potential impacts result from, for example, diversions or changes in access to walking, cycling and horse riding (WCH) routes which may change journey times and changes to the amenity value of the path and cycleway network due to noise, dust, and visual intrusion. Potential impacts and effects that are common to all proposed junction options are presented in Table 3.7.

Table 3.7: Impacts Common to All Proposed Junction Options for Population – Accessibility

Path Reference	Description of Potential Impacts	Sensitivity	Potential Effect
NCR77 (south) National Cycle Route	**Journey Length:** No change in journey length is anticipated due to the proposed junction options. **Amenity Value:** Due to the provision of a proposed grade separated junction at Murthly (Option 1) or Birnam (Option 2 and Option 3), there would be an increase in traffic along the B867 between its intersection with the A9 and the grade separated junction. There would also be adverse impacts on visual amenity on approach to the proposed junction due to the increased visibility of the structure.	Very High	Significant
Path 7 Local Path (non-designated)	**Journey Length:** Access to the path from the A9 would be severed by each of the proposed options and instead access would be provided from the B867. A proposed grade separated crossing is provided for all proposed options which would incorporate provision for WCH, and this is anticipated to result in an increase in journey length. **Amenity Value:** Due to the provision of a grade separated crossing, safety would be improved for WCH crossing the carriageway at this location. There would be a decrease in visual amenity due to the greater visibility of the proposed route options from Path 7. Overall an increase in amenity value is expected for WCH using this path due to the improved safety of the grade separated crossing.	Medium	Not Significant
Path 15 Local Path (non-designated)	**Journey Length:** The path would be truncated in the west by all of the proposed options and therefore a decrease in journey length is assumed. **Amenity Value:** There would be a decrease in visual amenity due to the greater visibility of the proposed options from Path 15.	Low	Not Significant
Path 19 Local Path (non-designated)	**Journey Length:** The path would be truncated in the east by all of the proposed options and therefore a decrease in journey length is assumed. **Amenity Value:** Due to the closer proximity of the path to the proposed options, there is expected to be a decrease in amenity value for WCH using this route.	Low	Not Significant
Path 20 Core Path	**Journey Length:** No change in journey length is anticipated due to the proposed options. **Amenity Value:** There would be a decrease in visual amenity due to the greater visibility of the proposed options from Path 20.	High	Significant
Path 21 Local Path (non-designated)	**Journey Length:** The path would be truncated in the south by all of the proposed options and therefore a decrease in journey length is assumed. **Amenity Value:** Due to its closer proximity to the proposed options and the subsequent visual impact, there is expected to be a decrease in the amenity value for WCH using this path.	Low	Not Significant
Path 22/NCR77 Core Path and National Cycle Route	**Journey Length:** The path would be severed by all of the proposed options for the majority of its route and it is anticipated that WCH would be redirected via Perth Road (Path 25) to then re-join the existing NCR77 through Little Dunkeld. A decrease in journey length is anticipated. **Amenity Value:** Due to the closer proximity of the path to the proposed Birnam Junction for Option 2 and Option 3 and subsequent potential visual impact, there is expected to be a decrease in the amenity value for WCH using this path. A decrease in amenity is also anticipated due to the change from being a segregated off road WCH route to along Perth Road for all proposed options.	Very High	Significant

Path Reference	Description of Potential Impacts	Sensitivity	Potential Effect
Path 23 Core Path and Right of Way	**Journey Length:** This path would be severed by all proposed options and access across the A9 at the existing at-grade crossing (CP02) would be stopped up. WCH would be redirected to cross the proposed route options via the proposed realignment linking the B867 and Perth Road. However, this would be confirmed during DMRB Stage 3. There is anticipated to be an increase in journey length for WCH using this path and crossing point. **Amenity Value:** Removal of the at-grade crossing point at this location would result in an improvement in safety for WCH and it is expected that they would be redirected to the proposed underbridge which forms part of the proposed realignment linking the B867 and Perth Road. This would be confirmed as part of the DMRB Stage 3 assessment. There would be a decrease in visual amenity due to the greater visibility of the proposed options from Path 23. Overall an increase in amenity value is expected for WCH using this path due to the improved safety of the grade separated crossing.	High	Significant

3.11.4 Potential impacts that differ between proposed junction options are presented in Table 3.8.

Table 3.8: Impacts Specific to Particular Proposed Junction Options for Population – Accessibility

Path Reference	Description of Potential Impacts	Sensitivity	Potential Effect
Option 1			
Path 24 Core Path and Right of Way	**Journey Length**: No change in journey length is anticipated due to Option 1. **Amenity Value:** Due to the closer proximity of the path to the proposed realigned B867/Perth Road and subsequent potential visual impact, there is expected to be a decrease in the amenity value for WCH using this route.	Very High	Significant
Option 2			
Path 24 Core Path and Right of Way	**Journey Length**: No change in journey length is anticipated due to Option 2. **Amenity Value:** Due to the closer proximity of the path to the proposed junction option and subsequent potential visual impacts, there is expected to be a decrease in the amenity value for WCH using this route.	Very High	Significant
Option 3			
Path 24 Core Path and Right of Way	**Journey Length**: The path would be severed by the southbound loop for Option 3. As the loop is on a viaduct structure there may be an opportunity to reinstate post construction however for the purpose of this assessment, an increase in journey length is anticipated. **Amenity Value:** Due to the closer proximity of the path to the proposed junction option and subsequent potential visual impacts, there is expected to be a decrease in the amenity value for WCH using this route.	Very High	Significant

Potential Mitigation

3.11.5 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Chapter 17: Population - Accessibility* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.11.6 Potential mitigation, in addition to standard construction best practices, would include, but is not limited to:

- Diversion or re-routing of existing paths to provide relief from severance and maintain access; and
- Creation of new paths/cycleways to provide relief from severance and maintain access.

Summary of Assessment

3.11.7 All proposed junction options are anticipated to have significant adverse effects on NCR77 (south), Path 20 (Core Path DUNK/69), Path 22/NCR77 (Core Path DUNK/142 and NCR77), Path 23 (Core Path DUNK/57 and Right of Way TP102), and Path 24 (Core Path DUNK/10 and Right of Way TP102).

3.11.8 The differences between the proposed junction options in terms of impact on WCH routes are not considered sufficient to be a differentiator.

Compliance Against Plans and Policies

3.11.9 *Appendix A21.1: Assessment of Policy Compliance* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Population - Accessibility assessment undertaken, in accordance with DMRB guidance.

3.11.10 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability, Placemaking, Maximising the Benefits of Green Infrastructure* and *Promoting Sustainable Transport and Active Travel*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

It is assessed that, without mitigation, there is potential for non-compliance of all proposed junction options with policy of relevance to Population - Accessibility, due to both increases in journey length and amenity value on Core Paths and Rights of Way identified within Tables 3.7 and 3.8. However, upon development of mitigation at DMRB Stage 3, further assessment of policy compliance would be undertaken.

3.12 Material Assets and Waste

Approach and Methods

3.12.1 The assessment for Material Assets and Waste considers the potential environmental impacts and effects related to the use and consumption of material assets and the production and management of waste, that can reasonably be anticipated from the construction of the proposed junction options.

3.12.2 The approach and methods used to assess Material Assets and Waste, the baseline conditions and information as to how the impacts are assessed is included in *Section 18.2: Approach and Methods* of *Chapter 18: Material Assets and Waste* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.12.3 Professional engineering judgement has informed the determination of material assets and wastes quantities, and whether the difference between each proposed junction option is considered sufficient to be a differentiator.

Baseline Conditions

3.12.4 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 18.3: Baseline Conditions* of *Chapter 18: Material Assets and Waste* of the

'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'.

3.12.5 Receptor and resource baseline types likely to be at risk of impacts include the following:

- regional primary, secondary and recycled aggregate resources;
- mineral safeguarding sites and peat resources; and
- regional landfill capacity.

Potential Impacts and Effects

3.12.6 All proposed junction options would require quantities of material assets to build the carriageways and infrastructure, which would also lead to the generation of waste from all options. The use of appropriate materials and waste management plans, combined with re-use of materials on-site to reflect best practice, would reduce any potential effects arising from the materials required, and waste generated. Table 3.9 presents the material assets and waste assessment parameters associated with each proposed junction option.

Table 3.9: Material Assets and Waste Assessment Parameters

Parameter	Option 1	Option 2	Option 3
Total Cut Excavation	187,000m^3	215,000m^3	200,000m^3
Total Fill Required	354,000m^3	203,000m^3	219,000m^3
Total Import Fill Required	186,000m^3	10,000m^3	39,000m^3
Total Disposal	23,400m^3	25,500m^3	39,000m^3
New Pavement Import	45,200m^3	34,500m^3	36,000m^3
Number of New Structures	2	2	3
Number of Demolitions	0	0	0
Comparative Cost of Structures	108%	100%	365%
Mineral Safeguarding Sites	0	0	0
Peat Resources	0	0	0

Potential Mitigation

3.12.7 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail. However, potential mitigation measures considering best practice, legislation and guidance has been included in *Section 18.5: Potential Mitigation* of *Chapter 18: Material Assets and Waste* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.12.8 Potential mitigation would be required during the construction phase of the proposed junction options and would include but is not limited to:

- Complying with all relevant legislation, policy and plans pertaining to the use of material resources and the management of waste; and taking cognisance of all relevant SEPA definition of waste guidance, end-of-waste guidance, special waste guidance, statutory guidance and position statements.
- Designing for resource efficient construction in order to make the best use of materials and minimise embodied carbon emissions.
- Responsibly sourcing construction materials and products and investigating alternatives to the use of primary aggregates.

- Designing out waste and facilitating the prevention, reuse, recycling and other recovery of Construction, Demolition and Excavation (CD&E) waste through the implementation of a Site Waste Management Plan (SWMP).

Summary of Assessment

3.12.9 Option 1 would require the greatest fill and import of fill and the greatest new pavement import. Option 3 would require the greatest total disposal, the greatest number of structures and the highest comparative cost of structures due to the viaduct structure for the southbound loop. Option 2 would have the lowest comparative cost of structures and would require the least import of fill material.

3.12.10 The differences in impacts between the proposed junction options are considered sufficient to be a differentiator, with Option 3 having the highest overall effect. As reported in Section 1.5, Option 3 also has the highest anticipated construction cost of all three proposed junction options. Industry benchmarks and key performance indicators show that construction costs are linked to the amounts of materials consumed and waste generated.

Compliance Against Plans and Policies

3.12.11 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Material Assets and Waste assessment undertaken, in accordance with DMRB guidance.

3.12.12 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability* and *Planning for Zero Waste*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.12.13 It is assessed that all proposed junction options would comply with policy of relevance to Material Assets and Waste once appropriate mitigation is further developed at DMRB Stage 3.

3.13 Climate

Approach and Methods

3.13.1 The approach and methods used to assess Climate is included in *Section 19.2: Approach and Methods* of *Chapter 19: Climate* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.13.2 The assessment of Climate considers the potential environmental impacts and effects from the release of greenhouse gas (GHG) emissions during construction of the proposed junction options from the manufacture of materials.

3.13.3 At this stage of design, due to limited data availability, a full assessment of the GHG emissions likely to arise as a result of the construction and operation of each of the proposed junction options has not been undertaken. This assessment therefore focuses on those elements of the construction phase for which data are currently available (namely earthworks, aggregates and soils). Estimates of these material requirements have been used to calculate the carbon emissions associated with each of the proposed junction options. These estimates, along with professional judgement, have been used to compare the options and assess whether any differences in likely GHG emissions are sufficient to be a differentiator.

3.13.4 It has not been possible to estimate changes in road user GHG emissions as a result of each option as traffic data for each proposed junction option are not available. It is, however, considered unlikely that any of the proposed junction options would result in substantially different traffic flows and consequently road user GHG emissions. Operational road user GHG emissions have therefore not been considered further as they are considered unlikely to differentiate between the options.

3.13.5 An assessment of the vulnerability of each of the proposed junction options to climate change has not been carried out at this stage, as potential climate related impacts are likely to be similar for each of the options under consideration and are therefore unlikely to differentiate between them. Furthermore, any such impacts and effects can likely be mitigated so as to be not significant, through the implementation of mitigation measures embedded within the scheme design in later stages.

Baseline Conditions

3.13.6 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 19.3: Baseline Conditions* of *Chapter 19: Climate* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.13.7 The proposed junction options are located within the administrative boundaries of PKC. PKC's estimated council-wide CO_2 emissions were obtained from the most recent UK National Atmospheric Emissions Inventory (NAEI) dataset for local authorities (i.e., 2018). These data indicate that 'A roads' (including the A9) are estimated to have contributed 34.4% of total PKC CO_2 emissions in 2018.

3.13.8 The baseline against which the proposed junction options have been compared is the 'Do-Nothing' scenario as data for a 'Do-Minimum' scenario are not available.

Potential Impacts and Effects

3.13.9 All proposed junction options would release carbon emissions as a result of the manufacture of materials, transport of materials to and from the site and construction activities. Estimated GHG emissions (in tonnes of cardon dioxide equivalent (tCO_2e)) for each proposed junction option associated with earthworks import and disposal and imported pavement aggregates are shown in Table 3.10.

Table 3.10: Estimated GHG Emissions for each Proposed Junction Option (tCO_2e)

Element	Option 1	Option 2	Option 3
Earthworks Import	9,207	495	1,931
Earthworks Disposal	348	380	580
Imported Pavement Aggregates	2,117	1,616	1,686
Total	11,672	2,491	4,197

3.13.10 At the time of assessment, detailed design information is not available regarding material quantities for the proposed junction options. A comparison of the number of new structures required for the proposed junction options is outlined in *Section 3.12: Material Assets and Waste*. Table 3.9, which indicates Option 1 and Option 2 require two new structures whilst Option 3 requires three new structures. A greater number of new structures would be expected to correspond with higher GHG emissions due to greater material requirements and construction activities.

Potential Mitigation

3.13.11 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering

best practice, legislation and guidance has been included in *Section 19.5: Potential Mitigation* of *Chapter 19: Climate* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.13.12 DMRB LA 114 states that projects should seek to minimise GHG emissions in all cases to contribute to the UK's target for a net reduction in carbon emissions. The largest savings can be achieved during the design stage, with more modest reductions being achievable during construction. Appropriate consideration of likely GHG emissions at the option selection stage can, therefore, have a substantial influence on scheme related GHG emissions.

Summary of Assessment

3.13.13 Option 2 is considered likely to have the lowest impact on GHG emissions, primarily due to the requirement for a smaller volume of imported earthworks compared to Option 1 and Option 3, with Option 1 having the highest impact. Furthermore, as outlined in *Paragraph 3.13.10*, Option 3 would have the greatest requirement for new structures and associated GHG emissions.

3.13.14 The difference in impacts between the proposed junction options are considered sufficient to be a differentiator, with Option 2 considered likely to have the lowest overall impact on GHG emissions according to the data available at the time of assessment.

Compliance Against Plans and Policies

3.13.15 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Climate assessment, undertaken in accordance with DMRB guidance.

3.13.16 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) theme *Sustainability*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*.

3.13.17 The Climate assessment identifies GHG emissions as a differentiator between the proposed junction options and as such, whilst further assessment is required at DMRB Stage 3, at this stage Option 1 and Option 2 are assessed to have a better opportunity of supporting policy objectives around reducing climate emissions. Further assessment of policy compliance would be undertaken at DMRB Stage 3.

3.14 Human Health

Approach and Methods

3.14.1 The assessment considers the potential environmental impacts and effects on human health and wellbeing during construction and operation of the proposed junction options from changes to health and wellbeing determinants. The assessment follows DMRB LA 112 'Population and human health' guidance in relation to the effects of proposed trunk road schemes on human health (Highways England et al., 2020a), and also considers the broader notion of wellbeing.

3.14.2 Full details of the approach and methods used to assess health and wellbeing, including details of health pathways in relation to determinants, is included in *Section 20.2: Approach and Methods* of *Chapter 20: Human Health* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.14.3 For the assessment of the proposed junction options the potential residual effects reported in the other environmental factor assessments have been considered, including identified differentiators, and these have been assessed in turn against health and wellbeing determinants. Professional judgement has been used to determine how changes to health and wellbeing determinants that are likely to occur as a result of the proposed junction options would likely affect health and wellbeing outcomes, considering the sensitivity of the local communities. The community objectives in relation to wellbeing have not been considered in relation to the assessment of proposed junction options as these apply to the DMRB Stage 2 proposed route options as a whole.

3.14.4 Where other environmental factor assessments have not assessed the construction phase due to a lack of available information, this approach has been carried forward to the relevant health determinants where there is not sufficient detail to establish whether changes to health outcomes would arise.

Baseline Conditions

3.14.5 The baseline conditions were identified through a desk-based assessment and review of information from sources listed in *Section 20.3: Baseline Conditions* of *Chapter 20: Human Health* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.14.6 People living in the four communities of Dunkeld, Little Dunkeld, Birnam and Inver (referred to in this assessment as 'the communities') were considered as having the potential to be impacted by the proposed junction options in relation to health and wellbeing. The detailed baseline data that has informed the health and wellbeing profile of the communities is set out in *Section 20.3: Baseline Conditions* of *Chapter 20: Human Health* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment'*.

3.14.7 Dunkeld, Little Dunkeld, Birnam and Inver have a small population (0.8% of Perth and Kinross) with a median age higher than that of the Scottish population. There is a high proportion of residents that belong to what are termed as vulnerable groups (young people including school children, the elderly and people with disabilities).

3.14.8 Health is considered to be good or very good, similar to the average for Scotland, but there is a slightly higher proportion than those in the wider Scottish population that consider themselves as limited by a health problem or disability in some capacity. It is possible to surmise that this is linked to the higher median age in the local population.

3.14.9 Personal wellbeing indicators suggest that the local population should have higher life satisfaction, a feeling of worthwhileness, and happiness as compared with the wider Scottish population. Levels of anxiety have risen between 2018-2019 to 2019-2020 but remain below the national average.

3.14.10 The health and wellbeing sensitivity of the communities has been determined using professional judgement, taking into account and balancing the various factors that make up the health and wellbeing profile of the area.

3.14.11 Due to the relatively high standard of health and wellbeing in the communities as measured against the national average, the overall health and wellbeing sensitivity of the communities of Dunkeld, Little Dunkeld, Birnam and Inver is reported as medium. However, it is recognised that there are vulnerable groups of higher sensitivity within the communities and these groups are considered separately, where applicable.

Potential Impacts and Effects

3.14.12 Potential impacts and effects on health and wellbeing for construction (where applicable) and operation are reported in Table 3.11.

Table 3.11: Potential Effects on Health and Wellbeing Determinants and Likely Health Outcomes

Health and wellbeing determinant	Relevant environmental assessment section	Potential residual effects reported in DMRB Stage 2 Environmental Factor Assessments	Likely health and wellbeing outcome
Air quality management areas and ambient air quality	*Section 3.9: Air quality*	Construction and Operation No significant adverse effects are predicted for air quality at sensitive human health locations for any of the proposed junction options and the differences in air quality impacts between the options are not considered sufficient to be a differentiator.	There is no material difference between the proposed junction options for this determinant, and pollutant concentrations during operation are anticipated to be below the objective values set to protect human health. The likely health and wellbeing outcome for all options is considered to be Neutral for construction and operation and this determinant is not considered to be a differentiator.
Landscape amenity	*Section 3.6: Landscape* and *Section 3.7: Visual*	Construction All of the proposed junction options are likely to result in temporary adverse impacts on the landscape and on visual amenity as a result of typical construction activities. Operation *Landscape* Options 1 and Option 2 would result in Slight effects on landscape character; however, Option 3 is predicted to result in a Moderate significance of effect on the Strath Tay: Lower Glen LLCA. All of the proposed junction options are predicted to have effects on the Special Qualities of the River Tay (Dunkeld) NSA. Effects on the 'Exceptionally Rich, Varied and Beautiful Woodlands' Special Quality of the NSA would be similar between all junction options. Option 1 and Option 2 would be likely to result in a Slight significance of effect on the 'Beauty of Cultural Landscapes Accompanying Natural Grandeur' Special Quality of the River Tay (Dunkeld) NSA whereas Option 3 would be likely to result in a Moderate significance of effect. All of the proposed junction options would result in a change in the experience of the 'Gateway to the Highlands' Special Quality. Option 1 would be likely to result in a Large significance of effect on this Special Quality, whereas Option 2 and Option 3 are predicted to have a Slight effect. All of the proposed junction options	All proposed junction options have potential to have adverse landscape and visual effects during construction and operation and as a result may reduce visits to the outdoors, journeys by active travel, and physical activity. However, impacts during construction would be temporary and the majority of adverse landscape amenity effects during operation which may affect health and wellbeing would be expected to reduce over time with the establishment of landscape mitigation planting. The likely health and wellbeing outcome for all options is considered to be Neutral for construction and operation and this determinant is not considered to be a differentiator.

Health and wellbeing determinant	Relevant environmental assessment section	Potential residual effects reported in DMRB Stage 2 Environmental Factor Assessments	Likely health and wellbeing outcome
		are predicted to have effects of a similar significance on the Murthly Castle GDL. The differences in effects between the options are considered sufficient to be differentiators, with Option 3 resulting in the highest overall effect on the landscape resource, and Option 2 resulting in the lowest overall effect. *Visual* Option 1 would result in a greater visual effect on residential receptors than Option 2 and Option 3, as there would be greater effects at Ink Pot Cottage. In terms of outdoor receptors, Option 1 is predicted to result in effects of a lower significance on visual amenity than Option 2 and Option 3. Option 3 would result in effects of greater significance than Option 2. On balance, the overall differences in effects between the proposed junction options, taking account of the visual amenity of both built and outdoor receptors are not considered sufficient to be a differentiator.	
Sources and pathways of potential pollution	*Section 3.3: Geology, Soils and Groundwater*	Construction and Operation No residual significant adverse effects are expected on agricultural soils, groundwater quality and land contamination. The differences in effects between the proposed junction options are not considered sufficient to be a differentiator.	None of the proposed junction options are considered to influence human health through exposure to pollution from contaminated land. The likely health and wellbeing outcome for all options is considered to be Neutral for construction and operation and this determinant is not considered to be a differentiator.
Areas recognised as being sensitive to noise and the ambient noise environment	*Section 3.10: Noise and Vibration*	Construction After mitigation, construction noise and vibration impacts for all proposed junction options are unlikely to result in significant effects. Operation The differences in potential significant effects between the options are considered sufficient to be differentiators, with Option 2 resulting in the highest overall adverse effect on residential properties, although this may reduce following mitigation considered at DMRB Stage 3.	Noise increases during operation would not pass the threshold at which there may be an influence on human health for any of the proposed junction options. The likely health and wellbeing outcome for all options is considered to be Neutral for construction and operation and this determinant is not considered to be a differentiator.

Health and wellbeing determinant	Relevant environmental assessment section	Potential residual effects reported in DMRB Stage 2 Environmental Factor Assessments	Likely health and wellbeing outcome
Community, recreational and education facilities and severance/separation of communities from such facilities	*Section 3.2: Population - Land Use*	*Effects on access and land-take are assessed for the operation phase only.* Operation Option 2 would only allow vehicle access to properties and businesses in Birnam for journeys from the south, with access provided by other means outwith the proposed junction option. Option 1 and Option 3 facilitate all vehicle movements at the proposed junction. Change in access is not considered sufficient to be a differentiator between the proposed junction options.	Better access to community, recreational and education facilities within Birnam due to access improvements could provide benefits in relation to social cohesion and mental health. However, the extent of the change to severance/separation from these facilities is unlikely to result in a perceptible impact on health. The likely health and wellbeing outcome for all options is considered to be Neutral for operation and this determinant is not considered to be a differentiator.
Cultural heritage resources and severance/separation of communities from such facilities	*Section 3.8: Cultural Heritage*	Construction and Operation The significance of the residual effect for construction and operation of all proposed junction options on Murthly Castle Garden and Designed Landscape (GDL) has been assessed to be Large adverse. While mitigation could reduce the magnitude of impact, it is unlikely that the residual significance of effect would be lessened. The residual significance of effect for construction and operation is the same for each proposed junction option and is not considered to be a differentiator between proposed junction options.	Murthly Castle GDL would be adversely affected by all proposed junction options due to the presence of new access roads, permanent land-take, and the change in alignment of the western drive, a special feature of the GDL. These effects may potentially reduce visits to the Murthly Castle GDL for cultural purposes and impact on social cohesion and connectivity. It is unknown the extent to which Murthly Castle GDL is used by the communities for these purposes and the implications for the health and wellbeing of the communities from a change in cultural heritage resources is uncertain. The likely health and wellbeing outcome for all options is considered to be Uncertain for construction and operation and this determinant is not considered to be a differentiator.

Health and wellbeing determinant	Relevant environmental assessment section	Potential residual effects reported in DMRB Stage 2 Environmental Factor Assessments	Likely health and wellbeing outcome
Green/open space and severance/separation of communities from such facilities	*Section 3.2: Population - Land Use*	*Effects on access and land-take are assessed for the operation phase only.* Operation All proposed junction options would result in land-take, predominantly from woodland. Option 2 and Option 3 would result in a significant adverse change in vehicle access for journeys travelling to and from the south (Murthly Castle and Estate). Changes in access and land-take are not considered sufficient to be a differentiator between proposed junction options.	A reduction in the availability of green/open space could reduce visits to the outdoors for recreational and social purposes, resulting in potentially adverse effects on social cohesion and connectivity. Change in access to green/open space at Murthly Castle and Estate for Option 2 and Option 3 could reduce the use of the grounds for recreation and physical activity and have an adverse effect on health and wellbeing. It is unknown the extent to which Murthly Castle and Estate is used by the communities for these purposes, and there are alternative green/open spaces available in the surrounding area. The likely health and wellbeing outcome for all options is considered to be Uncertain for operation and this determinant is not considered to be a differentiator.
Healthcare facilities and severance/separation of communities from such facilities	N/A	*Effects on access and land-take are assessed for the operation phase only.* Operation There are no healthcare facilities within the vicinity of the proposed junction options, therefore severance/separation of communities from such facilities has not been assessed.	As there is no change anticipated for this determinant, the likely health and wellbeing outcome for all options is considered to be Neutral for operation and this determinant is not considered to be a differentiator.
Transport network and usage in the area, including the surrounding road network, Public Rights of Way (including bridleways), cycle ways, non-designated public	*Section 3.11: Accessibility*	*Effects on WCH are assessed for the operation phase only.* Operation All proposed junction options are anticipated to have significant adverse impacts on NCR77 (south), Path 20 (Core Path DUNK/69), Path 22/NCR77 (Core Path DUNK/142 and NCR77), Path 23 (Core Path DUNK/57 and	Improvements to path amenity may encourage the uptake of journeys by active travel and increased physical activity, which brings health benefits. Conversely, a reduction in amenity may discourage the use of active travel routes and result in a decrease in physical activity.

Health and wellbeing determinant	Relevant environmental assessment section	Potential residual effects reported in DMRB Stage 2 Environmental Factor Assessments	Likely health and wellbeing outcome
routes and public transport routes		Right of Way TP102), and Path 24 (Core Path DUNK/10 and Right of Way TP102). The differences between the proposed junction options in terms of impact on WCH routes are not considered sufficient to be a differentiator.	The likely health and wellbeing outcome for all options is considered to be Negative during operation and this determinant is not considered to be a differentiator.
Safety information associated with the existing affected road network	*Section 3.11: Accessibility*	*Effects on WCH are assessed for the operation phase only.* Operation All proposed junction options would improve safety for WCH on Path 7 due to the provision of a grade separated crossing and on Path 23 due to the proposed underbridge which forms part of the B867/Perth Road realignment (although this would be confirmed at DMRB Stage 3).	Improvements to the safety of WCH routes may reduce and the likelihood of accidents enhance the uptake of active travel, improving mental and physical health wellbeing. The likely health and wellbeing outcome for all options is considered to be Positive for all proposed junction options and this determinant is therefore not considered to be a differentiator.

Potential Mitigation

3.14.13 For the DMRB Stage 2 assessment, the design has not been sufficiently developed to allow the mitigation measures to be defined in detail at this stage. However, potential mitigation considering best practice, legislation and guidance has been included in *Section 20.5: Potential Mitigation* of *Chapter 20: Human Health* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*' and is relevant to this assessment.

3.14.14 It is likely that the majority of potentially significant effects on human health and wellbeing would be reduced by the essential mitigation measures proposed in the other environmental factor assessments referred to in this assessment.

Summary of Assessment

3.14.15 For all proposed junction options, a likely Neutral health and wellbeing outcome is assessed for the communities for the following determinants, which are not considered to be differentiators:

- Air quality management areas and ambient air quality;
- Landscape amenity;
- Sources and pathways of potential pollution;
- Areas recognised as being sensitive to noise and the ambient noise environment;
- Community, recreational and education facilities and severance/separation of communities from such facilities; and

- Healthcare facilities and severance/separation of communities from such facilities.

3.14.16 During operation, there is potential for the communities to experience severance/separation from green/open space and a change in cultural heritage resources due to the impacts on the Murthly Castle and Estate. This may have an effect on the health and wellbeing of the communities due to the potential for reduced physical activity, social cohesion and mental wellbeing. It is considered that Option 2 and Option 3 would have a greater impact than Option 1 due to the significant adverse change in vehicle access to Murthly Castle and Estate (as reported in *Section 3.2: Population - Land Use*). There may also be a disproportionate effect on older people, who may be more likely to visit the Murthly Castle and Estate for recreational and cultural purposes. However, the extent to which the communities of Dunkeld, Little Dunkeld, Birnam and Inver use the Murthly Castle and Estate for recreational and cultural purposes is unknown, and there is alternative green/open space available in the area surrounding the villages. Based on the available information, the likely health and wellbeing outcome is considered Uncertain and is not considered to be a differentiator between proposed junction options.

3.14.17 During operation, a likely Negative health and wellbeing outcome is assessed for all proposed junction options due to the significant adverse effect on amenity of Path 22/NCR77, which may discourage use of the path by the communities for active travel and result in a decline in physical activity. These amenity impacts are common to all proposed junction options and are therefore not considered to be a differentiator.

3.14.18 All proposed junction options would improve safety for WCH on Path 7 and Path 23 once operational and a likely Positive health and wellbeing outcome for the communities is anticipated, though as the improvements would be facilitated by all proposed junction options this is not considered to be a differentiator.

Compliance Against Plans and Policies

3.14.19 *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'* provides a review of national and local policy documents which are of relevance to this Human Health assessment undertaken, in accordance with DMRB guidance.

3.14.20 National Planning Policy objectives of relevance to this assessment are provided in National Planning Framework 3 (Scottish Government, 2014a) and Scottish Planning Policy (SPP) (Scottish Government, 2014b) themes *Sustainability, Valuing the Natural Environment, Managing Flood Risk and Drainage* and *Promoting Sustainable Transport and Active Travel*. Development Plan policies and accompanying supplementary guidance of relevance to this assessment are outlined in *Appendix A21.1: Assessment of Policy Compliance* of the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environmental Assessment'*. Although the policy objectives identified do not specifically refer to human health and wellbeing, they relate to themes against which it is assessed and are of relevance to human health and wellbeing aspects drawn from other assessments.

3.14.21 It is assessed that there is potential for non-compliance for all proposed junction options with policy objectives related to the severance from green/open space and cultural heritage resources, which is assessed to result in likely Negative health and wellbeing outcomes to communities during operation. Further assessment would be undertaken at DMRB Stage 3 where it is anticipated that mitigation proposed in other environmental factor assessments would reduce significant effects.

3.15 Policies and Plans

Introduction

3.15.1 The assessment includes a review of national, regional and local planning policy and guidance documents, and consideration of potential policy conflicts or compliance of the proposed junction options.

3.15.2 The approach and methods used to assess compliance with policies and plans is reported in *Section 21.2: Approach and Methods of Chapter 21: Policies and Plans* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'.

Summary of Plans and Policies

3.15.3 DMRB LA 104 '*Environmental Assessment and Monitoring*' (Highways England *et al*., 2020) states that environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation. In addition, DMRB LA 101 '*Introduction to Environmental Assessment*' (Highways England *et al*., 2019) requires that project objectives and environmental objectives should deliver improved environmental performance by being linked and informed by wider legislative, regulatory or strategic requirements.

3.15.4 A summary of the plans and policies of relevance to the proposed junction options is provided in *Section 21.3: Summary of Plans and Policies* of *Chapter 21: Policies and Plans* of the '*DMRB Stage 2 Scheme Assessment Report, Volume 1 - Main Report and Appendices, Part 3 - Environment Assessment*'.

Assessment of Compliance of Proposed Junction Options

3.15.5 Table 3.12 provides a summary of the outcome of this assessment for each proposed junction option. It identifies whether the proposed junction option is broadly compliant with all policy relevant to that environmental factor ('✓'); may pose noncompliance issues ('**X**'); or requires further assessment during DMRB Stage 3 ('**?**').

3.15.6 A summary of the relevant policy principles, and the assessment of policy compliance is provided in each of the relevant environmental factors section of this appendix (*Sections 3.2 to 3.14*). As stated in each of those sections, mitigation has not been developed for the proposed junction options, but potential mitigation is suggested. The policy compliance assessment takes into account where the assessment concludes that potential mitigation would reduce effects to be not significant.

Table 3.12: Summary of Policy Compliance

Relevant Environmental Assessment Sections	Option 1	Option 2	Option 3
3.2: Population - Land Use	?	?	?
3.3: Geology, Soils and Groundwater	✓	✓	✓
3.4: Road Drainage and the Water Environment	✓	✓	✓
3.5: Biodiversity	X	X	X
3.6: Landscape	?	?	?
3.7: Visual	?	?	?
3.8: Cultural Heritage	X	X	X
3.9: Air Quality	?	?	?
3.10: Noise and Vibration	✓	?	✓

Relevant Environmental Assessment Sections	Option 1	Option 2	Option 3
3.11: Population - Accessibility	X	X	X
3.12: Material Assets and Waste	✓	✓	✓
3.13: Climate	?	?	?
3.14: Human Health	?	?	?

3.15.7 The main environmental impacts and effects expected to result from the proposed junction options that demonstrate potential non-compliance with policy relate to, Biodiversity, Cultural Heritage and Population - Accessibility. Non-compliance is assessed in relation to potential significant impacts and effects upon AWI sites, Murthly Castle GDL (HLT 14) and accessibility via Core Paths and Rights of Way.

3.15.8 Where there are areas of policy non-compliance or uncertain impacts and effects, further assessment of policy compliance would be undertaken at DMRB Stage 3, and when mitigation measures have been further developed.

4. Traffic and Economic Assessment

4.1 Modelling Approach

4.1.1 The traffic and economic assessment has been undertaken using the Paramics A9 Dualling Traffic Model (A9DTM). The model years used in the assessment are 2026 and 2041, representing the first year of full programme operation and 15 years thereafter. The Paramics model has been used to compare the route options in terms of performance indicators, such as changes in travel behaviour and junction choice due to the introduction of each to the future year models. The most recent version of the model is A9DTM:15.

4.1.2 In addition to the A9DTM:15 Paramics corridor model, which is the principal assessment tool, the Birnam Local Traffic Model (BLTM), which represents a typical summer weekend, was developed in Paramics Discovery to consider the operational aspects of the network under peak travel demand rather than the typical flow represented in A9DTM:15. The base year traffic demand in the BLTM was developed from traffic surveys undertaken on a typical summer weekend in August 2017, with two separate models created representing a typical summer Saturday and a typical summer Sunday. The BLTM is also more sensitive when considering the impacts on Perth Road, which is particularly prevalent to the assessment of the junction options at Murthly/Birnam.

4.1.3 For the purposes of the assessment, the Do-Minimum network relates to the conditions as they are in 2015 (after the introduction of Average Speed Safety Cameras).

4.1.4 A more detailed description of the approach and methods used for the traffic and economic assessment is included in the *'DMRB Stage 2 Scheme Assessment Report, Volume 1 – Main Report and Appendices, Part 4: Traffic and Economics Assessment'*.

4.2 Effects of Junction Option

Existing Traffic Flows

4.2.1 The existing AADT flows (2015) on Perth Road have been calculated, based on traffic counts and surveys. For assessment purposes, Perth Road has been split into four sections. The sections and existing traffic flows are noted in Table 4.1

Table 4.1: Existing Traffic Flows (2015)

Section	Location	Existing Traffic Flows (2015)
1	A9 to Woodville	1,800
2	Woodville to Station Road	1,300
3	Station Road to Stell Park Road	1,800
4	Stell Park Road to A923	2,600

Do-Minimum Traffic Flows

4.2.2 For the Do-Minimum scenario, two-way AADT flows have been estimated on Perth Road for the year of opening (2026) and the Design Year (2041). The estimated traffic flows for the four sections are noted in Table 4.2.

Table 4.2: Do-Minimum Traffic Flows (2026 and 2041)

Section	Location	Estimated Traffic Flows (2026)	Estimated Traffic Flows (2041)
1	A9 to Woodville	2,200	2,400
2	Woodville to Station Road	1,600	1,700
3	Station Road to Stell Park Road	1,900	1,800
4	Stell Park Road to A923	2,800	2,800

4.2.3 Traffic flows are higher in Section 1: A9 to Woodville section of Perth Road than Section 2: Woodville to Station Road and Section 3: Station Road to Stell Park Road. The reason for this is that the dominant traffic movements are between Birnam and the south, rather than Birnam and the north. As a result, the traffic flows quoted for Section 1: A9 to Woodville include traffic to and from the centre of Birnam. In addition, this section includes traffic travelling to the southern extent of Birnam, which includes the holiday park at Erigmore.

4.2.4 Traffic flows are higher in Section 4: Stell Park Road to A923. This estimated traffic flow is based on junction turning counts and is likely to be a result of vehicle movements to the Royal School of Dunkeld and from local journeys between Dunkeld and Birnam.

Do-Something Traffic Flows

4.2.5 The impact on traffic flows on Perth Road has been estimated for Options 1, 2 and 3 under consideration at Murthly/Birnam. Traffic models have been generated for each of the junction options to obtain the AADT flows on Perth Road. The year of opening (2026) and the Design Year (2041) have been considered, as shown in Table 4.3 and 4.4. All models assume a full movement junction at Dunkeld.

Table 4.3: Do-Something Traffic Flows (2026)

Section	Location	Option 1	Option 2	Option 3
1	A9 to Woodville	1,400	2,000	1,700
2	Woodville to Station Road	1,500	2,000	1,400
3	Station Road to Stell Park Road	2,900	3,000	2,600
4	Stell Park Road to A923	3,800	4,000	3,600

Table 4.4: Do-Something Traffic Flows (2041)

Section	Location	Option 1	Option 2	Option 3
1	A9 to Woodville	1,600	2,200	1,900
2	Woodville to Station Road	1,600	2,100	1,500
3	Station Road to Stell Park Road	2,900	3,100	2,700
4	Stell Park Road to A923	4,000	4,100	3,700

4.2.6 The traffic model makes the following general assumptions:

- Perth Road has a 30 miles per hour speed limit;
- The A923 has a 20 miles per hour speed limit east of the junction with Perth Road;
- Traffic for Birnam will utilise the Birnam Junction; and
- Traffic for Dunkeld will utilise the Dunkeld Junction.

(Note: While the traffic model assumes a set speed limit (for example 30 miles per hour), each individual vehicle has its own speed, reflecting the real-life behaviour of drivers. As such, some vehicles within the model may exceed the designated speed limit slightly, and some may be below the designated speed limit.)

4.2.7 The current signing strategy directs traffic for Dunkeld through Birnam along Perth Road. The traffic model assumes a change to the signing strategy with Dunkeld traffic remaining on the A9 until the proposed Dunkeld Junction. In addition, the increased traffic speeds on the A9 and increased opportunities for vehicles to overtake slower moving vehicles will encourage traffic to remain on the A9 for longer. As a result, regardless of the junction option under consideration at Murthly/Birnam, and assuming a full movement junction at Dunkeld, traffic will increase within Section 3: Station Road to Stell Park Road and Section 4: Stell Park Road to A923, compared to the Do-Minimum scenario, as more traffic is directed to the Dunkeld Junction, as detailed in Tables 4.5 and 4.6.

Table 4.5: Sections 3 and 4 Traffic Change (2026 and 2041)

Section	Location	Increase in traffic flows on Perth Road in 2026 (2041)		
		Option 1	Option 2	Option 3
3	Station Road to Stell Park Road	+1,000 (+1,100)	+1,100 (+1,300)	+700 (+900)
4	Stell Park Road to A923	+1,000 (+1,200)	+1,200 (+1,300)	+800 (+900)

4.2.8 Within Section 1: A9 to Woodville and Section 2: Woodville to Station Road, traffic flows decrease, compared to the Do-Minimum scenario, as shown in Table 4.6, for Options 1 and 3. This is largely as Dunkeld traffic is assumed to remain on the A9 for longer, given the increased speed limit and increased overtaking opportunities, and that there are primarily only residential properties to the south of Perth Road.

Table 4.6: Sections 1 and 2 Traffic Change (2026 and 2041)

Section	Location	Increase in traffic flows on Perth Road in 2026 (2041)		
		Option 1	Option 2	Option 3
1	A9 to Woodville	-800 (-800)	-200 (-200)	-500 (-500)
2	Woodville to Station Road	-100 (-100)	+400 (+400)	-200 (-200)

4.2.9 As shown in Table 4.6, for a restricted movement junction at Birnam (Option 2), traffic flows increase on Section 2: Woodville to Station Road, compared to the Do-Minimum scenario. This increase in traffic flows is largely vehicles destined for the southern extent of Birnam, Bankfoot and the surrounding area, which currently use the existing Birnam Junction and the B867. Eliminating the southbound diverge slip road means that southbound Bankfoot traffic can either utilise the Dunkeld Junction and Perth Road, or continue on the A9 to the Bankfoot Junction to the south.

4.2.10 The traffic model makes a judgement as to what proportion of vehicles remain on the A9 or utilise Perth Road. The routing of vehicles in the traffic model is based on 'generalised cost'. This is effectively a combination of time and distance, the weightings of which vary slightly by vehicle type and journey purpose. In-work drivers are generally more inclined to use the quickest route, as employer's place a higher value on staff time, whereas Heavy Goods Vehicles (HGVs) are more inclined to take a shorter route, which utilises the least volume of fuel.

4.2.11 In addition, vehicles are also subdivided into familiar and unfamiliar drivers. Unfamiliar drivers are more likely to follow a major route, in this case the A9. Familiar drivers are more likely to ignore the signing strategy and use minor roads as they are perhaps quicker or shorter.

4.2.12 In this case, for a vehicle travelling from Dunkeld to Auchtergaven Primary School in Bankfoot, the A9 is the quickest route, whereas Perth Road and the B867 is the shorter route. As such, considering the text above, the traffic model shows traffic making both movements. It should be noted that not all traffic is necessarily travelling as far as Bankfoot and therefore Perth Road and the B867 is always likely to be a preferred destination for this traffic.

4.2.13 Traffic flows within Section 1: A9 to Woodville reduce for Option 2, compared to the Do-Minimum scenario. However, the reduction is not as significant as Options 1 and 3 that facilitate full junction movements at either Murthly or Birnam. This is traffic destined for Bankfoot and the surrounding area, which utilises the Dunkeld Junction and Perth Road to access the B867.

4.2.14 It should be noted that the increase in traffic noted on Perth Road for Option 2 is not considered significant and would not affect the effective operation of the road.

Do-Something Traffic Flows, Mitigation

4.2.15 While the proposed increase in traffic on Perth Road, Section 2: Woodville to Station Road, resulting from Option 2 is not considered significant, further modelling has been undertaken to determine if traffic flows would reduce if a 20 miles per hour speed limit was imposed on Perth Road. The traffic model suggests that a reduced speed limit on Perth Road encourages more traffic destined for Bankfoot and the surrounding area to remain on the A9, which will have a 70 miles per hour speed limit and increased opportunities for vehicles to overtake and utilise the Bankfoot Junction. As such, it is anticipated that the traffic flows quoted for all four sections would decrease, by approximately 200 vehicles. Within Section 2: Woodville to Station Road, which the traffic model indicates an increase in traffic, compared to the Do-Minimum scenario, the increase in traffic would be even less significant.

4.3 Economic Performance

Economic Assessment

4.3.1 The economics of the Murthly/Birnam cannot be calculated in isolation and has therefore not been considered at this time.

5. Conclusions and Recommendations

5.1 Introduction

5.1.1 As part of this DMRB Stage 2 assessment, three junction options have been considered and assessed for Murthly/Birnam.

- The Community's Preferred Route Option (Option 1);
- Additional Option 1 (Option 2); and
- Additional Option 2 (Option 3).

5.1.2 The DMRB Stage 2 assessment has considered the options, taking account of constraints, potential environmental, engineering and traffic and economic effects to identify a preferred junction option. The preferred junction option will then be taken forward and used in Whole Route Options, which will be subject to further DMRB Stage 2 assessment.

5.2 Option Assessment Summary

5.2.1 A summary of the key findings of the DMRB Stage 2 assessment, focussing on the key benefits and disbenefits of each option, is given in Table 5.1.

Table 5.1: Junction Options, Key Benefits and Disbenefits

Junction Option	Benefits	Disbenefits
Option 1	▪ Facilitates all vehicle movements, therefore does not increase traffic on Perth Road. ▪ Limited construction complexity, as the works are outwith the extents of the current A9. ▪ No significant adverse noise effects on sensitive receptors.	▪ Not in accordance with the A9 Dualling Programme Junctions & Accesses Strategy. ▪ Requires an additional 270 metre length of new dual carriageway at the southern extent to facilitate verge and central reserve widening while maintaining a smooth alignment. ▪ Has the highest overall effect on biodiversity as it results in the greatest loss of ancient woodland. ▪ Results in greater effects on the view from the road, compared to Options 2 and 3, due to the proposed overbridge associated with the junction, slip roads and associated earthworks.
Option 2	▪ In accordance with the A9 Dualling Programme, Junctions & Accesses Strategy. ▪ Does not require the extension of the southbound tie-in point of the A9 dual carriageway to facilitate carriageway widening. ▪ Limited construction complexity, as the southbound merge slip road is outwith the extents of the River Tay floodplain. ▪ Least loss of ancient woodland area of all the junction options. ▪ Lowest overall effect on the landscape resource compared to Options 1 and 3. ▪ Lowest anticipated construction cost. ▪ Considered likely to have the lowest impact on greenhouse gas emissions, primarily due to the	▪ Increases traffic flows on Perth Road (south of Station Road) through the omission of a southbound diverge slip road. The increase in traffic on Perth Road is expected to be between 200 and 400 vehicles per day, which is not considered to be significant. ▪ Without mitigation, predicted to result in six potentially significant adverse noise effects. A reduction in speed limit on Perth Road may be considered at DMRB Stage 3, in consultation with PKC, to reduce the number of significant adverse noise effects.

Junction Option	Benefits	Disbenefits
	requirement for a smaller volume of imported earthworks.	
Option 3	▪ In accordance with the A9 Dualling Programme, Junctions & Accesses Strategy. ▪ Does not require the extension of the southbound tie-in point of the A9 dual carriageway to facilitate carriageway widening. ▪ Facilitates all vehicle movements, therefore does not increase traffic on Perth Road. ▪ No significant adverse noise effects on sensitive receptors.	▪ Viaduct structure, included in the southbound loop, to avoid encroachment towards the River Tay floodplain, would require significant piled foundations in close proximity to the River Tay and its floodplain, and a high-pressure gas pipeline, generating construction complexity and added costs. ▪ Significantly higher structural costs, due to the viaduct structure for the southbound loop. ▪ Requires the greatest total disposal of materials. ▪ Highest overall impact on the landscape resource, with significant effects predicted on both the Strath Tay: Lower Glen LLCA and the River Tay (Dunkeld) NSA. ▪ Highest anticipated construction cost.

5.2.2 Consultation has been undertaken with local residents and key stakeholders. A public consultation event, which identified the three options under consideration at Murthly/Birnam was also held on 26th and 27th March 2019. A summary of the feedback is given in Table 5.2. A further public consultation event was also undertaken on 16th and 17th May 2019, which showed the Whole Route Options that were developed using the options shown at the previous community engagement event.

Table 5.2: Summary of Public and Stakeholder Feedback

Stakeholder	Summary of Comments
Local Community (General)	The wider local community has expressed a preference through the A9 Co-Creative Process for the Murthly Junction (Option 1), which is approximately 1 kilometre south of the current Birnam Junction. It is assumed this is because the junction is further from more densely populated areas and therefore has perceived noise and visual benefits. However, there are a number of isolated dwellings in the locality of the proposed junction, these residents have suggested their preference would be for a junction in the vicinity of the existing Birnam Junction (Options 2 and 3). It should be noted that at Stage 4 of the A9 Co-Creative Process, the Murthly Junction (Option 1) was first with 11.1%. The second place junction, which was a grade separated junction at Birnam, with restricted movements, obtained 10.8% of the vote.
Local Community (Public Consultation Event)	Feedback following the public consultation event, held in late March 2019, has indicated that the local community generally favour Options 1 and 2 over Option 3.
NatureScot	NatureScot has suggested that a junction in the locality of the existing Birnam Junction would be more favourable (Options 2 and 3), with thought required as to how impacts could be mitigated for Option 1.
SEPA	In terms of flood risk, SEPA has previously expressed serious concerns about the flood risk impacts of Option 3. However, the current design, which includes a viaduct structure for the southbound loop, limits the impacts on the floodplain. SEPA has suggested that Option 1 would remove completely any conflict with the floodplain.
Historic Environment Scotland (HES)	HES has noted the outstanding landscape of Murthly GDL that will be directly impacted by all options.

Stakeholder	Summary of Comments
PKC	PKC has stated a preference for a junction that facilitates all vehicle movements (Options 1 and 3).

5.3 Preferred Junction Option

5.3.1 Based on the findings of the DMRB Stage 2 assessment, summarised in Table 5.1, and considering feedback from the public and other stakeholders, the preferred junction option for Murthly/Birnam is **Option 2**.

5.3.2 The preferred junction option (Option 2) will be taken forward for inclusion in the Additional Whole Route Options.

5.4 Project Objectives

5.4.1 Scheme objectives were identified for the A9 Dualling Programme through the Preliminary Engineering Services (PES) commission, which was equivalent to a DMRB Stage 1 assessment. Prior to the commencement of the A9 Co-Creative Process, the Birnam to Ballinluig A9 Community Group generated community objectives. These objectives have been considered throughout the DMRB Stage 2 assessment process. A summary of the objectives is given in Tables 5.3 and 5.4, along with details as to how the preferred junction option (Option 2) meets the objectives.

Table 5.3: Summary of Transport Scotland Objectives

Scheme Objectives	Delivered Through Options
Improve the operational performance of the A9 by: ▪ Reducing journey times; and ▪ Improving journey time reliability.	Option 2 does not impact journey times on the A9 dual carriageway. However, as Option 2 omits a southbound diverge slip road, traffic for Bankfoot, via the B867, will be diverted through Little Dunkeld and Birnam, impacting side road journey times.
Improve safety for motorised and WCH by: ▪ Reducing accident severity; and ▪ Reducing driver stress.	The proposed A9 dual carriageway provides a continuous overtaking opportunity along the route, which will reduce driver frustration and stress. Option 2 is considered a safety benefit over the existing layout, which incorporates at-grade junctions and right-turn manoeuvres.
To facilitate active travel within the corridor.	Option 2 includes an underbridge structure, which facilitates safe crossing of the A9 dual carriageway for WCH.
To improve integration with Public Transport facilities.	The layout of Option 2 does not influence integration with Public Transport facilities.

Table 5.4:Summary of Community Objectives

Community Objectives	Delivered Through Options
Reduce current levels of noise and pollution in the villages of Dunkeld, Birnam and Inver to protect human health and well-being of residents and visitors and to enable them to peacefully enjoy their properties and amenity spaces.	Option 2, due to the omission of a southbound diverge slip road, introduces an additional 200 to 400 vehicles per day to Perth Road, south of Station Road, resulting in potential significant adverse noise effects for adjacent residents in the short-term. However, it is anticipated that these potential significant adverse noise effects could be mitigated and will be investigated as part of the DMRB Stage 3 assessment. It is noted that there are no potential significant noise effects in the long-term.
Protect and enhance the scenic beauty and natural heritage of the area and its distinctive character and quality.	Option 2 results in the least loss of ancient woodland and has the least effect on the landscape resource.

Community Objectives	Delivered Through Options
Provide better, safer access on and off the A9 from both sides of the road while ensuring easy, safe movement of vehicular traffic and WCH through the villages, helping to reduce stress and anxiety and support the local community.	Option 2 provides safe access to the A9 for motorised users. WCH routes would be maintained, albeit some would be diverted as a result of the proposed junction.
Promote long-term and sustainable economic growth within Dunkeld and Birnam and the surrounding communities.	Option 2 facilitates safe access to and from the A9 dual carriageway, improving access to the local area, potentially positively impacting the local economy.
Examine and identify opportunities to enhance the levels of cycling and walking for transport and leisure, including the improvement of existing footpaths and cycle ways, to promote positive mental health and well-being.	Option 2 includes an underbridge structure, which facilitates safe crossing of the A9 dual carriageway for WCHs.
Ensure that all local bus, intercity bus services and train services are maintained and improved.	Option 2 does not interact with Dunkeld & Birnam Station. The junction option improves the level of junction provision, compared to existing, providing an opportunity for improved bus services.
Preserve and enhance the integrity of the unique and rich historical and cultural features of the Dunkeld, Birnam and Inver communities, thereby supporting well-being and the local economy.	Option 2 requires land-take from Murthly Castle GDL, resulting in significant adverse effects on this designation.

Annex A. Existing Conditions Drawing

Appendix A7.1: Mapping of Community Objectives Against DMRB Stage 2 Route Options

1.1 Introduction

1.1.1 At an early stage in the A9 Co-Creative Process, the Birnam to Ballinluig A9 Community Group generated community objectives. The seven objectives cover a wide range of topics but focus predominantly on environmental issues. Tables 1 to 7 in this Appendix indicate how each objective relates to the environmental factors considered in the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment. The tables also indicate how each environmental factor contributes towards achieving the community objective.

1.1.2 The community objectives have been considered during the operation phase for the proposed route options only. Contribution to community objectives for the construction period is not reported, since the construction phase for all options would have adverse impacts and effects and is therefore not expected to contribute to the community objectives. It should be noted that mitigation for all proposed route options would reduce impacts and effects during construction.

1.1.3 A DMRB Stage 2 assessment of Human Health and mapping of the wellbeing related elements of the community objectives is reported in Volume 1, Part 3 - Environmental Assessment (Chapter 20: Human Health). Therefore, Volume 1, Part 3 - Environmental Assessment (Chapter 20: Human Health) is not reported in this appendix.

1.1.4 Similarly, it should be noted that a separate and distinct assessment of tourism and local business impacts has been prepared and this considers how the DMRB Stage 2 proposed route options impact local businesses, tourist attractions and the local economy (refer to *Appendix A7.2: Perceived Tourism and Local Business Impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing*). Mapping of the tourism related elements of the community objectives is therefore not reported in this appendix.

1.1.5 The key below indicates how each community objective has been considered during operation. The tables indicate whether or not the proposed route options may contribute to the community objectives, they do not report most/least favourable proposed route options. The comparative assessment identifying the lowest overall effects, intermediate overall effects and highest overall effects are reported in each of the environmental factor chapters.

Contributes to all/most of the community objective	
Contributes to part of the community objective	
Contributes to little/none of the community objective	

Table 1: Community objective 1 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 1:	**Reduce current levels of noise and pollution in the villages of Dunkeld, Birnam and Inver to protect human health and well-being of residents and visitors and to enable them to peacefully enjoy their properties and amenity spaces.**					
The potential impacts and effects on air quality have been assessed as part of the DMRB Stage 2 assessment in Volume 1, Part 3 - Environmental Assessment (Chapter 15: Air Quality). Noise modelling has also been undertaken as part of the DMRB Stage 2 assessment in Volume 1, Part 3 - Environmental Assessment (Chapter 16: Noise and Vibration) to identify residential properties that meet operational noise mitigation criteria and determine what mitigation measures may be required. The potential impacts and effects on existing amenity space and the potential for creating new amenity space has been assessed in Volume 1, Part 3 - Environmental Assessment (Chapter 8: Population - Land Use).						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
8	Population - Land Use					Option ST2A provides the opportunity to create a new open space on top of the 1.5km cut and cover tunnel that could be used by the local community in addition to maintaining the function of existing amenity spaces used by the community. Option ST2A is considered to contribute to all/most of this objective due to the potential for new open space on top of the 1.5km cut and cover tunnel. Option ST2B, Option ST2C and Option ST2D do not provide the potential for new open space for community use and existing amenity/recreational areas are maintained. These proposed route options are considered to contribute in part to this community objective.
15	Air Quality					Generally, there is an increase in concentrations of pollutants at most receptors for all proposed route options. However, no Air Quality Objectives are breached and the pollutant concentrations at all assessed human health receptors are below the objective values set to protect human health.
16	Noise & Vibration					Options ST2A and ST2B result in fewer operational adverse potential effects than Options ST2C and ST2D, and more potential beneficial effects. This arises predominantly due to the cut and cover tunnel (Option ST2A) and 150m underpass (Option ST2B), which is in the vicinity of Birnam and Little Dunkeld. All proposed route options have similar potential impacts at Inver. Option ST2C and Option ST2D result in some beneficial potential effects at various locations along the proposed route options and so are considered to contribute in part to this objective as there are also adverse potential effects at other receptors.

Table 2: Community objective 2 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 2:	**Protect and enhance the scenic beauty and natural heritage of the area and its distinctive character and quality.**					
The attributes of the surface water environment are intrinsically linked to the ecology of the area. The potential impact and effect to the surface water environment has been assessed during DMRB Stage 2 in Volume 1, Part 3 - Environmental Assessment (Chapter 10: Road Drainage and the Water Environment). The assessment included consideration of hydrology and flood risk, fluvial geomorphology and water quality. The impacts on freshwater and terrestrial habitats and ecosystems are also fully considered in the DMRB Stage 2 assessment in Volume 1, Part 3 - Environmental Assessment (Chapter 11: Biodiversity). The DMRB Stage 2 assessment, Volume 1, Part 3 - Environmental Assessment (Chapter 12: Landscape) and (Chapter 13: Visual) consider the impacts on the landscape resource and visual amenity experienced by people, including residents.						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
10	Road Drainage & the Water Environment					All of the proposed route options would discharge routine surface runoff to receiving water features. A minimum of two levels of treatment are proposed prior to discharge, in accordance with SEPA and NatureScot requirements to protect water quality. It is noted that this is an improvement on existing conditions. As such, an improvement in water quality is expected during operation of the proposed scheme, for all proposed route options. Option ST2A and Option ST2B involve lowering Inchewan Burn into a culvert, resulting in the potential for significant adverse effects to the natural characteristics of the burn. Option ST2C and Option ST2D would preserve Inchewan Burn in its current course. Although there would be some improvements in drainage that could potentially improve water quality, there is the potential for significant adverse effects to Inchewan Burn (for Option ST2A and Option ST2B) which are considered overall to outweigh the benefits in relation to water quality. Accordingly, Option ST2A and Option ST2B are considered to contribute little to this objective with regards to road drainage and the water environment.
11	Biodiversity					The scenic beauty and natural heritage of the Pass of Birnam to Tay Crossing section of the A9 dualling includes ancient woodland habitat and watercourses intersecting the proposed route options. All proposed route options would have a significant adverse effect through removal of woodland on the Ancient Woodland Inventory (AWI), with Option ST2A resulting in the greatest loss and Option ST2D the least loss. Option ST2A and Option ST2B involve significant engineering works to lower Inchewan Burn, which would have the potential for adverse impacts and effects on fish species of conservation interest due to habitat fragmentation. For Option ST2C and Option ST2D, Inchewan Burn would retain its current course, reducing the potential impacts and effects on the ecology of the burn. Although there would be some benefits, such as the potential for additional habitat of conservation value in the amenity/recreation area on top of the 1.5km cut and cover tunnel (for Option ST2A only), there are significant adverse effects on the AWI (for all proposed route options) and Inchewan Burn (for Option ST2A and Option ST2B) which are considered overall

Relevant Environmental Chapter		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Explanation
						to outweigh the benefits in relation to biodiversity. Accordingly, all proposed route options are considered to contribute little/none to this objective with regards to biodiversity.
12	Landscape					Option ST2A, which includes the 1.5km cut and cover tunnel, would have the potential to provide a degree of enhancement along the tunnelled section, assuming a high-quality landscape is provided in the open space on top of the tunnel. However, in order to maintain the integrity of the tunnel structure, mitigatory planting of large trees in this area would not be possible. This would be necessary to be fully in keeping with the distinctive character of the area and with this limitation, Option ST2A is considered to meet little/none to this objective. Option ST2B and Option ST2C have the potential to increase the prominence of road infrastructure, due to the 150m underpass (Option ST2B) which is a large structure that would be visible from various viewpoints, and the grade separated junction at Dunkeld (Option ST2C). The potential to mitigate the prominent road infrastructure of Option ST2B and Option ST2C and protect and enhance the scenic beauty of the area would be more limited than for Option ST2A and Option ST2D. Option ST2B and Option ST2C are considered to contribute little/none to the objective. Option ST2D has a compact footprint allowing for a degree of protection. However, similar to the other proposed route options, it is considered to contribute little/none to the objective as potential for enhancement in accordance with the objective is limited.
13	Visual					Option ST2A and Option ST2B lower the A9 dual carriageway, removing traffic from view at Birnam. However, traffic would be visible elsewhere along these proposed route options. Option ST2C is predicted to result in the potential for the greatest overall visual effect, largely as a result of the grade separated junction at Dunkeld, which requires a raised A9 dual carriageway. Option ST2D is largely at-grade, limiting impacts on existing views, but there is limited potential for enhancement in accordance with the objective. Therefore, Option ST2D is considered to contribute little/none to this objective. All proposed route options would result in the potential for adverse impacts and effects to the visual qualities of the area and therefore they are all considered to contribute little/none to this objective.

Table 3: Community objective 3 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 3:		**Provide better, safer access on and off the A9 from both sides of the road while ensuring easy, safe movement of vehicular traffic and NMUs[1] through the villages, helping to reduce stress and anxiety and support the local community.**				
The A9 will be a Category 7A all-purpose dual carriageway in accordance with the DMRB. The standard requires that there will be no gaps in the central reserve and no at-grade minor junctions. One of Transport Scotland's objectives for the scheme is to improve safety for motorists and WCH. The DMRB Stage 2 assessment considers access to private property & housing, businesses, community assets, community land and agricultural holdings in Volume 1, Part 3 - Environmental Assessment (Chapter 8: Population - Land Use). The DMRB Stage 2 assessment Volume 1, Part 3 - Environmental Assessment (Chapter 17: Population - Accessibility) also considers impacts on WCH.						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
8	Population - Land Use					During operation, all proposed route options provide safe access to the A9 for vehicle users via the proposed junctions. It is therefore considered that all proposed route options contribute to all/most of the community objective.
17	Population - Accessibility					WCH routes would be maintained, albeit some would be diverted as a result of the proposed route options. Any diversions or changes to WCH routes would be developed during DMRB Stage 3 and opportunities to improve them would be considered. While Option ST2A, Option ST2B and Option ST2D incorporate an at-grade roundabout at Dunkeld Junction, which may impede WCH movements, it is noted that there is currently no existing WCH provision in this location and WCH connectivity would be developed during DMRB Stage 3. Overall, it is considered that all proposed route options contribute most/all to the community objective.

[1] Non-Motorised Users (NMU's) are referred to as Walkers, Cyclists and Horse-riders (WCH) in the current version of the DMRB and throughout the DRMB Stage 2 Assessment. In previous versions of the DMRB they were referred to as NMUs.

Table 4: Community objective 4 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 4:		**Promote long-term and sustainable economic growth within Dunkeld and Birnam and the surrounding communities.**				
The DMRB Stage 2 assessment considers the impact on businesses, agricultural holdings, land allocated for development through the local development plan and community assets in Volume 1, Part 3 - Environmental Assessment (Chapter 8: Population - Land Use).						
Relevant Environmental Topic Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
8	Population - Land Use					All proposed route options are anticipated to benefit economic growth and perceptions of the local area during operation. Traffic is predicted to increase on the A9, which has the potential to increase the number of visitors to the communities, positively affecting the local economy. The local area would benefit from improved links to other towns and cities, from both the A9 itself and from the improved connection to Dunkeld & Birnam Station. Option ST2A, Option ST2C and Option ST2D would result in the demolition of three buildings within Birnam Industrial Estate, which are currently used as business premises. Birnam Industrial Estate is also a designated site for existing employment land in the local development plan. As such, these options would compromise the development capacity of this land allocation. Option ST2B would require demolition of one of the business properties located within Birnam Industrial Estate. All proposed route options would result in the demolition of two business buildings at Foster Contracting Limited. This area is also a designated site for existing employment land in the local development plan, therefore these options would compromise the development capacity of this land allocation. It is considered that all proposed route options contribute to part of the community objective.

Table 5: Community objective 5 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 5:		**Examine and identify opportunities to enhance the levels of cycling and walking for transport and leisure, including the improvement of existing footpaths and cycleways, to promote positive mental health and well-being.**				
The DMRB Stage 2 assessment considers impacts and effects on WCH, including consideration of footpaths, cycle routes and informal access to land in Volume 1, Part 3 - Environmental Assessment (Chapter 17: Population - Accessibility). The DMRB Stage 2 assessment also considers the impact and effect on landscape resource and visual amenity and views experienced in Volume 1, Part 3 - Environmental Assessment (Chapter 12: Landscape) and (Chapter 13: Visual). It should be noted that although impact to WCH routes are considered at this stage, further design and assessment work would be undertaken at DMRB Stage 3, in consultation with relevant WCH groups and organisations.						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
12	Landscape					Option ST2A, which involves the cut and cover tunnel, is considered to partly contribute to this community objective as it would provide a degree of enhancement along the tunnelled section for WCH, assuming a high-quality landscape is provided on top of the cut and cover tunnel. WCH routes may also be established on top of the cut and cover tunnel in the amenity/recreation area, improving connectivity and amenity value for the WCH. Option ST2B and Option ST2C increase the prominence of road infrastructure, due to the underpass (Option ST2B) and the grade separated junction at Dunkeld (Option ST2C), with no scope for protection or enhancement of scenic beauty and which may impact WCH. It is considered that this proposed route option contributes little/none to the community objective. Option ST2D is largely at-grade, therefore existing views would be relatively unchanged, and therefore it is considered that this proposed route option contributes little/none to this community objective.
13	Visual					All proposed route options would result in a reduction in the visual amenity of some paths, this is due to the closer proximity and increased visibility of the carriageway resulting from the dualling. The 1.5km cut and cover tunnel associated with Option ST2A has the potential to be landscaped as an amenity/recreation space, in addition to improvements to the WCH footpath, and cycle networks. This would improve the visual amenity around the 1.5km cut and cover tunnel section. As such, it is considered that Option ST2A may contribute to part of this objective. Option ST2B and Option ST2C increase the prominence of road infrastructure, due to the 150m underpass (Option ST2B) and the grade separated junction at Dunkeld (Option ST2C), with no scope for protection or enhancement of scenic beauty and which may impact WCH. Option ST2D is largely at-grade, therefore existing views for WCH would be relatively unchanged, so it is not considered to contribute to the objective. It is therefore considered that Option ST2B, Option ST2C and Option ST2D contribute little/none to this community objective.

Relevant Environmental Chapter		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Explanation
17	Population - Accessibility					All proposed route options are considered to contribute to part of the community objective as all WCH routes would be maintained, although some WCH routes would be subject to diversions, which may impact journey distances. The design of WCH diversions would be progressed at DMRB Stage 3 with the aim of reducing the effects on WCH where possible.

Table 6: Community objective 6 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 6:		Ensure that all local bus, intercity bus services and train services are maintained and improved.				
The DMRB Stage 2 assessment considers impacts and effects on WCH and access arrangements to facilities, including public transport in Volume 1, Part 3 - Environmental Assessment (Chapter 8: Population - Land Use) and (Chapter 17: Population - Accessibility). Specific consideration of bus stops within the scheme would be considered as part of the DMRB Stage 3 assessment. It should be noted that although the A9 dualling is able to provide the infrastructure to allow opportunities to integrate and potentially improve the various forms of public transport, the operation and maintenance of these services are controlled by other organisation such as Perth & Kinross Council (PKC), Network Rail and bus companies, all of whom would be consulted during DMRB Stage 3.						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
8	Population - Land Use					All proposed route options improve WCH accessibility to Dunkeld & Birnam Station, compared to the existing conditions. All options also provide bus access and turning facilities as part of the proposed route option designs, providing opportunities for integrating public transport services. Option ST2A and Option ST2B would provide direct vehicular access to Dunkeld & Birnam Station and replacement car parking facilities. Option ST2C and Option ST2D would provide replacement car parking facilities for Dunkeld & Birnam Station at Birnam Industrial Estate and would provide improved access to the station via a pedestrian underpass. It is considered that all proposed route options contribute to part of the community objective.
17	People and Communities - All Travellers					Bus services would benefit from the dual carriageway with the road improvements reducing journey times and increasing journey time reliability, these both being specific A9 Dualling Programme objectives. The potential to retain and/or replace local bus and intercity services is anticipated to be considered at DMRB Stage 3, however on the basis of consultation with relevant bus companies to-date, it is expected that local and intercity services would not be adversely affected and bus service provision at Dunkeld & Birnam Station is included in all proposed route options. It is considered that all proposed route options contribute to all/most of the community objective.

Table 7: Community objective 7 mapped against DMRB Stage 2 proposed route options and environmental factors

Community objective 7:		**Preserve and enhance the integrity of the unique and rich historical and cultural features of the Dunkeld, Birnam and Inver communities, thereby supporting well-being and the local economy.**				
The DMRB Stage 2 assessment considers access to community land, community assets and places of local interest in Volume 1, Part 3 - Environmental Assessment (Chapter 8: Population - Land Use). The assessment also considers impacts on sites of cultural heritage in Volume 1, Part 3 - Environmental Assessment (Chapter 14: Cultural Heritage).						
Relevant Environmental Chapter		**Option ST2A**	**Option ST2B**	**Option ST2C**	**Option ST2D**	**Explanation**
8	Population - Land Use					All proposed route options are considered to benefit economic growth and perceptions of the local area during operation. Traffic is predicted to increase on the A9 which has the potential to increase the number of visitors to the communities, potentially providing a boost to the local economy. The local area would have improved links to other towns and cities, from both the A9 itself and from the connection between Dunkeld & Birnam Station and Birnam. It is considered that all proposed route options contribute to part of the community objective.
14	Cultural Heritage					The inclusion of the 1.5km cut and cover tunnel and 150m underpass in Option ST2A and Option ST2B respectively would significantly improve the physical connection between Dunkeld & Birnam Station and Birnam and would provide better opportunities for the sustainable re-use of the station building. For Option ST2C and Option ST2D, changes to the setting of Dunkeld & Birnam Station, including the loss of the public forecourt and the continued presence of the proposed route options would continue into operation. However, Option ST2C and Option ST2D would also improve connectivity compared to the existing layout and would provide an opportunity for the re-use of the building. A left-in-left-out junction on the northbound carriageway would provide maintenance and emergency access only. All proposed route options would require land-take from Murthly Castle designed landscape (an Inventory Garden and Designed Landscape), which would reinforce the existing severance of Murthly Castle designed landscape and Birnam from the majority of the Inventory Garden and Designed Landscape and potentially impact on the landscape's setting. All proposed route options would also physically impact on Dalpowie Lodge (site of) and Auchlou historic building.

1.2 DMRB Stage 3 Assessment

1.2.1 The community objectives will continue to be taken into consideration throughout the DMRB Stage 3 assessment of the Preferred Route Option. The DMRB Stage 3 design will include mitigation developed during the DMRB Stage 3 assessment and design process with the aim to remove and reduce potential environmental impacts and effects of the proposed scheme where possible. Details on anticipated mitigation which may contribute to the community objectives are listed in the following paragraphs and further information can be found in Section 5 of each DMRB Stage 2 environmental chapter.

1.2.2 Design and mitigation measures that would be developed during DMRB Stage 3 that would contribute to multiple objectives, are anticipated to include, but are not limited to, the following:

- Embedded and essential mitigation for the Preferred Route Option would be designed to reduce the impact of air and noise pollution during construction and operation. This will include consideration of the use of acoustic screens and earthwork bunds, the use of low noise road surfacing materials and the careful selection and proper use of construction plant to minimise noise emissions during construction.
- Development of a design strategy to mitigate impacts and effects on the landscape elements, which contribute to the Special Qualities (SQ) of the River Tay (Dunkeld) NSA. This would include consideration of the 'Gateway to the Highlands' experience (Special Quality 2 (SQ2)) as experienced by road users, but also tree planting proposals and other mitigation measures in consideration of 'the beauty of cultural landscapes accompanying natural grandeur' and 'exceptionally rich, varied and beautiful woodlands' SQ's (SQ1 and SQ4). This would be considered to contribute to objectives 2 and 5.
- Planting new areas with compensatory woodland. This would contribute to objectives 1, 2 and 5.

1.2.3 Design and mitigation measures that would contribute mostly to objective 2, includes, but is not limited to:

- Mitigation measures to protect habitats and protected species during construction and operation e.g. temporary fencing to limit disturbance areas.
- The provision of new habitat aiming to reduce fragmentation (of habitats and their supporting species) and creating new linkages or more ecologically resilient functional units. Replacement habitat would be identified for the Preferred Route Option at DMRB Stage 3 but would require careful planning to avoid creating habitats for invasive species such as grey squirrels.

1.2.4 Design and mitigation measures that would contribute to objective 4 includes, but is not limited to:

- Where vehicular access to private property & housing and business properties would be temporarily affected during construction, it is anticipated that reinstatement or an alternative access would be provided as part of mitigation developed during DMRB Stage 3.
- Mitigation measures with respect to agricultural holdings would be developed during DMRB Stage 3 with the aim of protecting, where practicable, the agricultural capability of land and soils and the maintenance of the viability of agricultural holdings.
- Mitigation for potential impacts and effects on development land identified as existing employment land (Birnam Industrial Estate) would include reinstatement or provision of alternative access; and DMRB Stage 3 design development to avoid or reduce land-take impacts for the Preferred Route Option.

1.2.5 Design and mitigation measures that would contribute to objective 5 includes, but is not limited to:

- Mitigation embedded into the DMRB Stage 3 design, such as the provision of WCH crossing points, and re-routing/diversions of affected paths.

1.2.6 Design and mitigation measures that would contribute to objective 6 includes, but is not limited to:

- Maintaining access to Dunkeld & Birnam Station and bus stops during construction.

1.2.7 Design and mitigation measures that would contribute to objective 7 includes, but is not limited to:

- Development of the horizontal and/or vertical alignments to avoid or reduce impacts and effects on cultural heritage assets where possible. Design development would seek to avoid impacts in the first instance, and where this is not feasible should seek to minimise impacts and effects.
- Appropriate temporary physical protection of cultural heritage assets to protect them during construction.
- Detailed structural surveys of specific cultural heritage assets prior to construction and monitoring during construction to reduce the risk of physical impacts to them.
- Sympathetic design within Conservation Areas and Inventory Gardens and Designed Landscapes that aims to limit changes to their setting.

1.3 References

Lennon, J. J., 2019. Perceived tourism and local business impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing. Prepared For: Transport Scotland.

A9 Dualling Programme: Pass of Birnam to Tay Crossing

DMRB Stage 2 Scheme Assessment Report

Volume 1: Main Report and Appendices

Part 6 - Appendices

Appendix A7.2: Perceived Tourism and Local Business Impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing

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Transport Scotland

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Title: Perceived tourism and local business impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing.

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Author Notes

The assessment has been undertaken by Professor J John Lennon, Dean of Glasgow School *for* Business and Society, Glasgow Caledonian University. Professor Lennon is also a Director of the Moffat Centre for Travel and Tourism Business Development, www.moffatcentre.com which is responsible for the production of international consumer and market research in tourism.

John was involved in developing Tourism Satellite Accounting for Scotland, developing the definitive methodology for the economic impacts of wind farms on area tourism and an author of the most cited report in Scottish Government planning decisions in this sector. John and the Moffat team have significant experience of infrastructure projects in tourism and have been employed by Transport Scotland and Jacobs on a variety of road development projects including; the A9 Dualling (since 2015); the A96 Dualling, the Manchester North West Quadrant development (A61, A62 and A63) and the Strategic Plan for Infrastructure and Roads in Edinburgh.

John also undertook the proof of concept and feasibility analysis for the North Coast 500 and recently the Moffat Centre undertook a major economic impact and employment analysis of the route 2014-2018 on behalf of the North Highland Initiative. John has also provided major planning input to the Coig (a collection of five circular routes in development across Ayrshire and the Islands) and has worked on air and rail infrastructure projects nationally and internationally.

In total, John has undertaken more than 650 projects in over 50 countries. The Centre competes with commercial agencies at a national and international level and has helped fund student scholarships with retained profits from trading. To date over £1,200,000 scholarships have been awarded to over 190 University students creating one of the Universities' most enduring student legacies generating access to higher education for students with significant need.

1.0 Aims

To understand perceived tourism and business impacts of the A9 dualling between the Pass of Birnam and Tay Crossing. The survey is designed to provide individual business and community organisations with the opportunity to communicate their concerns in respect of the dualling via a confidential and anonymised questionnaire.

2.0 Background

The objective of the local business assessment is to consider the potential impacts on local business, tourist attractions and the local economy as a result of dualling the A9 between the Pass of Birnam and Tay Crossing. The assessment will consider potential impacts both during construction and operation and will be referenced in the Design Manual for Roads and Bridges (DMRB) Stage 2 Scheme Assessment Report, which seeks to identify a Preferred Route Option for this section of A9 dualling.

The route options under consideration as part of the DMRB Stage 2 assessment are detailed in the Jacobs Fact Sheet distributed with the survey and included as Appendix 1. This report has been specifically created to consider local business impacts and to gain views of the community following the A9 Co-Creative Process.

Prior to the A9 Co-Creative Process beginning, the Birnam to Ballinluig A9 Community Group generated community objectives. Two of the objectives, highlighted below, make reference to impacts on Local Economy.

- Promote long term and sustainable economic growth within Dunkeld and Birnam and the surrounding communities.
- Preserve and enhance the integrity of the unique and rich historical and cultural features of the Dunkeld, Birnam and Inver Communities, thereby supporting wellbeing and the local economy.

This report seeks to consider the direct and indirect impacts on local commercial business for consideration in the DMRB Stage 2 assessment.

3.0 Methodology

Professor Lennon attended two community events in Birnam, and details are summarised below;

Date	Location	Approximate Attendees
Tues 27 Aug 2019	Birnam Arts & Conference Centre, Station Road, Birnam, PH8 0DS.	16
Thurs 29 Aug 2019	Birnam Arts & Conference Centre, Station Road, Birnam, PH8 0DS.	36

Following the meetings, a survey framework was established to provide further data from the business community.

The Moffat Centre, Glasgow Caledonian University prepared an open ended short questionnaire. This research follows a qualitative methodology and adopts an explorative/interpretive position to consider perception of impacts. The questionnaire is semi-structured allowing respondents to enlarge on areas of interest using a standard set of open-ended questions.

The questionnaire is constructed in five parts to ascertain perceived impacts during and after completion of the A9 dualling works. The breakdown of open-ended questions is as follows:

- Please indicate any business impacts you may anticipate during the construction period.
- Please note any comments on the wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of the A9 dualling during the construction period
- Please indicate any business impacts you may anticipate after completion of the A9 dualling (Pass of Birnam to Tay Crossing), once the scheme is operational.

- Please note any comments on the wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of the A9 dualling after completion, once the scheme is operational.

- Please indicate any other comments in relation to the potential impacts on the local economy, tourism and local businesses within the locality.

3.1 Distribution of Survey

The framework for distribution and response is included below:

Dates	**Activities**
Wed 4 Sept 2019	Initial distribution of survey by post/email
Fri 20 Sept 2019	Initial deadline for survey completion
Mon 23-27 Sept 2019	Follow up telephone calls (undertaken by Jacobs)
Mon 30 Sept 2019	Extended deadline for survey completion

Each recipient was provided with:

- The questionnaire (contained as Appendix 2)

- Introductory letter explaining context (see Appendix 3)

- Fact Sheet (see Appendix 1)

This was distributed in partnership with Jacobs to 157 recipients in Birnam, Dunkeld and the wider region, which are listed in Appendix 4. These were largely commercial businesses and included; hotels, other accommodation providers, retail, food and beverage operators, activity providers, trades people and a range of other miscellaneous business and community organisations. All recipients were contacted via e-mail or letter, with a follow-up telephone call undertaken, as per the table on the previous page. The list was generated from *Jacob's* list of contacts built up over years of engagement in the area, as well as a web review, which included a list of businesses contact details provided in *The Bridge* local

newsletter website page. It was felt that the sample size (157 recipients) was representative of the local business community.

3.2 Response Rate

In total, a response rate of 9.5% was achieved, which compares favourably with normal response rates for postal or electronic surveys (normally circa 2.5-3%). These results are considered in Section 4.0 and the report concludes with the Moffat Centre review of perceived tourism and business impacts. Responses were not sampling units collated to provide a stratified result. Rather the sample was composed of those choosing to respond (i.e., not a stratified sample). However, the level of response merits reportage and has provided data that we believe can enrich understanding of perceived impacts. The report draws cross-case patterns about various stakeholders' perceptions contextualised at a regional level.

4.0 Findings

The responses provided to the questionnaire, detailed in Section 3.0, have been analysed. The results of this analysis are summarised below. While the response rate compares favourably with what is normal for a survey of this kind, it is noted that the responses represent a small percentage of the local business community. As such, the findings may not be fully representative of the complete local business community.

1. Business impacts anticipated during the construction period.

    - Majority of those that responded expressed no strong feelings during construction;

    - Whilst acknowledging potential delays, many felt construction would have a positive commercial impact on the local economy due to the influx of construction personnel to the area; and

    - A minority of those that responded, were overwhelmingly positive about the construction period and the possible economic advantages.

2. Wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of the A9 dualling during the construction period.

- A number of respondents noted a clear potential for increased traffic, which must be set against increased demand and consumption;

- Concerns regarding wider tourism impacts at a regional level and loss of specific facilities, such as Newtyle (Birnam) quarry access, was noted; and

- Of those that responded, a number stated no strong feelings or felt unable to forecast any impacts, whether positive or negative.

3. Business impacts that you may anticipate after completion of the A9 dualling (Pass of Birnam to Tay Crossing), once the scheme is operational.

    - The majority of those that responded were positive about tourism and other impacts following completion of the works;

    - Improved road infrastructure was seen as having a possible negative impact on town visitation as potential visitors would continue their journeys north or south rather than diverting through Birnam and/or Dunkeld; and

    - A number felt it was impossible to anticipate such post completion impacts.

4. Wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of A9 dualling after completion, once the scheme is operational.

    - A number of respondents were positive about the road development, with improved safety a particular benefit;

    - A minority stated that they felt that the completion of the works would have a negative impact on the regional economy and visitation to the area; and

    - A small sample felt it was difficult to predict impacts at a regional level.

5. Other comments in relation to the potential impacts on the local economy, tourism and local businesses within the locality.

    - The majority of those that responded were positive about the post completion impacts on the region's economy;

- A number were concerned that improved transportation via the proposed A9 dual carriageway would lead to a reduction in visitation and negative impacts to the area;

- A number expressed concerns around the need for marketing the destination, given the new road infrastructure; and

- Any improved connectivity with rail transport would be positively received.

5.0 Analysis and Commentary

Whilst response rates could have been greater this survey provides an important and acceptable response level for such a survey. It provided an anonymous and confidential indicator of the real concerns of a segment of the local population responding to the survey request.

It would appear that overall, the dualling works; both during construction and post-construction are viewed positively. The negative responses were in the minority and it is clear that for many, the commercial benefits envisaged far eclipse the negative. There was not significant evidence of demand for the Community's Preferred Route Option (the 1.5km cut and cover tunnel). Indeed, this option was mentioned by only 13% of respondents.

Whilst some congestion, traffic calming, and potential diversions were anticipated it is clear that the respondents felt there were significant potential benefits and advantages for the towns and region.

The concerns expressed relating to improved transportation catalysing an unwillingness to stop and explore the towns and region has to be explored more fully. This thinking has its origins in a failure to understand how decision making about destinations is realised. Road transportation whether efficient and trouble free or congested and offering potential for delays does not constitute the catalyst for visitor motivation. Visitation to this area is not a function of the effectiveness or otherwise of the A9. Rather it is the result of a range of contributory factors that impact on destination marketing.

Tourism destination marketing would undoubtedly benefit Dunkeld and Birnam, as well as the local region. Currently, it is not a highly visible and well visited destination as relative accommodation occupancy and accommodation rates achieved testifies (based on

information obtained from the Scottish Visitor Attraction Monitor and the Scottish Occupancy Accommodation Survey, which are used by Scottish Government in the compilation and calculation of the value of tourism in Scotland). Similarly, visitors to visitor attractions remains in the lower quartile in Scotland. Notably, there are no visitor attractions in the top 20 paid and free admission operations in Scotland and local attendance has not shown significant growth in recent years (Visitor Attraction Monitor, 2019, 2018, 2017). This low level of visitation is also reflected in accommodation performance which has remained fairly static in recent years suggesting limited destination awareness (VisitScotland, 2019, 2018, 2017).

This is the case currently, before any perceived impacts during construction or afterwards. The area would certainly benefit from more planned and strategic marketing using social and digital channels as well as capitalising on other techniques. Given the quality of the built and natural heritage it has much greater potential than is currently being realised.

The potential advantage of rail connectivity has yet to be fully realised and awareness of relative ease of access to this area should feature in any related destination marketing. This is a significant competitive advantage for the towns and the region and merits more consumer visibility.

The visibility and presence of the region and towns on social and digital media is limited and most of those contacted as part of the project had limited awareness of their presence on the Highland Discovery App or any benefits forthcoming. The Highland Discovery App was funded by Transport Scotland and launched in 2018. It can be downloaded free from the App store and it has catalysed more than 10,000 downloads across Europe, USA and Canada as well as significant UK downloads. As well as A9 tourism orientation it offers geo-relevant audio delivery to connect listeners with places, culture and people.

Tourism data is organised around key areas of consumer interest, e.g., scenic views, film and television locations, Big Nature experiences, towns of the Highlands, Arts and Highland Culture, Kids Activities etc. More than 50% of users have granted access to usage of the App and it is an increasingly important planning, orientation and data source as can be seen from analysis of use. In car use is highly significant providing audio, musical as well as

thematic orientation information. Given existing and future traffic flows forecast, which is shown below, this is undoubtedly an appropriate investment.

Traffic Flows	Volumes
Existing Traffic Flows (2015)	Approximately 15,000 Annual Average Daily Traffic (AADT)
Proposed (2026)	Approximately 24,000 AADT
Proposed (2041)	Approximately 26,000 AADT

Awareness about the centrality of marketing to mobile devices was not appreciated from the meetings attended with the community and some were more concerned with the loss of the VisitScotland visitor centre (formerly Tourist Information Centre), which has recently closed. Simply put, this thinking reflects a low appreciation of destination marketing and how visitors source data and make decisions on leisure activities.

The route development and improvements in signage, orientation and visitor infrastructure can all be harnessed to improve awareness and appeal of the towns and region through more effective marketing. The design of traffic signs will be considered in greater detail as part of the future assessment work. Signs will be designed in accordance with relevant standards and guidance, and with reference to the A9 Dualling Programme Traffic Sign Strategy. Tourist signs, that provide direction to tourist destinations, including historic monuments, tourist regions, caravan or camp sites, picnic areas, sporting facilities and cultural places, such as museums, will be considered as part of the design. The traffic sign design will seek to rationalise sign provision, minimising where possible, to ensure clear direction to places of interest. To eliminate sign clutter, tourist signs may be placed on one sign where possible. Provision of variable message signs that can be used to highlight maintenance activity, lane closures and driving conditions on the dual carriageway will also be considered.

5.1 Scottish Tourism in a post Covid-19 Environment

The most critical development in tourism at a global, national and regional level is related to the advent of the pandemic and attempts to reduce infection rates. The medical emergency of Covid-19 has led to significant economic downturns. Travel and trading restrictions have led to a collapse in tourism at a domestic, national and international level. The tabulations

below illustrates comparative performance in accommodation and visitor attractions in 2020 compared with 2019. This data is compiled by the Moffat Centre and used by Scottish Tourism Emergency Recovery Group (STERG), Scottish Government and VisitScotland.

Serviced and Self-Catering Accommodation 2019 and 2020 (Source: Moffat Centre, 2021, Glasgow Caledonian University)

Accommodation Type	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hotel Room Occupancy (%)	2020	52.52	44.14	35.14	0.26	0.66	0.96	14.86	53.34	52.89	38.35	26.03	19.35
	2019	47.62	58.25	63.27	70.49	80.58	83.58	82.78	86.16	82.36	72.23	61.04	54.04
Guest House/B&B Room Occupancy (%)	2020	21.02	13.42	19.68	0.23	0.36	1.07	4.27	43.02	36.17	21.04	16.27	8.35
	2019	26.83	28.54	28.03	46.60	65.32	62.27	68.82	79.76	65.20	40.98	36.22	30.98
Self-Catering Unit Occupancy (%)	2020	23.66	28.46	19.30	4.79	2.83	3.89	19.29	50.76	45.12	38.63	10.65	4.09
	2019	32.23	35.15	37.34	51.63	55.98	58.90	64.36	66.83	53.58	49.22	32.70	32.49

Scottish Visitor Attractions 2019 and 2020: Visitor numbers (Source: Moffat Centre, 2021, Glasgow Caledonian University)

Admission (Sample)	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Free (256)	2020	1,356,456	1,640,880	928,641	268,110	310,241	576,766	802,699	1,151,219	1,095,545	973,407	740,386	507,658
	2019	1,360,998	1,823,931	1,760,337	2,580,690	2,794,441	2,631,115	3,312,904	3,890,101	2,473,854	2,225,932	1,894,077	1,672,108
Paid (323)	2020	554,523	660,578	408,294	1,226	2,128	11,700	388,708	830,332	684,666	805,157	279,774	148,492
	2019	529,917	711,920	737,880	1,704,539	2,106,925	2,178,138	2,783,291	3,028,857	1,810,179	1,387,635	761,130	690,730
Total (579)	2020	1,910,979	2,301,458	1,336,935	269,336	312,369	588,466	1,191,407	1,981,551	1,780,211	1,778,564	1,020,160	656,150
	2019	1,890,915	2,535,851	2,498,217	4,285,229	4,901,366	4,809,253	6,096,195	6,918,958	4,284,033	3,613,567	2,675,207	2,362,838

This collapse in visitation with a minor upswing between July and October 2020 (when restrictions were eased) is of course directly linked to the pandemic and the advent of tier restrictions and 'lockdown'. However, what is not obvious from these figures is the disappearance of international visitation as travel has become extremely constrained. The reduction in the number of airlines, air routes, frequency of travel and coverage of the globe, has made international travel difficult. These factors combined with issues of access, quarantine and reciprocal border closures have decimated international visitation.

International visitors with their extended dwell time and higher expenditure were a crucial contributor to expenditure in many regions of Scotland, including this one.

UK and Scottish intervention to prevent collapse and insolvency across the tourism and hospitality sectors has been significant, however, the current lockdown restrictions enacted since Christmas 2020 will add significantly to the financial burdens on the sector. The limitations on revenue streams since mid-March 2020 has had an enormous impact on many businesses, despite intervention in the form of grants and furlough schemes, and it is likely that a significant number of operators in the Highlands will face insolvency in early 2021. This will of course impact on rural unemployment.

The pandemic has demonstrated the fragility of tourism in this region and nationally. The sector will also continue to be profoundly impacted by Brexit in terms of; continued issues of access, sources of labour and currency. Normally weaker sterling makes Scotland attractive to visitors but travel during the period of the pandemic has been hugely restricted. Outbound travel will become increasingly expensive and costs of accommodation, food and beverages in overseas locations will increase. Similarly, safety concerns will not reduce in the short to medium term until national vaccination programmes are complete and comparable levels of vaccination are recorded internationally. Domestic staycations will characterise Scottish (and the UK) leisure demand in the short to medium term for this region. Initial indications on advance reservations in the Highlands of Scotland for late 2021 and early 2022 suggest significant latent lesiure demand that is being focussed on domestic locations. Furthermore, rural, coastal and island destinations are likley to benefit more than urban centres. Transport is likley to be via independent motor vehicle as a direct consequence of anxiety, nervousness and fears of infection and contagion via shared transportation. As a result, the arterial routeways are likley to see a return to pre-Covid leisure traffic volumes with little regard to infrastructure upgrade and reduced speed on proportions of carriageways. The relaxation of travel restrictions in 2020 (late June to September) evidenced this phenomena and is very likely to be replicated following reduction in travel restrictions by Scottish Government in summer 2021.

References

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VisitScotland (2021) Scottish Occupancy and Accommodation Survey, Edinburgh, VisitScotland

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VisitScotland (2017) Scottish Occupancy and Accommodation Survey, Edinburgh, VisitScotland

Appendix 1: Fact Sheet detailing options for A9 Dualling between the Pass of Birnam and Tay Crossing

A9 Dualling Programme
Pass of Birnam to Tay Crossing
Local Economy Fact Sheet

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A9 Co-Creative Process

The A9 Co-Creative Process, a partnership between Transport Scotland and the Birnam to Ballinluig A9 Community Group and facilitated by PAS (formerly Planning Aid Scotland), involved the community suggesting ideas for A9 dualling for the Pass of Birnam to Tay Crossing section of the A9.

The process consisted of five stages, beginning in January 2018 and concluding in July 2018 with the identification of the Community's Preferred Route Option. The Community's Preferred Route Option achieved 37% of the total score at Stage 5 of the A9 Co-Creative Process.

Option Assessment

Since July 2018, Transport Scotland and Jacobs have been considering the Community's Preferred Route Option, which was voted for by the public at the final stage of the A9 Co-Creative Process and have undertaken initial assessment work on this option. As part of the assessment work, the various elements of the Community's Preferred Route Option have been considered in consultation with key stakeholders and some residents living in close proximity to the A9. Some areas of technical difficulty and concern emerged from that exercise and so, alongside the initial assessment work, we have developed additional options to be assessed in the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment.

The dualling of the A9 will require the Scottish Government to compulsory purchase land from private individuals. Transport Scotland must be able to justify that land-take and the impacts on the individual that the dualling may create, both in the short-term, during construction, and in the long-term. The inclusion of these additional options in the formal route options assessment (DMRB Stage 2 assessment), ensures that the assessment process is robust and that decisions are made in full consideration of the choices available and that the Preferred Route Option is defendable through the planning process.

The requirement to include additional options in the next stage of assessment was agreed by all parties involved in the A9 Co-Creative Process (Transport Scotland, Birnam to Ballinluig A9 Community Group and PAS) prior to the process starting, and it was agreed that this may include grade separated junctions.

Four options are currently being considered for dualling the A9 between the Pass of Birnam and Tay Crossing.

- Community's Preferred Route Option (Option ST2A);
- Additional Whole Route Option 1 (Option ST2B);
- Additional Whole Route Option 2 (Option ST2C); and
- Additional Whole Route Option 3 (Option ST2D).

Local Economy

The impact on local businesses from a trunk road scheme is usually considered as part of the DMRB Stage 2 assessment. At this stage, the assessment focusses on the number of residential, commercial (including farming), industrial and other properties at risk of demolition or land-take, and where a business is impacted, the assessment details the number of people employed on-site, the likely impact of the scheme and the probable effect on the business's future viability. However, a key message from the local community through the A9 Co-Creative Process is that any proposed scheme should carefully consider the impact on local businesses, which are integral to the local economy of Dunkeld and Birnam and is reflected in the community's objectives.

As a result, both direct and indirect impacts on local commercial businesses will be considered in the assessment. Direct impacts are those that will be included within the Compulsory Purchase Order and will therefore lose land or face demolition as a result of the scheme. Indirect impacts are defined as those that are not directly impacted but may suffer financially as a result of the construction and future operational layout of the scheme.

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Community's Preferred Route Option (Option ST2A)

- On-line route, largely following the alignment of the existing A9 single carriageway.
- A9 dual carriageway lowered into a cut and cover tunnel for approximately 1.5 kilometres, commencing at the southern extent in the locality of the existing Birnam Junction and terminating at its northern extent approximately 300 metres south of the existing Dunkeld Junction.
- Dunkeld & Birnam Station retained in its current position with Station Road re-connected to the station with replacement car parking provision on the structure.
- Speed limit of 50 miles per hour required between the southern extent of the scheme and proposed Dunkeld Junction. 70 miles per hour speed limit north of proposed Dunkeld Junction.
- Murthly/Birnam Junction:
  - Grade separated junction in the locality of the existing private access to Murthly Castle;
  - Diamond layout, facilitating all vehicle movements, with northbound and southbound entry and exit slip roads. An overbridge is provided across the A9 linking to the B867; and
  - Requires a connection of the B867 and Perth Road in the locality of the existing Birnam Junction, crossing the A9 at the southern extent of the cut and cover tunnel.
- Dunkeld Junction:
  - At-grade roundabout in the locality of the existing junction at Dunkeld, including a segregated left-lane between the A923 and A9 south; and
  - Provides connections to the A9 (north and south), A923, A822 and road to Inver.
- The Hermitage:
  - Left-in left-out junction on the northbound carriageway.
- Dalguise Junction:
  - Grade separated junction south of the existing junction with the B898;
  - Loops in the northbound direction and slip roads in the southbound direction, facilitating all vehicle movements; and
  - Realigned B898 crosses the A9 on an underbridge, connecting to a roundabout on the east of the A9, which also connects to the southbound slip roads.
- 4 ½ to 5 years construction duration.

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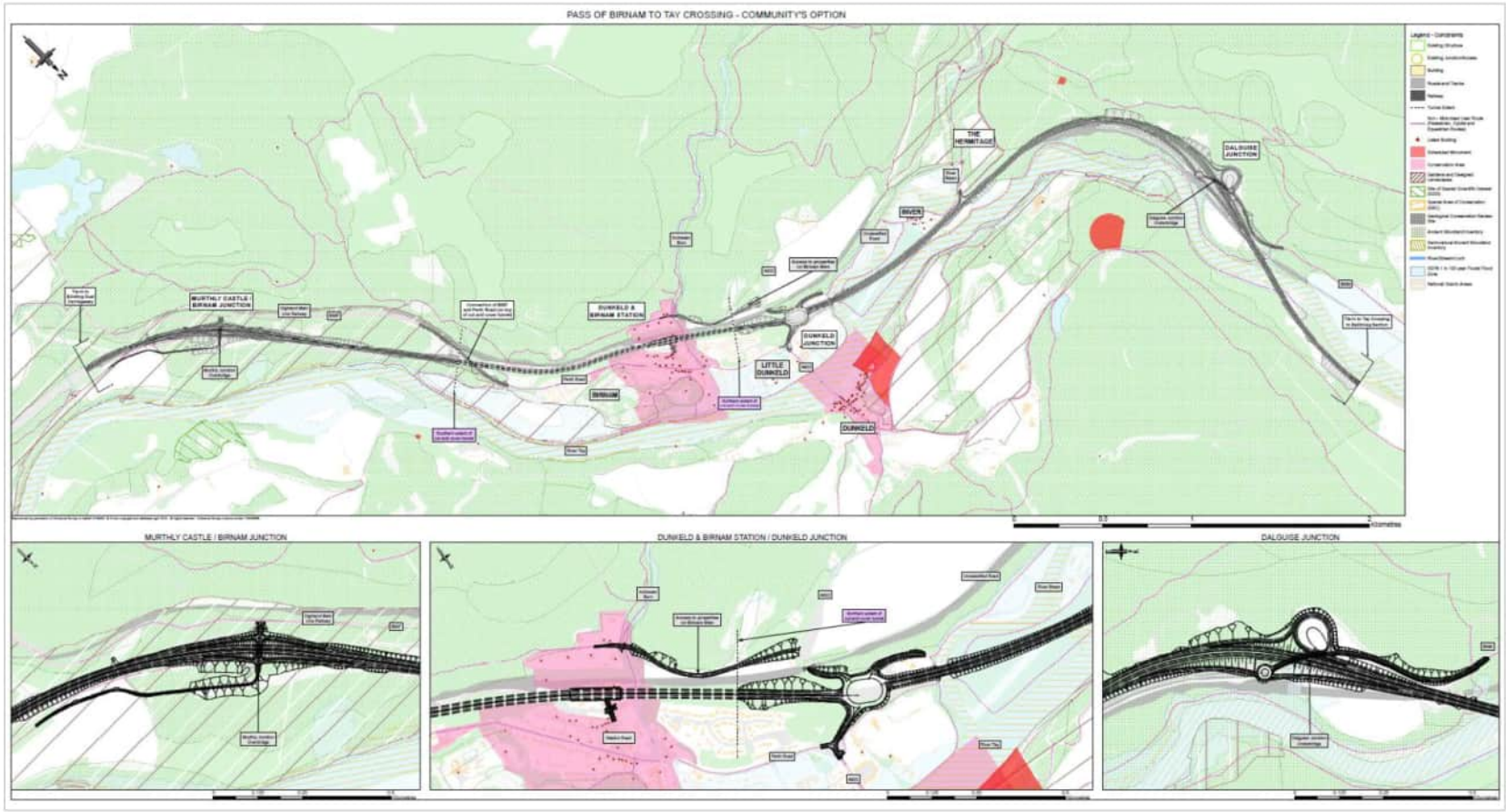
Community's Preferred Route Option (Option ST2A)



Additional Whole Route Option 1 (Option ST2B)

- On-line route, largely following the alignment of the existing A9 single carriageway.
- A9 dual carriageway lowered into a 150-metre-long underpass in the locality of Dunkeld & Birnam Station.
- Dunkeld & Birnam Station retained in its current position with Station Road re-connected to the station with replacement car parking provision on the structure.
- Speed limit of 70 miles per hour throughout.
- Murthly / Birnam Junction, three options under consideration:
  - Option 1:
    - Grade separated junction in the locality of the existing private access to Murthly Castle;
    - Diamond layout, facilitating all vehicle movements, Overbridge provided across the A9 linking to the B867; and
    - Includes a connection of the B867 and Perth Road in the locality of the existing Birnam Junction, crossing the A9 via an underbridge.
  - Option 2:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound direction and an entry slip road in the southbound direction, with no southbound exit slip road;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
  - Option 3:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound and southbound directions, facilitating all vehicle movements;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
- Dunkeld Junction:
  - At-grade roundabout in the locality of the existing junction at Dunkeld, including a segregated left-lane between the A923 and A9 south; and
  - Provides connections to the A9 (north and south), A923, A822 and road to Inver.
- The Hermitage:
  - Left-in left-out junction on the northbound carriageway.
- Dalguise Junction:
  - Grade separated junction south of the existing junction with the B898;
  - Loops in the northbound direction and slip roads in the southbound direction, facilitating all vehicle movements; and
  - Realigned B898 crosses the A9 on an underbridge, connecting to a roundabout on the east of the A9, which also connects to the southbound slip roads.
- 4 to 4 ½ years construction duration.

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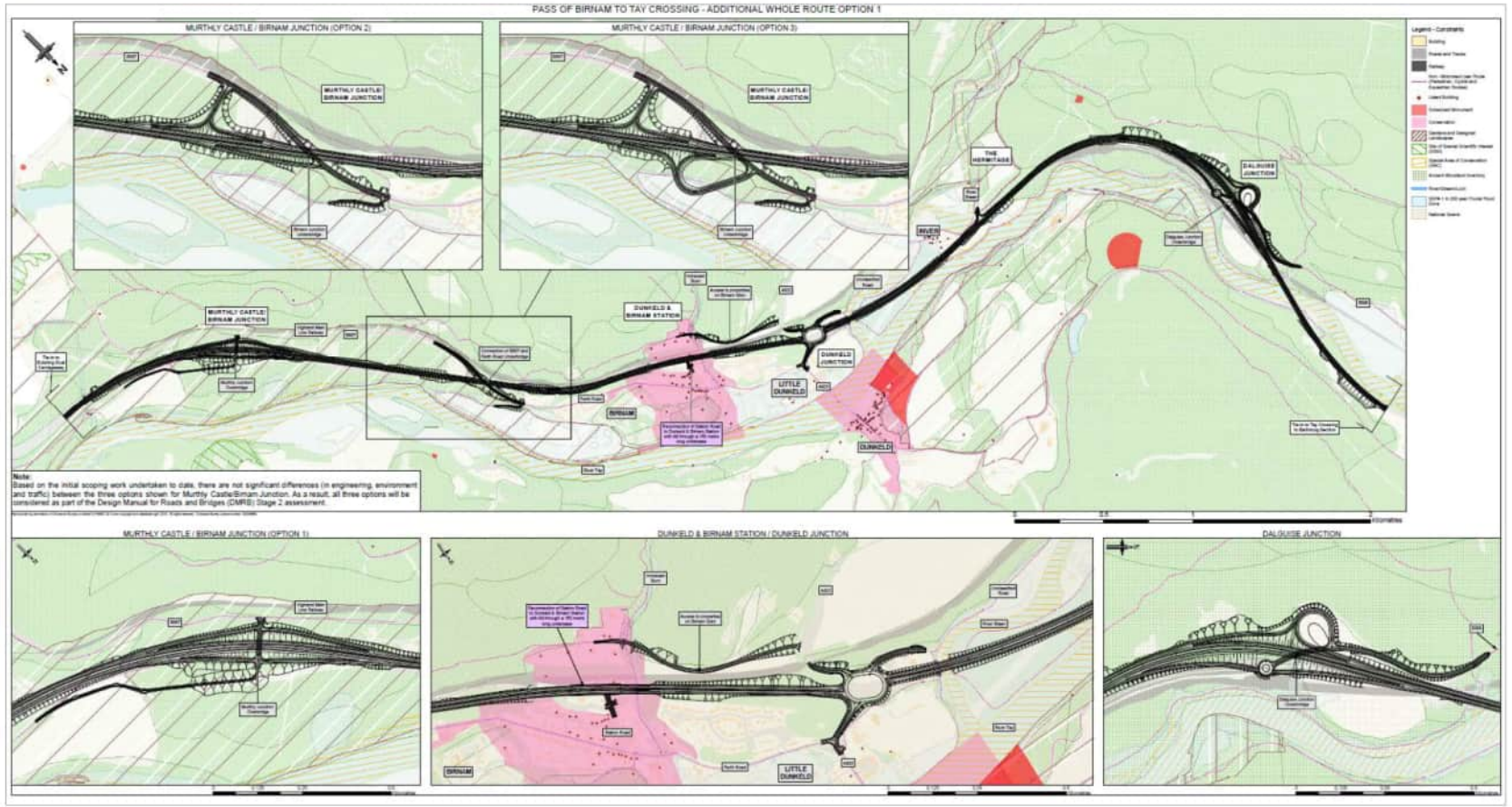
Additional Whole Route Option 1 (Option ST2B)



Additional Whole Route Option 2 (Option ST2C)

- On-line route, largely following the horizontal and vertical alignment of the existing A9 single carriageway, although raised at Dunkeld Junction to accommodate a grade separated junction.
- Generally, the same level as the existing A9 throughout.
- Dunkeld & Birnam Station retained in its current position.
- Birnam Industrial Estate acquired, and the land used to construct a car parking facility accessed from Station Road, incorporating approximately 50 spaces.
- A new pedestrian underpass structure, incorporating lifts, constructed below the proposed A9 dual carriageway, linking the new car park to the station.
- Speed limit of 70 miles per hour throughout.
- Murthly / Birnam Junction, three options under consideration:
  - Option 1:
    - Grade separated junction in the locality of the existing private access to Murthly Castle;
    - Diamond layout, facilitating all vehicle movements, Overbridge provided across the A9 linking to the B867; and
    - Includes a connection of the B867 and Perth Road in the locality of the existing Birnam Junction, crossing the A9 via an underbridge.
  - Option 2:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound direction and an entry slip road in the southbound direction, with no southbound exit slip road;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
  - Option 3:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound and southbound directions, facilitating all vehicle movements;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
- Dunkeld Junction:
  - Grade separated junction in the locality of the existing Dunkeld Junction.
  - Variation of a diamond layout, facilitating all vehicle movements.
  - A822 and A923 connected, crossing the A9 via an underbridge.
- The Hermitage:
  - Left-in left-out junction on the northbound carriageway.
- Dalguise Junction:
  - Grade separated junction south of the existing junction with the B898.
  - Loops in the northbound direction and slip roads in the southbound direction, facilitating all vehicle movements.
  - Realigned B898 crosses the A9 on an underbridge, connecting to a roundabout on the east of the A9, which also connects to the southbound slip roads
- 2 ½ to 3 years construction duration.

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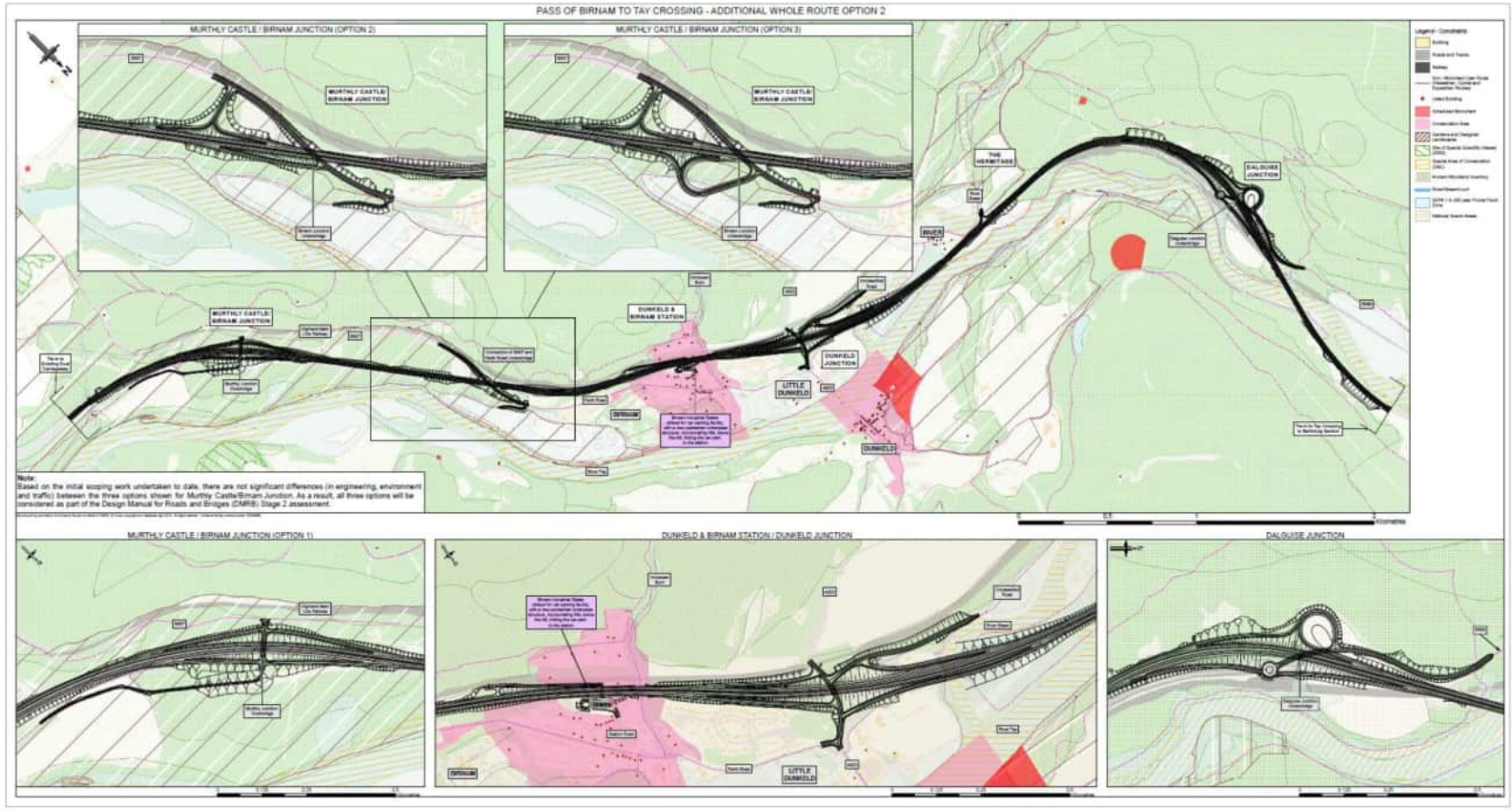
Additional Whole Route Option 2 (Option ST2C)



Additional Whole Route Option 3 (Option ST2D)

- On-line route, largely following the horizontal and vertical alignment of the existing A9 single carriageway.
- Generally, the same level as the existing A9 throughout.
- Dunkeld & Birnam Station retained in its current position.
- Birnam Industrial Estate acquired, and the land used to construct a car parking facility accessed from Station Road, incorporating approximately 50 spaces.
- A new pedestrian underpass structure, incorporating lifts, constructed below the proposed A9 dual carriageway, linking the new car park to the station.
- Speed limit of 70 miles per hour throughout.
- Murthly / Birnam Junction, three options under consideration:
  - Option 1:
    - Grade separated junction in the locality of the existing private access to Murthly Castle;
    - Diamond layout, facilitating all vehicle movements, Overbridge provided across the A9 linking to the B867; and
    - Includes a connection of the B867 and Perth Road in the locality of the existing Birnam Junction, crossing the A9 via an underbridge.
  - Option 2:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound direction and an entry slip road in the southbound direction, with no southbound exit slip road;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
  - Option 3:
    - Grade separated junction in the locality of the existing Birnam Junction;
    - Entry/exit loops in the northbound and southbound directions, facilitating all vehicle movements;
    - B867 and Perth Road connected, crossing the A9 via an underbridge; and
    - Includes an underbridge to connect the existing private access to Murthly Castle to the B867.
- Dunkeld Junction:
  - At-grade roundabout in the locality of the existing junction at Dunkeld, including a segregated left-lane between the A923 and A9 south; and
  - Provides connections to the A9 (north and south), A923, A822 and road to Inver.
- The Hermitage:
  - Left-in left-out junction on the northbound carriageway.
- Dalguise Junction:
  - Grade separated junction south of the existing junction with the B898.
  - Loops in the northbound direction and slip roads in the southbound direction, facilitating all vehicle movements.
  - Realigned B898 crosses the A9 on an underbridge, connecting to a roundabout on the east of the A9, which also connects to the southbound slip roads.
- 2 ½ to 3 years construction duration.

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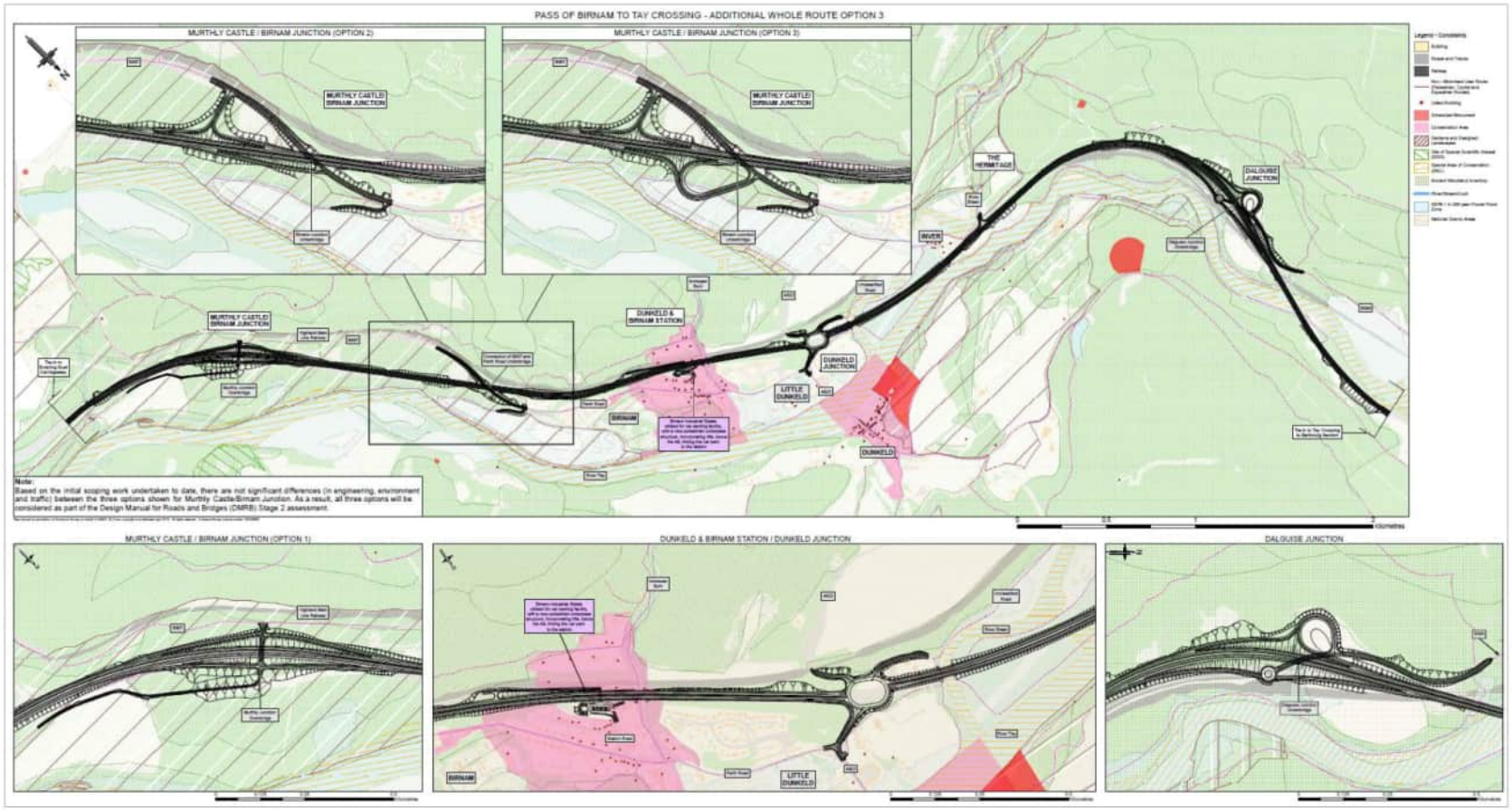
Additional Whole Route Option 3 (Option ST2D)



Appendix 2: Questionnaire: Impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing

Introduction

Transport Scotland are keen to better understand and analyse perceived tourism and business impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing. In this respect the Moffat Centre for Travel and Tourism Business Development, Glasgow Caledonian University, (led by Professor J John Lennon), have been commissioned to provide an independent analysis based on our understanding and knowledge of transport infrastructure and tourism. Transport Scotland are keen to understand the concerns of local business owners as part of the study and we ask that you participate by completing the below questionnaire. This is a short open-ended questionnaire designed to focus on perceived economic and business impacts.

The questionnaire can be emailed or posted as detailed at the end of the questionnaire. If you would prefer to speak directly to a member of the Moffat Centre team this can be organised by emailing me, Professor Lennon directly jjle@gcu.ac.uk.

The questionnaire is accompanied by a Fact Sheet prepared by Jacobs which should help in understanding the context.

Business Impacts

The term business impact is used in this context to refer to any significant impact, including impact on sales, profitability and human resources. Such impacts may be positive as well as negative.

1.0 Please indicate any business impacts you may anticipate during the construction period.

2.0 Please note any comments on the wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of the A9 dualling during the construction period.

3.0 Please indicate any business impacts you may anticipate after completion of the A9 dualling (Pass of Birnam to Tay Crossing), once the scheme is operational.

4.0 Please note any comments on the wider regional impacts (within Birnam, Little Dunkeld, Inver, Dunkeld and the surrounding areas) of the A9 dualling after completion, once the scheme is operational.

General

5.0 Please indicate any other comments in relation to the potential impacts on the local economy, tourism and local businesses within the locality.

Thank you for your participation. Please respond to this questionnaire by Friday 20 September 2019.

Email:	**jjle@gcu.ac.uk**
Address:	Moffat Centre for Travel and Tourism Business Development Glasgow Caledonian University Cowcaddens Road Glasgow, G4 0BA

Appendix 3: Jacobs Letter accompanying Moffat Centre questionnaire : Impacts of the A9 Dualling between the Pass of Birnam and Tay Crossing

Attention:

Project Name: A9 Dualling Programme: Pass of Birnam to Tay Crossing

Subject:

Dear <Name>

The Design Manual for Roads and Bridges (DMRB) Stage 2 assessment for the Pass of Birnam to Tay Crossing section of the A9 Dualling Programme is currently ongoing following the completion of the A9 Co-Creative Process in July 2018. All the route options under consideration were shown to the public in March and May of this year and are detailed in the attached Fact Sheet for your information. Additionally, more information can be found on the Transport Scotland website at www.transport.gov.scot/projects/a9-dualling-perth-to-inverness/a9-pass-of-birnam-to-tay-crossing/.

We are writing to invite you to participate in a local economy assessment, which will examine how local businesses will be affected by dualling of the A9: Pass of Birnam to Tay Crossing. You as a business owner have been selected to take part and we ask that you complete the enclosed questionnaire detailing your views and any concerns you may have. The information provided will be considered in the DMRB Stage 2 assessment to identify a Preferred Route Option for this section of A9 dualling.

The local economy assessment is being led by Professor J John Lennon, Dean of Glasgow Caledonian University Business School and founding Director of the Moffat Centre for Travel and Tourism Business Development (www.moffatcentre.com/).

There are five questions in the questionnaire, and we anticipate it will take up to 20 minutes of your time to complete. We would be grateful if you could return the enclosed questionnaire to Professor Lennon, either by post or e-mail, by Friday 20 September 2019. Return of the questionnaire will be considered consent in the study and participation is completely voluntary.

If you would find more information helpful, or if you wish to discuss any aspects of the study further, please contact Professor Lennon direct by e-mail (jjle@gcu.ac.uk) or telephone (0141 331 8405).

Yours sincerely

Judith McVinnie
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Appendix 4: List of Businesses Issued with a Questionnaire

Ref.	Business
1	3 Churches Charity Shop
2	A. Kidd Painter & Decorator
3	Aberfeldy Chiropractic
4	Bank of Scotland
5	Bankfoot Boutique
6	Best-one, Birnam Village Shop
7	Byways, B&B
8	C G Trailers Limited
9	Cooperative Food Store
10	Cut above the Rest, Hairdresser
11	Dunkeld Fish Bar
12	Dunkled Antiques
13	Dunkled Holiday Home
14	E F Carroll Electrical Contractor
15	Eden Lingerie Shop
16	Flotec Suspension
17	G M Auto Services
18	Infinity Blue Dental, Dunkeld Practice
19	Kettles of Dunkeld (Shop)
20	Lonely Mountain Skis
21	M&D Cabs
22	Merriman Joinery
23	Perth Arms Hotel
24	Perthshire Holiday Lets
25	Peter Greig Dentist
26	Puddleduck Nursery

Ref.	Business
27	Seafood House Restaurant
28	Spill the Beans Café
29	T.H. Stevenson & Sons, Family Butchers
30	The Birnam Reader Bookshop
31	The Blue Magpie Gift Shop
32	The Bridge Bed and Breakfast
33	The Naked Sheep, Knitwear Shop
34	The Pend
35	The Royal Dunkeld Hotel
36	A & J Stephen Ltd (Builders)
37	Alan Robertson Joinery
38	Alex Kettles Architect
39	Amulree Village Hall
40	Andy Law Pest Control
41	ARAN bakery
42	Atholl Arms Hotel
43	Baby & Toddler Group
44	Birnam and Dunkeld Golf Club
45	Birnam Arts Ltd
46	Birnam Cd Ltd (CD Manufacturing)
47	Birnam Guest House
48	Birnam Post Office and Tea Room
49	Birnam Vehicle Services
50	Bob's Mechanical Repairs & Fuel
51	Brodies Timber
52	Broughton-Stuart Jewellery
53	C Williams Furniture Restoration

Ref.	Business
54	Caledonian Forestry Services
55	Camphill Community Corbenic Café and Shop
56	Central Forestry
57	County Clays - Clay Pigeon Shooting, Archery & Air Rifle
58	Couthie Cottage - Self Catering Accommodation
59	Crightons Cycles
60	Darjeeling Bangladeshi Restaurant
61	Davidson Chemist
62	Duchess Anne
63	Dunkeld & Birnam Community Co-Working Space
64	Dunkeld Auto Services
65	Dunkeld Builders Ltd
66	Dunkeld Cars
67	Dunkeld Cathedral
68	dunkeld cottages.co.uk
69	Dunkeld House Hotel
70	Dunkeld Nurseries
71	Dunkeld Plumbers Ltd.
72	Dunkeld Post Office
73	Dunkeld Smoked Salmon
74	Dunkeld Whisky Box
75	Dunkeld & Birnam Golf Course
76	Earn Equestrian & Country Sports,
77	Eastwood House
78	Eclipse Hair and Nails
79	Elizabeth Allison Interiors
80	Ella's of Dunkeld (Shop)

Ref.	Business
81	Elly's Dolls
82	Erigmore Estate, Apartment and Lodges
83	Flowers by Bruges
84	Forest Enterprise Trust (Dunkeld)
85	Galbraith
86	Gatehouse Nursery
87	Gillian Vaughan Painter & Decorator
88	Glack Dog Kennels
89	Going Pottie, Gift Shop
90	Greg Robb Glazing
91	H & H Construction
92	Heron Hypnotherapy & NLP
93	Highland Off-road Quads
94	I & H Brown Ltd (Luncarty)/ Civil Engineering
95	Inchmagrannachan Farm Holiday Cottages
96	In Situ Climbing
97	Indigo Charlie
98	Invermill Farm Caravan Park
99	Jaggedy Thistle, Gift Shop
100	JB Decorating
101	JD Cox Plant Hire
102	Jeffreys Interiors, Dunkeld
103	Jeremy Law of Scotland
104	Jessie Mac's
105	Ladyhill House, Luxury Holiday Home
106	Land Rover Experience
107	Learning and Development Centre

Ref.	Business
108	Linocutting Workshops
109	Little Steps Childcare
110	Loch of the Lowes Nature Reserve
111	Lush & Leafy Garden Services
112	M H Services
113	MacNaughton Holdings
114	Michael Robertson Plasterer
115	Milton Birnam Hotel and Inn
116	Murthly Sawmill
117	Neil Fordyce Photography
118	Niel Gow Festival
119	Old Faskally Contracting Co Ltd
120	Painting and Decorating
121	Palmerston's Coffee Shop
122	Perthshire Chamber of Commerce
123	Perthshire Country Sports, Bridge St
124	Perthshire Timber Company
125	Perthshire Timber Company
126	Perthshire Visitor Centre Limited (Luncarty)
127	Playgroup
128	Potter Plumbing & Heating Ltd
129	Progression Bikes
130	Reid Estates
131	Robin Baker Architects
132	ROLMAR
133	Royal British Legion Scotland Branch Club
134	Sawdust Woodfuels Scotland

Ref.	Business
135	Scottish Deli
136	Seafood House Restaurant
137	Self-Catering Accommodation
138	Shian Cottage Bed & Breakfast
139	The Atholl Gallery
140	The Canyoning Company
141	The Country Bakery
142	The Ell House, National Trust Gift Shop
143	The Hermitage and other National Trust Properties in Dunkeld
144	The Meeting Place Bistro
145	The Merryburn Hotel B&B
146	The Orchard
147	The Royal Dunkeld Hotel
148	The Scottish Deli, Atholl St
149	The Taybank, Public House
150	Time-4-You
151	Tomnagrew Farm
152	U3A - University of the 3rd Age
153	VisitScotland Dunkeld iCentre
154	W & K Gerrie Funeral Directors
155	Watson & Lyall Bowie
156	Winski's of Kinross
157	Young's Garage

Appendix A8.1: Business Properties

1.1.1 Commercial and industrial property identified in OS AddressBase® Plus and located within the 500m study area comprises those detailed in Table 1 and which are also shown on Figures 8.1 to 8.4.

Table 1: Businesses located within the Study Area

Figure Reference	Business Name	Business Classification
1	Rohallion Depot	Commercial/Industrial
2	Potter Plumbing and Heating Garage And Store	Commercial/Industrial
3	Preston Tait Surveyors	Office/Workshop
4	Dunkeld Fuel Express	Petrol Filling Station
5	Bobs Mechanical Repairs	Motor Vehicle Retail, Repair or Hire
6	Neil Fordyce Photography	Office/Workshop
7	Oakbank Coach House	Accommodation
8	View Park	Accommodation
9	The Wee Nook	Accommodation
10	T&M Development Yard	Commercial/Industrial
11	Merriman Joinery	Commercial/Industrial
12	Lonely Mountain Skis	Office/Workshop
13	Erigmore	Accommodation
14	Ladywell	Waste transfer/Disposal
15	Birnam Driving School	Office/Workshop
16	Dunkeld Plumbers	Commercial/Industrial
17	Aran Bakery	Commercial/Industrial
18	The Old Bakehouse	Accommodation
19	Pinegrove Cottage	Accommodation
20	Paddle Surf Scotland	Office/Workshop
21	The Merryburn	Accommodation
22	Birnam CD	Retail/Showroom
23	Birnam Reader	Retail/Showroom
24	Chattan Tea Room	Restaurant/Cafeteria
25	Robin Baker Architects	Office/Workshop
26	The Canyoning Company	Office/Workshop
27	Cut Above the Rest	Retail/Showroom
28	Ladyhill Coach House	Accommodation
29	Jessie Macs	Accommodation
30	Dunkeld Cars	Office/Workshop
31	Ladyhill House	Accommodation
32	Birnam Guest House	Accommodation
33	Birnam Village Shop	Retail/Showroom
34	Birnam Hotel	Accommodation

Figure Reference	Business Name	Business Classification
35	Birnam Inn	Restaurant/Cafeteria
36	Tayburn House	Accommodation
37	Birnam Autopoint	Office/Workshop
38	Birnam Vehicle Services	Motor Vehicle Retail, Repair or Hire
39	W and K Gerrie funeral directors	Office/Workshop
40	Inver Mill Farm Caravan Park	Accommodation
41	Foster Contracting Ltd	Office/Workshop
42	Brodies Timber	Retail/Showroom
43	Forestry Commission	Office/Workshop
44	Dunkeld & Birnam Community Co-Working	Office/Workshop
45	Puddleduck Nursery	Education
46	Davidsons Chemists	Restaurant/Cafeteria
47	Dunkeld House Hotel	Accommodation
48	The Taybank	Restaurant/Cafeteria
49	Atholl Arms Hotel	Accommodation
50	Tayneuk	Accommodation
51	In Situ Climbing	Retail/Showroom
52	Jeffreys Interiors	Retail/Showroom
53	Ellas	Retail/Showroom
54	Earn Equestrian & Country Sport	Retail/Showroom
55	The Clootie Dumpling Café	Restaurant/Cafeteria
56	Going Pottie	Retail/Showroom
57	Co-Operative Retail Services Ltd	Retail/Showroom
58	Dunkeld Butcher	Retail/Showroom
59	The Bridge B&B	Accommodation
60	The Ell Shop	Retail/Showroom
61	Bank of Scotland	Financial
62	Three Churches Charity Shop	Retail/Showroom
63	Corbenic Shop	Retail/Showroom
64	LÒN	Retail/Showroom
65	Dunkeld Whisky Box	Retail/Showroom
66	Couthie Cottage	Accommodation
67	The Pend	Accommodation
68	Dunkeld House Lodges Club	Accommodation
69	Dunkeld Smoked Salmon	Retail/Showroom
70	The Blue Magpie	Retail/Showroom
71	Aran Bakery	Retail/Showroom
72	Perth Arms Hotel	Accommodation
73	The Scottish Deli	Retail/Showroom
74	Atholl Gallery	Retail/Showroom

Figure Reference	Business Name	Business Classification
75	Tourist Information Centre	Office/Workshop
76	Darjeeling	Restaurant/Cafeteria
77	The Dunkeld Traditional Fish Bar	Restaurant/Cafeteria
78	The Naked Sheep	Retail/Showroom
79	Eclipse Hair and Nails	Retail/Showroom
80	Palmerston's	Restaurant/Cafeteria
81	Kettles of Dunkeld	Retail/Showroom
82	The Country Bakery	Restaurant/Cafeteria
83	The Vintage Shop	Retail/Showroom
84	Progression Bikes	Retail/Showroom
85	Howies Bistro	Restaurant/Cafeteria
86	Royal Dunkeld Hotel	Accommodation
87	County Clays	Office/Workshop
88	Inch Cottage	Accommodation
89	Inchmagrannachan Farm	Accommodation

Appendix A9.1: Potential Sources of Land Contamination within Study Area

1.1 Introduction

1.1.1 This appendix provides information pertaining to potential sources of land contamination within the study area (250 m), supporting Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The potential sources of land contamination presented in Table A9.1.1 were obtained from review of historical and current maps and information provided within the Envirocheck Report (Landmark Information Group, 2015), information provided within six previous assessment reports (as listed in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater, Section 9.2 (Approach and Methods), Baseline Data)); Ground Investigation (GI) data (from the four GI reports as listed in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater, Section 9.2 (Approach and Methods), Table 9.2); consultation with statutory and non-statutory bodies; and site walkover information. Source references are cited within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater).

1.1.2 The review of GI data included in Table A9.1.1 also provides a summary of findings from an initial screening of geo-chemical results for soil, soil leachate and groundwater testing and ground gas monitoring data against published generic assessment criteria (GAC) suitable for human health and water environment receptors. Geo-chemical results for soil samples were screened against GAC suitable for a commercial/industrial end use based on the limited potential pathways to end users given the proposed end use as a Trunk Road. To provide an indication of acute risks to construction workers (or maintenance workers undertaking below ground works during operation) the results were also compared to GAC suitable for a residential (without plant uptake) end use. The following hierarchy of published human health GACs for soil concentrations were used (based on a soil organic matter concentration of 1% to provide the most conservative approach):

- Suitable for Use Limits (S4ULs) for Human Health Risk Assessment, Land Quality Management (LQM)/Chartered Institute of Environmental Health (CIEH) (2015); and
- Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination, Department for Environment, Food and Rural Affairs (Defra) (2014).

1.1.3 Geo-chemical results for soil leachate and groundwater samples were screened against Resource Protection Values (RPV), presented in SEPA's Position Statement (WAT-PS-10-01) Assigning Groundwater Assessment Criteria for Pollutant Inputs (SEPA, 2014). Ground gas monitoring data were screened against the following criteria:

- Concentrations of methane have been compared to the Lower Explosive Limit (LEL) of methane concentrations in air which equates to 5 % volume per volume (v/v) and a typical safety threshold value which equates to 20 % of the LEL (1 % v/v) (CIRIA, 2007);
- Concentrations of carbon dioxide, carbon monoxide and hydrogen sulphide have been compared to the equivalent Workplace Exposure Limits (WELs) for long-term and short-term exposure presented in EH40/2005 Workplace Exposure Limits (Health and Safety Executive, 2018); and
- Concentrations of oxygen have been compared to the Mines and Quarries Act (1954) threshold value of 19 % v/v. The act states that where concentrations of oxygen fall below 19 % v/v then a sufficiency of oxygen would not be provided.

1.1.4 The locations of the potential sources of land contamination are presented on Figures 9.1 to 9.4. .

Table A9.1.1: Potential Sources of Land Contamination within Study Area

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C1	Existing A9	OS map	1973 to present	0 m, Full length	Potential contamination associated with areas of embankment constructed from materials of unknown composition.	Made ground was encountered to a maximum proven depth of 12.8 m bgl. The made ground generally composed sand and gravel deposits with occasional inclusions of tarmac, ash, charcoal, clinker and brick. Olfactory evidence of contamination (odours) were noted in 15 locations (ch2500, ch2750, ch2950, ch3550, ch3850, ch4850, ch5150, ch5350, ch5520, ch5870, ch6020, ch6570, ch6670, ch7100 and ch7410). PID measurements were predominantly below 10 ppm, ranging from <0.1 ppm to 35.4 ppm, however an outlier measurement (79.3 ppm) was encountered adjacent to the existing A9 at ch4350. Soil samples in proximity to the existing A9 (117) were analysed and compared against Generic Assessment Criteria (GAC) suitable for the proposed end use. Elevated polycyclic aromatic hydrocarbons (PAHs) were recorded in three samples from two locations. The results were also compared to GAC suitable for a residential (without plant uptake) end use to provide an indication of acute risks to construction workers. Elevated hydrocarbons were recorded in three samples from two locations and elevated PAHs in eight samples from six locations. Groundwater locations (27) in proximity to the A9 were sampled once and the chemical analysis results were compared against Resource Protection Values (RPV) as defined within SEPA Position Statement WAT-PS-10-01 (SEPA, 2014). SEPA have not assigned an RPV for petroleum hydrocarbons, therefore, the laboratory limit of detection (LOD) has been adopted as a conservative GAC. Isolated and marginal elevated occurrences of ammoniacal nitrogen, nitrite, arsenic, chloride, chromium and iron were observed. Marginal and isolated exceedances of cadmium and mercury with respect to the minimum reporting value have also been observed, the concentrations, however, are well below the RPV indicative of significant pollution. Elevated manganese concentrations were recorded in 17 samples. Elevated concentrations of petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs) were noted in 15 and eight locations respectively, generally coinciding with soils where visual and olfactory evidence (tarmac and odours) were noted within the borehole logs. There were no corresponding exceedances of the RPVs from the three available 2:1 soil leachate results relating to this source. Of the 83 boreholes monitored for ground gas, 55 were in the vicinity of the existing A9. Methane (CH_4) concentrations were all below the recommended safety threshold of 20 %

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
						of the lower explosive limit (LEL) (1 % v/v). Carbon dioxide (CO_2) concentrations above the long-term and short-term workplace exposure limits (WELs) were recorded in 43 and 17 boreholes respectively. Oxygen concentrations below the mining act limit (19 % v/v) were recorded in 20 boreholes. Two boreholes recorded carbon monoxide (CO) above the long-term WEL (30 ppm).
PBTC-C2	Highland Main Line railway	OS map	1867 to present	Within 15 m for majority of full length	Potential for made ground to be present associated with areas of embankment. Potential for contaminants associated with railway use.	Made ground was encountered to a maximum proven depth of 2.5 m bgl. The made ground generally composed sand and gravel deposits with occasional inclusions of ash, clinker and brick. Olfactory evidence of contamination (a strong chemical odour) was noted in three locations (ch1850, ch2000 and ch5880) and a slight organic odour was noted in one location (ch7000). PID measurements were predominantly below 10 ppm, ranging from <0.1 ppm to 28.6 ppm. Soil samples (33) in proximity to the Highland Main Line railway were analysed and compared against GAC suitable for the proposed end use. Elevated concentrations of PAHs in two samples from one location. The results were also compared to GAC suitable for a residential (without plant uptake) end use to provide an indication of acute risks to construction workers. Elevated concentrations of hydrocarbons were encountered in two samples/locations and elevated PAHs in three samples from one location. Groundwater sampling was undertaken once at eight locations in proximity to the Highland Main Line railway. The same pattern noted for the existing A9 embankment soils was observed, with isolated and marginal elevated occurrences of chloride, toxic metals and PAHs. Elevated manganese concentrations were recorded in seven samples. Elevated petroleum hydrocarbons were recorded in six locations and generally coincided with soils where visual and olfactory evidence of contamination were noted within the borehole logs. There were no corresponding exceedances of the RPVs from the single 2:1 soil leachate result relating to this source. Of the 83 boreholes monitored for ground gas, 16 were in the vicinity of the Highland Main Line railway. No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v), CO_2 was recorded above the long-term WEL in 12 boreholes and above the short-term WEL in six boreholes. Concentrations of oxygen below the mining act limit (19 % v/v) were recorded in six boreholes. Two boreholes recorded CO above the long-term WEL.

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C3	Storage Tank	OS map	1977 to 1995	50 m north, ch450	Contents of tank unknown.	No direct interaction within the expected footprint of the potential land contamination source. However, no chemical exceedances or visual/olfactory signs of evidence (PID measurements all below 0.1 ppm) were noted within soil samples from two nearby locations (TPBT011 and TPBT013). No groundwater or 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source.
PBTC-C4	Gravel Pit	OS map	1867	145 m north-east, ch450	Potentially infilled with made ground of unknown composition with associated sources of potential contamination.	No direct interaction within the expected footprint of the potential land contamination source. However, no chemical exceedances or visual/olfactory signs of evidence (PID measurements all below 0.1 ppm) were noted within soil samples from two nearby locations (TPBT011, and TPBT013). No groundwater or 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source.
PBTC-C5	Curling Pond	OS map	1867 to1938.	200 m south-west, ch1500	Potentially infilled with made ground of unknown composition with associated sources of potential contamination.	Not investigated
PBTC-C6	Infilled Pond	OS map	1901 to 1938	175 m south-west, ch1550	Change in size of pond between maps indicates the pond is potentially infilled with made ground of unknown composition with associated sources of potential contamination.	Not investigated
PBTC-C7	Birnam Lower Level Quarry (disused)	OS map	1901 to present	325 m south-west, ch1700	Marked as disused from 1983, potentially infilled with made ground of unknown composition with associated sources of potential contamination.	Not investigated
PBTC-C8	Ringwood Sawmill	OS map	2006 to present	240 m south-west, ch1850	-	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C9	Birnam Quarry	OS map, Envirocheck Report	1867 to present	280 m south-west, ch2000	Opencast Slate mine - inactive	Not investigated
PBTC-C10	Old Quarry	OS map	1886 to 1938	200 m south-west, ch2000	Potentially infilled with made ground of unknown composition with associated sources of potential contamination.	Not investigated
PBTC-C11	Curling Pond	OS map	1867 to 1938	0 m, ch1950	Curling pond shown as a marsh/salting on 1977 map. Potentially infilled with made ground of unknown composition with associated sources of potential contamination prior to or as part of the existing A9 construction.	No direct interaction within the expected footprint of the potential land contamination source. However, ten soil samples from nearby exploratory hole locations were analysed and compared against relevant GAC with no exceedances observed. PID measurements all below 10 ppm, ranging from <0.1 ppm to 5.8 ppm. One groundwater sample was collected in proximity to the potential source. No elevated concentrations with respect to RPV were encountered, however concentrations of petroleum hydrocarbons were not included within the analytical suite tested for this groundwater sample. No 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source. Ground gas was monitored in four boreholes located to the north-east of the potential source. No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v), CO_2 was recorded above the long-term WEL in three locations and above the short-term WEL in two. Concentrations of oxygen below the mining act limit (19 % v/v) were recorded in two locations.
PBTC-C12	Dunkeld Waste Water Treatment Works	OS map	1983 to present	120 m north-east, ch2200	-	Not investigated
PBTC-C13	Gas Works	OS map	1867 to 1901	120 m north-east, ch2600	-	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C14	Youngs Garage Fuel Station	OS map, Envirocheck Report	1977 to present	90 m north-east, ch2650	Potential source of hydrocarbons.	Not investigated
PBTC-C15	Gravel Pit	OS map	1867 to 1938	0 m, ch2690 to ch2780	Potentially infilled with made ground of unknown composition with associated sources of potential contamination prior to 1977.	Made ground and embankment fill were encountered at seven locations in proximity to the potential source up to a maximum depth of 7.25 m bgl. (full extent was not proven). Olfactory evidence of contamination was noted within one location, a slight chemical odour between 1.4 to 2.4 m bgl, however, no soil sample was collected for analytical testing to confirm/identify the potential contaminants present. PID measurements were all below 10 ppm, ranging from <0.1 ppm to 1.9 ppm. Soil samples were collected from two trial pit locations in close proximity. Although, no chemical exceedances were observed when concentrations were compared against the relevant GAC, petroleum hydrocarbons were not included in the analytical suite tested for these two samples. Groundwater sampling at a nearby location was undertaken on three separate occasions. The minimum reporting value for mercury was marginally exceeded on one occasion (the second sampling round). No other chemical exceedances were observed. No 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source. Gas monitoring was undertaken at two locations in close proximity No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v) and oxygen concentrations were above 19 % v/v. Concentrations of CO_2 was recorded above the long-term WEL at both locations and above the short-term WEL at one.
PBTC-C16	Electric Substation	OS map	1977 to 1995	110 m north-east, ch2850	Potentially localised source of PCBs	Not investigated
PBTC-C17	Storage Tank	OS map	1977 to 1995	160 m north-east, ch2850	Contents of tank unknown.	Not investigated
PBTC-C18	Smithy	OS map	1867 only	40 m north-east, ch3350	-	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C19	Coach Works and Smithy	OS map	1867 to 1938	90 m north-east, ch3525	-	Not investigated
PBTC-C20	Filter Beds	OS map	1901 to Present	290 m south-west, ch3450	Within 250 m buffer from Option ST2B access road.	Not investigated
PBTC-C21	Fuel Station, Garage and Car Dealer	Envirocheck Report	Present	185 m north-east, ch3600	Birnam Autopoint and Birnam Vehicle Services. Potential sources of hydrocarbons.	Not investigated
PBTC-C22	Quarry (disused) Ladywell Landfill	OS map, Envirocheck report	1867 to 1983 (marked as disused in 1983)	25 m south, ch3450 to ch3800	Owned and operated by Perth & Kinross Council. Small to medium (10,000 to 75,000 tonnes per year) licenced landfill for construction/industrial, household and commercial, industrial non-hazardous wastes and old vehicles and machinery. SEPA indicated that this site holds a waste management licence (WML/E/20050).	The review of GI data pertinent to Ladywell Landfill is provided in *Appendix A9.2: Ladywell Landfill.*
PBTC-C23	Saw Mill	OS map	1866	55 m south, ch4950	-	Not investigated
PBTC-C24	Smithy	OS map	1866	90 m south, ch4975	-	Not investigated
PBTC-C25	Saw Mill	OS map	1867 to 1938	145 m south, ch5050	-	Not investigated
PBTC-C26	Corn Mill	OS map	1867 to 1938	125 m south, ch5050	-	Not investigated
PBTC-C27	Sewage Works	OS maps	1995 to Present	230 m north, ch5400	-	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C29	500L Underground Fuel Tank	A9 Route Improvement Strategy – Dualling of Birnam to Tay Crossing, Stage 2 Options Assessment Report, Part 2 Environmental Assessment, June 2011. (Transport Scotland, (2011).	Unknown	30 m north-east, ch3350	Letter from PKC states that a 500 gallon petrol UST licenced to James Robertson was located within a yard on Station Road, Birnam. The tank was to be filled with water in 1969 but this was not confirmed. The most conservative (closest) location on Station Road has been chosen.	Not investigated
PBTC-C30	Olfactory Evidence of Contamination	Soil Engineering GI Factual Report (Soil Engineering, 2015).	Present	40 m north-east, ch650	-	No made ground was recorded within the borehole log, however, a strong turpentine odour was noted at depth (between 2.2 to 3.65 m bgl) in natural gravel deposits. No soil sample was collected for analytical testing to confirm/identify the potential contaminants present. No PID measurements were taken from this location. A groundwater sample was collected from the borehole on one occasion and analytical testing recorded elevated concentrations of petroleum hydrocarbons and mercury concentrations marginally above the minimum reporting RPV but not the RPV indicative of significant pollution. No 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source. Ground gas monitoring was undertaken at the location on 24 occasions. No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v). Concentrations of CO_2 were recorded above the long-term WEL on 11 occasions and above the short-term WEL twice. Concentrations of oxygen below the mining act limit (19 % v/v) were recorded on two occasions.
PBTC-C32 to PBTC-C41	Septic Tanks	Land owner consultation	Unknown	Various	Exact location of Septic Tanks unknown, landowner parcel shown on figure.	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C42 to PBTC-C46	Septic Tank Discharges	Envirocheck report	Present	Various	-	Not investigated
PBTC-C48	Septic Tank	Land owner consultation	Unknown	140 m north-east, ch0	-	Not investigated
PBTC-C49	Depot and Storage Tank	OS map	Unknown	15 m south, ch4250	Activities at Depot and contents of tank unknown.	No direct interaction within the expected footprint of the potential land contamination source. Made ground was encountered (up to 0.7 m thick) within five exploratory locations in close proximity and generally comprised of reworked natural material with occasional reports of ash, bitumen or tarmacadam. Olfactory evidence of contamination was noted within two locations, a moderate chemical odour between 0.25 to 1.1 m bgl in one and between 0.6 to 0.9 m bgl in the other. PID measurements were all below 10 ppm, ranging from <0.1 ppm to 2.2 ppm. Soil samples (13) from six nearby exploratory hole locations were analysed and compared against GAC suitable for the proposed end use with no exceedances observed. The results were also compared to GAC suitable for a residential (without plant uptake) end use to provide an indication of acute risks to construction workers. One sample/location had elevated concentrations of PAHs (consistent with one of the two locations with olfactory evidence of contamination). Two groundwater samples were collected in proximity to the site on one occasion. The subsequent analytical testing indicated elevated concentrations of cadmium and PAHs at one location (PAH analysis only undertaken at one location) and elevated concentrations of petroleum hydrocarbons at both locations when compared to RPVs/LODs. No 2:1 soil leachate chemical analysis was undertaken in the vicinity of this source. Gas monitoring was undertaken at two locations in close proximity on 15 occasions at one location and only once at the other. No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v) and oxygen concentrations were consistently above 19 % v/v. Concentrations of CO_2 above the long-term WEL were only recorded at one location on one occasion (out of the 15 undertaken).

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
PBTC-C50	Former Hospital	OS map, A9 Pass of Birnam to Tay Crossing Preliminary Sources Study Report, March 2011 (Scott Wilson, 2011), West Stormont Historical Society	1740 to present day	25 m north, ch400 to ch550	The property was labelled as a hospital in the 1867 edition map and then as Dalpowie on later edition maps (between 1901 and 1959). Information from the West Stormont Historical Society indicated that the property was labelled as a hospital in 1740 but had in fact been built to house 12 poor and indigent men from across the Grantully Estate. By the 1840's the property was the private residence of Sir William Drummond Stewart. The property has been known at various times as Glen Birnam, Dalpowie Lodge, Birnam Hall and Dalpowie House. During World War One the property was used as an auxiliary hospital and as a billet for Polish troops during World War Two. The main building was demolished in 1951 with only the ruins of a former cottage, an icehouse and the garden remaining. The existing A9 and Murthly Estate access track now occupy part of the former property's associated land parcel.	No direct interaction with the former property, however, no chemical exceedances or visual/olfactory signs of evidence (PID measurements all below 0.1 ppm) were noted within soil samples from two nearby locations (TPBT011, and TPBT013). No groundwater or 2:1 soil leachate chemical analysis was undertaken in the vicinity of the property.
PBTC-C51	Tank	A9 Pass of Birnam to Tay Crossing Preliminary	1981	30 m north, approximately ch6300	The Preliminary Sources Study Report references OS map NO0539, publication date 1981, which locates an unspecified tank	Not investigated

Source ID	Historical Land Use/ Source	Source of Information	Dates present	Distance from Existing A9	Desk Study Comments	Review of GI Data
		Sources Study Report, March 2011 (Scott Wilson, 2011)			approximately 30m north of the existing A9.	
n/a	Classified and Unclassified Roads (excluding the existing A9) *	Ground Investigation	n/a	Various	n/a	Made ground was encountered across the project area to a maximum proven depth of 4mbgl. The made ground generally composed tarmacadam above sand and gravel deposits with occasional inclusions of tarmac, ash, and charcoal. Olfactory evidence of contamination (odours) were noted in six locations. PID measurements were predominantly below 10 ppm, ranging from <0.1 ppm to 14.1 ppm. Soil samples in proximity to existing and former classified and unclassified roads (excluding the existing A9) (35) were analysed and compared against GAC suitable for the proposed end use. Elevated PAHs were recorded in five samples from three locations. The results were also compared to GAC suitable for a residential (without plant uptake) end use to provide an indication of acute risks to construction workers. Elevated hydrocarbons were recorded in three samples from two locations and elevated PAHs in 12 samples from ten locations. One groundwater sample was collected in proximity to an existing side road which indicated marginally elevated concentrations of petroleum hydrocarbons and PAHs. There were no corresponding exceedances of the RPVs from the three available 2:1 soil leachate results relating to this source. Of the 83 boreholes monitored for ground gas, 15 were located in proximity to existing side roads. No CH_4 was encountered above the monitoring equipment limit of detection (0.1 % v/v). Concentrations of CO_2 were recorded above the long-term WEL at 11 locations and above the short-term WEL at five locations. Concentrations of oxygen below the mining act limit (19 % v/v) were recorded at four boreholes.

* Numerous existing and former classified and unclassified roads encountered along the proposed route options, not indicated on Figures.

1.2 References

Reports and Documents

Chartered Institute of Environmental Health (CIEH)/Land Quality Management (LQM) (2015). Suitable for Use Limits (S4ULs) for Human Health Risk Assessment.

Construction Industry Research and Information Association C665 (CIRIA) (2007). Assessing risks posed by hazardous ground gases to buildings.

Department for Environment, Food and Rural Affairs (Defra) (2014). Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination.

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Landmark Information Group (2015). Envirocheck Report, Order Number 65915015_1_1.

The Mines and Quarries Act (1954). The Mines and Quarries Act, 27 (Section 55(2)(B)). Scott Wilson (2011). A9 Pass of Birnam to Tay Crossing Preliminary Sources Study Report.

SEPA (2014). Position Statement (WAT-PS-10-01). Assigning Groundwater Assessment Criteria for Pollutant Inputs.

Soil Engineering (2015). Report on a Ground Investigation for the A9 Dualling: Birnam to Tay Crossing. Volumes 01 to 24.

Transport Scotland (2011). A9 Route Improvement Strategy – Dualling of Birnam to Tay Crossing, Stage 2 Options Assessment Report, Part 2 Environmental Assessment.

Appendix A9.2: Ladywell Landfill

1.1 Introduction

1.1.1 The DMRB Stage 2 assessment Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) identified Ladywell Landfill as a potential land contamination source (PBTC-C22). This appendix has been prepared to assess the potential land contamination risks associated with Ladywell Landfill for each proposed route option, supporting Chapter 9 (Geology, Soils and Groundwater).

1.1.2 Ladywell Landfill (hereafter referred to as 'the site') lies to the south of Little Dunkeld adjacent to the Highland Main Line railway and in proximity to the existing A9. The site is operated by Perth & Kinross Council (PKC) under Waste Management Licence (WML) WML/E/20050. The currently active licence authorises the treatment, keeping or disposal of controlled waste in or on land within the licensed area by the licence holder.

1.1.3 This appendix includes a review of the available information relating to the site, a summary of the anticipated ground conditions, an assessment of the potential land contamination risks associated with each route option and identification of data and information gaps.

1.2 Data Sources

Documentary Information

1.2.1 In addition to the reference material detailed within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) the following sources of information have been consulted in the preparation of this appendix:

- Ladywell Landfill leachate assessment collection and treatment study on behalf of Perth & Kinross Council, 6 April 1994 (Thorburn Colquhoun 1994).
- Waste Management Licence No. WML/E/20050 dated 7 April 1998 (SEPA 1998).
- Ladywell Landfill Site Synopsis of Results 2003 (Perth & Kinross Council 2003).
- Engineers' exploratory hole logs for BH07, BH08, BH09 and BH10 (SLR Consulting Limited 2005).
- Drillers' exploratory hole logs for BH07, BH08, BH09 and BH10 (Raeburn Drilling and Geotechnical Limited 2005).
- Annual Synopsis of the Ladywell Landfill Site 2014, WML/E/20050 (Perth & Kinross Council 2014).
- Annual Synopsis of the Ladywell Landfill Site 2015, WML/E/20050 (Perth & Kinross Council 2015a).
- Working Plan for Ladywell Landfill Site Dunkeld WML/E/20050, dated 19 November 2015 (Perth & Kinross Council 2015b).
- Annual Synopsis of the Ladywell Landfill Site 2016, WML/E/20050 (Perth & Kinross Council 2016).
- Annual Synopsis of the Ladywell Landfill Site 2017, WML/E/20050 (Perth & Kinross Council 2017).

Site Walkover

1.2.2 A site walkover survey was undertaken on 13 September 2018 by a Jacobs Land Quality consultant escorted around the site by PKC staff.

Ground Investigation Data

1.2.3 Ground investigation (GI) data specific to Ladywell Landfill and the surrounding area is available from GI undertaken on behalf of PKC in 1993 and 2005; and two phases of GI associated with the A9 Dualling Programme, undertaken on behalf of Transport Scotland in 2015. Table A9.2.1 provides details of each relevant GI. GI locations relevant to Ladywell Landfill are shown on Figure A9.2.1.

Table A9.2.1: Ladywell Landfill Ground Investigation Timeline and Summary

GI Report Publication Date	1994	2005	2015	2016
Designer	Thorburn Colquhoun Holdings Limited (acquired by URS in 1999)	SLR	AECOM	Jacobs (Advanced GI)
Client	PKC	PKC	TS	TS
Drilling Contractor	Geotechnical Services	Raeburn Drilling and Geotechnical Limited	Soil Engineering Geoservices Limited (SEGL)	Fugro Geoservices Limited (Fugro)
Date GI Undertaken	June - December 1993	April 2005	June 2014 - February 2015	August - December 2015
Total No. of Boreholes within Ladywell Landfill Land Plot	9	4	7	1
Boreholes available for Groundwater and/or Gas Monitoring	6	4	4	1
Trial Pits	1	0	12	0
Laboratory Testing	3 soil samples. Monthly groundwater samples from 6 locations. Six-monthly gas monitoring at 3 locations.	N/A	Soil samples from 21 locations. Groundwater samples from 17 locations. 8 gas monitoring visits at 3 locations.	Soil sample from 1 location. Groundwater samples from 2 locations. 6 gas monitoring visits at 1 location.
	Tay River Purification Board.	N/A	Alcontrol Laboratories.	Derwentside Environmental Testing Services.
	Completed in December 1993.	N/A	Completed in November 2015.	Completed in January 2016.
Report Reference	Thorburn Colquhoun (1994).	SLR Consulting Limited (2005)	SEGL (2015)	Fugro (2016)

1.3 Baseline Conditions

Site Description

1.3.1 The site is located approximately 100 m to the south-west of the existing A9, adjacent to the village of Birnam at approximate grid reference NO 02664 41762. The licensed site, under management by PKC, occupies an area of approximately 2.7 ha. The landfill cell has an area of approximately 0.015 ha, measuring approximately 50 m by 150 m.

1.3.2 The site is mostly covered by grassland, with trees and bushes delineating the site perimeter and internal access tracks. The site slopes towards the north-east, with a steeper slope down to the Highland Main Line railway at the northern site boundary. Site infrastructure includes the landfill cell, a collection lagoon/sump pond, two settlement lagoons, a three-tiered reed bed treatment area, three spray irrigation zones and associated pipelines and drainage channels.

Site History

1.3.3 The site operated as a whinstone quarry between 1863 and 1938 and was subsequently used for private waste disposal post World War 2. The landfill was inherited by PKC in the 1950s and the Council used the site for the disposal of domestic refuse until 1993. Post cessation of waste disposal activities, the site was re-engineered to enable the long-term aftercare of the waste material held on-site. By 1996 the waste cell was covered with a clay cap and a leachate collection lagoon with associated leachate treatment infrastructure was in place. In addition, drainage ditches to re-direct clean surface water were situated on the northern and western perimeters.

Current Site Activities

1.3.4 Current site activities are centred on the control and management of leachate generated within the waste cell as stipulated by the WML (WML/E/20050). Leachate is collected within a leachate lagoon situated adjacent to the north-east face of the landfill cell. Dependant on the volume held within the collection lagoon, leachate is then pumped uphill to two settlement lagoons located to the south-west of the landfill cell (towards the apex of the site). A manually operated system of pipework then directs the leachate in one of three directions. The primary flow direction is towards the three-tiered reed bed treatment area after which the leachate is returned to the collection lagoon, forming a closed loop of leachate circulation. Should the volume of leachate exceed the storage capacity of this closed loop system the excess leachate can be redirected to three spray irrigation zones. Spray Irrigation Zone 1 consists of perforated plastic tubing above the landfill cell clay cap with the resultant leachate run off collected within internal drainage ditches and returned to the collection lagoon. Spray Irrigation Zones 2 and 3 consist of perforated plastic tubing within a grass covered field (Zone 2) and a woodland area (Zone 3) located to the north-east and east of the collection lagoon respectively. Once leachate is directed to Spray Irrigation Zones 2 and 3 it is no longer within the closed loop system and is left to percolate through the soil substrate eventually migrating to shallow groundwater and from there perhaps migrating towards the Inchewan Burn. Diagram A9.2.1 illustrates the leachate management cycle at Ladywell Landfill.

1.3.5 The WML (WML/E/20050) governing the site requires ongoing monitoring of surface water (Inchewan Burn), groundwater, leachate, landfill gas and soil until it is agreed between SEPA and PKC that there is no hazard to the surrounding environment and the leachate no longer requires management.

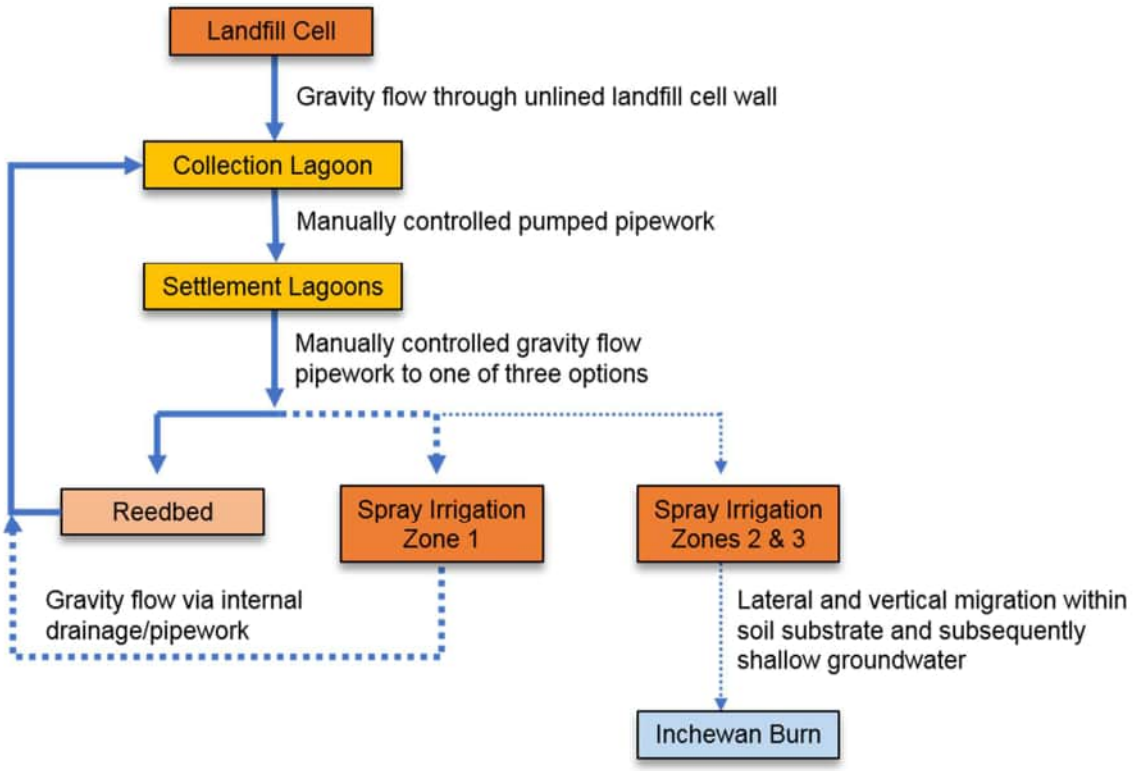

Diagram A9.2.1: Ladywell Landfill leachate management system flowchart

Geological Setting

1.3.6 A desk-based review of geological mapping (BGS, 2021) indicates superficial deposits of Devensian Glacial Till in the southern part of the site, with Glaciofluvial Sheet Deposits (Gravel, Sand and Silt) towards the north. Bedrock mainly comprises metamorphic rocks of the Southern Highland Group (semipelite and psammite), with a south-west to north-east trending igneous dyke present in the centre of the site. Further details are presented in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater).

1.3.7 Geological information obtained from GI includes one borehole within the landfill cell and 29 exploratory locations (boreholes and trial pits) within the site boundary. The one borehole within the landfill cell proved the presence of waste material to a depth of 14.2 m below ground level (bgl) terminating upon hard rock or an obstruction. One borehole to the south-west of the landfill cell recorded sand and gravel deposits to a depth of 3.5 m bgl above mica schist bedrock (described as weathered to a depth of 7.2 m bgl). One location to the south of the landfill cell recorded no drift material encountering schist bedrock at surface. Five locations to the north of the landfill cell recorded sand and gravel deposits to a maximum depth of 3.3 m bgl over schist/Dalradian bedrock. The remaining locations were located to the north and north-east of the landfill cell (predominantly within Irrigation Spray Zone 2). The locations predominantly recorded sand and gravel textured deposits of glacial and alluvial origin with dispersed cobbles and boulders. Recorded depths to bedrock were relatively shallow in proximity to the landfill cell, between 3 and 6 m bgl, while towards the north-eastern extent of the site depths ranged between 7 and 15 m bgl. Below these natural superficial deposits, bedrock consisting of either phyllite, psammite, dolerite or schist/mica schist/chlorite schist was recorded. GI locations outside the site boundary but in the surrounding area are consistent with the geology within the north

and north-east of the site with sand and gravel deposits (6 to 22 m thick) over bedrock consisting of either phyllite, psammite, dolerite or schist/mica schist/chlorite schist.

Hydrogeological Setting

1.3.8 The SEPA Water Classification Hub (SEPA, 2021) shows the area to be underlain by Quaternary sands and gravels of the Isla and Lower Tay Sand and Gravel Aquifer. Quantitative, chemical and overall status for this aquifer are indicated to be poor. The bedrock is assigned to the Killin, Aberfeldy and Angus Glens aquifer. Quantitative, chemical and overall status for this aquifer are indicated to be good. Further details are presented in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater).

1.3.9 Boreholes completed for groundwater observation as part of the 2015 GI were monitored between July 2014 and October 2015. The measured groundwater levels were recorded within the superficial deposits at depths varying between approximately 0.5 m bgl and 9.87 m bgl (73 and 58 m AOD) for boreholes located on-site and between 5 and 23 m bgl (75 and 46 m AOD) for boreholes located in the surrounding area.

Land Contamination Setting

1.3.10 The Thorburn Colquhoun Report from 1994 provided detail on two historical contamination incidents associated with the site:

- During severe weather in early 1993, leachate was recorded entering the Inchewan Burn via a small watercourse located in the north-eastern area of the site and towards the Highland Main Line railway drainage system (which forms the north-east site boundary). During the subsequent earthworks for the creation of a temporary clay bund in the north-eastern extent of the site it was discovered that a drainage pipeline connected the landfill cell with this watercourse. The connection was intersected with the drainage from the landfill cell redirected to the leachate lagoon. The small watercourse was then connected to the clean water drainage ditches.
- Site observations of leachate emerging at the foot of steep slopes to the north of the landfill cell via springs. This leachate was initially collected in unlined French drains prior to discharge into the leachate lagoon. The drainage system was subsequently upgraded, and the French drains replaced with lined drains by 1996.

<u>Visual and Olfactory Evidence of Contamination during GI</u>

1.3.11 The one GI location within the landfill cell recorded waste material comprising mixed domestic and industrial waste with a strong sour smell to a depth of 14.2 m bgl.

1.3.12 No made ground was observed within any other GI location within the site boundary.

1.3.13 In-situ photoionisation detector (PID) measurements (used in the field to indicate the presence of volatile organics), were undertaken in all but two GI locations within the curtilage of Ladywell Landfill (BHBT114 and BH18100). The PID measurements were predominantly below 0.1 ppm (the limit of detection) with trace amounts found at the following two locations:

- 3.4 ppm at 0.5 m bgl within BHBT101B; and
- 1.6 ppm at 0.25 m bgl, 1.7 ppm at 0.5 m bgl and 1.4 ppm at 1 m bgl within BHBT118.

<u>Chemical Analysis of Soils</u>

1.3.14 Data obtained from the 2015 GI (SEGL, 2015) included the collection of nine soil samples from within the site which were submitted for chemical analysis as follows:

- eight samples were analysed for arsenic, cadmium, chromium, hexavalent chromium, lead, mercury, selenium, copper, zinc, vanadium, boron, total and free cyanide, soil organic matter content, sulphate as SO4, sulphide and speciated polycyclic aromatic hydrocarbons;
- one sample was analysed for arsenic, cadmium, chromium, lead, mercury, selenium, copper, zinc, vanadium, boron, total and free cyanide and speciated polycyclic aromatic hydrocarbons;
- four samples were analysed for total petroleum hydrocarbons including carbon banding; and
- four samples were analysed for total petroleum hydrocarbons including carbon banding with aliphatic/aromatic fraction separation.

1.3.15 The results of chemical analysis of soil sampling undertaken by PKC between 2013 to 2017 were also available for review. The Council annually collect surface soil samples from three locations that are within the spray irrigation zones; one from the clay cap within Zone 1 and two from within Zone 2. These samples are then analysed for the following analytes: pH value, arsenic, cadmium, chromium, lead, mercury, selenium, copper, nickel, zinc, iron and molybdenum.

1.3.16 These results have been compared against Generic Assessment Criteria (GAC; industry standard criteria) suitable for a commercial/industrial end use based on the limited potential exposure pathways to end users given the proposed use as a road. However, potential pathways remain including those for construction or maintenance workers. A conservative assessment using residential values (without plant uptake) has been carried out to highlight contaminants that may require further review as part of adopting appropriate health and safety procedures for future construction and/or maintenance workers.

1.3.17 The following hierarchy of GACs has been used to screen soil sample analysis results (based on a soil organic matter concentration of 1% to provide the most conservative approach):

- Suitable for Use Limits (S4ULs) for Human Health Risk Assessment, Land Quality Management (LQM)/Chartered Institute of Environmental Health (CIEH) (2015); and
- Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination, Department for Environment, Food and Rural Affairs (Defra, 2014).

1.3.18 The chemical analysis results indicate generally low concentrations of contaminants, with no exceedances of the relevant GACs recorded with one exception. Elevated concentrations of two polycyclic aromatic hydrocarbons (PAHs) were recorded in two soil samples from one location as shown in bold text in Table A9.2.2.

Table A9.2.2: Soil Sample Exceedances of GACs for PAHs.

Soil Sample ID (Exploratory Hole ID and depth of sample)	Soil Sample Location (with respect to Site Infrastructure)	Benzo (a) pyrene (mg/kg)	Dibenzo (ah) anthracene (mg/kg)
Residential without plants GAC (number of exceedances)		3.2 (2)	0.3 (2)
Commercial/Industrial GAC (number of exceedances)		35 (0)	3.5 (0)
Spray Irrigation Zone 2			
BHBT118: 0.5mbgl	Approximately 20m north/north-east of Leachate Lagoon	Not Analysed	Not Analysed
TPBT092: 0mbgl	Approximately 100m east of leachate lagoon	0.392	0.0585
TPBT092: 0.5mbgl		<0.015	<0.023
TPBT091: 0.5mbgl	Approximately 130m east of leachate lagoon	<0.015	<0.023

Soil Sample ID (Exploratory Hole ID and depth of sample)	Soil Sample Location (with respect to Site Infrastructure)	Benzo (a) pyrene (mg/kg)	Dibenzo (ah) anthracene (mg/kg)
BHBT110: 0.3mbgl	Approximately 170m east of leachate lagoon	<0.015	<0.023
Northern Landfill Cell Perimeter			
TPBT095: 0mbgl	Approximately 15m north of landfill cell	**4.710**	**0.941**
TPBT095: 0.5mbgl		**6.000**	**0.725**
TPBT097: 0mbgl	Approximately 50m north-west of landfill cell	0.050	<0.023
TPBT097: 0.5mbgl		<0.015	<0.023

1.3.19 The table presents the chemical analysis results for the two PAHs, benzo (a) pyrene and dibenzo (ah) anthracene, for all nine soil samples collected from the site during the 2015 GI (SEGL, 2015) along with an indication of the soil sample location with respect to site infrastructure. No visual or olfactory evidence of contamination was noted within the exploratory hole with the elevated concentrations (TPBT095) nor was any made ground encountered. However, the trial pit was located at the foot of the steep slope delineating the northern extent of the landfill cell, perhaps in the vicinity of the reported historical incident of leachate emerging via springs to the north of the landfill cell (Thorburn Colquhoun, 1994).

1.3.20 No significant contamination has been observed; however, it should be noted that the amount of GI data available is limited in both spatial coverage and range of analysis undertaken.

Groundwater

PKC Data

1.3.21 Monthly monitoring of surface water, groundwater and leachate is carried out by PKC (in compliance with WML/E20050). Each annual period of monitoring is summarised in a report by PKC for submission to SEPA. Annual summaries of the monitoring results for 2003, 2014, 2015, 2016 and 2017 were available for review. The monitoring locations are shown in Figure A9.2.1.

1.3.22 The PKC monthly monitoring covers key landfill water quality indicators, including pH, electrical conductivity, dissolved oxygen, ammoniacal nitrogen, nitrate and nitrite. In addition, concentrations of major ions and some heavy metals are measured quarterly. The majority of parameters were analysed against EU Council Directive 98/83/EC guidelines on the quality of water intended for human consumption. Guideline values for potassium were taken from inhouse drinking water standards from Severn Trent Water which equal standards set in The Water Supply (Water Quality) (Scotland) Regulations 1990. Concentrations of ammonia and chloride were also compared against Waste Management Paper Number 26A (WMP26A) (Department of Environment, 1993) leachate completion criteria. To establish baseline conditions with respect to groundwater quality the PKC water quality results have also been screened against resource protection values (RPV) published by SEPA (SEPA 2014).

1.3.23 Three locations have strong indications for the presence of leachate; the leachate lagoon, the reedbed discharge point and PKC BH3 (located to the north of the landfill cell). These three locations have concentrations of electrical conductivity, ammonium, nitrite and potassium far above those observed elsewhere across the site. When compared against PKC and SEPA guideline values, ammonium, nitrite and potassium exceed by a large order of magnitude as shown in Table A9.2.3.

Table A9.2.3: PKC Groundwater Quality Indicator Concentrations

Location	Water Quality Indicator Maximum Concentration			
	Electrical Conductivity (µS/cm)	Ammonium as NH_3 (mg/l)	Nitrite (mg/l)	Potassium (mg/l)
SEPA RPV	**2500**	**0.50**	**0.50**	-
PKC GAC	**1500**	**0.50**	**0.10**	**12.0**
WMP26A Leachate Completion Criteria	-	**5.00**	-	-
Leachate Lagoon	1330	73.00	75.00	52.0
Reedbed	1000	43.00	42.00	28.0
BH3 (north of landfill cell)	1460	75.00	70.00	70.0
BH1 and BH2 (south-east and south-west of landfill cell (up-gradient))	310	0.50	7.00	5.0
BH7 (north-west of landfill cell)	240	0.90	0.05	2.2
BH8 and BH9 (far north of landfill cell)	600	0.55	2.20	13.2
BH4, BH5 and BH6 (north-east of landfill cell (Spray Irrigation Zone 2))	780	8.40	0.80	16.8
BH10 (far north-east of landfill cell (Spray Irrigation Zone 2))	580	0.19	0.04	4.8

1.3.24 The remaining analytes do not show as high a variation in concentrations but there is a difference between the three locations containing or largely influenced by leachate (leachate lagoon, reedbed and BH3) and the remaining locations. With respect to the surrounding borehole locations, concentrations are generally higher within BH4, BH5, BH6, BH10 to the north and north-east and BH8 and BH9 to the north-west than BH1, BH2 (up-gradient) and BH7. Additional observations of note include:

- isolated occurrences of high concentrations for a few water quality indicators are observed in boreholes within Spray Irrigation Zone 2 (BH4, BH5, BH6);
- maximum chloride concentrations within BH8, BH9 and BH10 are equivalent to those observed within the leachate lagoon;
- maximum nitrate concentrations at BH6 are equivalent to those recorded within the reedbed; and
- the leachate lagoon is the only location to record the presence of cadmium with concentrations ranging between 9 and 23 mg/l, far in excess of SEPA RPV (0.0005 mg/l) and PKC GAC (0.0001 mg/l).

1.3.25 Based on the large variation in typical leachate constituents observed, the PKC monitoring results suggest that leachate influence is mainly confined to the landfill cell and leachate circulatory system with a seepage towards BH3 (located in close proximity to the landfill cell northern wall). The lower concentrations within BH8 and BH9 to the northwest suggest that if there is a leakage from the landfill cell in the vicinity of BH3 then natural dilution and dispersion effects are in place. The lower concentrations within BH10 to the north-east also suggest that natural attenuation is diluting the spray irrigation discharge concentrations observed within BH4, BH5 and BH6.

GI Data - Soil Leachate

1.3.26 The 2015 GI undertook single stage leachate analysis (10:1) of two soil samples from Spray Irrigation Zone 2; BHBT110 (0.3-1 m bgl) and TPBT092 (0.5-0.7 m bgl). No exceedances with respect to SEPA

RPVs were observed. No leachate analysis was undertaken on soils samples within which elevated concentrations of PAH had been observed (Table A9.2.2).

GI Data - Groundwater Sampling

1.3.27 Data obtained from the 2015 and 2016 GI included the collection of five groundwater samples from four boreholes located within the site (all within Irrigation Spray Zone 2) and one within the adjacent Ladywell Plantation (south of Irrigation Spray Zone 2). The five groundwater samples were submitted for chemical analysis as follows;

- all samples analysed for arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc, total cyanide, chloride, nitrate, nitrite and sulphate as SO_4;
- four samples included analysis for aluminium, boron, calcium, iron, manganese, magnesium, potassium, phosphorus, sodium, tin, electrical conductivity, free cyanide, total petroleum hydrocarbons including carbon banding with aliphatic/aromatic fraction separation and phenols;
- three samples included analysis for chromium iv, phosphate, sulphide, thiocyanate, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs); and
- one sample included analysis for molybdenum and speciated polycyclic aromatic hydrocarbons (PAHs).

1.3.28 To establish baseline conditions with respect to groundwater quality, the results from the five groundwater samples have been compared against SEPA RPVs. SEPA have not assigned an RPV for petroleum hydrocarbons, therefore, the laboratory limit of detection (LOD) has been adopted as a conservative GAC. The results of this comparison show that concentrations of typical leachate constituents were comparable with the concentrations encountered within PKC boreholes BH5 and BH6 with only minor exceedances for iron, manganese and some petroleum hydrocarbons with respect to RPV and LODs observed. The exceedances are as follows;

- the one borehole within Ladywell Plantation had minor exceedances of iron (0.88 mg/l), manganese (0.26 mg/l) and aliphatic petroleum hydrocarbons (19 to 39 µg/l);
- three boreholes within Spray Irrigation Zone 2 had minor exceedances of manganese (0.16 to 1.1mg/l), concentrations of manganese were not analysed at the fourth location; and
- two boreholes within Spray Irrigation Zone 2 had minor exceedances of aliphatic petroleum hydrocarbons (13 to 44 ug/l) with aromatic petroleum hydrocarbons also observed in one of the two boreholes (29 ug/l). The third borehole analysed for petroleum hydrocarbons (which is located closest to the leachate lagoon) did not recorded any petroleum hydrocarbons above the LOD (10 ug/l).

1.3.29 The 2015 and 2016 GI included a wider range of groundwater quality analysis. These results also show exceedances for manganese and petroleum hydrocarbons. Four locations to the north and north-east and two locations to the north-west of the site recorded exceedances of both aliphatic and aromatic petroleum hydrocarbons in addition to marker PAH benzo(a)pyrene. Given the higher concentrations and the proximity to alternative contamination sources; the existing A9 (PBTC-C1) and the Highland Main Line railway (PBTC-C2) it is likely that these exceedances are unrelated to the site.

Summary

1.3.30 The available data suggest that leachate influence on groundwater may not extend a great distance from the landfill; however, it is observed within PKC BH3 outside the leachate control system. No significant contamination has been observed; however, it should be noted that the amount of GI data available is limited in both spatial coverage and range of analytical analysis undertaken.

Ground Gas

PKC Data

1.3.31 PKC undertake ground gas monitoring of 3 borehole installations at six-month intervals in compliance with WML/E20050. The locations of the gas monitoring boreholes are shown in Figure A9.2.1 with two locations to the north of the landfill cell (LG1 and LG2) and one positioned within the landfill cell (LG3).

1.3.32 Monitoring was undertaken using a portable infra-red gas analyser (a GA2000 in 2003, 2014 and 2015 and a GFM436 in 2016 and 2017) measuring methane, carbon dioxide and oxygen concentrations. Barometric pressure was observed but flow rates from within the gas monitoring boreholes were not presented within the annual reports available for review.

1.3.33 As shown in Table A9.2.4, concentrations of methane and carbon dioxide were elevated and oxygen concentrations depleted within the landfill cell (LG3), with far lower concentrations of methane and carbon dioxide and less oxygen depletion within the two locations in the surrounding area.

1.3.34 Table A9.2.4 also compares the PKC ground gas concentrations against GACs considered appropriate for the protection of construction and maintenance workers from the following UK guidance for methane, carbon dioxide, carbon monoxide, hydrogen sulphide and depleted oxygen:

- Construction Industry Research and Information Association (CIRIA) 2007, Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007);
- Health and Safety Executive (HSE), Workplace Exposure Limits:2018 (HSE, 2018); and
- Mines and Quarries Act 1954, 27 (Section 55(2)(b)).

1.3.35 The HSE workplace exposure limits (WELs) are British occupational exposure limits set to protect the health of workers over a specified period of time, generally long term (LT), a period of 8 hours, and short term (ST) a period of 15 minutes.

Table A9.2.4: Summary of PKC Gas Monitoring Data

Location	Year	Number of Monitoring Events	Concentration Range (number of exceedances)		
			Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)
Ground Gas GAC			**Over 1 % v/v**	**Over 0.5 % v/v LT Over 1.5 % v/v ST**	**Under 19 % v/v**
LG1 – surrounding area north of landfill cell	2003	3	0.2 - 0.3 (0)	0.2 – 0.6 (2 LT) (0 ST)	18.6 – 20.2 (1)
	2014	2	<0.1 (0)	0.7 – 0.9 (2 LT) (0 ST)	19.3 (0)
	2015	2	<0.1 (0)	0.1 – 0.5 (1 LT) (0 ST)	18.6 – 20.9 (1)
	2016	2	<0.1 (0)	0.9 – 1.3 (2 LT) (1 ST)	20.1 – 23.3 (0)
	2017	2	<0.1 (0)	0.6 – 0.9 (2 LT) (0 ST)	20.6 – 22.6 (0)
LG2 – surrounding area north of landfill cell	2003	3	0.1 - 0.4 (0)	0.1 – 0.3 (0)	18.8 – 20.4 (1)
	2014	2	<0.1	1.5 – 3.4	17.1 – 20.4

Location	Year	Number of Monitoring Events	Concentration Range (number of exceedances)		
			Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)
			(0)	(2 LT and ST)	(1)
	2015	2	<0.1 (0)	0.5 – 2.9 (2 LT) (1 ST)	18.4 – 20.5 (1)
	2016	2	<0.1 (0)	<0.1 – 0.2 (0)	19.8 – 20.9 (0)
	2017	2	<0.1 (0)	<0.1 – 1.9 (1 LT and ST)	20.7 – 21.1 (0)
LG3 – within landfill cell	2003	3	2.6 – 14.4 (3)	1.3 – 8.7 (3 LT and ST)	5.2 – 18.7 (3)
	2014	2	16.5 -22.27 (2)	17.8 – 18 (2 LT and ST)	<0.1 – 1.2 (2)
	2015	2	20.3 – 20.6 (2)	17.5 – 19.4 (2 LT and ST)	0.6 – 1 (2)
	2016	2	<0.1 (0)	<0.1 (0)	21.1 – 22.8 (0)
	2017	2	<0.1 (0)	0.5 – 0.9 (2 LT) (0 ST)	19.3 – 20.9 (0)

1.3.36 High concentrations of methane are present within the landfill cell (LG3) in 2003, 2014 and 2015, however, in 2016 and 2017, methane concentrations are reported below the instrumentation limit of detection (<0.1 % v/v). Concentrations of carbon dioxide and depleted oxygen show a similar trend with high concentrations observed in 2003, 2014 and 2015 with a dramatic decrease in 2016 and 2017. The concentrations within LG3 have historically varied according to atmospheric pressure, with higher methane and carbon dioxide concentrations recorded during periods of low atmospheric pressure. The dramatic decreases in methane and carbon dioxide during 2016 and 2017 coincide with a change in ground gas monitoring instrumentation and it is therefore unclear whether this could be due to instrumentation errors or not.

GI Data

1.3.37 The boreholes installed for groundwater quality monitoring described in paragraph 1.3.27 were also utilised for monitoring concentrations of ground gases including methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide (SEGL, 2015; Fugro, 2016). Atmospheric pressure and borehole flow rate were also reported. Monitoring was undertaken using a portable infra-red gas analyser (a GA2000 for BH18100 and a GA5000 for all other locations). The ground gas data is summarised and compared against relevant ground gas GAC in Table A9.2.5.

Table A9.2.5 Summary of GI Gas Monitoring Data

Borehole ID	Number of Monitoring Events	Concentration Range (number of exceedances)					Flow Rate (l/hr)
		Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
Ground Gas GAC		**>1 % v/v**	**> 0.5 % v/v LT >1.5 % v/v ST**	**<19 % v/v**	**> 30ppm LT > 200ppm ST**	**> 5ppm LT > 10ppm ST**	
BHBT114	18	<0.1 (0)	0.3 – 5.9 (15 LT) (4 ST)	14.8 – 21.9 (3)	<1 – 15 (0)	<1 (0)	<0.1 – 0.8
BH18100	1	<0.1 (0)	<0.1 (0)	21.3 – 21.4 (0)	<1 (0)	<1 (0)	- 0.1
BHBT100	8	<0.1 (0)	– 0.8 (4 LT) (0 ST)	19.6 – 2.3 (0)	<1 (0)	<1 (0)	0.6
BHBT103	20	<0.1 (0)	0.2 – 5.4 (16 LT) (6 ST)	14.1 – 22.4 (0)	<1 – 7 (0)	<1 (0)	0.8
BHBT109A	8	<0.1 (0)	0.4 – 1.3 (7 LT) (0 ST)	19.5 – 20.6 (0)	<1 (0)	<1 (0)	<0.1 – 0.8

1.3.38 No methane or hydrogen sulphide was detected above the instrumentation limit of detection. Minor concentrations of carbon dioxide, carbon monoxide and depleted oxygen were observed on occasion. Flow rates are generally low. All monitoring locations are within Spray Irrigation Zone 2 to the north and north-east of the landfill cell with one location within 70 m and the other four over 200 m from the leachate lagoon.

Summary

1.3.39 The PKC gas data has shown that high concentrations of methane ground gas have been present within the landfill cell. Ground gas monitoring undertaken as part of the 2015 and 2016 GIs within the surrounding area to the north and north-east of the landfill cell do not observe methane concentrations above instrumentation limit of detection. Depleted oxygen and concentrations of carbon dioxide in exceedance of HSE workplace exposure limits are present across the site. No ground gas monitoring has been undertaken at PKC BH3 where a potential leachate outbreak has been observed.

1.4 Potential Land Contamination Risks

Introduction

1.4.1 Potential land contamination risks relating to current and historical soil and groundwater contamination associated with Ladywell Landfill for each proposed route option have been assessed in accordance with the methodology set out in *Appendix 9.3: Land Contamination Risk Assessment*.

1.4.2 There are two potential ways in which construction of the proposed route options could be impacted by the site:

- direct disturbance of potential land contamination (i.e. the proposed route option's footprint impinges on the site; pollutant linkages PL1, PL2, PL3, PL12, PL13 and PL14); and

- indirect disturbance of potential land contamination (i.e. a potential pathway exists or is created within the proposed route option's footprint; pollutant linkages PL4, PL10, PL15 and PL21).

1.4.3 Construction and operation have been considered together as the majority of construction effects (such as removal of excavated material or dewatering due to road cuttings) would extend throughout operation, although the likelihood of direct disturbance is considered to decrease during operation. Where differences in potential land contamination risks are predicted between construction and operation, these risks have been assessed for each in turn.

1.4.4 Where pollutant linkages due to indirect disturbance of groundwater are anticipated the Sichardt method (Preene et al., 2016) has been used to estimate the zone of influence of dewatering around each of these cuttings. Local ground models were then considered to provide an informed assessment of likely indirect land contamination risks for each cutting.

Consequence of Effect

1.4.5 Adopting the criteria within Table A9.3.3 within *Appendix A9.3 Land Contamination Risk Assessment* and based on the nature of contamination associated with the site, direct disturbance of potential land contamination via pollutant linkages PL1, PL3, PL12 and PL14 (direct interaction with soil and groundwater) and indirect disturbance via pollutant linkages PL10 and PL21 (indirect contact with groundwater) are considered to be of medium consequence in the landfill cell or very close proximity. Direct disturbance of ground gas (pollutant linkages PL2 and PL13) and indirect disturbance (PL4 and PL15) are considered to be of severe consequence in the landfill cell or very close proximity. The consequence is expected to decrease as direct/indirect disturbance takes place further away from the landfill cell. This is reflected in the assessment below.

Land Contamination Risks Specific to Option ST2A

Soils and Groundwater

1.4.6 Potential land contamination risks specific to Option ST2A due to direct and indirect disturbance of potentially contaminated soils and groundwater related to Ladywell Landfill may occur in relation to the proposed new access road to Birnam Glen which incorporates two cuttings (CS3 and CS4), an attenuation pond cutting (Pond D) and mainline cutting C2 (sub-zone C2c).

Direct Disturbance

1.4.7 The proposed new Birnam Glen access road (incorporating cuttings CS3 and CS4) and Pond D are located within the site boundary and therefore will involve the direct disturbance of potentially contaminated soils and groundwater.

Direct Disturbance - CS3 and Pond D

1.4.8 Cutting CS3 and Pond D will be excavated into an area formerly used for spray irrigation of excess landfill leachate. The likelihood of an event linking human health receptors to potentially contaminated soils and groundwater via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is considered to be likely during construction and low likelihood during operation. Given the distance from the landfill cell and the known chemical composition of the soils and groundwater in the proposed locality of the cuttings the consequence is considered to be mild, giving a potential land contamination risk of Moderate/Low risk during construction and Low risk during operation.

Direct Disturbance - CS4

1.4.9 Cutting CS4 will be partially excavated into Spray Irrigation Zone 2; however, the cutting is in close proximity to the landfill cell and leachate lagoon, therefore it is likely to encounter soils potentially affected by contaminated groundwater. The likelihood of an event linking human health receptors to potentially contaminated soils and groundwater via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is considered to be likely during construction and low likelihood during operation. Given the proximity to the landfill cell and leachate lagoon the consequence is considered to be medium, giving a potential land contamination risk of Moderate risk during construction and Moderate/Low risk during operation.

Indirect Disturbance

1.4.10 Cuttings C2 (sub-zone C2c), CS3 and CS4 were considered likely to intercept groundwater in Table 9.17 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) and therefore potential land contamination risks due to indirect disturbance of potentially contaminated groundwater exist. The following ground models have been consulted to determine the likelihood and consequence and subsequently the potential land contamination risk for each cutting:

- Figure A9.2.2, long-section along and parallel to the proposed A9 alignment (ch3500 to ch4000);
- Figure A9.2.3, cross-section perpendicular to the proposed A9 and Birnam Glen access road (ch3500);
- Figure A9.2.4, cross-section perpendicular to the proposed A9, Birnam Glan access road and the site (ch3770);
- Figure A9.2.5, cross-section perpendicular to the proposed A9 and Birnam Glen access road (ch3900); and
- Figure A9.2.6, long-section along and parallel to the south of the proposed A9 alignment within the site boundary (ch3650 to ch3950).

Indirect Disturbance - C2 (sub-zone C2c)

1.4.11 The ground models suggest that cutting C2 (sub-zone C2c), approximately 75 m north of the leachate lagoon and approximately 15 m deep, will intercept groundwater. Based on the assumption that concentrations of potential contaminants within groundwater will reduce due to the operation of natural attenuation processes and the distance between the landfill cell and the cutting, the potential consequence is considered to be mild. The likelihood of an event linking surface water receptors to potentially contaminated groundwater via pollutant linkages PL10 (construction) and PL21 (operation) due to intercepting a contamination plume is considered to be likely, giving a potential land contamination risk of Moderate/Low risk.

Indirect Disturbance - CS3

1.4.12 The ground models have established that cutting CS3 is unlikely to intercept groundwater and therefore there are no anticipated indirect pollutant linkages associated with this cutting.

Indirect Disturbance - CS4

1.4.13 Cutting CS4 is located in close proximity to the landfill cell and leachate lagoon and potentially down gradient from PKC BH3, where the highest concentrations of contaminants in groundwater are observed. This cutting will be over 8 m deep and the ground models suggest the cutting will intercept shallow groundwater. The likelihood of an event linking surface water receptors to potentially contaminated groundwater via pollutant linkages PL10 (construction) and PL21 (operation) due to intercepting a

contamination plume is considered to be high and the consequence medium giving a potential land contamination risk of High risk.

Ground Gas

1.4.14 Significantly elevated concentrations of methane and carbon dioxide ground gas have only been detected within the landfill cell. Option ST2A will not directly disturb the landfill cell, therefore, there should be no alteration to the present-day gas regime and consequently no creation of new pollutant linkages involving off-site receptors (PL4 and PL15) (indirect disturbance). Depleted oxygen and concentrations of carbon dioxide in exceedance of HSE workplace exposure limits will present a risk to construction and maintenance workers via PL2 and PL13 (direct disturbance) during construction and operation respectively.

C2 (sub-zone C2c), CS3 and Pond D

1.4.15 Based on the distance from the landfill cell and the known ground gas concentrations encountered in the vicinity of cuttings C2 (sub-zone C2c), CS3 and Pond D, the consequence in this locality is considered to be medium. The likelihood of a complete source-pathway-receptor linkage is considered to be likely, therefore, the potential land contamination risk is considered to be Moderate risk for construction and maintenance workers via PL2 and PL13.

CS4

1.4.16 Considering the close proximity of cutting CS4 to the landfill cell and the lack of ground gas data in the locality, a precautionary approach has been adopted. Thus, in the vicinity of CS4, the consequence with respect to ground gas is considered to be severe. A complete source-pathway-receptor linkage is considered to be likely and so the potential land contamination risk is considered to be High risk for construction and maintenance workers via pollutant linkages PL2 and PL13.

Land Contamination Risks Specific to Option ST2B

Soils and Groundwater

1.4.17 Potential land contamination risks specific to Option ST2B due to direct and indirect disturbance of potentially contaminated soils and groundwater related to Ladywell Landfill may occur in relation to the proposed new access road to Birnam Glen which incorporates two cuttings (CS3 and CS4), an attenuation pond cutting (Pond D) and mainline cutting C7.

Direct Disturbance

1.4.18 The proposed design for the new Birnam Glen access road and associated attenuation pond are identical to that proposed for Option ST2A, therefore, the identified land contamination risks for cuttings CS3, CS4 and Pond D within Option ST2A are also applicable for Option ST2B. A Moderate/Low potential land contamination risk due to direct disturbance of potential land contamination for cuttings CS3 and Pond D during construction reducing to Low risk during operation and a Moderate potential land contamination risk for cutting CS4 during construction lowering to Moderate/Low risk during operation.

Indirect Disturbance

1.4.19 Cuttings C7, CS3 and CS4 were considered likely to intercept groundwater in Table 9.20 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) and therefore potential land contamination risks due to indirect disturbance of potentially contaminated groundwater exist. The following ground models have been consulted to determine the likelihood and consequence and subsequently the potential land contamination risk for each cutting:

- Figure A9.2.7, long-section along and parallel to the proposed A9 alignment (ch3500 to ch4000); and
- Figure A9.2.8, cross-section perpendicular to the proposed A9, Birnam Glan access road and the site (ch3770).

Indirect Disturbance - C7

1.4.20 The ground models suggest that cutting C7, approximately 75 m north of the leachate lagoon and approximately 10 m deep, will intercept groundwater. Based on the assumption that concentrations of potential contaminants within groundwater will reduce due to the operation of natural attenuation processes and the distance between the landfill cell and the cutting, the potential consequence is considered to be mild. The likelihood of an event linking surface water receptors to potentially contaminated groundwater via pollutant linkages PL10 (construction) and PL21 (operation) due to intercepting a contamination plume is considered to be likely, giving a potential land contamination risk of Moderate/Low risk.

Indirect Disturbance - CS3

1.4.21 Identical to CS3 within Option ST2A, the ground model (Figure A9.2.3) has established that CS3 is unlikely to intercept groundwater and therefore no indirect pathways are predicted for this cutting.

Indirect Disturbance - CS4

1.4.22 This cutting is identical to CS4 within Option ST2A and therefore identified potential land contamination risks are also applicable for Option ST2B i.e. a High potential land contamination risk on surface water receptors via pollutant linkages PL10 (construction) and PL21 (operation).

Ground Gas

1.4.23 The proposed design for the new Birnam Glen access road and associated attenuation pond are identical to that proposed for Option ST2A. In addition, the proposed design for mainline cutting C7 is equivalent to that for Option ST2A C2 (sub-zone C2c) with a similar footprint excavated to a shallower depth. Therefore, the identified potential land contamination risks for Option ST2A are also applicable for Option ST2B i.e. Moderate potential land contamination risk for construction and maintenance workers via pollutant linkages PL2 and PL13 in the vicinity of cuttings C7, CS3 and Pond D and High potential land contamination risk in the vicinity of CS4.

Land Contamination Risks Specific to Option ST2C

Soils and Groundwater, and Ground Gas

1.4.24 No earthworks associated with Option ST2C are proposed within the site boundary and therefore no direct disturbance of potentially contaminated soils or groundwater and no direct/indirect disturbance of ground gas associated with Ladywell Landfill are predicted.

Indirect Disturbance

1.4.25 Potential land contamination risks due to the indirect disturbance of contaminated groundwater may occur in relation to four cuttings which are considered likely to intercept groundwater, CS13, CS14, CS15 and CS16 (as shown in Table 9.23 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater)). The following ground models have been consulted to determine the likelihood and consequence and subsequently the potential land contamination risks for each cutting:

- Figure A9.2.9, long-section along and parallel to the south of the proposed A9 alignment (ch3500 to ch4000);
- Figure A9.2.10, cross-section perpendicular to the proposed A9 alignment and the site (ch3770);
- Figure A9.2.11, cross section through proposed A9 alignment (ch4000); and
- Figure A9.2.12, long-section along and parallel to the south of the proposed A9 alignment (ch4000 to ch4500).

Indirect Disturbance - CS13

1.4.26 The ground models suggest that CS13, approximately 75 m north of the leachate lagoon and approximately 11 m deep, will intercept groundwater. Based on the assumption that concentrations of potential contaminants within groundwater will reduce due to the operation of natural attenuation processes and the distance between the landfill cell and the cutting, the potential consequence is considered to be mild. The likelihood of an event linking surface water receptors to potentially contaminated groundwater via pollutant linkages PL10 (construction) and PL21 (operation) due to intercepting a contamination plume is considered to be likely, giving a potential land contamination risk of Moderate/Low risk.

Indirect Disturbance - CS14

1.4.27 Cutting CS14, approximately 130 m north of the leachate lagoon and approximately 8 m deep, may intercept groundwater to a limited degree. Consequently, the dewatering zone of influence predicted is small in extent and does not include the site. Therefore, no indirect disturbance of potentially contaminated groundwater associated with Ladywell Landfill is predicted for CS14.

Indirect Disturbance - CS15

1.4.28 The ground models suggest that cutting CS15, approximately 180 m north-west of the leachate lagoon and approximately 7 m deep, will intercept groundwater. Although the site lies within its potential dewatering zone of influence it is more likely that any groundwater contamination plume would move towards the closer and deeper CS13. If any contaminated groundwater did reach CS15 a high degree of natural attenuation is expected to have occurred and the potential consequence is considered to be minor. The likelihood of cutting CS15 intercepting a groundwater plume from the site is considered to be low. Consequently, the potential land contamination risk is Very Low risk.

Indirect Disturbance - CS16

1.4.29 Although the calculated dewatering zone of influence for Cutting CS16 extends to include Ladywell Landfill, the local ground models (Figure A9.2.11 and Figure A9.2.12) indicate that due to existing topography CS16 is unlikely to intercept groundwater originating from Ladywell Landfill. The cutting is located approximately 230 m north-east of the site and on the opposite side of a valley containing the A822. As there is not expected to be groundwater flow from the site to the cutting, there is no indirect disturbance of potentially contaminated groundwater associated with Ladywell Landfill for CS16.

Land Contamination Risks Specific to Option ST2D

Soils and Groundwater, and Ground Gas

1.4.30 No earthworks associated with Option ST2D are proposed within the site boundary and therefore no direct disturbance of potentially contaminated soils or groundwater and no direct/indirect disturbance of ground gas associated with Ladywell Landfill are predicted.

Indirect Disturbance – C9

1.4.31 Potential land contamination risks due to the indirect disturbance of contaminated groundwater may occur in relation to one cutting which is considered likely to intercept groundwater, C9 (as shown in Table 9.26 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater)). A local ground model (Figure A9.2.13) has been consulted to determine the likelihood and consequence and, subsequently, the potential land contamination risk.

1.4.32 The ground model (Figure A9.2.13) suggests that cutting C9, approximately 85 m north of the leachate lagoon and approximately 5 m deep, may intercept groundwater to a limited degree. The dewatering zone of influence is predicted to intercept groundwater within Spray Irrigation Zone 2 and not the main contamination source (the landfill cell and leachate lagoon). Therefore, considering the predicted zone of influence and the process of natural attenuation, the potential consequence is considered to be mild. The likelihood of intercepting a contamination plume is considered to be likely, giving a potential land contamination risk of Moderate/Low risk.

1.5 Summary and Information Gaps

Summary

1.5.1 The Ladywell Landfill near Dunkeld has been identified as a potential risk to the proposed route options during both the construction and operational phases. This appendix has presented a review of the available GI and documentary information and a preliminary assessment of the potential land contamination risks associated with the landfill.

1.5.2 The landfill site initially operated as a stone quarry from 1867 to 1938, subsequently operating as a landfill accepting a variety of waste types until 1993. Landfill restoration work was carried out until 1996, since which the site has been subject to an environmental monitoring programme undertaken by PKC, who manage the site under WML reference WML/E/20050.

1.5.3 Leachate drains from the waste mass to a leachate collection lagoon down gradient of the landfill, which is then pumped to two storage reservoirs at the top of the landfill prior to being diverted through a reed bed system and then returned to the collection lagoon in a loop. A spray irrigation system is in place on the face of the tip and fields to the north which operates should the volume of leachate exceed the storage capacity.

1.5.4 The available data indicates that typical landfill leachate constituents are present within the leachate circulation and irrigation system, but leachate influence does not appear to be spreading significantly beyond the circulation system and irrigation area to off-site areas. However, PKC have identified a potential leak of leachate from the north side of the landfill (in the vicinity of monitoring borehole BH3).

1.5.5 Uncertainty remains over the source of the hydrocarbons identified in the soil and groundwater within the vicinity of the existing A9. There is a plausible transport mechanism between the landfill and the affected area (via shallow groundwater) but the railway and existing A9 are alternative sources. However, as monitoring of the landfill does not include hydrocarbon analysis it cannot currently be definitively discounted as a source. Ground gas (methane and carbon dioxide) concentrations are high within the landfill cell itself, with lower concentrations of carbon dioxide (methane is absent) within the monitoring locations to the north and north-east suggesting that ground gas is not migrating far beyond the cell boundary. It should however be noted that the spatial extent of monitoring is limited with no coverage within the area of the potential leak.

Potential Effects of Proposed Route Options

1.5.6 Potential land contamination risks associated with Ladywell Landfill site may arise either through direct disturbance of potential land contamination (pollutant linkages PL1, PL2, PL3, PL12, PL13 and PL14), or through indirect disturbance of potential land contamination (pollutant linkages PL10 and PL21).

1.5.7 The land contamination risk assessment has identified potential land contamination risks associated with each proposed route option as a result of interaction with Ladywell Landfill. Potential direct land contamination risks are summarised in Table A9.2.6 and potential indirect land contamination risks are summarised in Table A9.2.7. These land contamination risks are assessed prior to the implementation of mitigation; potential mitigation is identified and described in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The results are incorporated into the land contamination risk assessment presented in *Appendix A9.3: Land Contamination Risk Assessment*.

Table A9.2.6: Potential Direct Land Contamination Risks associated with Ladywell Landfill.

Route Option	Cutting	Pollutant Linkage	Likelihood	Consequence	Risk
ST2A	CS3 (Birnam Glen Access Road)	PL1 and PL3	Likely	Mild	Moderate/Low
		PL12 and PL14	Low Likelihood	Mild	Low
		PL2 and PL13	Likely	Medium	Moderate
	CS4 (Birnam Glen Access Road)	PL1 and PL3	Likely	Medium	Moderate
		PL12 and PL14	Low Likelihood	Medium	Moderate/Low
		PL2 and PL13	Likely	Severe	High
	C2c	PL2 and PL13	Likely	Medium	Moderate
ST2B	CS3 (Birnam Glen Access Road)	PL1 and PL3	Likely	Mild	Moderate/Low
		PL12 and PL14	Low Likelihood	Mild	Low
		PL2 and PL13	Likely	Medium	Moderate
	CS4 (Birnam Glen Access Road)	PL1 and PL3	Likely	Medium	Moderate
		PL12 and PL14	Low Likelihood	Medium	Moderate/Low
		PL2 and PL13	Likely	Severe	High
	C7	PL2 and PL13	Likely	Medium	Moderate

Table A9.2.7: Potential Indirect Land Contamination Risks associated with Ladywell Landfill.

Route Option	Cutting	Pollutant Linkage	Likelihood	Consequence	Risk
ST2A	C2: sub-zone C2c (Mainline Cut and Cover Tunnel)	PL10 and PL21	Likely	Mild	Moderate/Low
	CS3 (Birnam Glen Access Road)	The ground model (Figure A9.2.3) has shown that CS3 is unlikely to intercept groundwater, therefore no indirect land contamination risks are predicted for this cutting.			
	CS4 (Birnam Glen Access Road)	PL10 and PL21	High Likelihood	Medium	High
ST2B	C7 (Mainline Underpass)	PL10 and PL21	Likely	Mild	Moderate/Low

Route Option	Cutting	Pollutant Linkage	Likelihood	Consequence	Risk
	CS3 (Birnam Glen Access Road)	The ground model (Figure A9.2.3) has shown that CS3 is unlikely to intercept groundwater, therefore no indirect land contamination risks are predicted for this cutting.			
	CS4 (Birnam Glen Access Road)	PL10 and PL21	High Likelihood	Medium	High
ST2C	CS13 (Dunkeld Junction: Northbound Diverge)	PL10 and PL21	Likely	Mild	Moderate/Low
	CS14 (Dunkeld Junction: Southbound Merge)	The calculated zone of influence has shown that CS14 is unlikely to intercept groundwater originating from Ladywell Landfill. Therefore, there is no indirect disturbance of potentially contaminated groundwater associated with Ladywell Landfill for CS14.			
	CS15 (Dunkeld Junction: Realigned A923/A822)	PL10 and PL21	Low Likelihood	Mild	Low
	CS16 (Dunkeld Junction: Road to Inver)	The ground model (Figure A9.2.8) has shown that CS16 is unlikely to intercept groundwater originating from Ladywell Landfill. Therefore, there is no indirect disturbance of potentially contaminated groundwater associated with Ladywell Landfill for CS16.			
ST2D	C9 (Mainline Cutting)	PL10 and PL21	Likely	Mild	Moderate/Low

Uncertainties and Information Gaps

1.5.8 This land contamination risk assessment has been developed using data currently available for the site (including site history, previous reports, and recent ground investigation). There are limited data in some areas relating to soil, groundwater and ground gas conditions and potential contaminants of concern. The main uncertainties are as follows:

- Limited groundwater level monitoring data in the area around the landfill and in some areas of the proposed route options. Potential groundwater flow pathways and interactions with proposed cuttings may not be fully understood.
- Limited spatial extent of ground gas monitoring outside the waste mass perimeter and insufficient additional field data gathered during monitoring events such as ground gas flow rates and borehole groundwater level at time of measurement. As such, information on potential gas migration pathways in all directions from the source zone is not available.
- It is assumed, given the age of the landfill, that no confining low permeability basal layer is present, and that leachate is likely to be hydraulic continuity with any shallow groundwater present.
- The composition of the waste is unclear; it has not been possible to review deposition records (assuming they exist), and a wide variety of potentially hazardous substances could be present within the waste which may not have been identified to date, including solid phase pollutants such as asbestos.
- Petroleum hydrocarbons have been identified within the vicinity of the A9, and, while the Ladywell Landfill is not considered to be a likely hydrocarbon source it cannot currently be discounted as the PKC monitoring programme does not include hydrocarbon analysis.

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Appendix A9.3: Land Contamination Risk Assessment

1.1 Introduction

1.1.1 This appendix provides the land contamination risk assessment supporting Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). Potential sources of land contamination are listed within *Appendix A9.1: Potential Sources of Land Contamination within Study Area* with locations provided on Figures 9.1 to 9.4. Further detail on potential land contamination risks specific to Ladywell Landfill (PBTC-C22) is provided in *Appendix A9.2: Ladywell Landfill*. The findings from the Ladywell Landfill review have informed the land contamination risk assessment within this appendix.

1.2 Approach

1.2.1 Risk assessment for the assessment and management of land contamination is central to Part IIA of the Environmental Protection Act 1990, which was implemented through the Contaminated Land (Scotland) Regulations 2000 (as amended). The main principle of this approach is that a risk only exists if a suitable pathway exposes identified receptors to the hazard (or source) in question. This is referred to as a pollutant linkage.

1.2.2 The Part IIA regime and supporting guidance has therefore resulted in the development of a formalised and explicit technical approach to assess risks to humans, the water environment, ecosystems and buildings (building materials), which is applicable to any land contamination and management project.

1.2.3 Statutory guidance for the assessment of land contamination, Land Contamination: Risk Management (LCRM) (EA, 2020), identifies three core components in the assessment and management of land contamination, comprising: Risk Assessment; Options Appraisal; and Remediation.

1.2.4 The first stage, risk assessment has 3 tiers:

- Tier 1: Preliminary Risk Assessment;
- Tier 2: Generic Quantitative Risk Assessment; and
- Tier 3 Detailed Quantitative Risk Assessment.

1.2.5 The first tier, a Preliminary Risk Assessment, was undertaken within three separate Preliminary Sources Study Reports (PSSR) that cover the study area (Scott Wilson, 2011; Jacobs, 2013a; Jacobs 2013b). The preliminary risk assessments are presented within a preliminary conceptual site model (CSM). The preliminary CSMs were developed in general accordance with the methodologies set out in Contaminated Land Report 11: Model Procedures for the Management of Land Contamination (CLR 11) (Defra & Environment Agency, 2004) which was the statutory guidance at that time.

1.2.6 This appendix documents the revision of the preliminary CSM via the development of a series of generic quantitative risk assessments (GQRA), undertaking Tier 2 of the LCRM methodology, to identify the potential land contamination risks which are common to all proposed route options and those which are route option specific. The GQRAs have been developed based on information gathered subsequent to the preliminary CSMs and during the DMRB Stage 2 assessment process and includes data derived from the scheme specific ground investigations (GIs) designed specifically to support the project. The GQRAs developed are considered suitable for a DMRB Stage 2 options assessment although they are highly conservative and reflect the worst-case scenario. Once the Preferred Route Option is confirmed a full GQRA specific to the Preferred Route Option would be undertaken.

1.3 Updated Conceptual Site Model

1.3.1 The updated CSM represents a network of relationships between potential hazards (sources) and the receptors that may be exposed to the hazards through linking pathways. The proposed route options involve the alteration of existing road infrastructure that will include earthworks such as excavations, stockpiling of excavated material and piling. Therefore, the potential pollutant linkages in the context of the proposed route options are related to the direct and non-direct disturbance of existing on/off-site contamination, thereby creating new pollutant linkages. The potential pollutant linkages relevant to the proposed route options are provided in Table A9.3.1 and have been compiled based on the legal definitions used in Part IIA of the Environmental Protection Act 1990, as provided in statutory guidance (Scottish Executive, 2006). Details of the potential land contamination sources are provided within *Appendix A9.1: Potential Sources of Land Contamination within Study Area* and *Appendix A9.2: Ladywell Landfill*.

Table A9.3.1: Potential Pollutant Linkages – Receptors and Pathways

Pollutant Linkage	Receptor	Pathway
Construction		
PL1	On-site Human Health (Construction)	Ingestion, inhalation and dermal contact with soil, soil dust and fibres (asbestos), inhalation of vapours, deep and shallow groundwater and surface water.
PL2		Migration of ground gases into shallow pits or site buildings.
PL3	Off-site Human Health (local residents, recreational open space users and transient traffic (foot, road and rail))	Ingestion, inhalation and dermal contact with wind-blown dust created during excavation works.
PL4		Migration of ground gases into homes or workplaces through preferential pathways created during construction posing a potential asphyxiation/ explosion risk.
PL5	Water Environment (superficial groundwater)	Leaching and migration of contaminants through natural deposits and made ground.
PL6	Water Environment (bedrock groundwater)	Migration of contaminants or contaminated shallow groundwater into the deeper rock aquifer.
PL7	Water Environment (surface water)	Migration/mobilisation of contaminated shallow groundwater through drift deposits or made ground.
PL8		Runoff from contaminated source(s).
PL9		Migration of contaminated bedrock groundwater towards surface water receptor.
PL10		Discharge of intercepted contaminated groundwater during passive or active dewatering.
PL11	Ecological receptors (water dependant habitats and agricultural land/livestock)	Inhalation, ingestion and direct contact with contaminated soils, soil dust, fibres (asbestos) and water.
Operation		
PL12	On-site Human Health (Operational)	Ingestion, inhalation and dermal contact with soil, soil dust and fibres (asbestos), inhalation of vapours, deep and shallow groundwater and surface water in the long term during routine maintenance e.g. drainage inspections.
PL13		Migration of ground gases into shallow pits or site buildings confined spaces e.g. service pits, accommodation buildings creating an asphyxiation/explosion risk.
PL14	Off-site Human Health (local residents, recreational open space users, transient traffic: foot, road and rail)	Ingestion, inhalation and dermal contact with wind-blown dust created during excavation works from contaminated soils re-used within road features such as embankment and landscaped areas.
PL15		Migration of ground gases into homes or workplaces through preferential pathways remaining following created during construction thus posing a potential asphyxiation/explosion risk.
PL16	Water Environment (superficial groundwater)	Leaching and migration of contaminants.

Pollutant Linkage	Receptor	Pathway
PL17	Water Environment (bedrock groundwater)	Migration of contaminants or contaminated shallow groundwater into the deeper rock aquifer.
PL18	Water Environment (surface water)	Migration/mobilisation of contaminated shallow groundwater through drift deposits or made ground.
PL19		Runoff from contaminated source(s).
PL20		Migration of contaminated shallow superficial groundwater through drainage channels and associated granular bedding materials or engineered structures towards surface water receptor.
PL21		Discharge of intercepted contaminated groundwater.
PL22	Ecological receptors	Inhalation, ingestion and direct contact with contaminated soils/water soil dust, fibres (asbestos) and water.

1.4 Generic Qualitative Risk Assessment (Evaluation of Land Contamination Risk)

1.4.1 A number of potential sources of land contamination, pollutant linkages and receptors that may be at risk as a result of the proposed route options have been identified. Potential risks have been assessed where complete pollutant linkages have been identified between potential sources of land contamination and receptors.

1.4.2 There are two potential ways in which construction of the proposed route options could impact land contamination:

- direct disturbance of potential land contamination sources (i.e. sources are within the proposed route option footprint); and
- indirect disturbance of potential land contamination sources as a result of construction of the proposed route option (i.e. a potential pathway exists or is created within the proposed route option footprint).

1.4.3 In order to establish the level of potential risk that may be present, the guidance set out within CIRIA C552 'Contaminated Land Risk Assessment: A Guide to Good Practice' (CIRIA, 2001) and 'Land Contamination: Risk Management' (EA, 2020) has been followed. These state that the designation of land contamination risk should be based on:

- the likelihood of the risk being present – cognisant of the presence of a source and receptor, and the integrity of the pathway, versus
- the severity of the potential consequence should the risk be realised – taking into account the severity of the source, the sensitivity of the receptor and the duration of potential effects where appropriate.

1.4.4 The output of the land contamination assessment is therefore reported as the 'likelihood' of a complete pollutant linkage being present, the 'consequence' of effect on likely receptors, followed by an evaluation of risk, taking account of both likelihood and consequence, as defined in Table A9.3.2 (Likelihood), Table A9.3.3 (Consequence) and Table A9.3.4 (Matrix for Evaluation of Land Contamination Risk).

Table A9.3.2: Likelihood Criteria for Evaluation of Land Contamination Risk

Likelihood	Definition
High Likelihood	There is a complete pollution linkage of an event that either appears very likely in the short term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is a complete pollution linkage and all the elements are present and available, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over a long-term.
Low Likelihood	There is a complete pollution linkage and the circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.
Unlikely	There is a complete pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table A9.3.3: Consequence Criteria for Evaluation of Land Contamination Risk

Consequence	Definition
Severe	Short-term (acute) damage to human health (significant harm). Pollution of sensitive water resources as a result of short-term exposure. Damage to a particular ecosystem as a result of acute exposure. Catastrophic damage to buildings/property.
Medium	Long-term (chronic) damage to human health (significant harm). Pollution of sensitive water resources as a result of chronic exposure. A significant change in a particular ecosystem, or organism forming part of such an ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.
Minor	Harm (not necessarily significant), which may result in financial loss or require expenditure to resolve. Non-permanent health affects to human health. Easily reparable damage to buildings, structures and services.

Table A9.3.4: Matrix for Evaluation of Land Contamination Risk

Consequence	Likelihood			
	Unlikely	**Low Likelihood**	**Likely**	**High Likelihood**
Severe	Moderate/Low	Moderate	High	Very High
Medium	Low	Moderate/Low	Moderate	High
Mild	Very Low	Low	Moderate/Low	Moderate
Minor	Very Low	Very Low	Low	Moderate/Low

1.4.5 The land contamination risk assessment first considers those impacts which are common to all proposed route options before presenting additional risks which are option specific.

Common to All Proposed Route Options

Direct Disturbance

Soils and Groundwater - Construction

1.4.6 Direct disturbance of a number of potential sources of land contamination has the potential to create pollutant linkages to human health receptors during construction as summarised in Table A9.3.5 with potential land contamination risks ranging from Moderate/Low to Moderate risk.

Table A9.3.5: Construction - Potential Direct Disturbance Land Contamination Risks - Common to All

Source ID	Source Name	Pollutant Linkage	Likelihood	Consequence	Risk
PBTC-C1	Existing A9 Carriageway	PL1 and PL3	Likely	Mild	Moderate/Low
PBTC-C2	Highland Main Line railway	PL1 and PL3	Likely	Mild	Moderate/Low
PBTC-C11	Curling Pond	PL1 and PL3	Likely	Medium	Moderate
PBTC-C15	Gravel Pit	PL1 and PL3	Likely	Medium	Moderate
PBTC-C38	Septic Tank	PL1 and PL3	Likely	Mild	Moderate/Low
PBTC-C45	Septic Tank Discharge	PL1 and PL3	Likely	Mild	Moderate/Low
PBTC-C49	Depot and Storage Tank	PL1 and PL3	Likely	Medium	Moderate
n/a	Various Side Roads	PL1 and PL3	Likely	Mild	Moderate/Low
n/a	Excavated material removed and temporarily stored	PL1 and PL3	Likely	Medium	Moderate

1.4.7 Direct disturbance and subsequent stockpiling of excavated materials associated with potential sources of land contamination could pose a risk to the water environment through pollutant linkages PL5, PL6, PL7, PL8 and PL9. The potential of these risks occurring during construction has been assessed as likely with a consequence of medium, resulting in a potential land contamination risk of Moderate risk for all proposed route options.

Soils and Groundwater - Operation

1.4.8 Potential sources of land contamination also have the potential to be directly disturbed during operation as summarised in Table A9.3.6 with potential land contamination risks ranging from Low to Moderate/Low risk.

Table A9.3.6: Operation - Potential Direct Disturbance Land Contamination Risks - Common to All

Source ID	Source Name	Pollutant Linkage	Likelihood	Consequence	Risk
PBTC-C1	Existing A9 Carriageway	PL12 and PL14	Low Likelihood	Mild	Low
PBTC-C2	Highland Main Line railway	PL12 and PL14	Low Likelihood	Mild	Low
PBTC-C11	Curling Pond	PL12 and PL14	Low Likelihood	Medium	Moderate/Low
PBTC-C15	Gravel Pit	PL12 and PL14	Low Likelihood	Medium	Moderate/Low
PBTC-C38	Septic Tank	PL12 and PL14	Low Likelihood	Mild	Low
PBTC-C45	Septic Tank Discharge	PL12 and PL14	Low Likelihood	Mild	Low
PBTC-C49	Depot and Storage Tank	PL12 and PL14	Low Likelihood	Medium	Moderate/Low
n/a	Various Side Roads	PL12 and PL14	Low Likelihood	Mild	Low

1.4.9 In addition, reuse of excavated materials associated with potential sources of land contamination could pose a risk to human health and the water environment. Potential risks to human health via pollutant linkages PL12 and PL14 have been assessed as low likelihood with a consequence of medium, resulting in a potential land contamination risk of Moderate/Low risk for all proposed route options. Potential risks to the water environment through pollutant linkages PL16, PL17, PL18, PL19 and PL20 have been assessed as likely with a consequence of medium, resulting in a potential land contamination risk of Moderate risk for all proposed route options.

Ground Gas

1.4.10 Throughout the study area depleted oxygen and concentrations of carbon dioxide and carbon monoxide above Health and Safety Executive (HSE) workplace exposure levels (WELs) (HSE, 2018) have been recorded. In addition, PID measurements potentially indicative of volatile vapours were encountered at two hotspots (both common to all proposed route options). As such, potential land contamination risks to construction and maintenance workers exist via pollutant linkages PL2 and PL13 during construction and operation respectively. The consequence is considered to be medium and is considered likely to occur giving a Moderate land contamination risk for construction and maintenance workers.

1.4.11 Methane ground gas has been observed within the landfill cell within Ladywell Landfill (PBTC-C22) and while there are no land contamination risks common to all, there are risks specific to Options ST2A and ST2B. These option specific potential risks are discussed in full within *Appendix A9.2: Ladywell Landfill* and summarised in the relevant sections below.

Indirect Disturbance

Groundwater

1.4.12 Indirect interactions may occur where proposed cuttings intercept groundwater, as they could draw contaminated groundwater towards the cutting. The Sichardt method (Preene et al., 2016) was used to estimate the zone of influence of dewatering around each of the cuttings considered likely to intercept groundwater, using the dimensions of the cuttings and the estimated drawdown of groundwater levels due to the excavation.

1.4.13 Three cuttings that are common to all have the potential to intercept groundwater as shown in Table 9.10 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The land contamination risk assessment for these three cuttings drawing in contaminated groundwater which then needs discharged (creating pollutant linkage PL10 during construction and PL21 during operation) is presented in Table A9.3.7.

Table A9.3.7: Potential Indirect Disturbance Land Contamination Risks - Common to All

Cutting ID	Source ID	Likelihood	Consequence	Risk
C4	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C51	Likely	Mild	Moderate/Low
CS7	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C51	Likely	Mild	Moderate/Low
Pond J (ST2A)/ Pond K (ST2B)/ Pond I (ST2C and ST2D)	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Unlikely	Mild	Very Low

1.4.14 Construction and maintenance personnel could be at risk through pollutant linkage PL1 and PL12, direct contact with contaminated groundwater during construction and operation respectively. The potential of this event occurring has been assessed as likely with a consequence of mild, resulting in a potential land contamination risk of Moderate/Low risk for all proposed route options.

Ground Gas

1.4.15 It is considered unlikely that any ground gas present within the footprint of all proposed route options will be disturbed in such a way as to create new preferential pathways which would impact receptors via indirect pollutant linkages PL4 (construction) and PL15 (operation). This includes Ladywell Landfill (PBTC-C22) since none of the proposed route options will directly disturb the landfill cell (the only area to have evidence of significant ground gas generation).

Specific to Option ST2A

Direct Disturbance

Soils and Groundwater

1.4.16 There are an additional five potential sources of land contamination which are assessed as at risk of direct disturbance specific to Option ST2A during the construction and operation phases. The potential land contamination risks on human health via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is presented in Table A9.3.8. Further detail on potential direct disturbance risks specific to Ladywell Landfill (PBTC-C22) is provided in *Appendix A9.2: Ladywell Landfill,* with the resultant overall highest land contamination risk included in Table A9.3.8.

Table A9.3.8: Potential Direct Disturbance Land Contamination Risks Specific to Option ST2A

Source ID	Source Name	Construction			Operation		
		Likelihood	Consequence	Risk	Likelihood	Consequence	Risk
PBTC-C3	Storage Tank (1977 – 1995)	Likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low
PBTC-C22	Quarry (disused) Ladywell Landfill	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low
PBTC-C29	500L Underground Fuel Tank	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low
PBTC-C30	Olfactory Evidence of Contamination	Likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low
PBTC-C33	Septic Tank	Likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low

1.4.17 Direct disturbance of these five additional potential sources of land contamination could also pose a risk to the water environment through pollutant linkages PL5, PL6, PL7, PL8 and PL9 during construction and PL16, PL17, PL18, PL19 and PL20 during operation. The potential of these risks occurring during construction and operation have been assessed as likely with a consequence of medium, resulting in a potential impact land contamination risk of Moderate risk.

Ground Gas

1.4.18 The potential land contamination risks on human health via pollutant linkages PL2 (construction) and PL13 (operation) is unchanged from that presented in the common to all assessment i.e. a potential land contamination risk of Moderate risk with one exception. Due to the potential presence of methane within the landfill cell at Ladywell Landfill (PBTC-C22) a potential land contamination risk of High risk has been predicted for construction and maintenance workers via pollutant linkages PL2 and PL13 respectively. Further detail is provided in *Appendix A9.2: Ladywell Landfill*.

Indirect Disturbance

Soils and Groundwater

1.4.19 Six cuttings specific to Option ST2A have the potential to intercept groundwater as detailed in Table 9.17 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The land contamination risk assessment for these six cuttings drawing in contaminated groundwater which then needs to be discharged (via PL10 during construction and PL21 during operation) is provided in Table A9.3.9 Further detail on potential indirect risks specific to Ladywell Landfill (PBTC-C22) associated with C2c, CS3 and CS4 is provided in *Appendix A9.2: Ladywell Landfill*.

Table A9.3.9: Potential Indirect Disturbance Land Contamination Risks Specific to Option ST2A

Cutting ID	Source ID	Likelihood	Consequence	Risk
C1	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
C2 Sub-zone C2b	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
	PBTC-C15	Likely	Mild	Moderate
C2 Sub-zone C2c	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C18	Likely	Mild	Moderate/Low
	PBTC-C19	Likely	Mild	Moderate/Low
	PBTC-C21	Low Likelihood	Medium	Moderate/Low
	PBTC-C22	Likely	Mild	Moderate/Low
	PBTC-C29	Likely	Mild	Moderate/Low
	PBTC-C33	Likely	Minor	Low
	PBTC-C34	Likely	Minor	Low
	PBTC-C49	Low Likelihood	Medium	Moderate/Low
CS3	The ground model (Figure A9.2.3) developed for the assessment of potential risks associated with Ladywell Landfill in *Appendix A9.2* has shown that CS3 is unlikely to intercept groundwater, therefore no indirect impacts are predicted for this cutting.			
CS4	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C22	High Likelihood	Medium	High
Pond C	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Low Likelihood	Mild	Low
	PBTC-C12	Likely	Mild	Moderate/Low

1.4.20 The identified potential land contamination risks to construction and maintenance staff from indirect disturbance of potential sources of land contamination which are common to all proposed route options (paragraph 1.4.14) also apply to the five cuttings specific to Option ST2A likely to intercept groundwater (C1, C2 (sub zones C2b and C2c), CS4 and Pond C). The potential of this event occurring has been assessed as likely with a consequence of medium, resulting in a potential land contamination risk of Moderate risk.

Specific to Option ST2B

Direct Disturbance

Soils and Groundwater

1.4.21 There are three additional potential sources of land contamination specific to Option ST2B which are assessed as at risk of direct disturbance during the construction and operation phases. The potential land contamination risks on human health via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is presented in Table A9.3.10. Further detail on potential direct risks specific to

Ladywell Landfill (PBTC-C22) is provided in *Appendix A9.2: Ladywell Landfill* with the resultant overall highest land contamination risk included in Table A9.3.10.

Table A9.3.10: Direct Disturbance Land Contamination Risks Specific to Option ST2B

Source ID	Source Name	Construction			Operation		
		Likelihood	Consequence	Risk	Likelihood	Consequence	Risk
PBTC-C22	Quarry (disused) Ladywell Landfill	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low
PBTC-C29	500L Underground Fuel Tank	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low
PBTC-C33	Septic Tank	likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low

1.4.22 Direct disturbance of these three additional potential sources of land contamination could also pose a risk to the water environment through pollutant linkages PL5, PL6, PL7, PL8 and PL9 during construction and PL16, PL17, PL18, PL19 and PL20 during operation. The potential of these risks occurring during construction and operation have been assessed as likely with a consequence of medium, resulting in a potential impact land contamination risk of Moderate risk.

Ground Gas

1.4.23 The potential land contamination risks on human health via pollutant linkages PL2 (construction) and PL13 (operation) is unchanged from that presented in the common to all assessment i.e. a potential land contamination risk of Moderate risk with one exception. Due to the potential presence of methane within the landfill cell at Ladywell Landfill (PBTC-C22) a potential land contamination risk of High risk has been predicted for construction and maintenance workers via pollutant linkages PL2 and PL13 respectively. Further detail is provided in *Appendix A9.2: Ladywell Landfill*.

Indirect Disturbance

1.4.24 Five cuttings specific to Option ST2B have the potential to intercept groundwater as detailed in Table 9.20 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The land contamination risk assessment for these five cuttings drawing in contaminated groundwater which then needs to be discharged (via PL10 during construction and PL21 during operation) is provided in Table A9.3.11. Further detail on potential indirect risks specific to Ladywell Landfill (PBTC-C22) associated with C7, CS3 and CS4 is provided in *Appendix A9.2: Ladywell Landfill*.

Table A9.3.11: Potential Indirect Disturbance Land Contamination Risks Specific to Option ST2B

Cutting ID	Source ID	Likelihood	Consequence	Risk
C7	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C18	Low Likelihood	Mild	Low
	PBTC-C19	Low Likelihood	Mild	Low
	PBTC-C22	Likely	Mild	Moderate/Low
	PBTC-C29	Likely	Medium	Moderate
	PBTC-C33	Low Likelihood	Minor	Very Low
CS3	The ground model (Figure A9.2.3) developed for the assessment of potential risks associated with Ladywell Landfill in *Appendix A9.2* have shown that CS3 is unlikely to intercept groundwater, therefore no indirect impacts are predicted for this cutting.			
CS4	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C22	High Likelihood	Medium	High
CS12	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low Likelihood	Medium	Moderate/Low
	PBTC-C10	Likely	Medium	Moderate
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
Pond B	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low likelihood	Medium	Moderate/Low
	PBTC-C10	Low Likelihood	Medium	Moderate/Low
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
	PBTC-C15	Low Likelihood	Medium	Moderate/Low

1.4.25 The identified potential land contamination risks to construction and maintenance staff from indirect disturbance of potential land contamination sources which are common to all proposed route options (paragraph 1.4.14) also apply to the four cuttings likely to intercept groundwater specific to Option ST2B (C7, CS4, CS12 and Pond B) with a potential land contamination risk of Moderate risk.

Specific to Option ST2C

Direct Disturbance

Soils and Groundwater

1.4.26 There are two additional potential sources of land contamination specific to Option ST2C which are assessed as at risk of direct disturbance during construction and operation phases. The potential land contamination risks on human health via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is presented in Table A9.3.12.

Table A9.3.12: Direct Disturbance Land Contamination Risks Specific to Option ST2C

Source ID	Source Name	Construction			Operation		
		Likelihood	Consequence	Risk	Likelihood	Consequence	Risk
PBTC-C18	Smithy	Likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low
PBTC-C29	500L Underground Fuel Tank	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low

1.4.27 Direct disturbance of these two additional potential sources of land contamination could also pose a risk to the water environment through pollutant linkages PL5, PL6, PL7, PL8 and PL9 during construction and PL16, PL17, PL18, PL19 and PL20 during operation. The potential of these risks occurring during construction and operation have been assessed as likely with a consequence of medium, resulting in a potential impact land contamination risk of Moderate risk.

Ground Gas

1.4.28 The potential land contamination risks on human health via pollutant linkages PL2 (construction) and PL13 (operation) is unchanged from that presented in the common to all assessment i.e. a potential land contamination risk of Moderate risk.

Indirect Disturbance

1.4.29 Seven cuttings specific to Option ST2C have the potential to intercept groundwater as detailed in Table 9.23 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The potential land contamination risk assessment for these seven cuttings drawing in contaminated groundwater which then needs to be discharged (via PL10 during construction and PL21 during operation) is provided in Table A9.3.13. Further detail on potential indirect risks specific to Ladywell Landfill (PBTC-C22) associated with CS13, CS14, CS15 and CS16 is provided in *Appendix A9.2: Ladywell Landfill*.

Table A9.3.13: Potential Indirect Land Contamination Risks Specific to Option ST2C

Cutting ID	Source ID	Likelihood	Consequence	Risk
CS12	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low Likelihood	Medium	Moderate/Low
	PBTC-C10	Likely	Medium	Moderate
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
CS13	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C19	Unlikely	Mild	Very Low
	PBTC-C22	Low Likelihood	Medium	Moderate/Low
CS14	PBTC-C1	Likely	Mild	Moderate/Low
CS15	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C22	Low Likelihood	Mild	Low
	PBTC-C33	Likely	Minor	Low
	PBTC-C34	Likely	Minor	Low
CS16	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C19	Low Likelihood	Mild	Low
	PBTC-C21	Low Likelihood	Medium	Moderate/Low
	PBTC-C23	Low Likelihood	Mild	Low
	PBTC-C24	Low Likelihood	Mild	Low
	PBTC-C26	Low Likelihood	Mild	Low
	PBTC-C32	Unlikely	Minor	Very Low
	PBTC-C33	Likely	Minor	Low
	PBTC-C34	Likely	Minor	Low
	PBTC-C40	Low Likelihood	Minor	Very Low
	PBTC-C49	Likely	Medium	Moderate
Pond B	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low Likelihood	Medium	Moderate/Low
	PBTC-C10	Low Likelihood	Medium	Moderate/Low
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low

Cutting ID	Source ID	Likelihood	Consequence	Risk
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
	PBTC-C15	Low Likelihood	Medium	Moderate/Low
Pond D	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C49	Likely	Medium	Moderate

1.4.30 The identified potential land contamination risks to construction and maintenance staff from indirect disturbance of potential land contamination sources which are common to all proposed route options (paragraph 1.4.14) also apply to the seven cuttings likely to intercept groundwater specific to Option ST2C (CS12, CS13, CS14, CS15, CS16, Pond B and Pond D) with a potential land contamination risk of Moderate risk during construction and operation.

Specific to Option ST2D

Direct Disturbance

Soils and Groundwater

1.4.31 There are three additional potential sources of land contamination sources to Option ST2D which are assessed as at risk of direct disturbance during construction and operation phases. The potential land contamination risks on human health via pollutant linkages PL1 and PL3 (construction) and PL12 and PL14 (operation) is presented in Table A9.3.14.

Table A9.3.14: Direct Disturbance Land Contamination Risks Specific to Option ST2D.

Source ID	Source Name	Construction			Operation		
		Likelihood	Consequence	Risk	Likelihood	Consequence	Risk
PBTC-C18	Smithy	Likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low
PBTC-C29	500L Underground Fuel Tank	Likely	Medium	Moderate	Low Likelihood	Medium	Moderate/ Low
PBTC-C33	Septic Tank	likely	Mild	Moderate/ Low	Low Likelihood	Mild	Low

1.4.32 Direct disturbance of these three additional potential sources of land contamination could also pose a risk to the water environment through pollutant linkages PL5, PL6, PL7, PL8 and PL9 during construction and PL16, PL17, PL18, PL19 and PL20 during operation. The potential of these risks occurring during construction and operation have been assessed as likely with a consequence of medium, resulting in a potential impact land contamination risk of Moderate risk.

Ground Gas

1.4.33 The potential land contamination risks on human health via pollutant linkages PL2 (construction) and PL13 (operation) is unchanged from that presented in the common to all assessment i.e. a potential land contamination risk of Moderate risk.

Indirect Disturbance

1.4.34 Three cuttings specific to Option ST2D have the potential to intercept groundwater as detailed in Table 9.26 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The land contamination risk assessment for these three cuttings drawing in contaminated groundwater which then needs to be discharged (via PL10 during construction and PL21 during operation) is provided in Table A9.3.15. Further detail on potential indirect risks specific to Ladywell Landfill (PBTC-C22) associated with C9 is provided in *Appendix A9.2: Ladywell Landfill.*

Table A9.3.15: Potential Indirect Land Contamination Risks Specific to Option ST2D

Cutting ID	Source Ref	Likelihood	Consequence	Risk
C9	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C22	Likely	Mild	Moderate/Low
CS12	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low Likelihood	Medium	Moderate/Low
	PBTC-C10	Likely	Medium	Moderate
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
Pond B	PBTC-C1	Likely	Mild	Moderate/Low
	PBTC-C2	Likely	Mild	Moderate/Low
	PBTC-C8	Low Likelihood	Mild	Low
	PBTC-C9	Low Likelihood	Medium	Moderate/Low
	PBTC-C10	Low Likelihood	Medium	Moderate/Low
	PBTC-C11	Low Likelihood	Medium	Moderate/Low
	PBTC-C12	Likely	Mild	Moderate/Low
	PBTC-C13	Low Likelihood	Medium	Moderate/Low
	PBTC-C14	Low Likelihood	Medium	Moderate/Low
	PBTC-C15	Low Likelihood	Medium	Moderate/Low

1.4.35 The identified potential land contamination risks to construction and maintenance staff from indirect disturbance of potential land contamination sources which are common to all proposed route option (paragraph 1.4.14) also apply to the three cuttings likely to intercept groundwater specific to Option ST2D (C9, CS12 and Pond B) with a potential land contamination risk of Moderate risk during construction and operation.

1.5 References

Legislation

Contaminated Land (Scotland) Regulations 2000 (as amended)

Environmental Protection Act 1990: Part IIA

Reports and Documents

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Appendix A9.4: Surface Water Indirect Dewatering Assessment

1.1 Introduction

1.1.1 This appendix provides an assessment of the expected dewatering impacts on surface water features within the study area, supporting Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater). The assessment has been carried out in two stages.

1.1.2 Initial assessment considered potential impacts on all surface water features identified within the potential zone of influence of dewatering at proposed excavations (including cuttings, widenings and attenuation ponds). This initial assessment exercise is deemed to be extremely conservative.

1.1.3 The second tier of assessment utilised ground investigation (GI) data to develop local ground models to enable the refinement of the initial assessment. Information on ground conditions from the GI listed in Table 9.1 within Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) inform the local ground models for each cutting. GI data supplied by Perth & Kinross Council (PKC) with respect to Ladywell Landfill has also informed the ground model for Cutting C2: sub-zone C2c (references for the Ladywell Landfill specific data set are provided within *Appendix A9.2: Ladywell Landfill*).

1.2 Initial Assessment – First Tier

1.2.1 The initial assessment is based on simple estimates of the zone of influence of dewatering, calculated using the Sichardt method (Preene et al., 2016), around each excavation considered likely to intercept groundwater, consistent with the approach defined in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater, Section 9.4: Potential Impacts and Effects). Any surface water feature within the zone of influence for a cutting expected to intercept groundwater was then included within the first tier. The magnitude of impact for each surface water feature has been derived based on the expected groundwater drawdown at the location of the surface water feature. It was assumed that a degree of hydraulic conductivity exists between groundwater and the surface water receptor. The significance of effect derived was based on the methodology described in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater, Section 9.2 (Approach and Methods)). The outcome of the initial assessment is presented in Table A9.4.1 with the receptors encountering significant effects coloured red.

Table 9.4.1: Initial Screening of Indirect Dewatering Impacts and Effects on Surface Water Features

Cutting ID	Water Feature ID	Importance of Receptor	Magnitude of Impact	Significance of Effect
Common to all proposed route options				
C4	WF6 (River Tay)	Very High	Minor	**Large**
	WF12A	Low	Negligible	Slight
	WF12B	Low	Moderate	Slight
CS7	WF6 (River Tay)	Very High	Major	**Very Large**
	WF12B	Low	Major	**Moderate**
	WF13	Medium	Major	**Large**
	WF14	Medium	Major	**Large**
Pond J (ST2A) Pond K (ST2B)	WF6 (River Tay)	Very High	Moderate	**Very Large**
	WF16	Medium	Moderate	**Moderate**

Cutting ID	Water Feature ID	Importance of Receptor	Magnitude of Impact	Significance of Effect
Pond I (ST2C and ST2D)				
Specific to Option ST2A				
C1	WF4	Low	Negligible	Slight
	WF5	Low	Negligible	Slight
C2: sub-zone C2b (Mainline Cut and Cover Tunnel – ch2450 - 3200)	WF186	Low	Negligible	Slight
C2: sub-zone C2c (Mainline Cut and Cover Tunnel - ch3200 – 4000)	WF8 (Inchewan Burn)	High	Moderate	**Large**
	WF9*	Medium	Moderate	**Moderate**
	WF186	Low	Minor	Slight
	WF187**	Low	No change**	Neutral
CS3	WF8 (Inchewan Burn)	High	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS4	WF9*	Medium	Negligible	Slight
	WF187**	Low	No change**	Neutral
Pond C	WF6 (River Tay)	Very High	Negligible	Slight
Specific to Option ST2B				
C7	WF8 (Inchewan Burn)	High	Negligible	Slight
	WF9	Medium	Negligible	Slight
	WF186	Low	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS3	WF8 (Inchewan Burn)	High	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS4	WF9*	Medium	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS12	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Negligible	Slight
Pond B	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Major	**Very Large**
	WF7*	Low	Minor	Slight
Specific to Option ST2C				
CS12	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Negligible	Slight
CS13	WF8 (Inchewan Burn)	High	Minor	**Moderate**
	WF9*	Medium	Minor	Slight
	WF187**	Low	No change**	Neutral
CS15	WF9*	Medium	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS16	WF6 (River Tay)	Very High	Moderate	**Very Large**
	WF8 (Inchewan Burn)	High	Negligible	Slight

Cutting ID	Water Feature ID	Importance of Receptor	Magnitude of Impact	Significance of Effect
	WF9*	Medium	Major	**Large**
	WF11 (River Braan)	Very High	Major	**Very Large**
	WF11A	Low	Major	**Moderate**
	WF12	Medium	Negligible	Slight
	WF187**	Low	No change**	Neutral
Pond B	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Major	**Very Large**
	WF7*	Low	Minor	Slight
Pond D	WF9*	Medium	Negligible	Slight
	WF11 (River Braan)	Very High	Negligible	Slight
Specific to Option ST2D				
C9	WF8 (Inchewan Burn)	High	Negligible	Slight
	WF9*	Medium	Negligible	Slight
	WF187**	Low	No change**	Neutral
CS12	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Negligible	Slight
Pond B	WF5A	Low	Moderate	Slight
	WF6 (River Tay)	Very High	Major	**Very Large**
	WF7*	Low	Minor	Slight

* Culverted watercourses are expected to have some degree of isolation from groundwater and therefore measurements are taken from the open channel section as indicated from OS mapping.

** WF187 is a man-made drainage system created to control and manage landfill leachate in a closed loop at Ladywell Landfill (refer to *Appendix A9.2: Ladywell Landfill*) and as such is isolated from groundwater therefore no change is predicted from indirect dewatering effects.

1.3 Detailed Assessment – Second Tier

1.3.1 The initial assessment identified potential effects of Moderate or greater significance on nine surface water features (WF6, WF8, WF9, WF11, WF11A, WF12B, WF13, WF14 and WF16) as a result of potential dewatering associated with seven cuttings. Three cuttings are common to all proposed route options (C4, CS7 and Pond J (Option ST2A)/Pond K (Option ST2B)/Pond I (Option ST2C and Option ST2D)), one cutting is common to three proposed route options (Pond B (Option ST2B, Option ST2C and Option ST2D)) and three cuttings are specific to one route option each (C2: sub-zone C2c (Option ST2A), CS13 (Option ST2C) and CS16 (Option ST2C)).

1.3.2 The detailed assessment for each of these cuttings are described below. These assessments consider the local ground model specific to each cutting to enable an accurate portrayal of the zone of influence and a refinement of the estimate of the potential magnitude of impact. They are based on consideration of all available relevant information, including available GI, groundwater level monitoring data and the local topography. The significance of effect was then predicted based on the methodology described in Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater, Section 9.2 (Approach and Methods)).

Common to All Proposed Route Options

C4

1.3.3 Cutting C4 is a widening cut into the hillside above the Highland Main Line railway and River Tay, between mainline ch6150 and ch6450. The cutting has a maximum depth of approximately 12 m and is likely to be constructed primarily in low permeability metamorphic bedrock. The River Tay (WF6) is located 150 m north-east of the cutting, at an elevation of circa 46 m AOD. The ground model for C4 is presented on Figure A9.4.1.

1.3.4 Groundwater level information coverage is very limited in this area, but there is a monitoring borehole (BHBT179) close to the location of the proposed maximum excavation depth. The available information suggests that the cutting is likely to cause groundwater drawdown, at least in its deeper central section (in the vicinity of BHBT179). However, this is expected to be relatively limited in scale due to the configuration of the cutting and the low permeability of the bedrock. In the ground model (Figure A9.4.1), the River Tay delineates the boundary of the dewatering zone of influence from C4. Considering the large size of the River Tay catchment, the potential magnitude of impact is considered to be negligible, resulting in an effect significance of Slight.

CS7

1.3.5 Cutting CS7 is a new cutting which would form the proposed Dalguise Junction, including slip roads and mainline areas between mainline ch6650 and ch7150. The cutting has a maximum depth of approximately 24 m and would be constructed in permeable sand and gravel deposits, along with some sandy clay deposits, which are underlain by low permeability metamorphic bedrock.

1.3.6 The following surface water receptors are located within the initial calculated zone of influence:

- WF6 (River Tay) located 55 m west of the cutting at an elevation of circa 47 m AOD;
- WF12B (unnamed watercourse) is culverted below the existing A9 at ch6600 prior to entering the River Tay. The watercourse is located approximately 40 m south of the cutting.
- WF13 (unnamed watercourse) is culverted below the existing A9 at ch6940 prior to entering the River Tay. The watercourse runs below the proposed footprint for the cutting; and
- WF14 (unnamed watercourse) is culverted below the existing B898 and existing A9 (ch7490) prior to discharge into the River Tay. Located approximately 365 m north of the cutting.

1.3.7 The ground model for CS7 is presented on Figure A9.4.2, Figure A9.4.3 and Figure A9.4.4. The available information suggests that CS7 would cause very limited to no groundwater drawdown over the southern-most two thirds to three quarters of its extent, only intercepting groundwater from around ch7000. Although the potential groundwater drawdown used for the initial screening assessment was overly conservative (based on proposed depth of maximum excavation against the maximum groundwater level), it is considered necessary to continue with a conservative assessment given the limited groundwater level information available at this stage. The maximum recorded groundwater level in this area was at BH21550 (58.15 m AOD), located at ch7130, just to the north of the cutting. The deepest proposed excavation depth in this area is 54.6 mAOD at ch7100. Combined these would give a maximum potential groundwater drawdown of around 3.5 m and an associated distance of influence of around 105 m in the area of maximum expected effect.

1.3.8 WF6 (River Tay) is located outside the potential zone of influence of groundwater drawdown effects in the area of maximum expected effect (the northern end of CS7). At its closest proximity to CS7, around ch6800, no groundwater drawdown effects are expected. Therefore, considering the area of groundwater interception by CS7 and the potential distance of influence of groundwater drawdown, no groundwater drawdown effects on WF6 are expected.

1.3.9 WF12B is located outside the cutting and is outside the potential zone of influence of groundwater drawdown effects expected within the area of maximum effect further to the north. No groundwater drawdown effects on WF12B are expected.

1.3.10 WF13 is located outside the area where the cutting intercepts groundwater and is outside the potential zone of influence of groundwater drawdown effects expected within the area of maximum effect further to the north. No groundwater drawdown effects on WF13 are expected.

1.3.11 WF14 is located outside the cutting and is outside the potential zone of influence of groundwater drawdown effects. No groundwater drawdown effects on WF14 are expected.

Pond J (Option ST2A)/Pond K (Option ST2B)/Pond I (Option ST2C and Option ST2D)

1.3.12 The attenuation pond is located immediately to the west of the mainline between ch7900 and ch8000. The cutting has a maximum depth of approximately 13 m and would be constructed in permeable clayey sand and gravel deposits which are (assumed to be) underlain by low permeability metamorphic bedrock. The River Tay (WF6) is located 25 m west of the cutting, at an elevation of circa 47.5 m AOD and WF16 (unnamed watercourse) is located adjacent to the northern most edge of the cutting and is culverted below the existing A9 at ch8000 prior to entering the River Tay. The ground model is presented on Figure A9.4.5.

1.3.13 The attenuation pond would be excavated into a small hump of elevated ground between the existing A9 and the River Tay, this accounts for the maximum excavation depth of 12.7 m used in the screening assessment. This maximum excavation depth does not coincide with the location of the highest recorded groundwater level in the locality and therefore the potential groundwater drawdown used for the screening assessment was overly conservative. There are groundwater level monitoring installations available for this area including points within the proposed excavation area. The monitoring record is limited in duration and only covers part of a winter period. However, even allowing for higher groundwater levels to occur this excavation is not expected to intercept groundwater. No groundwater drawdown effects associated with this attenuation pond are expected to impact WF6 (River Tay) or WF16 (unnamed watercourse).

Specific to Option ST2A

C2: sub-zone C2c

1.3.14 Cutting C2: sub-zone C2c forms the north-western end of the long section of cut associated with the proposed mainline cut and cover tunnel between ch3200 and ch4000. The cutting has a maximum depth of approximately 15 m and would be constructed in permeable sand and gravel deposits which are underlain by low permeability metamorphic bedrock.

1.3.15 The following surface water receptors are located within the initial calculated zone of influence:

- The Inchewan Burn (WF8) crosses the cutting at ch3460 at an elevation of circa 60 m AOD.
- WF9 (unnamed watercourse) is culverted alongside the A822 for approximately 400 m with the culvert extending below the existing A9 at ch4000. Downstream of the existing A9 the watercourse is artificially straightened prior to discharge into the River Braan (WF11). A brief open channel section of the watercourse is located approximately 30 m north of the cutting.

1.3.16 The ground model for C2: sub-zone C2c is presented on Figure A9.2.2, Figure A9.4.6 and Figure A9.4.7.

1.3.17 Cutting sub-zone C2c is unlikely to intercept groundwater until approximately ch3400. Based on the groundwater level data available at this stage of assessment and consideration of the proposed design and local topography, depth of groundwater interception is expected to increase to the north-west but

the proposed depth of maximum excavation (at ch3550) does not coincide with the maximum groundwater level and therefore the potential groundwater drawdown used for the initial screening assessment was overly conservative. The area of maximum groundwater interception by this cutting is most likely between ch3400 to ch3800, with a maximum potential groundwater drawdown of around 7 m and an associated distance of influence of around 200 m.

1.3.18 WF8 (Inchewan Burn) would be significantly altered in the vicinity of the proposed A9 alignment. *Appendix A10.2: Inchewan Burn* provides a detailed description of the proposed works for the Inchewan Burn crossing. In summary, WF8 (Inchewan Burn) would be lowered and culverted to cross beneath the proposed cut and cover tunnel and with a further open concrete channel extending downstream from the end of the culvert. This section would extend from immediately upstream of the cut and cover tunnel to approximately 40 m upstream from the existing Perth Road bridge in Little Dunkeld. It is assumed that the new constructed section would be effectively isolated from the groundwater system. This assessment considers the potential effects on the natural course of the burn, outside the area of the proposed culverted portion.

1.3.19 Examination of the available groundwater level monitoring data suggests that WF8 (Inchewan Burn) is probably perched above the regional groundwater level and not in contact with groundwater where it crosses the existing A9 or to the north-east. This assessment indicates that, considering the area of groundwater interception by C2c and the potential distance of influence of groundwater drawdown, WF8 (Inchewan Burn) would not be impacted by groundwater drawdown effects at C2c.

1.3.20 WF9 is located 200 m to the north-west of the area of maximum groundwater interception and is at the fringe of the potential zone of influence of groundwater drawdown effects expected. The potential magnitude of impact is considered to be negligible, giving an effect significance of Slight.

Specific to Option ST2B

Pond B

1.3.21 The attenuation pond is located immediately to the east of the mainline between ch2175 and ch2350 in the vicinity of Birnam Junction. The cutting has a maximum depth of approximately 24 m and would be constructed in both permeable sand and gravel superficial deposits and underlying low permeability metamorphic bedrock. The River Tay (WF6) is located 120 m east of the cutting, at an elevation of circa 42 m AOD. The ground model is presented on Figure A9.4.8.

1.3.22 The ground model shows that Pond B would be excavated into a shoulder of elevated ground that lies between the River Tay and the existing A9. The available groundwater level information includes data from one monitoring borehole within the pond footprint and this indicates that the excavation would intercept groundwater (other local monitoring boreholes are completed above the water table and record no useful groundwater levels). However, the maximum depth of interception is a consequence of the elevated landform and both this and the proposed pond have a relatively small footprint. Recorded groundwater levels in the surrounding area fall rapidly to the north-west and south-east. Consequently, the potential zone of influence of groundwater drawdown would be more limited than indicated by the initial screening assessment.

1.3.23 Although WF6 (River Tay) is located within the potential zone of influence of groundwater drawdown effects due to the configuration of the topography and groundwater surface around the proposed pond the degree of groundwater drawdown at the River Tay would be relatively limited. Considering the large size of the River Tay, the potential magnitude of impact is considered to be negligible, giving an effect significance of Slight.

Specific to Option ST2C

Cutting CS13

1.3.24 Cutting CS13 forms the proposed northbound diverge to Dunkeld Junction which is south of the mainline between ch3500 and ch4000. The cutting has a maximum depth of approximately 11 m and would be constructed in permeable sand and gravel deposits, which are underlain by low permeability metamorphic bedrock. The Inchewan Burn (WF8) is located 45 m south east of the cutting at ch3460 at an elevation of circa 60 m AOD.

1.3.25 The ground model for CS13 is presented on Figure A9.2.9 and Figure A9.2.10. The ground models show that depth to groundwater is highly variable within the area of interest and lies within the superficial deposits immediately overlying bedrock and therefore the initial assessment was overly conservative. As a result, where bedrock is shallow, the cutting may intercept groundwater. Based on the available data, the potential maximum groundwater drawdown is very conservatively estimated to be around 3 m where bedrock is shallow, with an associated potential maximum distance of influence of around 100 m. The bedrock is expected to be shallow, and therefore groundwater to be intercepted, between ch3580 and ch3700. The potential magnitude of impact on the Inchewan Burn (WF8) is considered to be negligible, resulting in an effect significance of Slight.

Cutting CS16

1.3.26 Cutting CS16 forms the realigned road to Inver from Dunkeld Junction which is south of the mainline between ch4000 and ch4500. The cutting has a maximum depth of approximately 22 m and would be constructed in permeable sand and gravel deposits, which are underlain by low permeability metamorphic bedrock.

1.3.27 The following surface water receptors are located within the initial calculated zone of influence:

- WF6 (River Tay) is located 250m north of the cutting, at an elevation of circa 48 m AOD;
- WF9 (unnamed watercourse) passes close to the eastern extent of the cutting around ch3900, at an elevation of circa 55 to 60 m AOD; and
- WF11 (River Braan) passes close to the western extent of the cutting around ch4400, at an elevation of circa 49 to 50 m AOD, approximately 300 m upstream of its confluence with the River Tay.
- WF11A (unnamed watercourse) a small tributary of the River Braan, passes close to the western extent of the cutting around ch4400 where the watercourse is culverted below the existing access road to Inver Mill Holiday Park.

1.3.28 The ground model for CS16 is presented on Figure A9.4.9 (refer also to Figure A9.2.11 and Figure A9.2.12). Groundwater level information is available from one borehole close to the cutting boundary line (BHBT138) and five situated in the surrounding area to the north and east. BHBT138 records groundwater levels below the base of the cutting, suggesting that it would not intercept groundwater. However, the topography surrounding the cutting is steep, rising to the south but falling rapidly to the west towards the River Braan. It is likely that the groundwater surface mirrors this pattern. This theory is supported by groundwater levels observed in boreholes BHBT139A (located approximately 25 m from the River Braan) and BHBT141 (25 m from the River Braan on the opposite bank) where groundwater levels are recorded just below the elevation of the river, indicating that perhaps the River Braan may be providing groundwater recharge in this area. By extrapolating the groundwater surface at the deepest section of the cutting (around ch4300), the potential maximum groundwater drawdown is very conservatively estimated to be around 10 m, with an associated potential maximum distance of influence of around 300 m.

1.3.29 At the eastern end of the cutting, the available groundwater level information (BHBT124, BHBT135 and BH18720) indicates that the base of the cutting would be above the groundwater surface and no drawdown effects in this area (in the vicinity of WF9) are expected.

1.3.30 WF6 (River Tay) is located towards the limit of the potential maximum zone of influence of groundwater drawdown effect from CS16 and any potential groundwater drawdown at the River Tay is expected to be limited. The potential maximum magnitude of impact is considered to be negligible, giving an effect significance of Slight.

1.3.31 Although no groundwater drawdown effect is expected at the east end of cutting CS16, in the vicinity of WF9, the surface water feature is within the potential maximum zone of influence of groundwater drawdown effect from the deepest section of CS16, to the west. The potential magnitude of impact is considered to be minor, giving an effect significance of Slight.

1.3.32 WF11 (River Braan) is located closer to CS16 and is within the potential maximum zone of influence of groundwater drawdown effect from the cutting. However, groundwater level monitoring data indicates that the river level is above the groundwater surface in the reach immediately above its confluence with the River Tay. The potential for some effect due to groundwater drawdown or a reduction in groundwater flow towards the river further upstream cannot be ruled out but the potential magnitude of impact is considered to be negligible, giving an effect significance of Slight.

1.3.33 Like WF11 (River Braan), WF11A (unnamed watercourse) is located closer to CS16 and is within the potential maximum zone of groundwater drawdown effect from the cutting. Given the smaller size of the watercourse the potential magnitude of impact is considered to be moderate, giving an effect significance of Slight.

Pond B

1.3.34 This attenuation pond is identical to Pond B within Option ST2B; therefore, the assessment is the same as that provided for Option ST2B above i.e. the potential magnitude of impact is considered to be negligible, giving an effect significance of Slight.

Specific to Option ST2D

Pond B

1.3.35 This attenuation pond is identical to Pond B within Option ST2B; therefore, the assessment is the same as that provided for Option ST2B above i.e. the potential magnitude of impact is considered to be negligible, giving an effect significance of Slight.

Detailed Assessment Summary

1.3.36 The detailed assessment of potential dewatering impacts and effects on surface water features has established that no significant effects to surface water features from indirect dewatering is predicted. A summary of the predicted impacts and effects following the second tier of assessment is provided in Table A9.4.2.

Table A9.4.2: Summary of Detailed Assessment of Indirect Dewatering Impacts on Surface Water Features.

Cutting ID	Surface Water Feature ID	Importance of Receptor	First Tier Assessment		Second Tier Assessment	
			Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect
Common to All						
C4	WF6 (River Tay)	Very High	Minor	**Large**	Negligible	Slight
CS7	WF6 (River Tay)	Very High	Major	**Very Large**	No impact expected	N/A
	WF12B	Low	Major	**Moderate**	No impact expected	N/A
	WF13	Medium	Major	**Large**	No impact expected	N/A
	WF14	Medium	Major	**Large**	No impact expected	N/A
Pond J (ST2A) Pond K (ST2B)	WF6 (River Tay)	Very High	Moderate	**Very Large**	No impact expected	N/A
Pond I (ST2C and ST2D)	WF16	Medium	Moderate	**Moderate**	No impact expected	N/A
Specific to Option ST2A						
C2: sub-zone C2c	WF8 (Inchewan Burn)	High	Moderate	**Large**	No impact expected	N/A
	WF9	Medium	Moderate	**Moderate**	Negligible	Slight
Specific to Option ST2B						
Pond B	WF6 (River Tay)	Very High	Major	**Very Large**	Negligible	Slight
Specific to Option ST2C						
CS13	WF8 (Inchewan Burn)	High	Minor	**Moderate**	Negligible	Slight
CS16	WF6 (River Tay)	Very High	Moderate	**Very Large**	Negligible	Slight
	WF9	Medium	Major	**Large**	Minor	Slight
	WF11 (River Braan)	Very High	Major	**Very Large**	Negligible	Slight
	WF11A	Low	Major	**Moderate**	Moderate	Slight
Pond B	WF6 (River Tay)	Very High	Major	**Very Large**	Negligible	Slight
Specific to Option ST2D						
Pond B	WF6 (River Tay)	Very High	Major	**Very Large**	Negligible	Slight

1.4 References

Preene, M., Roberts, T.O.L., Powrie, W., (2016), Groundwater Control: Design and Practice, second edition, CIRIA, C750. British Library Cataloguing in Publication Data. ISBN: 978-0-86017-755-5.

Appendix A10.1: Baseline Conditions

1.1.1 This Appendix provides a detailed description of the baseline conditions of the water features referred to in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment) and shown on Figures 10.1 to 10.4.

1.1.2 Water Framework Directive (WFD) information has been obtained from the SEPA Water Classification Hub (SEPA, 2020). The most recent classification data available on the SEPA Water Classification Hub is from the 2018 classification year.

Table 1: Baseline Conditions

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
WF6 (River Tay) Reach: River Tummel to River Isla confluences 3210km^2 catchment Surrounding land use: development, plantation, grassland, uplands, agriculture, woodland.	Flood Risk	SEPA Flood Maps and Jacobs refined flood modelling show direct flood risk to the Dunkeld and Birnam villages, including a school. <100 properties within flood risk area.	Very High	 WF6 (River Tay) – view upstream towards Dunkeld and Birnam.
	Hydromorphology	SEPA hydromorphology status: Moderate (2018). Predominantly sinuous single-thread meandering planform within a symmetrical river valley. Active erosion and deposition at several locations. Historical change: erosion and deposition, island development. Riparian zone: Transitions between fragmentary and continuous vegetation comprising either a single row of deciduous trees or a narrow belt of mixed woodland. Structures: two bridge structures within study area (A9 and A923). Cobble bed, predominantly smooth flow, some large riffles.	High	
	Surface water quality	SEPA overall status: Good ecological potential (HMWB) (2018). SEPA physico-chemical/biological elements/specific pollutants status: High/ Good/ Pass (2018). High dilution capacity: Q_{95} calculated to be approximately 33.37m^3/s. Existing pressures: point source pollution from sewage disposal; morphological alterations preventing fish passage (dams/weirs); and alien species (Australian swamp stonecrop – *Crassula helmsii)*. Drinking water abstractions, abstractions for hydropower. Potential additional pollutant sources: diffuse rural sources, road drainage. Fisheries status: salmonid waters under WFD. Privately operated salmon fishing rights. Other designations: SACs (River Tay and Shingle Islands), SSSIs (Meikleour Area and Shingle Islands).	Very High	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
WF1 (Birnam Burn) 4.38km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	 WF1 View – Upstream of A9 looking upstream.
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform. Historical change: No change in planform since 1867. Riparian zone: Continuous sparse vegetation comprising mixed woodland, grass and bracken. Structures: culverted under local access tracks (masonry box culvert with concrete pipe), the Highland Main Line railway (Brick and stone arch way approx. 45m in length) and the existing A9 (concrete pipe culvert approx. 65m in length).	Medium	
	Surface water quality	SEPA overall ecology status: not classified. Fisheries status: not classified. SEPA physico-chemical/ biological elements/ specific pollutants status: not classified. Fed from three upstream lochs including Rohallion Loch. Potential pollutant sources: diffuse rural sources, rail and road drainage. Low dilution capacity: Q_{95} calculated to be 0.0195m^3/s.	Medium	
WF2 0.24km^2 catchment Surrounding land use: uplands, woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank but no risk to existing A9 carriageway.	Low	
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform upstream of the Highland Main Line railway, artificially straightened planform to confluence with Birnam Burn. Historical change: No change in planform since 1867, culverted under the existing A9 between 1959 and 1981.	Medium	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
		Structures: Culverted downstream of existing A9 under local access track by concrete pipe culvert (mapped as ~13m long). Conveyed below existing A9 for approx. 50m through 2 concrete pipes. Concrete steps at culvert apron extending 8m downstream. Riparian zone: Fragmented sparse vegetated riparian zone comprising mixed woodland, grass and bracken. Silt bed, evidence of berm formation and recovering sinuosity within the engineered channel downstream of existing A9, Variations in flow downstream of existing A9 likely during periods of incremental dry weather.		 WF2 – View downstream towards existing A9 culvert inlet.
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0011m^3/s. Potential pollutant sources: diffuse rural sources, rail and road drainage.	Medium	
WF4 0.07km^2 catchment Surrounding land-use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	 WF4 – upstream view from B867 towards the Highland Main Line railway.
	Hydromorphology	SEPA hydromorphology status: not classified. Mapped by OS (1:25,000 scale) as approximately 30m long and observed during site visit as the confluence of two minor surface water features culverted beneath the B867 flowing northward. Straight planform. Riparian zone: Sparsely vegetated comprising grass and bracken. Bank material consists of silts sands and rare gravels. WF4 exhibits poorly channelised flow downstream of existing A9 carriageway and does not have the capability to transport coarse sediment clasts to downstream reaches, therefore no clast size analysis has been conducted.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0003m^3/s. Fisheries status: not classified. Potential pollutant sources: diffuse rural sources, rail and road drainage.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
WF5 0.75km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank but no risk to existing A9 carriageway.	Low	 WF5 – downstream view from B867 towards A9.
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform upstream of B867, straight planform downstream of B867. Silt bed, limited flow variation. Riparian zone: Largely continuous riparian zone comprising mixed woodland, fragmentary in some sections. Bedforms comprise boulder and cobble steps and pools, and alternating bar features in upstream reaches.	Medium	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0014m^3/s. Mapped by OS (1:25,000 scale) as a discontinuous linear feature terminating north of the B867. However, it was noted that a dry channel exists to the north leading to the embankment of the existing A9. Potential pollutant sources: diffuse rural sources, road and rail drainage.	Medium	
WF5A <3km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank but no risk to existing A9 carriageway.	Low	
	Hydromorphology	SEPA hydromorphology status: not classified. Straight planform. Structures: culverted for approximately 50m under the existing A9. Riparian zone: Continuous comprising grass and bracken through felled woodland.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0019m^3/s. Potential pollutant sources: diffuse rural sources.	Medium	 WF5A – Downstream of existing A9 looking upstream towards A9.
WF7 0.59km^2 catchment Surrounding land use: woodland, uplands.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. However, simple assessment of the existing culvert indicates headwater level out of bank. This situation poses a potential risk to curtilage of a downstream residential property in Little Dunkeld.	High	 WF7 – view upstream from Highland Main Line railway.
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform. Gravel and cobble bed, intermittent/ephemeral downstream section, step-pool sequence. Flow dissipates prior to reaching the Highland Main Line railway existing A9 carriageway. As-built drawings of the existing A9 indicate that the watercourse is culverted over a significant reach under the Highland Main Line railway (headwall likely buried), existing A9 to Perth Road. It is then shown as connecting to the Perth Road drainage network. However, site surveys to date have not been able to confirm this arrangement or its final outfall location. Riparian zone: Continuous sparse comprising mixed woodland, grass and bracken.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0026m^3/s. Potential pollutant sources: diffuse rural sources.	Medium	
WF8 (Inchewan Burn) 5.77km^2 catchment Surrounding land use: development, woodland, plantation, uplands. Further detail is provided in *Appendix A10.2: Inchewan Burn*.	Flood risk	SEPA Flood Maps and Jacobs refined flood modelling show direct flood risk to the surrounding properties in Birnam.	High	 WF8 (Inchewan Burn) – downstream view of restored section underneath A9 overbridge.
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform with steep step-pool, tumbling and uniform/rapid flow types. Bedforms comprise bedrock cascades, boulder steps and pools, and cobble/gravel plane-riffles. Bed material comprises boulders, sand, gravel and cobbles. Riparian zone: continuous, comprising mixed woodland, grass and bracken. Historical change: erosion and deposition, weir structure 900m upstream of the existing A9, straightened from Highland Main Line railway to downstream of the existing A9 with artificial steps and pools (river restoration works). Structures: bridge crossing under the Highland Main Line railway, existing A9 and Perth Road (Birnam). Upstream section includes a dynamic bedrock cascade. Downstream section: gravel and cobble bed, step-pool sequence.	High	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low to medium flow with falls and weirs upstream of the existing A9. Medium dilution capacity: Q_{95} calculated to be 0.0257m^3/s. Potential pollutant sources: diffuse rural sources and urban, road and rail drainage. Multiple outfalls noted in lower reach, likely to be from residential septic tanks. Historic man-made barriers to fish passage under existing A9 now removed after river restoration works in 2007 (River Restoration Centre, 2013). Considered to be salmonid waters in its lower reaches; upper sections have falls and weirs, which are likely to block fish passage.	Medium	 WF8 (Inchewan Burn) – downstream view in Birnam.
WF9 0.75km^2 catchment Surrounding land use: development, grassland, plantation, woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank and risk to existing A9 carriageway.	Very High	 WF9 – upstream view upstream of Ladywell Cottage.
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform in upstream reach, culverted alongside the A822 for approximately 400m to junction with A9. Artificially straightened planform downstream of A9 prior to discharge into the River Braan (WF11) Structures: Culverted beneath Ladywell Cottage for approximately 38m. Conveyed through steeply graded chute with masonry bank protection. Culverted again beneath existing A9 carriageway through concrete sluice and culvert for approx. 52m. Culverted under local access road. Conveyed under footpath through plastic pipe prior to discharging to the River Braan. Riparian zone: Continuously sparse vegetation comprising mixed woodland, grass and bracken. Silt bed, smooth flow, Plane-bed Riffle, vertical earth banks.	Medium	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low to medium dilution capacity: Q_{95} calculated to be 0.0034m^3/s.Possible additional pollutant sources: diffuse rural sources, and urban, rail and road drainage.	Medium	 WF9 – downstream view from existing A9 culvert outlet towards River Braan.
WF11 (River Braan) 211km^2 catchment Surrounding land use: woodland, plantation, uplands, development, agriculture.	Flood risk	SEPA Flood Maps and Jacobs refined flood modelling show direct flood risk to properties at Inver and Inver Mill Farm caravan park, and the existing A9 due to the backwater effect at the existing A9 bridge, footbridge and bridge at Inver.	Very High	 WF11 (River Braan) – view upstream from footbridge, immediately upstream of A9 bridge crossing.
	Hydromorphology	SEPA hydromorphology status: High (2018). Sinuous planform with a single-thread channel. Active erosion and deposition at several locations. Historical change: island development, deposition and erosion. Riparian zone: Continuous narrow belt consisting of deciduous trees upstream of the Rumbling Bridge and downstream of the Hermitage to confluence with River Tay. Continuous wide belt consisting of mixed woodland between the Rumbling Bridge and the Hermitage. Structures: Three bridge crossings, including the existing A9 and Highland Main Line railway. Cobble bed, numerous boulders.	Very High	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall status: Good (2018). SEPA physico-chemical/ biological elements/ specific pollutants status: High/ Good/ Pass (2018). Medium dilution capacity: Q_{95} calculated to be 0.609m^3/s.Fisheries status: salmonid waters under WFD (associated with River Tay). Other designations: River Tay SAC. Potential additional pollutant sources: diffuse rural sources, road and rail drainage.	Very High	 WF11 (River Braan) – view downstream from railway bridge.
WF11A <3km^2 catchment Surrounding land use: Residential, arable grassland, temperate forest.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	 WF11A – view upstream of unclassified road to Inver.
	Hydromorphology	SEPA hydromorphology status: not classified. Artificially modified planform. Riparian zone: Continuous, comprising deciduous trees, grass and bracken. Bedforms comprise boulder steps and pools and boulder cascades. Silt, sand, gravel, cobbles and boulder bed material. Structures: culverted under access road to Inver (approx. 17m in length)	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0014m^3/s. Potential pollutant sources: diffuse rural sources.	Medium	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
WF12 (Mill Stream) 0.02km^2 catchment Surrounding land use: development, residential/ recreational (caravan park).	Flood risk	SEPA Flood Maps and Jacobs refined flood modelling show direct flood risk to properties at Inver and campsite due to flood mechanism of the River Braan.	Very High	 WF12 (Mill Lade/Mill Stream) – view downstream towards existing A9 culvert inlet.
	Hydromorphology	SEPA hydromorphology status: not classified. Artificial planform between River Braan and River Tay. Historic mapping shows multiple mills along course of the lade. Structures: Culverted for approximately 120m of its 320m length. Culverted under the existing A9, properties and local access routes at Inver. Riparian zone: Continuous narrow belt of deciduous woodland immediately upstream of existing A9. Gravel and cobble bed, incised, bank reinforcement.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.003m^3/s. Likely to be reliant on flow from the River Braan as areas of stagnant water noted onsite. Potential pollutant sources: road drainage, multiple outfalls from residential sources noted during site visits. Noted in Volume 1, Part 3 – Environmental Assessment (Chapter 11: Ecology and Nature Conservation) as having no suitable habitat for protected species and not accessible for migratory salmonids.	Medium	
WF12A 0.33km^2 catchment	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level within bank and no risk to existing A9 carriageway.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
Surrounding land use: woodland, plantation.	Hydromorphology	SEPA hydromorphology status: not classified. Artificially modified planform downstream of Highland Main Line railway. Structures: culverted under Highland Main Line railway and the existing A9 for approx. 100m. Riparian zone: Continuous wide belt consisting of mixed deciduous and coniferous trees upstream and downstream of the existing A9 and Highland Main Line railway. Sand and gravel bed, steep, step -pool flow.	Medium	 WF12A – Upstream view upstream of existing A9 and Highland Main Line railway.
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0015m^3/s. Potential pollutant sources: diffuse rural sources.	Medium	
WF12B <3 km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level within bank and no risk to existing A9 carriageway.	Low	 WF12B – view upstream towards Highland Main Line railway culvert.
	Hydromorphology	SEPA hydromorphology status: not classified. No watercourse observed upstream of existing A9 or Highland Main Line railway. Artificially modified planform downstream of Highland Main Line railway. Structures: culverted under Highland Main Line railway and the existing A9 through a culvert approximately 85m long. Riparian zone: Continuous wide belt consisting of mixed deciduous and coniferous trees upstream and downstream of the existing A9 and Highland Main Line railway. Sand and silt bed, plane bed and step – pool flow downstream of existing A9.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified.	Medium	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
		Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0016m^3/s.Potential pollutant sources: diffuse rural sources.		
WF13 1.33km^2 catchment Surrounding land use: woodland, plantation, uplands.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank and risk to existing A9 carriageway.	Very High	 WF13 – view upstream, upstream of existing A9.
	Hydromorphology	SEPA hydromorphology status: not classified. Historical change: erosion and deposition, meander migration. Structures: culverted for approximately 88m under the existing A9, Highland Main Line railway and local access routes Riparian zone: Continuous sparse consisting of coniferous woodland. Gravel and sand bed. Step-pool and pool – riffle bedforms and flow types and plane bed features. Mid channel and point bars were noted.	High	
	Surface water quality	SEPA overall chemical status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0043m^3/s.Potential pollutant sources: diffuse rural sources, road and rail drainage.	Medium	
WF14 0.64km^2 catchment	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level within bank and no risk to existing A9 carriageway.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
Surrounding land use: woodland, plantation.	Hydromorphology	SEPA hydromorphology status: not classified. Predominantly sinuous planform. Historical change: erosion and deposition, meander migration. Structures: bridge crossing under the existing A9 (Tay Bridge) and culverted under B898 road (approx. 24m in length), Highland Main Line railway (approx.14m in length) and local access routes (for approx. 10m). Riparian zone: Continuous sparse vegetation comprising mixed woodland. Gravel and sand bed, pool-riffle sequence.	Medium	 WF14 – view upstream towards arch structure under Highland Main Line railway.
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0029m^3/s.Potential pollutant sources: diffuse rural sources, road and rail drainage.	Medium	
WF16 0.29km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level out of bank but no risk to existing A9 carriageway.	Low	
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform. Structures: culverted under the existing A9 for approximately 44m, General Wade's Military Road (for approx. 10m) and forest tracks. Riparian zone: Continuous comprising mixed woodland (upstream of existing A9 crossing). Gravel and cobble bed, step-pool sequence.	Medium	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0013m^3/s. Potential pollutant sources: diffuse rural sources, road drainage.	Medium	 WF16 – view downstream towards A9.
WF17 0.11km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	No photo (not accessed, identified as roadside drain).
	Hydromorphology	SEPA hydromorphology status: not classified. Road drain.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Water feature 17 is an approx. 21m long road drain with no natural flow. Potential pollutant sources: road drainage. Fisheries status: not classified.	Low	
WF18 0.17km^2 catchment Surrounding land use: woodland.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map. Simple assessment of existing A9 culvert indicates headwater level is in bank however the headwater level is higher than the A9 road level (culvert inlet upslope of existing A9) therefore potential risk to the existing A9 carriageway.	Very High	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
	Hydromorphology	SEPA hydromorphology status: not classified. Low sinuosity planform. Structures: culverted under both the existing A9 and local access track for approximately 75m and General Wade's Military Road for approximately 8m. Riparian zone: Continuous comprising mixed woodland (upstream of existing A9 crossing). Gravel and cobble bed, step-pool sequence.	Medium	 WF18 – view downstream towards A9.
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low dilution capacity: Q_{95} calculated to be 0.0008m^3/s. Potential pollutant sources: diffuse rural sources, road drainage.	Low	
WF186 0.3km^2 catchment Surrounding land-use: woodland and residential	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	 WF186 – downstream view towards Highland Main Line railway.
	Hydromorphology	SEPA hydromorphology status: not classified. Straight planform. Silt, sand and gravel bed material, erratic's providing occasional bank protection upstream.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low flow, likely to be intermittent/ephemeral. Potential pollutant sources: diffuse rural sources.	Low	

Water Feature ID (water body name)	Attribute	Description	Importance	Photographs
WF187 0.06km^2 catchment Surrounding land-use: woodland/ agriculture.	Flood risk	No flood risk has been identified for this water feature using either the SEPA Flood Maps or OS map.	Low	 WF187 – view of boundary drain diverting clean surface water around Ladywell Landfill.
	Hydromorphology	SEPA hydromorphology status: not classified. Artificial drainage channels within Ladywell Landfill.	Low	
	Surface water quality	SEPA overall ecology status: not classified. SEPA physico-chemical/specific pollutants status: not classified. Fisheries status: not classified. Low flow, likely to be intermittent/ephemeral. Possible pollutant sources: contaminants from Ladywell Landfill.	Low	

Appendix A10.2: Inchewan Burn

1.1 Introduction

1.1.1 This appendix provides further detail and assessment of the works required on Inchewan Burn associated with the proposed route options. This includes:

- a more detailed baseline for Flood Risk, Hydromorphology, Surface Water Quality and Aquatic Ecology;
- a description of the works for the Inchewan Burn crossing for Options ST2A and ST2B (including alternatives) followed by an impact assessment of these on Flood Risk, Hydromorphology, Surface Water Quality and Aquatic Ecology, mitigation and residual impacts;
- a description of the works for the Inchewan Burn crossing for Options ST2C and ST2D followed by an impact assessment of these on Flood Risk, Hydromorphology, Surface Water Quality and Aquatic Ecology, mitigation and residual impacts; and
- a summary of consultation with Scottish Environment Protection Agency (SEPA) to date and assessment conclusions.

1.2 Detailed Baseline

Introduction

1.2.1 Inchewan Burn is a right bank tributary of the River Tay in the Grampian Mountains of Scotland. The River Tay main stem from the River Tummel to River Isla confluences is designated as a heavily modified water body having Good Ecological Potential (SEPA, 2019). The underlying Killin, Aberfeldy and Angus Glens Groundwater Body is classified as having an overall WFD status of 'Good' (SEPA, 2020).

1.2.2 Inchewan Burn rises in the Obney Hills where elevations reach 403m above mean sea level. The catchment shows a characteristic dendritic drainage network with evidence of stream capture in the upper headwaters from the adjacent tributary of Garry Burn to the southwest. Although there are no SEPA gauging stations in the Inchewan Burn catchment, the adjacent catchment on the River Braan suggests a responsive flow regime with annual average rainfall recorded as 1,326mm at The Hermitage.

Geological Context

1.2.3 The bedrock geology comprises the metamorphic rocks of the Southern Highland Group, and the Birnam Slate and Grit Formation which collectively form part of the Dalradian Supergroup. Several igneous dykes provide resistant outcrops in the catchment area. These rocks were formed during the Caledonian Orogeny which took place 470 million years ago and comprise metasedimentary rocks deposited as early as 730 million years ago. Superficial deposits of diamicton, sand and gravel are derived from the last glacial epoch with peat deposits reflecting the relief and climate of this area of Scotland.

1.2.4 Soil types in the Inchewan Burn catchment area are related to the superficial geology and are dominated by podzols with subordinate brown soils. Land use is predominantly heather moorland and rough grazing on the higher slopes, with coniferous plantation upstream from the Dunkeld & Birnam Station, and deciduous woodland and built-up areas on the lower gradients near the River Tay confluence. There is evidence of anthropogenic channel modification in the catchment area of Inchewan Burn, including: bank and channel reinforcement and several impoundments, such as a dam and reservoir in Tomgarrow Wood and a weir structure upstream from Dunkeld & Birnam Station. However, the channel generally follows topographic defiles and forms cascades, waterfalls, steps and pools where it encounters bedrock outcrops and glacial erratics.

Hydrological Context

1.2.5 The catchment area of Inchewan Burn is approximately 5.77km^2 and its catchment is essentially rural in nature, with URBEXT value of approximately 0.001. The catchment descriptors show that this burn has little attenuation due to rivers and lakes (FARL=0.984), the catchment is generally impermeable in nature with BFIHOST = 0.51 and SPRHOST=33.1, and it receives an annual rainfall of 994mm.

Flood Risk

1.2.6 Inchewan Burn is included on SEPA Flood Maps (SEPA, 2020). The flood extent for a medium likelihood (0.5% Annual Exceedance Probability (200-year)) flood event, remains largely in-bank upstream of the bridge crossing at Perth Road. Downstream of the bridge at Perth Road the Inchewan Burn is shown to overtop and flood properties on both the left and right banks of the watercourse as it interacts with the flood extent of the River Tay.

1.2.7 To improve the understanding of the baseline flood conditions and enable a more accurate assessment of the impacts, a flood model was developed for the River Tay and its larger tributaries, including Inchewan Burn, within the study area. Estimates of flow for the assessment scenario (the 0.5% Annual Exceedance Probability (AEP) (200-year) plus a 20% allowance for climate change (plus CC) event were calculated using both Flood Estimation Handbook (FEH) (CEH, 2009) statistical and rainfall runoff methods for small catchments and analysis using SEPA river flow gauge data for the larger watercourses.

1.2.8 In the baseline case, for the 0.5% AEP (200-year) plus CC event, it is noted that:

- Flooding from the left bank and the right bank of the River Tay, from the River Braan to the Inchewan Burn affects several properties.
- In the area of the existing A9 bridge crossing of Inchewan Burn, the watercourse is steep and water levels stay in bank at this location for up to and including the 0.5% AEP (200-year) plus climate change event. However, due to the backwater effect near the confluence with the River Tay, the Inchewan Burn overtops on the left bank and merges with the floodwater from the right bank of the River Tay, with floodwater affecting a number of properties in Burnmouth Road.
- Downstream of the junction with the Inchewan Burn, overtopping from the right bank of the River Tay causes flooding to the east of Oak Road. However, this is an open green area and neither roads/railways, or properties are affected by flooding.

Hydromorphology

Detailed Channel Characteristics

1.2.9 Table 1 provides a detailed description of the geomorphological characteristics of Inchewan Burn based on a reconnaissance survey undertaken in September 2018 over a reach length extending 1km upstream and 500m downstream, as centred on the existing A9. Historical mapping, a map of existing pressures, particle size analysis and sediment transport and dynamics are provided in *Annex A (Geomorphology Supporting Information)*.

Table 1: Baseline Conditions by Geomorphological Feature

Attribute	Description	Representative Photograph
Valley	The catchment terrain is dominated by the upland terrain of the southern Grampian Mountains and underlain by metasedimentary bedrock belonging to Dalradian Supergroup. Superficial deposits comprise glacial till, sands and gravels and fluvial terrace deposits. Land use is primarily natural grassland and moorland, temperate woodland and coniferous forest. The Inchewan Burn river valley is asymmetrical with heights averaging 20m above the channel and steep slope angles between 20°-50°. There was no evidence of valley failure.	
Floodplain	The valley floor, located within the confines of glacio-fluvial terraces, is fragmentary and <1 river width. It is in a bedrock-defined gorge upstream of the existing A9 road bridge but broadens with increasing distance downstream from the bridge into Dunkeld and Birnam and the River Tay confluence. Surficial deposits comprise glacio-fluvial deposits. Vegetation types are dominated by unimproved pasture, moorland, deciduous woodland and coniferous plantation. The riparian corridor is continuous, comprising mixed woodland, grass and bracken. At least two terraces were noted above the channel. Trash lines were observed 1m above the channel with no overbank deposits or levees.	
Channel	Inchewan Burn displays a low sinuosity planform with steep step-pool, tumbling and uniform/rapid flow types. Bedforms comprise bedrock cascades, boulder steps and pools, and cobble/gravel plane-riffles. Bed material comprises boulders, sand, gravel and cobbles. Bedrock outcrops, glacial erratics and boulders provide bed and bank controls. A characteristic imbricated pattern was observed in the bed and bar material. The finer, sand and gravel bed-material appears to be mobile and forms alternate, lateral bars. Average bankfull channel dimensions were obtained from the plane-riffle and step-pool reaches upstream from the existing A9 road crossing. Sections were selected which were not constrained by artificial reinforcement or bedrock. Average bankfull plane-riffle channel width = 4.8-5.7m; depth = 0.4-0.5m. Average step width = 4.2m; bankfull pool width = 4.7m; step height = 0.5m; maximum pool depth = 0.48m; step spacing = 1 channel width. Largest clast size in step is 100cm with an average range from 28-35cm; D_{50} riffle = 2.6cm.	

Attribute	Description	Representative Photograph
Left Bank	The left bank comprises non-cohesive sand/gravel/cobble/boulder materials with a sparse continuous cover of grass, mixed woodland and bracken. A mixed-stand of healthy, mature trees cover the whole bank and provide hard points at the bank toe. No bank erosion or geotechnical failures were noted upstream of the existing A9. The bank profile is planar to concave. Average bank heights are 1 to 2m with bank angles of 20° to 50°. A dry-stone wall was set-back from the left bank top forming a continuous feature extending to the Highland Main Line railway bridge at Dunkeld and Birnam.	
Right Bank	The right bank comprises non-cohesive sand/gravel/cobble and boulder materials with a sparse continuous cover of grass, mixed woodland and bracken. A mixed-stand of healthy, mature trees cover the whole bank and provide hard points at the bank toe. No bank erosion or geotechnical failures were noted upstream of the A9. Downstream there is evidence of erosion opposite a bar where artificial reinforcement is absent and likely results from steep slopes, impinging flow processes, vegetation clearance and shallow slides. The bank profile is planar to concave. Bank debris in the form of cobbles and boulders are stored at the bank toe at the failure location. Average bank heights are 1 to 2m with bank angles of 20° to 50°. The right bank was reinforced by gabions and stone blockwork at several locations as described below.	

Existing Morphological Pressures

1.2.10 There are three mapped impoundments within the Inchewan Burn catchment, two of which were observed during site surveys (Photographs 1 and 2). The weir structure 900m upstream from the A9 road bridge (Photograph 1) is associated with a broad, shallow pool upstream, 15m in length, which is infilling with gravel and sand-size sediment. Some sediment may be transported downstream as the pool has filled. Serious lateral erosion and vertical incision in the channel bed and banks was noted downstream from the weir sluice structure. The weir width was estimated as 5m with retaining walls each 6m in length and a sluice length of 6m. The backwater effect from the in-filling pond and weir extended approximately 12m upstream. A dry-stone wall was noted which was set-back from the left bank and affects 700m of the left bank downstream from the weir and is in poor repair in several locations. A small, low weir structure was also noted 450m upstream of the existing A9 crossing across the width of the channel (Photograph 2).

Photograph 1: Inchewan Burn – weir 900m upstream of existing A9 crossing.

Photograph 2: Inchewan Burn - Small weir structure 450m upstream of existing A9 crossing.

1.2.11 The right bank is impacted by a stone retaining wall which is discontinuous and affects 280m of right bank in total upstream from the railway bridge. A wooden foot bridge was noted approximately 400m upstream from the A9 road bridge with a single abutment in the channel bed. However, no adverse impacts were noted.

1.2.12 Cobble and concrete bed protection was observed to impact 220m of the channel bed from the waterfall to the confluence with the River Tay.

River Restoration Works

1.2.13 The section of Inchewan Burn between the Highland Main Line railway bridge to the downstream side of the existing A9 bridge crossing has been the focus of previous restoration attempts (Photograph 3) aimed at improving fish habitat quality and fish passage within the channel. Restoration works to recreate a boulder step-pool bed were completed in 2007 and are now used as an example of river restoration techniques by the River Restoration Centre (RRC, 2013). Stakeholders involved in the restoration included the local ghillie, Transport Scotland, SEPA, NatureScot (formerly Scottish Natural Heritage), Perth & Kinross Council, RRC and Scottish Native Woods.

1.2.14 Works to construct the existing A9 included realignment of the watercourse under the existing bridge crossing, with gabion baskets placed along the banks and a Reno Mattress bed. Artificial steps and pools have been constructed to replace the former bed reinforcement. The artificial steps and pools are largely intact, however, there is evidence of bank and step undercutting and mid-channel deposition suggesting mild instability. Winnowing of fine gravels has also led to exposure of the concrete foundations of the restored section.

1.2.15 The right and left banks were constrained by 70m of gabion baskets through the artificial step-pool reach, and then constrained by stone blockwork and boulders 420m downstream to the footbridge near the River Tay confluence.

Photograph 3: Inchewan Burn – restored section beneath the existing A9.

Summary

1.2.16 Inchewan Burn displays the characteristics of a Cascade Sensitivity A River Type, Step-Pool Sensitivity B River Type and Plane-Riffle Sensitivity C River Type (SEPA 2012, WAT-SG-21). River type varies according to channel gradient, bedrock outcrop location and artificial constraints. Historical records show the planform of Inchewan Burn has been straightened downstream from the railway line since mapped records of 1867, and the upstream reservoir, dam, pond and weir structures do not appear on maps prior to 1948.

1.2.17 Inchewan Burn is stable under the existing hydrophysiographic conditions and artificial constraints, in that it appears to be competent to transport the water and sediment supplied from upstream without excessive erosion or deposition.

1.2.18 Calculations of stream power, sediment transport and channel competence confirm the capability to transport coarse sediment under the existing conditions in Inchewan Burn. The analysis of sediment dynamics indicates that the bed material is mobile with QMED above the threshold for sediment transport of D_{50} clast sizes in the pools, riffles and bars. Entrainment computations suggest that the channel is competent to transport clast sizes smaller than 180mm during QMED flows in step-pool reaches; this represents the full size-range recorded in the bars upstream of the existing A9 crossing.

Surface Water Quality

1.2.19 Inchewan Burn is not classified by SEPA for its physico-chemical/specific pollutants status. Following crossing under the A9, the burn flows through an urban area, prior to converging with the River Tay and becomes part of the River Tay Special Area of Conservation (SAC) approximately 50m upstream of its confluence.

1.2.20 Land use within the catchment comprises rural/ farmland (~63%), planted forestry (~34%), and urban (road infrastructure, residential and commercial properties is ~3%). Potential pollutants from forestry could include sediment, dissolved organic carbon and nutrients. Potential pollutants from farmland could include diffuse sources with high levels of (agricultural) nutrients (nitrogen and phosphorus). Potential pollutants from urban sources could include suspended solids and contaminants bound to them (such as heavy metals and phosphorus); diffuse sources with high levels of (agricultural) nutrients (nitrogen and phosphorus); de-icing salt (chloride); and oil and related compounds.

1.2.21 The Ladywell Landfill is also located adjacent west of Inchewan Burn, and therefore could be a source of pollutants to the watercourse. Surface water runoff from the landfill site is collected through a series of drainage channels that direct flow around the landfill cells and convey flow to Inchewan Burn via an outfall at approximately NGR NO 02978 41673.

1.2.22 Flow in Inchewan Burn is perennial, and the watercourse has a modelled Q_{95} (flow exceeded for 95% of the flow record) of 0.025m^3/s. There are no licenced discharges or abstractions to or from the watercourse within the 500m study area under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR).

1.2.23 During surveys undertaken in April 2015, October 2016 and August 2018 a number of outfalls, (potentially from residential properties), were observed along the banks of the burn. These are not identified by CAR licenced discharges and therefore the purpose of these are unconfirmed, however, they are anticipated to be outfalls from private septic tanks. As-built drawings of the existing A9 indicates that the Inchewan Burn currently receives runoff from the existing A9, with limited treatment from relatively short lengths of filter drain along the carriageway (as observed during site surveys). Runoff from local roads within Birnam and Little Dunkeld may also discharge to Inchewan Burn.

1.2.24 Surface Water quality also typically considers biodiversity. The watercourse is not classified by the Water Framework Directive (WFD) for its ecological status and fisheries status. The upper sections of the burn have falls, which are likely to prevent fish passage. A historic man-made barrier to fish passage under the existing A9 was removed in 2007 during works to restore a section of the river (RRC, 2013). Therefore, Inchewan Burn is considered to be suitable for salmonids in its lower reaches.

Aquatic Ecology

1.2.25 Inchewan Burn is considered to be of regional importance as Atlantic salmon (*Salmo salar*) are a primary designating feature of the River Tay SAC (NatureScot, 2021), which is directly connected to Inchewan Burn. Atlantic salmon and brown/sea trout (*Salmo trutta*) share similar habitat requirements at all age classes; namely well-oxygenated gravels in stable flows at 17-76cm depth for spawning, mixed coarse substrates in shallow fast-flowing waters for juveniles, and migratory corridors free of in-stream barriers for adult migrations to spawning grounds (Hendry and Cragg-Hine, 2003).

1.2.26 Surveys of Inchewan Burn were conducted by the Tay District Salmon Fisheries Board (TDSFB) in 2013. These surveys indicated, from the fish community observed, in sections of the burn upstream of Perth Road there was a decrease in habitat quality for juvenile Atlantic salmon and brown/sea trout. Electrofishing results from the restored section between the existing A9 and Perth Road suggested this was an area of poor habitat quality for both spawning and juvenile habitat. Similar results were reported in the section of the burn between the existing A9 and a bedrock-controlled waterfall (Photograph4). In addition, spawning habitat was noted approximately 200m upstream of the confluence with the River Tay, and juvenile Atlantic salmon, thought to have spawned locally, were recorded in this section at the time of survey.

1.2.27 Surveys carried out by Jacobs in 2015, 2016, 2018 and 2019 corroborated the Tay District Salmon Fisheries Board (TDSFB) habitat assessment. It was concluded that the majority of habitat in Inchewan Burn below the waterfall was suitable for juvenile Atlantic salmon and brown/sea trout but there was limited spawning habitat in the burn, particularly downstream of Perth Road. DMRB Stage 2 assessment surveys (undertaken by Jacobs in 2018), noted no significant changes in fish habitat quality or availability. The waterfall upstream of the A9 (Photograph 4) is still considered likely to be a barrier to the upstream migration of Atlantic salmon under most (if not all) flow conditions.

Photograph 4: Inchewan Burn – bedrock-controlled waterfall upstream of A9.

1.2.28 A weir structure approximately 800m upstream of the waterfall also impedes further upstream movement of migratory fish. Juvenile fish were observed upstream of the waterfall at the time of the 2018 site visits but these were expected to be resident brown trout, which are known to be present in the burn at this location (based on the TDSFB 2013 electrofishing results). The burn downstream of the waterfall was found to contain areas of suitable habitat for juvenile Atlantic salmon and brown/sea trout, with moderate flows, mixed substrates and shallow pools, but no significant deposits of spawning gravels. Several juvenile fish (species unconfirmed) were observed in this section during the site visit.

1.2.29 The section of burn downstream of Perth Road and the River Tay was previously considered the only area of suitable spawning habitat within Inchewan Burn. Site conditions observed during 2018 and 2019 site visits suggest this area currently contains very limited, sub-optimal spawning habitat and no redds were observed during two surveys in 2019. The substrates in this section were covered by an overlying layer of silt and algae, and the gravel deposits that were present were sparse and fine. Spawning habitat within Inchewan Burn is therefore considered limited. Atlantic salmon may spawn at suboptimal spawning sites but given the close proximity of the River Tay and the high-quality spawning habitat it offers, the Inchewan Burn is not considered a primary spawning location within this catchment under current conditions.

1.3 Proposed Route Options in Relation to Inchewan Burn

Option ST2A and Option ST2B

1.3.1 Option ST2A requires the lowering of the alignment of the proposed A9 dual carriageway in a cut and cover tunnel in the locality of Dunkeld & Birnam Station and Inchewan Burn. The estimated construction durations for Option ST2A and Option ST2B are approximately 4.5-5 years and 4-4.5 years respectively. As a result, Inchewan Burn itself would be lowered by approximately 8 metres to accommodate the lowered A9, the necessary headroom clearance needed (6.45 metres for High Load Route), as well as incorporation of necessary ventilation equipment (1.5 metres) over the length of the 1.5 kilometre cut and cover tunnel.

1.3.2 Option ST2B requires the lowering of the alignment of the proposed A9 dual carriageway in an underpass structure in the locality of Dunkeld & Birnam Station and Inchewan Burn. As a result, Inchewan Burn itself would be lowered by approximately 6 metres to accommodate the lowered A9, the necessary headroom clearance as well as incorporation of the necessary ventilation equipment over the length of the approximately 150m underpass.

1.3.3 Works to Inchewan Burn for Option ST2A and Option ST2B would be complex given the degree of lowering required and the presence of existing adjacent constraints, including the Highland Main Line railway and associated masonry arch bridge, the A9, Ladywell Landfill, residential properties and existing topography. It is anticipated that these works would take approximately 12-18 months.

Alternative Options to Lowering Inchewan Burn

1.3.4 Given the complexity of the works in relation to Inchewan Burn, two alternative options were considered to eliminate or reduce the extent of lowering the burn, these are summarised in the following section. However, it is noted while these options would eliminate lowering of the Inchewan Burn, they would introduce further environmental impacts, affect cost, increase construction complexity and increase construction duration. As a result, the proposals to lower Inchewan Burn are considered the most appropriate to be included in the options assessed at DMRB Stage 2 for Option ST2A and Option ST2B.

Alternative Option 1

1.3.5 Diversion of Inchewan Burn to discharge to an alternative existing watercourse, eliminating the need for burn lowering. The most likely diversion would be to discharge into the River Braan, which is approximately 1 kilometre to the north. The River Braan forms part of the River Tay SAC.

1.3.6 The diverted burn would need to traverse existing side roads, the Ladywell Landfill and the Highland Main Line railway. In addition, traversing part of the Ladywell Landfill would introduce increased risk of contamination. Undulating topography and ancient woodland are further constraints on the alignment. The River Braan is also subject to flooding, which may be increased if additional flows are introduced. This could have a detrimental impact on nearby residential properties and a local caravan park. In addition, the closest point of the River Braan for any tie-in for a diversion is the steep right bank on the outside of a meander bend. Significant bank protection exists at this location.

1.3.7 While Alternative Option 1 eliminates the requirement to lower Inchewan Burn, it would result in further impacts, affecting cost, construction complexity, construction duration and environmental and ecological receptors. As a result, the option is not considered as feasible as lowering Inchewan Burn.

Alternative Option 2

1.3.8 Further lowering of the proposed A9 dual carriageway by approximately 11.5 metres, to enable Inchewan Burn to flow over the proposed structure, generally following its existing alignment and elevation. As Option ST2B includes an underpass structure, Alternative Option 2 is only applicable to Option ST2A.

1.3.9 Construction would be particularly complex for Option ST2A. Due to space constraints and ground conditions, retaining walls would be erected to form the cut and cover tunnel. The walls would likely be constructed using large diameter bored piles and installation would require heavy plant in close proximity to residential properties, Dunkeld & Birnam Station, the Highland Main Line railway and the Category A Listed station building.

1.3.10 Lowering the A9 deeper into the ground would increase the construction complexity significantly. Larger diameter bored piles may be required to accommodate the greater depth. It is therefore likely that more temporary works, to support the piled walls would be required, increasing risk, scheme cost and construction duration. Furthermore, there is potential that deeper piles would encroach within the track support zone for the Highland Main Line railway. The deeper tunnel would also have a greater weight of soil above, increasing the force on the structure. As a result, a larger deck slab would likely be required, again adding to the risk, cost and complexity of the project.

1.3.11 While Alternative Option 2 eliminates the requirement to lower Inchewan Burn, this option has significant construction issues, increasing the complexity, cost of the scheme and duration of construction. As a result of the greater depths and requirements for additional temporary works, the associated risk is heightened. Therefore, the option is not considered as feasible as lowering Inchewan Burn.

Lowering Inchewan Burn

1.3.12 An indicative design has been completed for a lowered Inchewan Burn. Table 2 details design considerations for the lowering.

Table 2: Design considerations for Option ST2A and Option ST2B

Element	Description
General	§ Structure must pass under the proposed cut and cover tunnel with a maximum culvert soffit level of approximately 52m Above Ordnance Datum (AOD) for Option ST2A and under the proposed underpass for Option ST2B with a maximum culvert soffit level of approximately 55m AOD for Option ST2B. § Downstream alignment must tie-in in the existing bed upstream of the crossing of Perth Road as further complex engineering and significant disruption would be required to achieve any works at or downstream of this crossing. § Provision of a new bridge crossing approximately 100m upstream of the Highland Main Line railway to provide alternative access to properties at Birnam Glen.
Flood Risk	§ Structure must convey the 0.5% AEP (200-year) plus CC flood flows without increasing flood risk upstream or downstream. § For Option ST2A, based on the required flow conveyance and effective hydraulic performance of the structure, a vertical drop of approximately 8 metres from the current bed level with an invert level of approximately 52m AOD for the main culvert inlet is required, with a culvert length of 55m. § For Option ST2B, based on the required flow conveyance and effective hydraulic performance of the structure, a vertical drop of approximately 6m from the current bed level with an invert level of 55m AOD is required. This falls to approximately 55m AOD at the culvert outlet with a culvert length of 35m. § Vertical realignment only possible through the incorporation of a drop structure and a box culvert at a shallow gradient (Option ST2A 1:1000, Option ST2B 1:500). § 2.5m (depth) by 1.5m high (width) culvert to convey the design flood event (0.5% AEP (200-year)) plus Climate Change) with small surcharging of the culvert within the drop structure. § Surcharge capacity of the proposed culvert arrangement will be capable of passing floods well in excess of the 0.1% AEP (1000-year) flood.
Hydromorphology	§ Culvert outlet headwall and realigned river bed will be re-sectioned and contained within a 5-metre-wide channel with vertical re-enforced concrete walls. § For Option ST2A, concrete walls will have heights of up to 5m at the upstream to 2.5m high at the point where the re-sectioned channel meets the natural river bed level approximately120m downstream of the outlet headwall and approximately 40m upstream of Perth Road. § For Option ST2B, concrete walls will have heights of up to 2m at the upstream to 0.5m high at the point where the re-section channel meets the natural river bed level approximately 30m downstream of the outlet headwall and approximately 150m upstream of Perth Road. § Shallow gradient necessary to promote self-cleaning flows for fine sediment but minimise the distance downstream to tie-in to the natural bed level. § It is not considered to be practical to maintain sediment transport within the structure. This is due to the potential management burden, feasibility of designing the culvert capacity and position underneath a tunnel.
Surface Water Quality and Aquatic Ecology	§ Limited distance exists between the existing Highland Main Line railway masonry arch bridge and Option ST2A and Option ST2B, which prevents the inclusion of fish passes or step-pool drop features. Therefore, a hydraulic drop structure is required to pass the culvert under the lowered route alignment.

Flood Risk

Potential Impacts

1.3.13 Construction of the tunnel/underpass, drop structure and operational culvert will require temporary diversion of the flows in the watercourse over one or two flood seasons. The size of the diversion culverts required has the potential to introduce a risk of blockage with debris during the construction period. Diverted watercourses also carry a higher risk of flooding as they tend to lack the opportunities for storage of flood flows provided by the floodplain in the pre-diversion scenario. Therefore, high magnitude flows are more likely to cause flooding, resulting in a significant effect.

1.3.14 As the watercourse is set deep in the surrounding topography, water levels stay in bank at this location during operation even after implementing the modifications. However, the downstream reach of the Inchewan Burn is highly influenced by the water levels on the River Tay and the change in water level on the River Tay causes a non-significant increase in water level of <1mm on the left bank of the Inchewan Burn. However, the required drop structure, and reduced gradient of the reconfigured Inchewan Burn in the long term, pose a risk of debris accumulation and hence blockage, introducing a further flood risk.

Mitigation

1.3.15 Given the duration and extent of works required to achieve the vertical realignment of Inchewan Burn an indicative construction sequence has been developed that also mitigates flood risk. An outline of the construction phases for the new culvert is provided in *Annex B*. The construction sequence includes an offline diversion of Inchewan Burn around the works area in a box culvert. The culvert would be sized to convey a flow return period proportionate to the duration of the construction of the permanent alignment of Inchewan Burn (WF8). The diversion would isolate flow from construction activities and safely convey flow into the downstream channel. For both Option ST2A and Option ST2B, Phases 1 to 8 of the culvert construction will be largely similar. However, two additional phases will be required for Option ST2A to allow for the construction of the cut and cover tunnel structure.

1.3.16 The risk of blockage during operation, due to the vertical channel realignment, would be mitigated through the inclusion of trash screens and an upstream weir with a sediment trap. The trash screen would be incorporated into the inlet arrangement of the drop structure to prevent blockage from debris as assessment of the upstream catchments highlights a significant risk of blockage. The weir and sediment trap would be located upstream of the Highland Main Line railway bridge. Access provision would be required to both the trash screen and sediment trap as they will require ongoing maintenance to ensure they are effective. The drop structure will require access for maintenance and inspection and will include access to the sump and culvert. The precise configuration of the access would be developed at later design stages. It may be possible however, to provide an additional manhole chamber and access door to allow safe access to the culvert for jetting and condition assessment.

1.3.17 If either Option ST2A or Option ST2B are carried forward to the DMRB Stage 3 assessment the flood risk implications of the proposed drop structures, channel regrading, construction sequence and any additional mitigation measures will be considered further.

Residual Impacts

1.3.18 During construction, the lowering works to Inchewan Burn are considered to have potential to increase flood risk. However, specific mitigation has been considered as part of a planned construction sequence (as described in Annex B which would be developed further and likely reduce this risk to not significant.

1.3.19 During operation, the proposed structures on Inchewan Burn would introduce the risk of debris blockage and siltation resulting in increased flood risk. However, appropriate mitigation in the form of a trash screen, weir and sediment trap (with ongoing maintenance) would be developed as part of the DMRB Stage 3 assessment. This mitigation is considered to reduce this effect to not significant.

Hydromorphology

Potential Impacts

1.3.20 Option ST2A and Option ST2B would require extensive construction in the channel and riparian zone of Inchewan Burn, including the removal or disturbance to approximately 240m (Option ST2A) and 130m (Option ST2B) of the banks (including artificial lengths) and bed from approximately 35m upstream of the Highland Main Line railway to the downstream extent of the vertical regrading for each proposed route option. This would include the total loss of the approximate 100m length restored reach of Inchewan Burn, including complete excavation of the artificial steps and pools that have been constructed downstream of the Highland Main Line railway and under the existing A9 road bridge to remediate the historic impacts caused by the construction of the existing A9. Works would also include the removal of trees, bankside vegetation, the artificial banks and supporting bank structure. This would result in changes with the potential to have a significant effect on channel morphology and increased delivery of fine sediment to the downstream reach of the watercourse.

1.3.21 Due to the severance of the existing access to properties at Birnam Glen, Option ST2A and Option ST2B would also require the construction of a new access road and bridge crossing of Inchewan Burn approximately 100m upstream of the Highland Main Line railway. This would result in the disturbance of approximately 45m of the riparian zone, including the removal of trees and bankside vegetation, which may have impacts on the stability of the steep bank at this location. It may also require changes to the bank profile to construct the new embankment and abutments on the left bank of the watercourse, resulting in significant effects on the watercourse.

1.3.22 It is not considered feasible to maintain coarse sediment transport within the structure during operation due to the necessary shallow gradient of the culvert and maintenance issues associated with potential blockage and the potential for reduced capacity and conveyance for floods which could lead to flooding. Any prevention of the natural conveyance of sediment to downstream reaches will limit the channel's ability to sustain bed and bar form variability through sediment replenishment and will therefore lead to an increase in the capacity for the discharge to excessively erode the banks and bed downstream. Sediment transport and the formation of diverse bed morphology naturally dissipates excess energy. Removal of either, or both, of these features will inevitably cause the channel to attempt to restore sediment transport and natural stable channel dimensions through excessive erosion and deposition. There is also the potential for headcut erosion to develop upstream from the drop structure as the channel tries to naturally adjust to the new, enforced base level downstream.

Mitigation

1.3.23 For both Option ST2A and Option ST2B, culvert barrel velocities are in the region of 3.6m/s during the design flood event, therefore some energy dissipation and scour protection may be required at the culvert outlet.

1.3.24 Upstream of the Highland Main Line railway masonry arch bridge, a sediment/silt trap is proposed. Access will be gained from the new access road to properties on Birnam Glen, to the west of Dunkeld & Birnam Station. This is included to prevent cobbles, gravels, sediment and silt entering the proposed structure and compromising the hydraulic capacity and increasing the maintenance burden, including access and health and safety considerations. In addition, a trash screen would be incorporated into the inlet arrangement of the drop structure.

1.3.25 The sediment basin, trash screen, drop structure and culvert will interrupt natural sediment supply to the downstream reach of the watercourse to the River Tay confluence. This may be partially mitigated by removing material from a proposed upstream sediment basin and re-distributing the accumulated material in the downstream reach. This will artificially maintain sediment supply to the downstream reach and prevent some of the degradation of the habitat in the lower reach of the watercourse. Material accumulation upstream of the structure will require regular monitoring, which will inform the frequency at which redistribution will be required in the downstream channel. This mitigation would be required for duration of the operational life of Option ST2A and Option ST2B.

1.3.26 There are opportunities to enhance the reach to benefit ecological interests and maintain riparian processes. It may be viable and beneficial to introduce vegetated berms at the toe of the retaining walls to provide marginal habitat, improve aesthetics and introduce localised shading. The bed in the re-sectioned reach can be designed to accommodate some natural features, such as boulders and pool features, however due to the requirement to minimise gradient and tie-in distance there is limited scope for hydraulic diversity in the form of pools and riffles or step-pool features common to the natural channel. It may be possible to introduce very small hydraulic drops along this reach, but the flow conditions will be relatively uniform during low flows.

Residual Effects

1.3.27 Demolition of the existing A9 bridge crossing, vertical realignment of the watercourse, construction of a drop structure and new box culvert would cause permanent impacts on Inchewan Burn. This would contravene River Basin Management Planning (RBMP) objectives and the WEWS Act. Mitigation measures outlined above would reduce long term effects on Inchewan Burn to a degree, however the effect on Hydromorphology would remain permanent and significant post-mitigation for both Options ST2A and ST2B.

Surface Water Quality

Potential Impacts and effects

1.3.28 Construction works on Inchewan Burn would require extensive in-channel works over an extended reach of the watercourse over a long duration and will result in significant effects on surface water quality. This could lead to increased suspended sediment, siltation and polluted runoff and spillages, potentially affecting surface water quality and associated aquatic ecology, particularly in the restored reach (RRC, 2013) in the vicinity of the existing A9 crossing and downstream towards Perth Road and the River Tay confluence.

1.3.29 An increase in suspended sediment concentrations could result from the significant excavation, soil stripping and vegetation removal required to construct the drop-structure and culvert, which could result in the mobilisation of significant volumes of sediment. This would form silt-laden runoff which could migrate to downstream water features if insufficient treatment is provided.

1.3.30 Excess sediment settling out within the downstream reach of Inchewan Burn, towards the confluence with the River Tay, could smother gravels used for salmonid spawning and affect the health of aquatic fauna by interfering with respiration and increasing stress levels.

1.3.31 Accidental release of oils, fuels, cementitious materials or chemicals could occur from mobile or stationary plant in or near to Inchewan Burn during construction, or from inappropriate refuelling and fuel or material storage practices. This could include an increase in alkalinity from poor management and spillages of concrete or cement. Releases of chemicals and concrete could have severe or fatal consequences on freshwater ecology.

1.3.32 The vertical realignment of Inchewan Burn and introduction of a drop structure would permanently reduce sunlight reaching the watercourse through the culverted length, affecting surface water quality and would also remove fish passage (surface water quality typically considers biodiversity) from the reach downstream of the A9 to the reach upstream of the A9 resulting in significant effects to the watercourse. This effect is considered to contravene the objectives of RBMP and the WEWS Act. Further details are provided in the Aquatic Ecology section of this Appendix.

Mitigation

1.3.33 In addition to best practice, legislation and guidance (as discussed in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment)) the indicative construction sequence would reduce the potential impacts to downstream surface water quality on Inchewan Burn. The offline diversion of Inchewan Burn around the works area in a box culvert would isolate flow from construction activities and safely convey flow into the downstream channel. This would reduce the risk of pollution during construction.

1.3.34 Further specific mitigation items would be developed as part of the DMRB Stage 3 assessment.

Residual Effects

1.3.35 The extensive works on Inchewan Burn for Options ST2A and ST2B have the potential to have a significant effect on surface water quality and aquatic ecology pre-mitigation. With the inclusion of mitigation, potential impacts associated with siltation, polluted runoff and spillages would reduce to non-significant, however the reduction in sunlight (affecting surface water quality) and loss of fish passage during operation on Inchewan Burn cannot be mitigated. This residual effect is considered to contravene the objectives of RBMP and the WEWS Act and would remain significant post-mitigation.

Aquatic Ecology

Potential Impacts and effects

1.3.36 Atlantic salmon, brown trout and European eels (*Anguilla anguilla*) have been recorded in Inchewan Burn, which contains mixed habitat with a large quantity of good supporting habitat for juvenile Atlantic salmon and brown/sea trout. The utilisation of available habitat under the immediate footprint of the proposed route option and further upstream will be disrupted during the construction phase. A reduction in available juvenile habitat within the Inchewan Burn, due to construction related disturbance and the temporary channel diversion, will likely result in a significant, adverse effect on the fish population of the burn.

1.3.37 Potential de-watering of watercourse sections to facilitate in-stream works for construction of the new culvert and side road bridge may result in temporary changes in hydrology leading to a change in functional habitat for species. This effect would be adverse, short-term and reversible.

1.3.38 Runoff from construction works including sediment release and chemical (nutrient and heavy metal) loads, and the risk of accidental spillages during construction may result in smothering of substrates, changes to surface water quality and modification of submerged habitats. This effect would be adverse and although reversable the effect would be long-term.

1.3.39 The culverting and regrading of the burn would result in permanent geomorphological changes and prevent fish passage to habitat upstream of the proposed culvert during the operation phase. Although it will remain accessible, habitat currently utilised by Atlantic salmon, brown/sea trout and European eels under the culvert footprint will be altered. Spawning potential within the burn is considered sub-optimal (Volume 1, Part 3 – Environmental Assessment (Chapter 11: Biodiversity) of this Stage 2 Report) and is restricted to the section downstream of Perth Road. Spawning potential will remain limited during operation. The reduction in accessible juvenile habitat available within the burn would likely have a significant adverse effect on the fish population of Inchewan Burn. This effect would be adverse, long-term and irreversible.

Mitigation

1.3.40 Implementation of an appropriate channel design would be required for the vertically realigned section of Inchewan Burn. The design should allow the re-establishment of fish habitat and passage as far upstream as practicable by ensuring suitable flows are present within the channel and optimising sediment deposition to create the accumulation of mixed substrates. This could be implemented through varying the channel topography and strategically placing large boulders within the channel to create optimal flows and step pool sequences.

Residual Effects

1.3.41 In the regraded lower reaches, it is expected that some suitable habitat for juvenile Atlantic salmon, brown/sea trout and European eels will re-establish subject to the implementation of an appropriate channel design. However, Options ST2A and ST2B have significant operation related residual effects on fish species of conservation interest due to permanent geomorphological changes to Inchewan Burn and prevention of fish passage.

Option ST2C and Option ST2D

1.3.42 Option ST2C and Option ST2D include a bridge crossing of Inchewan Burn, generally at-grade with the existing A9 carriageway. Option ST2C transitions into a left-hand horizontal curve and the mainline carriageway begins to rise from existing ground levels to negotiate the proposed Dunkeld Junction, permitting a direct link between the A822 (Old Military Road) and A923. Option ST2D remains at-grade, with an elongated roundabout at Dunkeld Junction. For Option ST2C and Option ST2D, the existing access to properties at Birnam Glen to the west of Dunkeld & Birnam Station is retained.

1.3.43 Option ST2C and Option ST2D provide access to the existing Dunkeld & Birnam Station with access provided beneath the A9 via an underpass.

1.3.44 The proposed route options require a new overbridge crossing of Inchewan Burn, as widening the existing bridge structure is not feasible. Due to the similarities in the proposed designs two route options at the crossing with Inchewan Burn, these are considered together.

<u>Flood Risk</u>

Potential Impacts and effects

1.3.45 Construction activities for the Inchewan Burn overbridge are not anticipated to have a significant effect on flood risk for Option ST2C and Option ST2D.

1.3.46 During operation, in the area of the proposed A9 bridge crossing, the watercourse is set deep in the surrounding topography and water levels stay in bank at this location during operation. However, the downstream reach of the Inchewan Burn is highly influenced by the water levels on the River Tay and the change in water level on the River Tay causes a non-significant increase in water level of <1mm on the left bank of the Inchewan Burn.

Mitigation

1.3.47 Details of mitigation are provided in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment). Further specific mitigation items would be developed as part of the DMRB Stage 3 environmental assessment as required.

Residual Effects

1.3.48 With the adoption of mitigation outlined in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment) and further specific mitigation developed at DMRB Stage 3, no significant residual effects on Inchewan Burn are anticipated for Option ST2C and Option ST2D at this stage.

Hydromorphology

Potential Impacts and effects

1.3.49 Construction works would include demolition of the existing A9 structure and construction of a new bridge structure. This would require construction in the channel and could potentially lead to removal of a portion of the riparian zone between the existing A9 bridge crossing and the Highland Main Line railway and also a short reach downstream of the new bridge structure, as well as changes to channel morphology from increased sediment delivery, resulting in a significant effect.

1.3.50 During operation, the new A9 bridge structure would permanently remove a portion of the riparian zone due to its larger footprint, resulting in a significant effect to the hydromorphology of the watercourse.

Mitigation

1.3.51 Details of mitigation are provided in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment). Further specific mitigation items would be developed as part of the DMRB Stage 3 environmental assessment as required.

Residual Effects

1.3.52 With the adoption of mitigation outlined in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment) and further specific mitigation developed at DMRB Stage 3, no significant residual effects on Inchewan Burn are anticipated for Option ST2C and Option ST2D at this stage.

Surface Water Quality

Potential Impacts and Effects

1.3.53 The A9 carriageway northbound widening associated with Option ST2C and Option ST2D would require the demolition of the existing A9 structure and construction of a new bridge structure and associated earthworks on Inchewan Burn (WF8). This could lead to increased siltation and polluted runoff and spillages, potentially affecting surface water quality and associated aquatic ecology, particularly in the restored reach (RRC, 2013) in the vicinity of the existing A9 crossing and downstream, resulting in a significant effect on the watercourse.

Mitigation

1.3.54 Details of mitigation are provided in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment). Further specific mitigation items would be developed as part of the DMRB Stage 3 environmental assessment as required.

Residual Effects

1.3.55 With the adoption of mitigation outlined in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment) and further specific mitigation developed at DMRB Stage 3, no significant residual effects on Inchewan Burn are anticipated for Option ST2C and Option ST2D at this stage.

Aquatic Ecology

Potential Impacts and effects

1.3.56 Potential de-watering of watercourse sections to facilitate in-stream works for construction of the new bridge may result in temporary changes in hydrology leading to a change in functional habitat for species. This would result in a significant adverse effect, which would however be short-term and reversible.

1.3.57 Runoff from construction works including sediment release and chemical (nutrient and heavy metal) loads, and the risk of accidental spillages during construction may result in smothering of substrates, changes to surface water quality and modification of submerged habitats. This significant effect would be adverse, long-term and reversible.

1.3.58 The proposed overbridge structure for the Option ST2C, and Option ST2D is not anticipated to affect fish passage or quality of the habitat during operation.

Mitigation

1.3.59 Details of mitigation are provided in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment and Chapter 11: Biodiversity) of this Stage 2 Report. Further specific mitigation items would be developed as part of the DMRB Stage 3 assessment as required.

Residual Effects

1.3.60 With the adoption of mitigation outlined in Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment and Chapter 11: Biodiversity) and further specific mitigation developed at DMRB Stage 3, no significant residual effects on Inchewan Burn are anticipated for Option ST2C and Option ST2D at this stage.

1.4 Consultation

1.4.1 Initial consultation with SEPA took place in September 2018 concerning the proposals to vertically realign Inchewan Burn as required for Options ST2A and ST2B. During this consultation, SEPA stated that these proposals would be unlikely to be compliant with The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) and may require derogation. A derogation is required where significant adverse effects on the water environment are anticipated, which contravenes the principles of River Basin Management Planning and therefore does not comply with 'The river basin management plan for the Scotland river basin district: 2015 – 2027' (SEPA, 2015) or the WEWS Act. Further detail on the derogation process is outlined in SEPA Regulatory Method (WAT-RM-34) Derogation Determination – Adverse Impacts on the Water Environment (SEPA, 2017).

1.4.2 Further consultation with SEPA took place in October 2018. As the catchment area of Inchewan Burn falls below 10km^2, it is not a classified water body under WFD. However, under CAR any engineering activities on the watercourse are still subject to SEPA Environmental Standards tests (in particular the Single Activity Limits and local scale 500m assessment), which determine whether engineering activities will result in a deterioration in morphological quality.

1.4.3 Proposals to lower Inchewan Burn as required for Options ST2A and ST2B would be likely to fail the Environmental Standards tests and would therefore invoke a Good Practice Test. The basic principles of the Good Practice Test are to demonstrate need for the engineering works, consider a range of options (with the selected option that causes the least ecological harm at a cost that is not disproportionately expensive), and includes mitigation.

1.4.4 The CAR determination process is then dependent on whether SEPA considers there to be any third-party interests. Should no third-party interests be identified and on the basis that Options ST2A and ST2B can comply with the Good Practice Test, determination of the licence can proceed (on the basis that SEPA also consider that conservation interests are not at risk). If SEPA do consider there to be third party interests, on the basis that Options ST2A and ST2B can comply with the Good Practice Test then the proposals can move forward to derogation.

1.4.5 SEPA will consider CAR authorisation for works through derogation if the proposals comply with a set of conditions, referred to as derogation tests (as detailed in SEPA, 2017). The tests are applied where there is a risk of a deterioration in hydromorphology (geomorphology), hydrology, ecology or water quality.

1.5 Summary

1.5.1 During both construction and operation, the lowering works to Inchewan Burn associated with Option ST2A is considered to have the greatest overall effect on Inchewan Burn followed by Option ST2B, as although the works required for both options are similar, the degree of lowering and the longitudinal extent of the works are lesser for Option ST2B. Options ST2C and ST2D are considered to have the least overall effect on Inchewan Burn.

Flood Risk

1.5.2 Both Option ST2A and Option ST2B are considered to have more potential to increase flood risk, compared to Option ST2C and Option ST2D (considered to result in no significant effect post-mitigation). Option ST2A and Option ST2B are likely to reduce the channel capacity during construction and the potential remains for blockages to cause a flooding risk during construction. The indicative construction sequence outlined in *Annex B* would be developed further at DMRB Stage 3 and would likely reduce construction flood risk to not significant.

1.5.3 As the watercourse is set deep in the surrounding topography, and water levels stay in bank upstream of the bridge at Perth Road during operation even after implementing the modifications. However, the required drop structure and reduced gradient of the reconfigured Inchewan Burn could pose a long-term risk of debris accumulation and hence blockage, introducing a further flood risk during operation therefore a sediment basin and trash screen will be incorporated into the design to reduce this risk to an acceptable level (e.g. not significant).

Hydromorphology

1.5.4 There would be more extensive works on Inchewan Burn associated with Option ST2A and Option ST2B, compared to Option ST2C and Option ST2D. Extensive construction in the channel and would lead to the total loss of the approximate 100m length of restored reach of Inchewan Burn. Removal of, or disturbance to approximately 240m of the riparian zone for Option ST2A, and approximately 130m of the riparian zone (including banks and bed) for Option ST2B, would be required from approximately 35m upstream of the Highland Main Line railway to the downstream extent of the vertical regrading for each proposed route option. The new access road and bridge crossing to properties at Birnam Glen would result in the disturbance of approximately 45m of the riparian zone, which may affect the stability of the steep bank at this location and may require changes to the bank profile.

1.5.5 During operation, the sediment basin, trash screen, drop structure and culvert will interrupt natural sediment supply to the downstream reach of the watercourse to the River Tay confluence. Interruption of natural sediment supply may be partially mitigated by removing material from a proposed upstream sediment basin and re-distributing the accumulated material in the downstream reach. However, the deterioration in geomorphology contravenes RBMP objectives and the WEWS Act and the effects would remain permanent and significant post-mitigation for both Option ST2A and Option ST2B.

Surface Water Quality

1.5.6 The in-channel activities on Inchewan Burn associated with all proposed route options are considered likely to lead to increased siltation, polluted runoff and spillages affecting surface water quality (and subsequently aquatic ecology) during construction. However, compared to Option ST2C and Option ST2D, the works on Inchewan Burn for Option ST2A and Option ST2B have the potential to result in a greater effect on surface water quality pre-mitigation. The indicative construction sequence outlined in *Annex B* would be developed further at DMRB Stage 3 and would reduce effects associated with siltation, polluted runoff and spillages for Option ST2A and Option ST2B to non-significant. However, the reduction in sunlight (affecting surface water quality) and loss of fish passage during operation on Inchewan Burn cannot be mitigated; this contravenes RBMP objectives and the WEWS Act and therefore the effect on Surface Water Quality would remain significant for Option ST2A and Option ST2B post-mitigation.

Aquatic Ecology

1.5.7 Both construction and operation would result in a reduction in accessible juvenile habitat available within Inchewan Burn for Option ST2A and Option ST2B, which would likely have a significant adverse effect on the fish population within the watercourse. In the regraded lower reaches, it is expected that some suitable habitat for juvenile Atlantic salmon, brown/sea trout and European eels will re-establish subject to the implementation of mitigation. However, Option ST2A and Option ST2B have significant operation related residual effects on fish species of conservation interest, due to permanent geomorphological changes to Inchewan Burn and prevention of fish passage. Post mitigation, Option ST2C and Option ST2D are not anticipated to have a significant adverse effect on Aquatic Ecology.

1.6 References

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Annex A: Geomorphology Supporting Information

Figure A-1: Inchewan Burn as mapped in 1867 (National Library of Scotland, 2019)

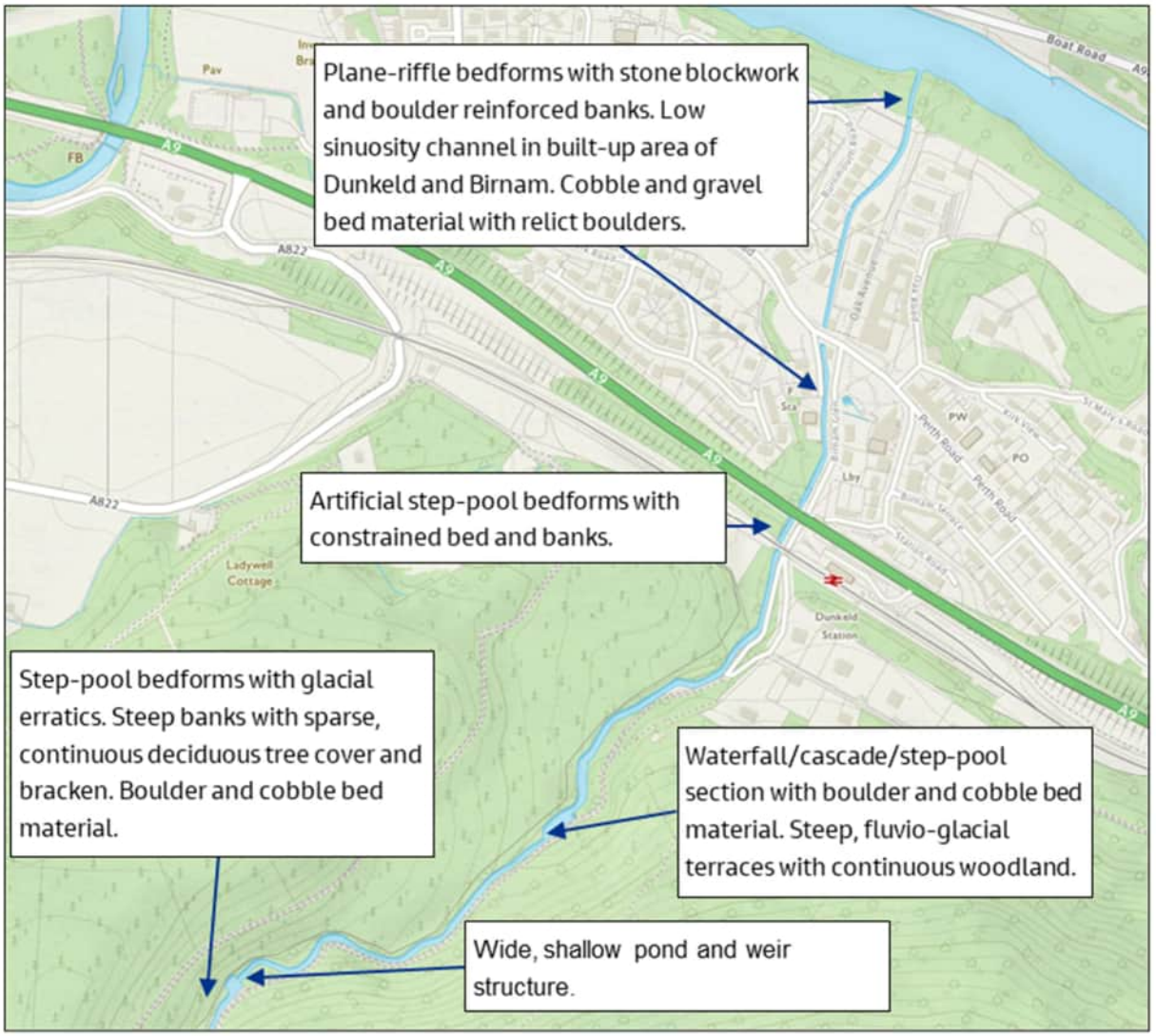
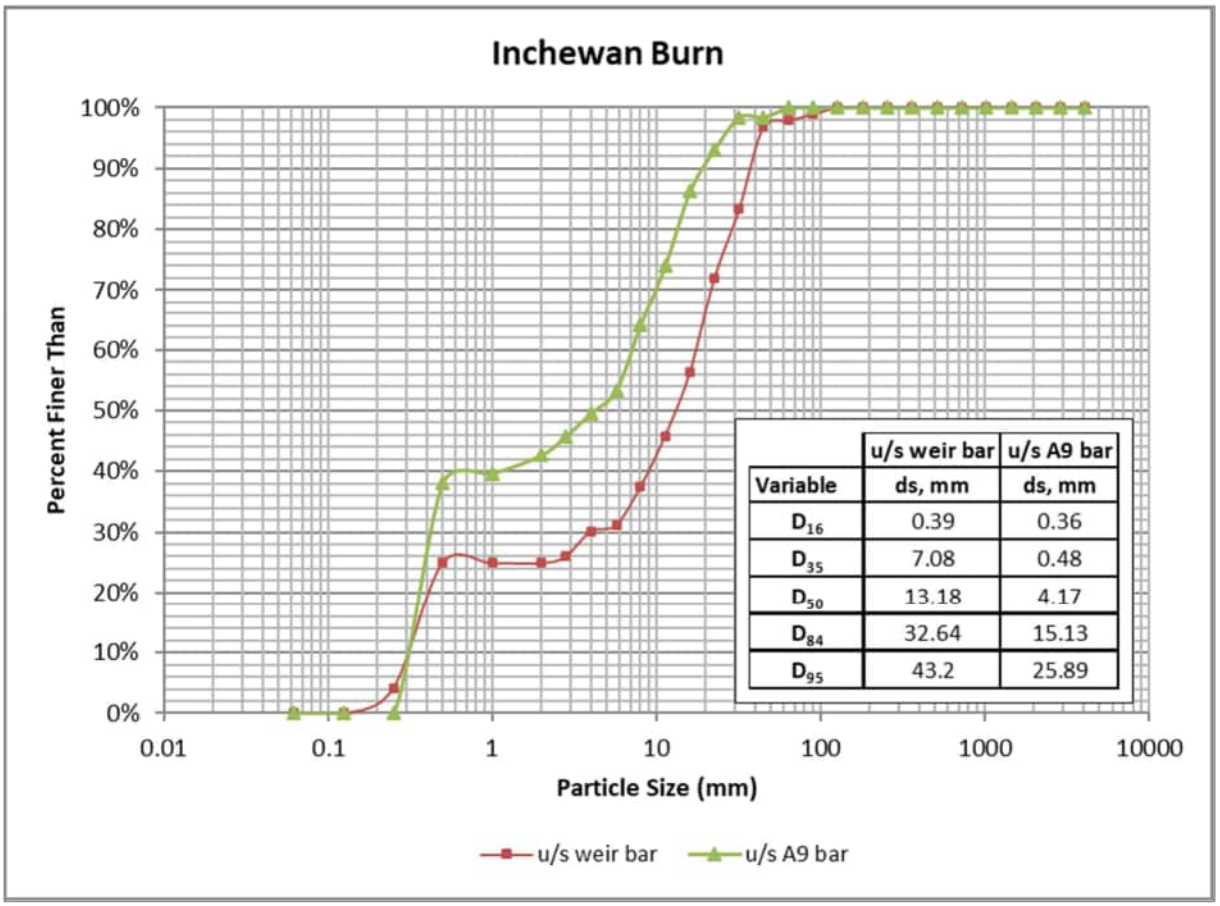


Figure A-2: Existing Geomorphological pressures on Inchewan Burn

Particle size analysis



Variable	u/s weir bar ds, mm	u/s A9 bar ds, mm
D_{16}	0.39	0.36
D_{35}	7.08	0.48
D_{50}	13.18	4.17
D_{84}	32.64	15.13
D_{95}	43.2	25.89

Diagram A-1: Particle Size Distribution of Inchewan Burn

Sediment transport and dynamics

Riffle D_{50} = 236mm; channel slope upstream from A9 bridge = 0.041, slope downstream from A9 bridge = 0.034; Valley slope = 0.047; QMED= 3.2m^3s^{-1}; Dmax on upstream bar = 150mm. Sediment competence calculations (Andrews, 1983; 1984) indicate that under the existing conditions, Inchewan Burn requires a bankfull depth of between 0.05 – 0.31m to transport the maximum clast size on the upstream bar. Estimated bankfull depth is 0.5m.

Computations indicate that Inchewan Burn is capable of transporting clast sizes of approximately 180mm under bankfull conditions (Leopold et al. 1964); this is supported by the estimate derived from Shield's (1936) entrainment function as shown below.

Shield's (1936) entrainment equation estimates plane bed reaches to be transporting clast sizes of 180mm during bankfull flow.

Estimates of critical flow conditions for transport using Bathurst et al. (1987) suggest that a bankfull discharge of 0.32m^3s^{-1} is required to initiate transport of D_{50} clast sizes from the riffles. A discharge of 18.97m^3s^{-1} would be required to transport the average clast sizes in the steps.

Analyses indicate that Inchewan Burn is able to transport the maximum clast sizes supplied from upstream where stream power is estimated to average 250-300Wm^2; this suggests a natural stable morphology of a steep, confined channel with cobble/gravel bed material.

Transport rates may be calculated using a number of means, notably Bagnold (1966) and Ackers and White (1973). For Inchewan Burn the latter was used as this equation is considered to be more appropriate for upland gravel-bed rivers as it was derived from flume-data based on the initiation of motion of gravel clasts.

Figure A-3: Representative clasts sizes transport at QMED

Computations of sediment transport calculated from Ackers and White (1973) reveals transport rates of 0.07kgm^{-1}s^{-1} during QMED flows.

The analyses of sediment transport, competence and critical discharge have unavoidable areas of uncertainty. Although these approaches are theoretically sound, and are successfully used to assess channel stability, there are inherent limitations in the analysis and understanding of sediment transport processes. The quality of the dataset and method used to compile the data will have a profound influence on the reliability of the derived equations. The derivation of equations is subject to uncertainty based on the data and methods used. For the purposes of assessing channel stability in this instance, equations have been selected which best represent mobile-bed, cobble and gravel alluvial channels. The results of the computations represent the best estimates of the current sediment dynamics with the provisos outlined above. These interpretations should be integrated with the results of multi-disciplinary analyses to provide a better prediction of channel competence.

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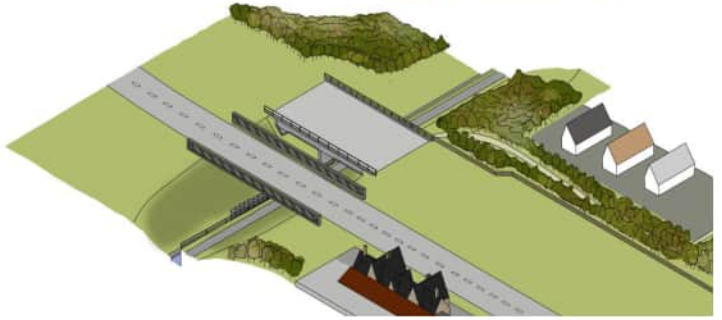
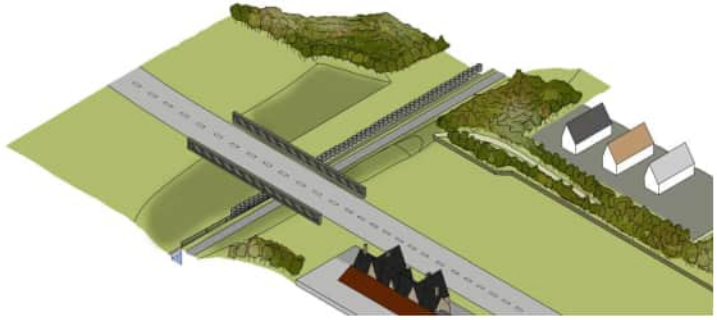
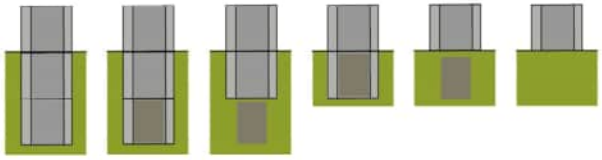
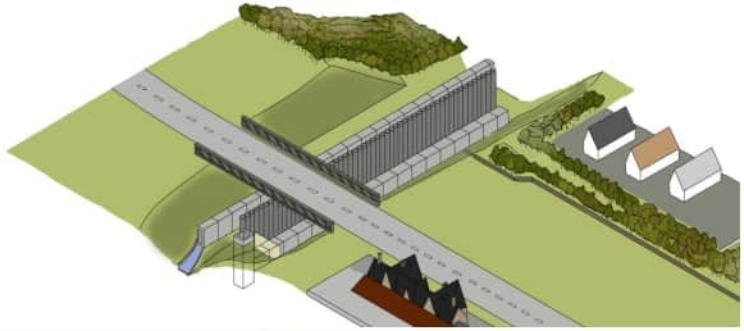
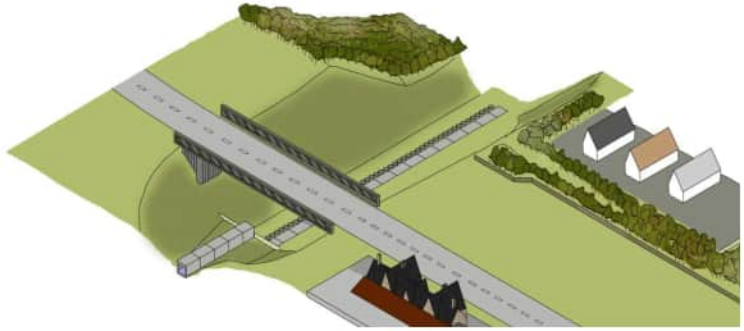
Annex B: Indicative Construction Sequence

Construction Phases for Inchewan Burn Drop-Culvert for Option ST2A and Option ST2B

Phase	Description	Diagram
1	Prior to the main construction works of lowering the Inchewan Burn, a length of bored piles and a temporary bridge can be constructed adjacent to the existing A9 in order to realign the carriageway, allowing the existing A9 road bridge over Birnam Glen access road and Inchewan Burn to be demolished and its foundations removed. Firstly, an approach ramp would be constructed adjacent to the A9 with a gentle slope leading to a 10-metre-wide working platform for piling plant. Temporary sheet piles would be installed beside the existing A9 bridge for stability. Bored piles in this location would also be installed along the northern bank of Inchewan Burn in preparation for lowering the burn. It should be noted that before work begins at Inchewan Burn, access to Birnam Glen will be stopped-up at this location. Alternative access to Birnam Glen will be provided via construction of a new access road from the A822 to the west of the Highland Main Line railway. Access to all residential properties will be maintained throughout the duration of the works.	
2	On completion of the bored piles installation, the slopes on both sides of Inchewan Burn would be filled with suitable material and temporary bored pile foundations installed before installing the temporary bridge. The existing pedestrian steps and access to the Dunkeld & Birnam Railway Station under the A9 will be stopped-up at this stage. Further discussions will be held with Network Rail to determine if possible alternative access to the station throughout the duration of the works would be achievable.	
3	The existing A9 would be realigned passed Dunkeld & Birnam Railway Station to utilise the temporary bridge. It should be noted that the realigned A9 requires the removal of the railway sidings at this stage. The existing A9 road bridge would then be demolished to foundation level. The works involving lowering the Inchewan Burn can now be undertaken whilst maintaining two-way traffic on the A9.	

Phase	Description	Diagram
4	Tree felling would be required north of the A9, adjacent to Inchewan Burn, to create temporary access for plant and materials. A 10-metre-wide piling platform would also be constructed to aid the installation of the remaining bored piles along the northern bank of the burn.	
5	In preparation of temporarily diverting the Inchewan Burn, culvert sections would be installed against the bored piles on the northern bank of the burn. The culvert section dimensions are 1.5 metres (width) by 2.5 metres (depth) by 3 metres (length). The total length of culvert sections required is approximately 55 metres for Option ST2A and 35 metres for Option ST2B.	
6	Inchewan Burn would then be diverted into the temporary culvert sections to allow excavation of the existing bed adjacent to the bored pile retaining wall. Original A9 bridge pier foundations removed and the installation of the permanent drop structure for lowering the Inchewan Burn. § Likely construction methodology as follows: § Place precast concrete segment vertically above the final position of the drop structure; § Excavate the soil from below the segment; § Drive the segment into the ground directly below; § Place the second segment directly above the first and excavate below the first segment; § Drive the two segments together into the ground; and § Repeat methodology for all remaining segments until desired depth is reached.	

Phase	Description	Diagram
7	On completion of the drop structure installation, temporary sheet piles would be installed for stability against the drop structure prior to the permanent culvert installation. The burn would then be excavated to the new level, approximately 8 metres for ST2A and 6 metres for ST2B below the existing burn level, and permanent culvert sections installed for approximately 55 metres (ST2A) / 35 metres (ST2B) of the burn.	
8	Prior to the main construction works of lowering the Inchewan Burn, a length of bored piles and a temporary bridge can be constructed adjacent to the existing A9 in order to realign the carriageway, allowing the existing A9 road bridge over Birnam Glen access road and Inchewan Burn to be demolished and its foundations removed. Firstly, an approach ramp would be constructed adjacent to the A9 with a gentle slope leading to a 10-metre-wide working platform for piling plant. Temporary sheet piles would be installed beside the existing A9 bridge for stability. Bored piles in this location would also be installed along the northern bank of Inchewan Burn in preparation for lowering the burn. It should be noted that before work begins at Inchewan Burn, access to Birnam Glen will be stopped-up at this location. Alternative access to Birnam Glen will be provided via construction of a new access road from the A822 to the west of the Highland Main Line railway. Access to all residential properties will be maintained throughout the duration of the works.	

Appendix A11.1: Target Notes

1.1 Purpose of Appendix

1.1.1 This appendix contains relevant target notes from the AECOM (formerly URS) Phase 1 habitat surveys of 2013 (Transport Scotland, 2014a-b) with additional information gathered through update Jacobs Phase 1 habitat surveys undertaken in 2019, and from the Jacobs aquatic walkover surveys of 2015, for ease of reference with Figures 11.3 to 11.6.

1.1.2 It is assumed that the target notes provided in the A9 Dualling Programme route-wide Phase 1 habitat survey were subject to appropriate quality assurance before being provided for use in this document. Minor changes have been made to the target notes below (e.g., to provide clarity) but no inference has been made to species where common names have provided, to prevent presenting incorrect information.

1.1.3 The additional information gathered through the update Phase 1 habitat 2019 surveys is highlighted within the target notes, in addition to four supplementary target notes.

1.2 Target Notes

1.2.1 Relevant target notes from the AECOM Phase 1 habitat survey and Jacobs updates are provided in Table 1. Aquatic target notes relating to aquatic surveys undertaken by Jacobs in 2015 are presented in Table 2.

Table 1: Phase 1 Habitat Surveys Target Notes (AECOM and Jacobs)

Target Note	Co-ordinates		Description
	X	Y	
TN1	300200	744594	Stone bridge over minor road offers opportunities for bats – note that a roost is reported from this vicinity. Bridge has been widened in past with expansion gap.
TN2	300251	744588	The Littleton Burn is a small burn with fairly steep but low banks on either side, which ran dry downstream at the time of survey a short distance beyond the B road (continuing under the cobbles). Near the bridge there is an area of rank neutral grassland with abundant ruderal species. Above the bridge both sides of the bank support a narrow strip of semi-natural broadleaved woodland, but below the bridge this is confined to the left (north) bank. It is composed of alder, sycamore and ash, with an understorey mainly of hawthorn and blackthorn. The ground flora is variable but wavy hair-grass, common bent and Yorkshire-fog tend to be the dominant grasses; herbs include hedge woundwort, crosswort, creeping buttercup and meadowsweet, less commonly meadow crane's-bill. There are also occasional patches of Himalayan Balsam. The bank on the right side is less steep and merges with the adjacent field vegetation (see Target note 17). Close to the confluence with the River Tay, Himalayan Balsam is dominant on both sides of the bank.
TN3	300103	744530	Inchmagrannachan farm buildings look suitable for bats.
TN4	300402	744485	Unimproved neutral grassland on a sandy alluvium with much scattered scrub, principally broom. Of the grasses common bent and Yorkshire-fog dominate, with frequent red fescue and occasional false oat-grass. There are small areas where the vegetation cover is sparse with patches of bare, sandy ground; species found here include silver hairgrass, thyme-leaved sandwort, violet (mountain), common stork's-bill, creeping yellow-cress and sheep's sorrel. Most of the grassland is more developed with frequent tansy, common bird's-foot-trefoil, kidney vetch, yarrow, ribwort plantain, common knapweed, yellow-rattle, common restharrow and lupin. Other less common

Target Note	Co-ordinates		Description
	X	Y	
			species include oxeye-daisy, field scabious, meadow crane's-bill and perforate St John's-wort. The floodplain bank leading up from the River Tay to this grassland has various species including some more typical of woodland, including wood crane's-bill, dog's mercury and ground elder.
TN5	300441	744467	Shallow bank composed primarily of swamp species at edge of river, dominated by reed canary-grass with willow. It supports a variety of other species including water-starwort, water forget-me-not, marsh marigold, common marsh-bedstraw, common spike-rush, jointed rush, sneezewort and meadow crane's-bill. In transition to the grassland there is often Himalayan balsam, common nettle, and tansy. Common couch and creeping buttercup are also frequent. At the time of survey, the water level revealed a discontinuous border of muddy and pebbly substrate.
TN6	300638	744427	On the slopes above the A9 by this target note there is a dense patch of Douglas fir, and, to the north, an area of bracken with brash. Adjacent to the B road there are mature trees of oak, which could offer bat roost potential. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 determined there to be no bat roost potential to be impacted by the proposed route options at this location.
TN7	300321	744420	This field was formerly semi-improved grassland but has been ploughed and sown with grass/clover. Edges have abundant arable weeds such as field pansy.
TN8	300510	744352	Mature oak/sycamore on often steep slopes running up from the river with occasional beech and frequent birch. The dominant grasses are tufted hair-grass and bearded couch. In the ground flora dog's mercury and bluebell are often. Frequent species include violet, buckler-fern, wood sorrel and herb-Robert. Where there are breaks in the trees Himalayan balsam is locally abundant. Further north the trees become younger and more dense with oak and birch dominant. There is rarely rhododendron growing in the understorey, and more often hazel and wych elm.
TN9	300518	744264	There are a variety of habitats sandwiched between the A9 and the fishing access track/footpath. Patches of mature woodland include birch/sycamore/oak with bluebell etc. beneath, a patch of wet woodland by a stream with alder, birch and willow, and some younger birch woodland with a grassy flora. Open areas include a patch of unimproved neutral grassland comprising bluebell, creeping soft-grass and male-fern with scattered broom, and dense bracken. There is also some dense broom scrub and semi-mature plantation with wild cherry and sycamore.
TN10	300641	744182	Semi-mature sycamore dominates this plantation, with scattered conifers throughout, and by the B road mature oak (possible bat roost potential); further to the south there is also some birch. Shade/leaf litter has generally led to a poor ground flora, sometimes almost absent, with male-fern abundant where conditions permit. Rhododendron is occasional. Present in small quantity are false brome and herb-Robert.
TN11	300523	744100	Thin strip of mown grassland next to the A9, which is a maximum of 10m wide but mostly much less. Species composition described here is typical of almost all of this strip along the A9. Both sides are dominated by common bent and red fescue. Frequent herbs include ribwort plantain, cat's-ear, germander speedwell, white clover, hawkbit, and yarrow. Less common but found all along the A9 is common bird's-foot-trefoil. Eyebright occurs occasionally.
TN12	300452	743942	Near the A9 bridge on the upstream side there is a large area that in the summer is apparently dominated by bracken, but earlier in the year dog's mercury and bluebell are dominant, so it is classed as tall non-ruderal; this area is relatively rich with scattered northern bedstraw, wood crane's-bill, red campion and tansy as well. By the river grasses are dominant in a strip of unimproved neutral grassland, including amongst the smaller

Target Note	Co-ordinates		Description
	X	Y	
			grasses, tall fescue, common knapweed and northern bedstraw. There is a large bank of pebble deposit in the river channel here. Where the target note is located there is a small clump of Japanese knotweed.
TN13	300461	743838	Modern steel/concrete bridge carrying A9, which is sub-optimal for bats but should be checked for them. May also provide nesting opportunities for birds underneath. Crosses River Tay which is a Special Area of Conservation (SAC).
TN14	300547	743796	The land above the river here is a large mosaic of birch woodland, broom scrub, dense bracken and buckler-fern, and (along the river edge) unimproved neutral grassland. The woodland, which may be of plantation origin, is reasonably mature with a semi-natural flora beneath including common bent, heath bedstraw, wood sage, common dog-violet, tufted hair-grass, creeping soft-grass and ferns. The bracken area is co-dominated by bluebell. By the river there is a thin strip of unimproved neutral grassland with tall herbs; herbs present amongst the grasses include tansy, bluebell, northern bedstraw and, rarely, lesser meadow-rue. At one point immediately by the water there is a patch of swamp vegetation dominated by bladder-sedge and wood club-rush.
TN15	300416	743790	Strip between the Highland Main Line railway and the river on often steep slopes of woodland with alder by river and mature oak/birch behind (with occasional larch). Ground flora near bridge disturbed with Himalayan balsam, dog's mercury with dame's-violet, bramble, common valerian, tansy, male-fern and rarely great bellflower. There are areas of bare earth as a result of construction work under the road bridge. Beneath the woodland proper wood sorrel, creeping soft-grass and bracken dominate, with frequent hazel and bluebell, and occasional yellow pimpernel; chickweed-wintergreen is locally frequent.
TN16	300354	743759	This mixed plantation of sycamore and Douglas fir has a sparse ground flora where tufted hair-grass is occasional. Dog's mercury is locally abundant and wood sorrel and male-fern are abundant.
TN17	300391	743738	Opportunities for bats may exist in a stone tunnel which passes under the Highland Main Line railway and in a nearby large oak between the Highland Main Line railway and A9. A squirrel drey (most likely red squirrel) was also noted nearby.
TN18	300475	743653	Peripheral riverside woodland here is a continuation of that described in the previous target note. Most of this area is a block of tall and dense Douglas fir with a largely suppressed flora. There is also a smaller block of mature oak with bracken, wood sorrel, bluebell and greater stitchwort.
TN19	300383	743633	Track leading to arable field with red fescue, Yorkshire-fog, cock's-foot and crested dog's-tail. Common herbs include wood sage, cat's-ear and mouse-ear-hawkweed.
TN20	300654	743542	Thin strip of semi-natural woodland between path and river is dominated by mature oak (often very large - bat roost potential), with some sycamore and conifers very rare. Typically, common bent is dominant in the ground flora with abundant wood sorrel, common dog-violet and bracken, plus frequent bluebell and greater stitchwort. Shortly downstream of this target note the woodland changes to dominance by mature beech and is thus mapped as plantation; this section is on a steeper bank, with frequent sapling beech and rhododendron in the understorey and a much impoverished ground flora. Behind (further from the river towards the B road) both of these woodlands is a larger area of mixed plantation composed largely of semi-mature larch/sycamore, with occasional to frequent birch (at least some of which is of natural origin). Near the semi-natural birch woodland of target note 122 sycamore is dominant alone. Shade/leaf litter has impoverished the ground flora throughout this area, but beech fern occurs rarely amongst more typical species such as common bent, tufted hair-grass, male-fern, hard-fern and wood sorrel. Bracken is locally abundant in more open parts.

Target Note	Co-ordinates		Description
	X	Y	
TN21	300573	743489	Shingle island at side of River Tay with a strip of vegetation near the bank and a periodically flooded backwater. Half of the vegetation is unimproved neutral grassland, with Salix/alder scrub at the south end. The grassland is rich including northern bedstraw, globeflower, water avens, tall fescue, greater bird's-foot-trefoil and occasional reed canary-grass.
TN22	300555	743424	Riverside semi-natural woodland dominated by oak but with occasional beech and sycamore along with occasional conifers. Alder and birch occur at the river edge. There is some oak and beech in the understorey. The ground flora is often dominated by bracken and wood sorrel, with greater stitchwort, bluebell, male-fern and locally abundant dog's mercury. great wood-rush is frequent on the steeper banks. There is a strip of reed canary-grass swamp with young alder right at the edge of the river (this was flooded at time of survey).
TN23	300450	743253	Mix of small blocks of Douglas fir and mature beech/oak, with younger beech and some hazel in the understorey. The woodland is partly semi-natural. Some areas of ground flora are sparse, and others have abundant dog's mercury and wood sorrel, with frequent greater stitchwort, hedge woundwort and bracken (the latter becoming locally dominant to the north). The strip along the river is dominated by oak, alder, hazel and birch is rare. The ground flora here is mainly great wood-rush and wood sorrel, with greater stitchwort, male-fern and common dog-violet, and less commonly Himalayan balsam and goldenrod.
TN24	300733	743235	A strip of natural damp downy birch woodland, probably along an old boundary. Bracken dominant under with frequent tufted hair-grass, bluebell and wood sorrel.
TN25	300382	743225	Culverts run under the A9 and Highland Main Line railway. Check for protected species.
TN26	300320	743216	Old stone bridge just west of A9, partly hidden by trees and not immediately obvious from A9, over small water channel. Check for bats.
TN27	300655	743144	Large area of mixed plantation of mature and semi-mature conifers (including spruce, Douglas fir) and sycamore, with smaller quantities of beech and birch. Rhododendron is scattered frequently throughout and is dominant in a strip adjacent to the broadleaved plantation by the River Tay. Ground flora sparse, typical species include bracken, hard-fern and wood sorrel.
TN28	300320	743107	Ride running through conifer plantation, which is approximately 5 metres wide. The dominant grass is red fescue and tufted hair-grass is abundant. Dog's mercury is locally abundant with abundant herb-Robert and bugle, occasional greater stitchwort and rare melancholy thistle.
TN29	300529	743054	Plantation dominated by tall spindly sycamore, with occasional young oak and locally frequent birch, bracken and male-fern are dominant beneath, plus abundant ground-ivy, frequent wood avens and wood sorrel and occasional soft-rush. Near the river, young beech becomes dominant, whilst at the river edge itself there is a strip of self-sown young alder with species such as tufted hair-grass, great wood-rush, Himalayan balsam and tansy.
TN2019_1	300195	743012	**2019 additional target note** Quarry for material to enhance forestry tracks. Invasive non-native species pirri-pirri burr locally dominant in areas around the quarry and nearby forestry tracks.
TN30	300397	742984	Strip of semi-natural woodland on steep riverbank dominated by oak with occasional ash, and alder along the river edge. Not much beech in the canopy but much in the understorey, along with frequent hazel. Wood sorrel and great wood-rush are most frequent in the ground flora; other species include sanicle, dog's mercury, common dog-violet and honeysuckle.

Target Note	Co-ordinates		Description
	X	Y	
TN31	300646	742741	Narrow strip of semi-natural woodland on riverbank with mix of oak, alder and beech, and occasional hazel in the understorey. The ground flora is dominated by dog's mercury with frequent yellow pimpernel and Himalayan balsam. Behind this woodland is coniferous plantation of tall, mature Douglas fir with wood sorrel dominant beneath. There is a narrow island in the river close to the riverbank; at the southern end it supports semi-natural woodland of alder, sycamore and willow; the northern end has tall herbs dominated by tansy and dog's mercury, plus Himalayan balsam, ground elder, common valerian, northern bedstraw and rarely Japanese knotweed.
TN32	300542	742719	Mixed plantation woodland composed of mature oak, beech and Douglas fir, with a rather poor flora dominated by wood sorrel with scattered ferns. A large block of with Douglas fir within the mixed woodland has an even poorer ground flora.
TN33	300653	742635	Mature beech with virtually no understorey. The ground flora is botanically poor with patchy mosses and scattered wavy hair-grass extending almost to the river, but there is a good diversity of fungi. At the riverside there is a thin strip with great wood-rush dominating the ground flora. A small open patch of acid grassland is dominated by creeping soft-grass and wavy hair-grass, with abundant mosses, frequent great wood-rush, occasional heath bedstraw and rare bilberry.
TN34	300630	742571	Semi-mature mix of oak, sycamore, ash and B. pendula. Some of the oaks are quite old and may have potential as bat roosts.
TN35	300723	742563	Beyond the narrowest part of the riverside the canopy changes to a mix of sycamore, oak and spruce/fir. The understorey has frequent hazel and young beech, sycamore and ash. Ground flora not as good as previous two target notes, but dog's mercury is locally dominant with frequent male-fern (the latter abundant on the Highland Main Line railway embankment along with frequent hazel and birch); elsewhere, wood sorrel and great wood-rush dominate. Between this woodland and the Highland Main Line railway is a stand of tall mature coniferous plantation, mainly of Douglas fir, with wood sorrel abundant beneath, and little else.
TN36	300687	742425	Area between the Highland Main Line railway and A9 dominated by scaly male-fern, but with areas of neutral grassland with false oat-grass, locally dominant bracken and rosebay willowherb, and scattered scrub/trees including sycamore and willow.
TN37	300651	742384	This grassland lies on a bank that leads to conifer plantation and is dominated by red fescue with abundant false oat-grass and occasional cock's-foot. Herbs include occasional violet, raspberry, greater stitchwort and wood sorrel. Towards the conifer plantation the grassland is dominated by soft-rush and great wood-rush. There is scattered birch along the grassy bank.
TN38	300531	742351	Mature spruce and Douglas fir conifer plantation. The dense areas of plantation have a poor ground flora, which is often sparse, dominated by wood sorrel and broad buckler-fern. The more open areas of the woodland are more species rich and have abundant bracken, wavy hair-grass and wood sorrel, occasional to frequent common haircap, and occasional chickweed-wintergreen and great wood-rush. Bluebell and bilberry are rare.
TN39	300510	742222	Small area of dry acid heath dominated by heather and wavy hair-grass. There is occasional bilberry and a few planted broadleaved trees, and scattered self-sown birch There is a monument on which maidenhair spleenwort is frequent along with wild strawberry and mosses.
TN40	300811	742425	This woodland runs down a steep bank to the riverside. Although there is still a lot of beech there are many mature oak in the canopy. Beech abundant in the understorey. Ground flora largely mosses with frequent hard-fern. Along the river edge the woodland is similar to that of the previous target note, but there is less wood-rush, no

Target Note	Co-ordinates		Description
	X	Y	
			rhododendron, and some additional species: frequent honeysuckle; occasional hazel, oak fern and dog's mercury; and rare (locally abundant) wood horsetail and beech fern.
TN41	300848	742461	Small island with dense willow, mainly grey willow. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 confirmed that the majority of these trees have been felled by beaver.
TN42	300848	742037	Mixed aged woodland containing spruce, Scots pine, beech, sycamore and birch. The ground flora is typical of this type of woodland with abundant wood sorrel and common bent, frequent broad buckler-fern, occasional climbing corydalis and rare bluebell. Sycamore is occasional in the understorey. There is a lot of Scots pine and oak near and on the crags with smaller quantities of beech and birch. There is a small open area of acid dwarf shrub heath on top of the crags with bell heather and heather, plus bilberry, wavy hair-grass and rarely chickweed-wintergreen; there are also a few small bushes of the UK BAP species juniper.
TN43	300865	742591	There are many mature oak (bat roost potential) along this section of riverbank woodland, but also many mature beech and various conifers, which together with an abundance of rhododendron have frequently eradicated the ground flora. The flora is best along the extreme river edge where there is some self-sown ash and alder with species such as great wood-rush, male-fern, Himalayan balsam and wood sage. The thin strip of plantation that extends to that of target note 17 is similar but with no conifers, and on a very steep bank with great wood-rush dominant.
TN44	300959	742390	Narrow strip of broadleaved semi-natural woodland between river and path. Dominated by mature beech but with semi-natural ground flora. great wood-rush is dominant with occasional goldenrod, wood sorrel, common dog-violet, bitter-vetch and wood sage; wild angelica and bush vetch are rare. Other trees include occasional mature sycamore and young alder by the river, with scattered rhododendron. Steep bank leading up to the road has mixed plantation with a mix of beech and spruce; the ground flora is sparse, but mosses are abundant and there are many types of fungi, with occasional hard-fern.
TN45	300968	742336	Adjacent to the road, this area is dominated by the grasses; perennial rye-grass and red fescue. The dominant herbs are cat's-ear and red clover, with frequent creeping buttercup. Rare herbs include violet and heath bedstraw. Mouse-ear-hawkweed is locally abundant.
TN46	301003	742309	Exposed rocks with young, self-sown conifers and occasional sycamore and locally abundant ivy.
TN47	301017	741920	Mature, tall coniferous plantation with spruce and Douglas fir. The ground flora is poor, but wood sorrel is abundant, with frequent raspberry, and occasional climbing corydalis and broad buckler-fern. There are many fungi species.
TN48	301048	742522	In front of the hotel there is amenity grassland that leads down to the water's edge. This area is planted with bird cherry and occasional rhododendron. There is also a mature large-leaved lime in the grounds. On the bank there is an area of dense rank grass. On the bank both young willow and alder are rare, and the ground flora consists of locally frequent reed canary-grass and locally abundant tansy. Himalayan balsam was found along the bank but in small numbers.
TN49	301049	742093	Species poor semi-improved grassland dominated by Yorkshire-fog and common bent with frequent red fescue. Germander speedwell is abundant, and common nettle and creeping thistle occur in patches. Approximately one third of the grassland had been mown at the time of survey.
TN50	301116	742371	Semi-mature, tall, thin sycamore and some large beech. The ground flora is reduced with wood sorrel dominant, and the ferns broad buckler-fern and male-fern abundant, together with bluebell. There is a dead tree, which may support bats. Closer to the road

Target Note	Co-ordinates		Description
	X	Y	
			there is mostly younger sycamore, which may be self-sown, with rhododendron abundant. The woodland becomes mixed to the west with a mix of beech and spruce and a few mature oaks, with a poor sparse ground flora.
TN51	301123	742676	On the bank behind the hotel there is semi-natural woodland that is composed of sycamore, birch and mature oak. Bracken is dominant and rhododendron is abundant. Broom and wood sage are occasional. It is difficult to access this area, as the bracken is very dense in places.
TN52	301137	742063	Mature larch and sycamore dominant with oak becoming more frequent to the east. The understorey has frequent sycamore, and more rarely bird cherry and hazel; there is also some rhododendron. Ground flora is dominated by male-fern, with abundant bluebell and frequent dog's mercury.
TN53	301200	742050	Mixed aged semi-natural woodland with a variety of species. Sycamore is dominant with occasional ash and birch. The understorey has numerous saplings of sycamore, ash and bird cherry. In the ground flora dog's mercury is dominant, with male-fern abundant, and occasional common nettle and hedge woundwort. There is a felled area to the west which is now scrub with raspberry dominant, together with rosebay willowherb, sycamore saplings and willow. Along the river there are various broadleaved trees including beech, oak, birch, sycamore and ash with some hazel in the understorey; the ground flora is somewhat suppressed but there is frequent dog's mercury and great wood-rush, and occasional rhododendron.
TN54	301208	742550	Mature planted mixed woodland on a steep bank leading down to the water's edge dominated by beech and conifers, with holly in the understorey. Rhododendron is locally dominant and there is rare snowberry but elsewhere the ground is very bare with no ground flora underneath the beech. A footpath splits the bank and on the side of the path leading down to the water there is frequent great wood-rush and rare hedge woundwort and male-fern. There are also occasional beech, sycamore and alder saplings. The bank has locally abundant bracken and raspberry. There is also Himalayan balsam along the bank.
TN55	301219	742250	West of track there is a strip of woodland on a steep bank with semi-mature sycamore and birch dominant. These species are also present as saplings. The ground flora includes great wood-rush and male-fern, which are co-dominant, with frequent creeping soft-grass. To the east of the track running down to the A9 the vegetation is similar but has frequent rowan, which may be partly planted.
TN56	301239	742743	This mature mixed plantation is dominated with beech with occasional conifers. Common bent is dominant and tufted hair-grass is abundant. bracken is locally dominant. Greater stitchwort and violet are occasional and hard shield-fern is rare. Four roe deer were seen running through the woodland.
TN57	301245	742601	Deciduous plantation with mature, large sycamore and oak. There is also an area of densely planted young, spindly birch. Bracken is dominant in the ground flora and rhododendron is locally dominant. Ground-ivy and germander speedwell are frequent in areas where bracken is not dominant and northern marsh-orchid is rare. This habitat may provide suitable bat roosting site.
TN58	301282	742426	Thin strip of semi-natural broadleaved woodland by river's edge with a mix of oak, alder and sycamore. In the understorey there is hazel, sycamore, ash and rowan. The ground flora consists mainly of dog's mercury, great wood-rush, male-fern and false brome. There is also occasional bluebell, wood sage and Himalayan balsam, and there are patches of rhododendron along the west end of the bank. Some of the oaks are very large, including the "Niel Gow" oak, and may support bat roosts. **Update from Jacobs Phase 1 Habitat Surveys (2019)**

Target Note	Co-ordinates		Description
	X	Y	
			Surveys in 2019 identified seven trees with bat roosting potential at this location.
TN59	301398	742262	Small strip of semi-natural woodland between car park/access road with occasional planted immature conifers and some planted dogwood and rhododendron. The ground flora is rather suppressed by the dense canopy.
TN60	301408	742170	Grassland field (probably neglected pasture) dominated by common bent but with frequent Yorkshire-fog and red fescue, and rare sweet vernal-grass. Common herbs include common ragwort, creeping thistle, creeping buttercup, germander speedwell, lesser stitchwort and ribwort plantain.
TN61	301424	742518	Opposite the sewage treatment works the bank becomes plantation with young sycamore and oak and ash. There is also hawthorn. The bank is dominated by red fescue and the bank ground flora consists of abundant ground-ivy, bugle, crosswort and dog's mercury. There is also frequent greater stitchwort and raspberry and occasional violet. Great wood-rush becomes dominant in places.
TN62	301473	742012	The Highland Main Line railway embankment has a mix of ruderal vegetation dominated by rosebay willowherb and self-sown young trees, mainly sycamore but also birch and ash. Most of the embankment is mapped as semi-natural woodland as the young trees are about dense enough to justify this, although on the south side there are small patches of grassy vegetation amongst the trees. On the north side there is a strip that is sufficiently open to map as tall ruderal. The bridge has no gaps and is therefore unsuitable for bats.
TN63	301487	742229	The large island in the River Braan (not accessible) has a mix of trees, some of which appear to be planted, and others (especially around the edge) semi -natural. Sycamore, ash, birch and alder dominate around the edge with great wood-rush dominant beneath. Towards the centre there is a mix of deciduous trees and conifers including spruce, Scots pine and larch. There is a smaller narrow island situated between this large island and the east bank of the river, supporting semi-natural woodland of variable age including alder, ash, beech and sycamore; the understorey contains wych elm, and young ash/sycamore, whilst the ground flora is dominated by great wood-rush, with abundant bluebell. The east bank of the river is dominated by sycamore/alder/ash; the ground is disturbed and is often bare, with evidence of tipping, with frequent common nettle. Near the weir the riverside vegetation becomes more open with common nettle, meadowsweet and monkeyflower. The channel in front of the mill has been canalised, and the bridge is too low for bats.
TN64	301519	742303	Strip of plantation on steep slope beside A9 with mature broadleaf trees including mature oak. Should be checked for bats. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 identified twelve trees with bat roosting potential at this location.
TN65	301529	742385	This broadleaved plantation is on a steep bank dominated by mature beech with a sparse ground flora including broad buckler-fern. Along the top edge of the bank there is a row of oak, which have possible bat roost potential. Along the river there are occasional thin strips of more semi-natural woodland with great wood-rush the dominant component of the ground flora. There is a strip of semi-mature planted sycamore by the road, which leads to an area of poor semi-improved grassland dominated by common bent. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 identified eight trees with bat roosting potential at this location.

Target Note	Co-ordinates		Description
	X	Y	
TN66	301545	741962	Mature beech dominant throughout, but with some other species including spindly oak at the east end, and many young ash and beech in the understorey. In the ground flora, broad buckler-fern, male-fern and bluebell are abundant, with frequent wood sorrel and common dog-violet.
TN67	301596	742714	Mature birch plantation. The trees are thin and spindly, but they are covered with lichen. Common bent is dominant and there is occasional rhododendron, bracken and bluebell.
TN68	301705	742290	The A9 passes over a small water channel at this point and should be checked for bats and breeding birds.
TN69	301812	742757	Strip of broadleaved woodland between shooting range and off -road area. Unable to gain access but it is dominated by sycamore, ash and hawthorn. There is abundant common nettle.
TN70	301923	742765	Mixed plantation, which is mainly deciduous but has scattered conifers throughout, but become more dominant in other areas. The canopy is dominated by beech and tall, spindly sycamore and birch. The ground flora is poor with a lot of leaf litter. Male-fern and rhododendron are occasional. Yew is locally frequent and there is an understorey is composed of young sycamore and beech. Common nettle and male-fern are locally abundant.
TN71	301930	742183	Island in River Braan with mature Scots pine, and some peripheral alder, sycamore and wych elm over great wood-rush/dog's mercury.
TN72	301947	742241	Mix of immature planted spruce and assumed self-sown young broadleaf trees. The eastern half has been felled leaving a mix of disturbed neutral grassland and brash.
TN73	302046	742742	On the bank leading to the water there is broadleaved plantation with young alder and beech. Common bent is frequent, and the ground flora consists of hedge woundwort and great wood-rush, which are both dominant. There is also occasional heath speedwell and rare three-nerved sandwort and hard shield-fern. There is a grassy section where the bank becomes more open and the tree cover is limited to occasional mature beech and oak. The bank becomes more densely vegetated and is dominated with great wood-rush and tufted hair-grass. There is also occasional hedge woundwort and Himalayan balsam with sycamore becoming dominant with common nettle locally abundant and bugle and male-fern occasional.
TN74	302131	742308	Most of this block of vegetation is mature spruce plantation with a very poor flora of scattered typical species like male-fern, wood sorrel and common nettle, with pink purslane very locally dominant. It is crossed by a power line beneath which rosebay willowherb dominates. Along the river edge there is a thin strip of planted mature beech with great wood-rush often dominant beneath, plus species such as common dog-violet, red campion, herb-Robert. **Update from Jacobs Phase 1 Habitat Surveys (2019)** This area of coniferous plantation woodland was felled in late 2017. Surveys in 2019 recorded planted broadleaved tree species of alder, willow sp., birch sp. and rowan. Rosebay willowherb and brambles common throughout. The area under the power line is predominantly tall ruderals. Himalayan balsam is abundant along the verge of the A9.
TN75	302182	742517	Mature, mixed woodland plantation dominated by large-leaved lime, beech and conifers. There is yew and an understorey of alder, bird cherry. The canopy becomes dense in places and there is little light penetrating the canopy and as a result the ground flora is sparse. Rhododendron is frequent, selfheal, dog's mercury and male-fern are occasional and wood avens is rare. There is also a lot of bare ground. Some felling has been carried out on the bank.

Target Note	Co-ordinates		Description
	X	Y	
TN76	302269	742080	A long wide strip of plantation on a steep bank running down from the Highland Main Line railway, dominated by mature beech and sycamore. Shade/leaf litter has resulted in a somewhat impoverished patchy ground flora, but male-fern, broad buckler-fern and wood sorrel are abundant, and bluebell is at least frequent (judging from remaining dead inflorescences). **Update from Jacobs Phase 1 Surveys (2019)** Surveys in 2019 reclassified this area as semi-natural broadleaved woodland.
TN77	302284	742223	Semi-natural woodland by River Braan and A9 bridge dominated by oak/sycamore, with occasional alder/willow sp. becoming dominant at the river edge. Understorey has hazel, hawthorn and young sycamore. Ground flora commonly includes dog's mercury, bugle and ground elder. There are also many scattered Japanese knotweed stems near the bridge (at closest about 6m from it).
TN78	302288	742189	Scattered Japanese knotweed is present, as small shoots, either side of the A9 west of the bridge over River Braan (steel beam with concrete abutments). Low bat potential in bridge but dipper nests present on underside.
TN79	302356	742358	Narrow riverside mixed plantation with many and various mature conifers, and broadleaves including sycamore and ash (some of natural origin) plus oak sp., wild cherry and sweet chestnut. Understorey has a mix of natives and non-natives including rhododendron, snowberry, cotoneaster, holly and hazel. Ground flora best and most natural near the River Braan confluence, including abundant great wood-rush and wood sage.
TN80	302477	742152	Unremarkable small area of plantation dominated by beech and sycamore, in places semi-mature and in others very young, with poor flora of primarily ruderal species including ground elder, common nettle and rosebay willowherb, the latter dominant in an open patch.
TN81	302477	742076	Fenced area between A9 and A822 with rank neutral grassland, large areas dominated by rosebay willowherb and lupin species. Common bent/Yorkshire-fog/red fescue occur in the grassland, with abundant creeping thistle. Common knapweed and germander speedwell are locally frequent, and more notably there is occasional melancholy thistle. There is scattered broom, elderberry, hawthorn and young sycamore, becoming plantation to the east. Just before the A822 passes under the Highland Main Line railway there is a small patch of Japanese knotweed.
TN82	302602	742394	Poorer quality semi-natural woodland strip where there are many planted trees (beech/sycamore dominant), but also self-sown ash and alder, especially at the river edge, and a semi-natural ground flora that is sometimes reduced by the occasional to frequent rhododendron. The adjacent semi-improved neutral grassland appears to be a neglected paddock, with frequent broad-leaved dock/common nettle. There is also an adjacent abandoned walled garden full of ruderal vegetation and developing self-sown young trees.
TN83	302631	742121	Small hill with monument, mainly broadleaved plantation of sycamore/beech, with a small area of coniferous plantation on the highest part dominated by Scots pine. Under the pine the flora is a natural acid woodland flora with wavy hair-grass, heath bedstraw and wood sorrel. Elsewhere the flora is often rather sparse, with species like male-fern, broad buckler-fern, bramble, great wood-rush, common nettle and occasionally bluebell; there are also frequent exotic shrubs and occasional elderberry. By the A9 younger sycamore is dominant.
TN84	302659	741764	These habitats occupy a waste disposal facility. There are fenced-off ponds hidden by plantation sycamore and scrub on the highest ground to the west, from which seepage has formed a marshy grassland down slope, becoming drier neutral grassland further

Target Note	Co-ordinates		Description
	X	Y	
			down. The grasslands are dominated by common bent/Yorkshire-fog/red fescue with frequent creeping thistle, and in the marshy section also frequent soft-rush. There are small strips of semi-natural woodland dominated by birch with some sycamore. There are also some small (experimental?) ponds surrounded by improved grass containing what appear to be planted swamp species including reed canary-grass and Iris species. This site has potential as amphibian habitat.
TN85	302766	741913	High grassy embankment between A9 and the Highland Main Line railway dominated by common bent/Yorkshire-fog/red fescue, with false oat-grass dominant in places. Germander speedwell is abundant throughout, with frequent common sorrel and creeping thistle, and occasional ribwort plantain, common knapweed, yarrow and wood sage. Common bird's-foot-trefoil is locally abundant. Species of rare occurrence include common dog-violet, fox-and-cubs and heather. Scattered throughout are raspberry and broom together with a few young birch. To the south the grassland eventually becomes dominated by rosebay willowherb with scattered young trees (birch, sycamore). Immediately beside the A9 there is the typical mown semi-improved neutral grassland found all along the A9, which is particularly wide opposite the Dunkeld junction.
TN86	302774	741961	Plantation on bank along east side of A9 (with thin strip of typical mown semi –improved neutral grassland immediately by A9), dominated by semi-mature sycamore/ash/beech, with small amounts of rowan, wild cherry and hawthorn. Flora beneath is rather rank, typically consisting of bramble, raspberry, broom and rosebay willowherb.
TN87	302820	742396	These habitats occupy two shingle islands in the River Tay near Dunkeld. The larger one has the woodland (mature/semi-mature ash, alder, birch, willow), the smaller dense scrub (willow sp. dominant with some young ash and alder).
TN88	302876	741689	Large area of coniferous plantation mostly of spruce but with larch towards the Highland Main Line railway. Flora as usual poor beneath spruce but under larch there is a semi-natural flora dominated by wavy hair-grass together with frequent wood sorrel and broad buckler-fern. There is also a small area of young and very evenly aged/spaced birch overwhelmingly dominated beneath by common bent.
TN89	302877	741780	Poor quality semi-improved grassland (not entered into), perhaps an abandoned paddock, and partly connected to the adjacent waste disposal facility, with frequent broad-leaved dock and occasional common nettle.
TN90	302923	742316	Thin strip of woodland with variable mix of sycamore, alder, oak, ash, beech. Flora similar to that of semi-natural broadleaved woodland downstream, with species including dog's mercury, ground elder, male-fern, great wood-rush, red campion, hedge woundwort.
TN91	303035	741789	Plantation by the Inchewan Burn on west side of A9 is dominated by mature beech but also with sycamore, oak, and ash, the latter self-sown. Conditions are shady so the flora is often sparse, but includes wood sorrel, wood avens, common dog-violet, great wood-rush and several ferns (hard shield-fern, male-fern, broad buckler-fern). On east side of A9 the plantation is a mix of various species including sycamore, beech, oak (mature – bat roost potential), willow and wild cherry. Flora variable and often rather poor, including male-fern, broad buckler-fern, wood avens, red campion and bluebell.
TN2019_2	303080	741844	**2019 additional target note** Snowberry hedgerow recorded along the bank of the Inchewan Burn.
TN92	303039	741736	This modern road bridge is sub-optimal for bats but should be checked for them, and for nesting birds.
TN93	303104	741621	This mixed plantation is on a steep bank above the Highland Main Line railway opposite the station, with mature larch, beech and sycamore and with abundant rhododendron in the understorey.

Target Note	Co-ordinates		Description
	X	Y	
TN94	303150	742215	Riparian tall herb vegetation composed largely of sweet cicely, ground elder, tansy, meadowsweet and common nettle. Other species include raspberry, crosswort, herb-Robert and more notably wood crane's-bill and melancholy thistle. There are some alder trees at the river edge.
TN95	303228	742178	Riverside woodland dominated by mature oak and sycamore, with some alder/willow at river edge. Sapling sycamore/beech are frequent in the understorey, with occasional wych elm and very locally dominant snowberry. Variable flora including patches of great wood-rush, herb-Robert, bugle, dog's mercury, male-fern, ground elder. By the river Himalayan balsam is locally abundant, and Japanese knotweed occurs rarely. Yellow star-of-Bethlehem is known to be present in this area, which also contains the 'Birnam Oak'.
TN96	303299	741534	Embankment between A9 and the Highland Main Line railway with neutral grassland dominated by common bent red fescue. Germander speedwell is abundant, together with frequent St John's-wort, wild strawberry and creeping buttercup; less common plants include creeping thistle, cat's-ear, ribwort plantain and false oat-grass. There are scattered young planted sycamore/birch; there are also scattered self-sown very young birch. Bank up to the Highland Main Line railway is predominantly ruderal with a mix of rosebay willowherb, ferns, raspberry and comfrey, becoming bracken-dominated to the east.
TN97	303363	741935	Plantation within private grounds, dominated by mature beech with frequent oak and sycamore, and rare conifers; birch becomes dominant to the south. Heavily gardened beneath with exotic shrubs, dryopterid ferns and exotic herbs. Grassy in parts but still with exotic shrubs. Bluebell frequent.
TN98	303441	741520	Plantation on steep east bank of A9, dropping steeply away from it. Semi-mature sycamore dominant, but also birch, Scots pine, oak, beech. Poor often sparse flora beneath; typical species include male-fern, common nettle, raspberry, hedge woundwort.
TN99	303638	740920	Steep slopes with some areas of bare scree amongst vegetation dominated by heather, with small areas of bracken and scaly male-fern, and many scattered trees including silver birch and rowan.
TN100	303660	741408	At this point amongst the mixed plantation there are a few old large oak on a very steep slope running down from the A9. These trees have bat roost potential and are very close to the A9. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 did not identify trees with bat roosting potential in the vicinity of the proposed scheme at this location.
TN101	303713	740762	A bracken dominated area with scattered trees and shrubs including silver birch, ash and rowan and small patches of heather.
TN102	303768	741336	A small patch of open woodland on a hillock close to the A9, which is actually part of a garden. There are several mature oak which are probably of plantation origin, but their age combined with presence of mature birch and rowan, and a semi-natural acidic ground flora of wavy hair-grass and heath bedstraw with peripheral bluebell, suggests the classification as semi-natural woodland.
TN103	303791	741231	Grassland on ground in dip by A9 (through which cycle path runs). Common bent/red fescue dominant with abundant false oat-grass and germander speedwell, plus frequent creeping thistle, and occasional ribwort plantain and common bird's-foot-trefoil. Also locally frequent is wild marjoram. On the Highland Main Line railway embankment there is scrub, which includes raspberry, scattered saplings, rosebay willowherb and, near the target note location, Japanese knotweed.

Target Note	Co-ordinates		Description
	X	Y	
TN104	303793	740467	Disused slate quarry with some peripheral developing B. pendula, Larix decidua, willows sp. and butterfly bush. Ferns are frequent, mainly scaly male-fern with some oak fern. Around the edge there are small areas of heather and cross-leaved heath and occasional wood sage and foxglove. Racomitrium moss is abundant on the slate spoil heap. Deer droppings were found around the quarry.
TN105	303866	740616	Semi-mature European larch on slopes of former slate quarry. A lot of slate is still exposed and amongst it is regeneration of young silver birch. Rhododendron is occasional.
TN106	303935	741137	The section of woodland adjacent to the A9 on the east side is mainly mature oak but has a poor flora with abundant rhododendron beneath, and has therefore been coded as plantation except for a small area on the highest ground. This small area of semi-natural woodland is very close to the A9 and is also mature oak (bat roost potential) but, unlike adjacent woodland classed as plantation, it has a good semi-natural ground flora with wavy hair-grass dominant plus heath bedstraw, great wood-rush, wood sage and most notably chickweed-wintergreen. There is similar good quality woodland on the opposite side of the A9 sandwiched between it and the Highland Main Line railway, where there is both mature oak and birch. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 reclassified this area of plantation woodland as semi-natural broadleaved woodland.
TN107	303967	740527	In some parts the ground is flattened spoil and has patches of ephemeral short perennial vegetation. In most parts common bent is dominant and tufted hair-grass is occasional with selfheal, scattered creeping thistle, white clover and scentless mayweed. Around the edges of the grassland there is development of young scrub dominated by gorse. To the north the vegetation is better developed and is dominated by common bent and tufted hair-grass with scattered soft-rush.
TN108	303980	740935	Partially-vegetated rock exposure by the Highland Main Line railway with downy birch woodland, plus broom and elderberry scrub.
TN109	303982	740378	Diverse age structure dominated by silver birch with scattered rowan, ash and Norway maple. Male-fern and bracken dominate the ground flora. Dominant grasses in lower sections of the wood are common bent and tufted hair-grass with wood sorrel and wood sage. To the southeast of the quarry and car park the vegetation becomes more diverse with a greater number of species that are more typical of birch woodland with wavy hair-grass dominant and abundant wood sorrel, frequent dog's mercury, occasional bilberry, common dog-violet and tormentil, and rare oak fern.
TN110	304024	740901	Large expanse of flat neutral grassland, in parts unimproved with cowslip, greater bird's-foot-trefoil and northern marsh-orchid. Scattered semi-mature broad-leaved trees in central area.
TN111	304029	740595	Vegetation along the Highland Main Line railway line in the section is largely dominated by ferns (including some bracken), with scattered felled trees and scattered scrub; there are also patches of neutral grassland dominated by false oat-grass and ruderal patches of rosebay willowherb.
TN112	304060	740990	Broad-leaved semi-natural woodland around remnant of old A9 road. Central area on rocky ground dominated by mature oak; towards current A9 becoming dominated by birch; both these with acid grassy/bracken ground flora. On steep slope east of old A9 more mixed with pedunculate oak, ash and birch, and developing beech; understorey sparse here with hawthorn, sycamore and elderberry, and ground flora of buckler-fern and honeysuckle. Beside the A9 there is a band of semi-mature planted broadleaves

Target Note	Co-ordinates		Description
	X	Y	
			including oak, birch and sycamore over raspberry, broom, rosebay willowherb and ferns. Broom is locally abundant near the current A9.
TN113	304068	740783	This note covers the hollow between the A9 and B887 at the junction. This contains a patch of semi-natural woodland composed of mature downy birch with regenerating beech and sycamore, with ferns, tufted hair-grass and raspberry beneath, and occasional elderberry. Outwith this woodland there is unimproved acid grassland with creeping soft-grass, brown bent, heath bedstraw, patches of great wood-rush and developing scattered gorse scrub. Of more note, there are also two patches of fairly dry 'swamp' with bladder-sedge, one of which (beside the A9 embankment) has an adjacent patch of melancholy thistle. Female roe deer with fawn seen here.
TN114	304092	740812	A9 descending embankment here has dense scrub dominated by broom, gorse, raspberry and bramble, with a strip of neutral grassland immediately adjacent to the road.
TN115	304138	740487	Old stone wall adjacent to road with abundant polypody plants.
TN116	304144	740248	Young conifers growing in a mix of male-fern, raspberry and broom with scattered broad-leaved trees.
TN117	304182	740792	There is a longer than normal drop from the A9 at this point, at the bottom of which there is a small pool of standing water with surrounding downy birch and grey willow. Behind this is a narrow band of semi-natural birch/oak woodland. The bank down from the A9 has neutral grassland with scattered scrub and ferns.
TN118	304186	740839	Mixed and coniferous plantation, including Scots pine and scattered mature specimens of pedunculate oak and downy birch, with bracken dominant beneath in central area.
TN119	304203	740421	Wetland area with small amount of swamp dominated by bottle sedge and larger patch of grey willow. May provide suitable amphibian habitat. The drier peripheral areas have some planted poplar. **Update from Jacobs Phase 1 Habitat Surveys (2019)** Surveys in 2019 identified this wetland habitat as ephemeral, being dry during the summer months.
TN120	304290	740442	Ring Wood – Area of felled plantation coniferous woodland with mature sessile oak left in situ. Abundant rhododendron forming an understorey. Red squirrel observed feeding. **Update from Jacobs Phase 1 Habitat Surveys (2019)** This entire area of coniferous plantation was felled in 2017. Surveys in 2019 recorded clear fell with retained stumps, dominated by grasses (such as bent, Yorkshire fog and tufted-hair grass), bracken and scattered scrub of brambles. Remnant species of the coniferous plantation such as foxglove, wood sorrel, and heath bedstraw, were present. Some oaks left standing. The planted beech and copper beech avenue between the two felled areas of coniferous plantation remains.
TN121	304297	740691	River eroded cliff face for c. 100m at the salmon pool known as 'The Boil'. Bare rock and gravel being recolonised by broom, rosebay willowherb, Himalayan balsam and raspberry. Also, some tansy and tufted vetch. Cliff top unstable with a number of small holes which may be occupied by breeding sand martin or kingfisher.
TN2019_3	304470	740459	**2019 additional target note** Rhododendron is prevalent throughout this area of plantation woodland.
TN122	304300	741071	Strip of semi-improved grassland by River Tay, which is open to cattle grazing; it is often closely cropped and has scattered creeping thistle and common ragwort. The dominant grass is common bent with frequent red fescue and occasional cock's-foot. Common

Target Note	Co-ordinates		Description
	X	Y	
			herbs include common knapweed, mint, creeping buttercup, ribwort plantain and yarrow. Marsh violet and sedge (possibly bladder-sedge) occur in the damper areas. Garden lupin is occasional and perforate St John's-wort, heath groundsel and sneezewort are rare.
TN123	304304	741355	Recently mown semi-improved neutral grassland dominated by red fescue and common bent with occasional sweet vernal-grass and cock's-foot, which become more common in the upper less-diverse area of grassland. Frequent herbs include lady's-mantle, ribwort plantain, crosswort, common sorrel, eyebright, common bird's-foot-trefoil and white clover. Occasional herbs include oxeye daisy, yarrow, broom and common mouse-ear. Harebell and mouse-ear-hawkweed are rare.
TN124	304390	741230	Area of spoil with fairly flat top and bare spoil on steep edges. Partly recently planted with broadleaved trees in tubes, otherwise open with developing grassland and bracken. The grassland is quite diverse with a number of species characteristic of pioneer communities. The dominant grasses are red fescue and common bent. There are a number of scattered ruderals such as common ragwort, creeping thistle and common nettle. Herbs include autumn hawkbit, common stork's-bill, wood sage and more notably viper's-bugloss. Where the soil is thinnest there are mosses, crosswort, creeping buttercup, dove's-foot crane's-bill and selfheal.
TN125	304397	740825	Heavily grazed with common bent dominant but frequent perennial rye-grass, and Yorkshire-fog occasional. There are very few herbs and only germander speedwell is common.
TN126	304424	740685	Small patch of alder woodland with frequent old holly. There is a small patch of Himalayan balsam. Along the river edge there is marsh marigold, a sedge (possibly bladder-sedge) and water forget-me-not, which have all been grazed.
TN127	304497	740163	Broadleaved semi-natural woodland developed on a wet substrate dominated by downy birch, sycamore and sessile oak. Shrub layer is absent and ground flora is dominated by bracken, buckler-fern and tufted hair-grass.
TN128	304506	740843	Backwater of River Tay, with peripheral trees (principally alder, with some willow). At the southern end it was dry at the time of survey and is probably only very wet during times of flood. There are a lot of exposed cobbles and the area is open to cattle grazing. Bent grass is frequent and herbs include creeping yellow-cress, silverweed, greater plantain and mint. The northern end was also dry and grades into the adjacent semi-improved neutral grassland. The largest central part of the backwater contained standing water and would appear to be permanently flooded. The banks are steep with little marginal vegetation; species include water-pepper, water forget-me-not and mint. A kingfisher was seen flying along this backwater. Immediately adjacent to the east is a broadleaved plantation of dense semi-mature spindly alder. The southern part is heavily grazed, but the rest is fenced off and dominated by Yorkshire-fog.
TN129	304522	740072	Broadleaved semi-natural woodland dominated by sessile oak/birch with occasional ash. Heavily grazed understorey with some rowan, beech, dog-rose and honeysuckle. Ground flora includes greater stitchwort, common dog-violet with some areas dominated by bilberry. There are occasional stands of rhododendron.
TN130	304573	739938	Plantation coniferous woodland above the Highland Main Line railway line, extending a great distance uphill. Mainly spruce.
TN131	304577	740415	A grey squirrel was observed here in 2013
TN132	304639	739927	Railway reinforcement works with rock gabions at this point. Around the gabions and along the Highland Main Line railway in both directions and on both sides is neutral grassland (often with false oat-grass) with scattered scrub, recently cut trees (often sycamore), and patches of ferns and bracken.

Target Note	Co-ordinates		Description
	X	Y	
TN133	304721	740189	Dalpowie Plantation – dense coniferous plantation, including spruce and Douglas fir. Three roe deer were seen here in 2013.
TN134	304736	740047	A wide-open ride beneath a power line meets the A9 here. There is a small area of unimproved acid grassland dominated by wavy hair-grass within the ride. The ride itself is dominated by bracken. By the A9 there is a typical strip of semi-improved neutral grassland and a small bank with scattered scrub, bracken and acid grassland.
TN135	304744	740309	Woodland dominated by a mix of ash, beech, downy birch and pedunculate oak with some alder next to the river. The understorey is sparse with some sycamore regeneration and locally there is invasive rhododendron. Ground flora includes buckler-fern, great wood-rush, wood sorrel and bluebell.
TN136	304797	740414	Open alder woodland (often just two trees wide) running alongside the river. The ground beneath the trees is open to grazing; common species include common nettle, creeping thistle and cow parsley. The bank is steep with patches of tansy, bramble, common knapweed and ribwort plantain; bluebell is rare. There are also small patches of Japanese knotweed.
TN137	304867	739795	Avenue of mature redwood along former old road to Murthly Estate.
TN138	304960	739701	Mixed plantation including a row of mature tall redwoods forming a line along a former pathway. There are also some old yew. Broad-leaved species, some of which are probably self-sown, include sycamore, sessile oak, ash, downy birch and cherry sp.. Rhododendron is frequent in the understorey, along with young sycamore and scattered elderberry and holly. The ground flora is mostly somewhat impoverished owing to the shade but has semi-natural elements, with buckler-fern, wood sorrel, bracken, occasional bramble and notably rare beech fern. The former path which runs between this mixed plantation and the larch plantation by the A9 is grassy with occasional remote sedge and yellow pimpernel.
TN139	305081	739968	Large bracken-dominated area with scattered conifers and broadleaf trees including birch.
TN2019_4	305071	739826	**2019 additional target note** Rhododendron throughout larch plantation and wayleave for power line.
TN140	305180	739521	Mature oak woodland with an understorey of sycamore, ash, birch and holly. There is locally dominant male-fern and locally abundant bracken.
TN141	305182	740179	Mid-channel shingle island (composed mainly of cobbles). Reed canary-grass is dominant at the northern end of the island with willow and alder scrub becoming dominant to the south.
TN142	305254	740016	Plantation broadleaved woodland dominated by sycamore.
TN143	305254	739095	Plantation dominated by oak and beech with a sparse ground flora with a lot of bare ground. The grasses present include occasional common bent and cock's-foot and rare tufted hair-grass. The common herbs include locally abundant hedge woundwort, frequent male-fern and occasional wood sage. In more open sections of the woodland where there is less beech there is more grass along with ground elder, ground-ivy with rare rhododendron. There is also rare three-nerved sandwort.
TN144	305256	739905	Female goshawk flying overhead.
TN145	305342	739155	Recently planted, young broadleaved plantation with mainly oak, ash, sycamore and birch. There are also four large mature birch trees in the middle of the plantation along with some mature beech. The ground flora is dominated by the grasses; wavy hair-grass and common bent.

Target Note	Co-ordinates		Description
	X	Y	
TN146	305381	739445	Young, spindly alder, sycamore and birch with dominant tufted hair-grass and red fescue and locally abundant soft-rush, frequent raspberry and male-fern.
TN147	305439	739805	This is mature woodland dominated by ash and sycamore, in places with occasional horse chestnut, beech, downy birch and willow. The understorey often has abundant rhododendron, frequent bracken and common nettle, and occasional ferns.
TN148	305456	739360	Open area of grass surrounded by trees dominated by red fescue, common bent and cock's-foot with common herbs including abundant hard-fern, frequent tormentil and occasional germander speedwell and soft-rush and rare hard shield-fern.
TN149	305457	739153	Mature woodland of ash, beech and oak with an understorey of alder restricted to near the river. The common grasses include abundant tufted hair-grass and the ground flora includes locally abundant dog's mercury and male-fern, abundant wood sorrel, frequent greater stitchwort and occasional wood avens and herb-Robert and rare bluebell. By the track there is common bent, cock's-foot and Yorkshire-fog and there is also abundant soft-rush. South of the watercourse the woodland becomes dominated by mature oak with occasional beech. There is locally dominant bracken as this area is open to grazing the ground flora has been cropped and there is only occasional wood sorrel and rare bluebell. Hard-fern occurs only rarely. This woodland has bat roost potential.
TN150	305567	739362	Mixed and locally coniferous plantation. Mainly comprised of alder, birch sp. and mature conifers, the latter locally dominant. The dominant grasses include Yorkshire-fog and cock's-foot; raspberry and ferns are frequent, with local rhododendron.
TN151	305595	739442	Dominant grasses include red fescue and common bent and there is locally abundant male-fern and frequent raspberry and scattered birch and alder.
TN152	305619	739380	Oak and ash dominated woodland with some young beech in the understorey. There are also a few yew. The ground flora is sparse and there is a lot of leaf litter. The ground flora includes frequent male-fern, occasional violet, wood sorrel, wood avens and wood sage and rare hard-fern.
TN153	305640	739517	This area is a mixture of scrub and mixed plantation along the roadside between the A9 and the improved fields. Species include frequent Norway spruce and willow sp. and occasional beech, ash, elder, yew, silver birch, hazel and sycamore and there is rare rowan and cherry. The ground flora is composed of occasional false oat-grass, creeping bent, Yorkshire-fog and rare sweet vernal-grass. There is also abundant bracken and frequent ferns.

Table 2: Aquatic Survey Target Notes (Jacobs)

Target Note	Water Feature	Co-ordinates		Description
		X	Y	
A1	Birnam Burn WF2	305425	739464	Small watercourse on west side of A9. Less than 1m wide and around 5cm deep, dry in places. Multiple culverts. Could not be safely accessed on east side of A9. Not suitable for protected species.
A2a A2b	River Tay WF6	304308 301720	740688 742326	Large watercourse 40m wide and greater than 1m deep. Mixed substrate (where visible) suitable for adult Atlantic salmon and lamprey. Possible pearl mussel habitat. Watercourse not crossed at this point but close to A9.
A3	Inchewan Burn WF8	303082	741817	Medium size watercourse crossed by the A9 at Dunkeld. 2m wide with variable depth (20cm-3m). 5m high waterfall at upstream end, straightened downstream of A9. Suitable for salmonids and eels, but no spawning habitat observed.

Target Note	Water Feature	Co-ordinates		Description
		X	Y	
A4	Unnamed WF9	302487	742183	Small (0.5m wide) channel. Heavily modified/redirected around car park and sports field. No suitable habitat for protected species and no migratory access due to steep drop into River Braan.
A5	River Braan WF11	302308	742188	Large watercourse, 30m wide in places with depth varying from 10cm to approximately 2m. Mixed substrate providing habitat for all lamprey and salmonid life stages. Suitable pearl mussel habitat observed.
A6	Mill Lade (Invermill) WF12	301718	742313	2m wide channel running through woodland between River Braan and River Tay. Water depth of approximately 5cm, with little flow and heavily sedimented. No suitable habitat for protected species.
A7a A7b	Unnamed WF13 WF14	300413 300421	743191 743773	Small shallow stream flowing through woodland, under the Highland Main Line railway and A9 into the River Tay. Mixed substrate with artificial sections around rail line. No suitable habitat for protected species.
A8	River Tay WF6	300421	742954	River Tay close to A9 but not crossed. Large shallow riffle across channel and cobble deposition on left bank.
A9	River Tay (Tay Crossing) WF6	300460	743791	The River Tay is around 40m wide at this point, but the depth and substrate could not be determined. A large area of marginal backwater present at right bank at this location. Habitat suitable for protected species is likely to be present in this section.
A10	Unnamed WF16	300522	744242	Very small, dry channel culverted under the A9. No habitat for protected species.

1.3 References

Reports and Documents

Transport Scotland (2014a). A9 Birnam to Tay Crossing Dualling, Stage 2 Options Assessment, Ecology Surveys Technical Note, November 2014.

Transport Scotland (2014b). A9 Birnam to Tay Crossing Dualling: Stage 2 - Options Assessment Addendum Report, Part 2 - Environmental Assessment, Volume 1 - Report. Report to Transport Scotland, 5 September 2014.

Appendix A12.1: Assessment of Predicted Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) National Scenic Area

1.1 Introduction

1.1.1 This appendix provides an assessment of the predicted impacts and effects of the proposed route options upon the individual Special Qualities (SQs) of the River Tay (Dunkeld) National Scenic Area (NSA).

1.1.2 The SQs have been identified through review of NatureScot's 'The Special Qualities of the National Scenic Areas: Scottish Natural Heritage (SNH) Commissioned Report No.374' (Scottish Natural Heritage, 2010). This document defines the SQs of each NSA in Scotland and expands upon each one. The NSA's SQs are presented by NatureScot[1] to clarify *'what needs to be safeguarded to maintain its outstanding scenery'* and to provide a *'basis for future consultation and policy development, particularly in relation to managing development and land use change within NSAs'.*

1.1.3 An illustrative view of the NSA is provided in Image A12.1 and extracts from SNH Commissioned Report No.374 providing the details of the SQs of the River Tay (Dunkeld) NSA are provided below.

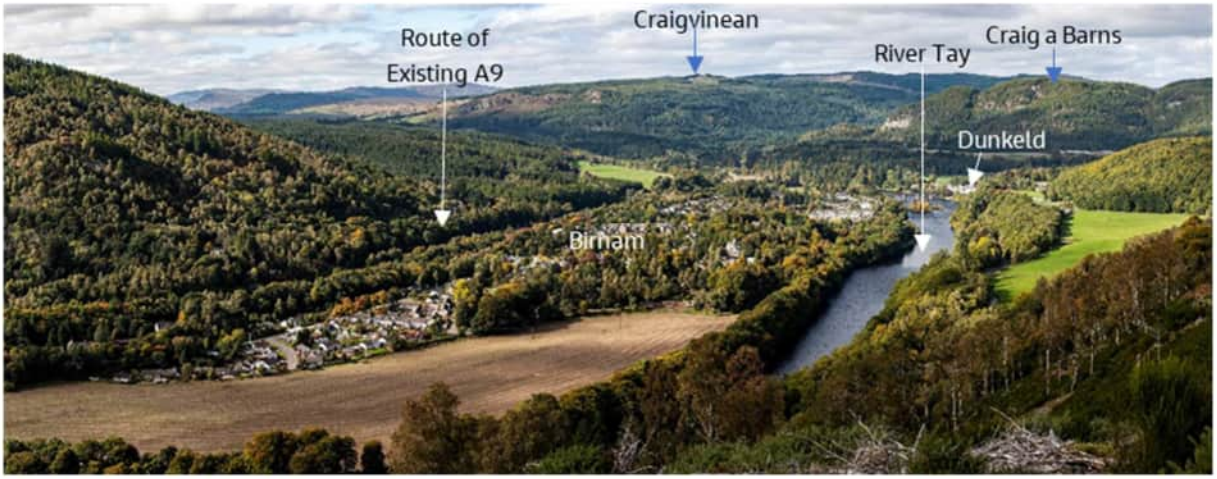


Image A12.1: Illustrative View of the River Tay (Dunkeld) NSA from Newtyle Hill

SQ1.The Beauty of Cultural Landscapes Accompanying Natural Grandeur
'Appreciation of this area's scenery goes back at least as far as the 18th century, when it was seen as a 'sublime' landscape, combining the qualities of power, vastness, light, colour, sound and loudness, and remoteness.

The area is now an extensive cultural landscape of managed policies, designed landscapes, compact settlements, farmland and forest.

The balance, variety and composition of these cultural features accompany, and often utilise, the natural grandeur of the surrounding highlands, straths, rivers, and haughlands. It is a delicate balance that relies on a blend of both cultural beauty and majestic natural scenery.

[1] In August 2020, Scottish Natural Heritage (SNH) was rebranded to NatureScot.

Even stretches of the apparently natural rivers and waters were modified in the late 18th century. This harnessed water power to service the flourishing linen industry. Many stretches of the River Tay's banks have been enhanced with tree planting, access and fishing stations.'

SQ2.The 'Gateway to the Highlands'
'Dunkeld has for long been lauded and visited as the 'Gateway to the Highlands', where lowland scenery changes to highland and both can be appreciated, often in the same view.

Strath Tay is at its narrowest here, with the river curving around under the crags of Craig a Barns to the north, and rocky Birnam Hill, with its old slate quarries, to the south. The wide and smooth-flowing River Tay has a lowland appearance, whereas the River Braan, whose confluence is opposite Dunkeld, presents a highland alternative.

This transition from highland to lowland is especially marked in winter, when snow covered summits are the backcloth to a low-lying mosaic of green and brown.

Nowadays this 'gateway feel' is experienced when travelling north on the A9 trunk road, descending the hill to Dunkeld, then rounding the corner to behold vistas opening-up of Strath Tay and the Highland hills behind.'

SQ3.Characterful Rivers, Waterfalls and Kettle-hole Lochs
'The rivers, falls and lochs vary greatly, with different water bodies adding different interest, experiences and atmosphere to the scene. The River Tay meanders in great loops of deep shining peaty water, the river gravelly rather than rocky and with alternating long pools and swift glides. In contrast the River Braan's course has spectacular turbulent and tumbling rapids and waterfalls as it forces its way through a deep gorge.

Contrasts between the characters of these two rivers were intentionally and consciously exploited in the Hermitage and Dunkeld designed landscapes. Walks led through from the broad, quiet course of the Tay at Inver, into the narrow, craggy valley of the swift, rushing waters of the Braan.

Other contrasts lie further east, where the Highland foothills that extend from Dunkeld to Rattray are cut by the Lunan Burn, a small, fast flowing highland burn arising in the Mounth Highlands north of Dunkeld. It forms a steep gorge as it descends through the hills.

As the burn flows eastwards forming the Lunan valley, so the area is peppered with tranquil lochans of varying size. These have all formed in a series of kettle-holes; three lie closely together in the east of the NSA, Loch of Lowes, Loch of Craiglush and Loch of Butterstone.'

SQ4.Exceptionally Rich, Varied and Beautiful Woodlands
'The NSA is richly afforested and wooded. The tree-cover varies widely with different tree species, management history and age structure, which creates exceptional variety. However, key to this variety are the areas of open field and pasture that provide an important setting for the woods and enable longer views to be possible.

The smaller areas of natural and semi- natural woodlands contrast with the extensive managed forests planted in the great 18th century forestry expansion, centred principally in this area. The Dukes of Atholl pioneered large-scale forestry and from 1738 to 1830 planted some 27 million conifers – 'for beauty and profit' – around Dunkeld.

The Hermitage woodland, originally planted in the 18th century, is now largely mixed conifers of Scots pine, Douglas fir and Norway spruce.

Craigvinean Forest is the greatest of the plantations. This was originally planted mainly with larch, but now the lower slopes have a mixed woodland of Scots pine and beech, while the upper slopes are mixed conifers including the third generation of larch.

On the opposite banks of the Tay are the Craig a Barns and Crieff Hill policy woodlands.'

SQ5.The Picturesque Cathedral Town of Dunkeld
'At the NSA's centre is the compact and picturesque cathedral town of Dunkeld, nestling in the hills on the Tay's north haughlands, connected by Telford's old stone bridge to the Victorian railway resort of Birnam with its distinctive station.

It is of special cultural and historic significance being strategically placed on a major north-south route to the Highlands crossing an east-west route leading through from Strath Braan to the Lunan Valley.

It has been a major ecclesiastical centre from the 7th century and then in the 9th century, Kenneth MacAlpin, the first King of Scots, made Dunkeld head of the Church in Scotia and the capital of the newly-formed nation created by the union of the Scots and the Picts.

It was a market town set at the junction of cattle-droving roads and a crossing point on the Tay; poor communication and transport links were improved in 1809 when the ferry across the Tay between Dunkeld and Birnam was replaced by a bridge built by Thomas Telford.

Dunkeld's compact built form, its integrity, its domestic scale, its close relationship to the River Tay and its beautiful setting results in a town of great charm and character. This, together with its historical sites, makes it popular with tourists.'

SQ6.Drama of The Falls of Braan and The Hermitage
'The height of scenic drama is met below Inver, where the River Braan falls, tumbling through the picturesque gorge of The Hermitage into the Tay.

The Hermitage is of outstanding cultural significance, exploiting the wild nature of the waterfall in giving visitors experience and enjoyment of it.

The natural riverside landscape is dramatic, with the roaring sound heard from woodland walks north of the river. Long distance views are limited as woodlands provide the main structure. However, this is intentional to guide movement through the landscape and, by its presence or absence, hide or reveal 'surprises' such as Ossian's Hall, Hermitage Bridge and Ossian's Cave.'

SQ7.Dunkeld House Policies
The Dunkeld House designed landscape makes up a major portion of the NSA, along the riverside from Dunkeld westwards and northwards. It forms a significant extent of designed and managed ornamental planting and walks.

Within this the River Tay is an important component, its banks laid out with walks and the remnants of ornamental planting, principally the fine trees which survive from the mid 19th century American Garden.

It is a place that exploits the dominant views on each side of the Tay and Braan to the coniferous woodlands and mountains beyond.

SQ8.Significant Specimen Trees
'There are trees of a great age, known individually for their historic, or even legendary, significance and associations: The Birnam Oak, Niel Gow's Oak, the Parent Larch and the Hermitage's Douglas Fir.

Many significant ornamental tree groups add to the visual variety and managed countryside character. These form avenues along some of the walks, and tree-lines along stretches of the river, such as the Bishop's Walk which extends around the beeches on Bishop's Hill to the Cathedral Lawn.'

SQ9.The Iconic View from King's Seat.
'Standing proudly on the edge of the Highland boundary fault line, King's Seat, the summit of Birnam Hill is an iconic Scottish viewpoint.

To the north is a panorama of the hills and glens of the Highlands, to the south the fertile fields of the Lowlands. Eastwards there are views along the boundary fault, across Loch of the Lowes to the fertile farmland of Strathmore. Westwards, the Perthshire hills lead the eye into the far distance.'

1.2 Assessment of Impacts and Effects on the Special Qualities of the Loch Tummel National Scenic Area

1.2.1 For the assessment (provided in Table 1), each SQ has been identified and the predicted impacts and effects associated with each proposed route option on the SQ described. Measures which could potentially be adopted to mitigate predicted impacts (as described in Volume 1, Part 3 – Environmental Assessment (Chapter 12: Landscape)) are then outlined and an indication of the predicted residual effect.

1.2.2 Further to this is consideration of the residual effects associated with each of the proposed route options on the overall integrity (or wholeness) of the NSA, acknowledging that an adverse effect in one area of the NSA could damage the integrity of the NSA as a whole, but also that an effects resulting from one or more of the SQs could potentially affect the integrity of the NSA. This assessment is provided in Table 1.

1.2.3 While there are differences between each of the proposed route options from the start of the scheme (ch0) to Inver (approx. ch4800), from Inver to the end of the scheme (c. ch8400) the proposed route options would be identical in their design. As such any effects on the Special Qualities of the NSA in the latter section would be the same for all options. Where effects are common to two or more of the route options, this is noted in Table 1.

Table 1: Assessment of Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
SQ1: The Beauty of Cultural Landscapes Accompanying Natural Grandeur				
Predicted Impact and Effect	Option ST2A would increase the prominence of road infrastructure, structures and earthworks amongst the managed policies, designed landscapes, compact settlements, farmland and forested landscapes of the NSA. In addition, it would reduce the area of woodland and farmland along the road corridor as a result of the road widening. These changes would potentially impact the balance of the cultural landscapes and natural scenery through the increased presence of man-made features within the NSA. A control building and associated access road would potentially be required on top of the tunnel. Tunnelling of the dualled A9 would however slightly reduce the influence of a busy trunk road on SQ1. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	Option ST2B would increase the prominence of road infrastructure, structures (including underpass) and earthworks amongst the managed policies, designed landscapes, compact settlements, farmland and forested landscapes of the NSA. In addition, it would reduce the area of woodland and farmland along the road corridor as a result of the road widening. These changes would potentially impact the balance of the cultural landscapes and the natural scenery by increasing the presence of man-made features within the NSA. **Predicted Magnitude of Impact:** Minor **Predicted Effect: Moderate**	Option ST2C would increase the prominence of road infrastructure, structures and earthworks amongst the managed policies, designed landscapes, compact settlements, farmland and forested landscapes of the NSA. In addition, it would reduce the area of woodland and farmland along the road corridor as a result of the road widening. Impacts would also result from the 9.5m increase in vertical alignment, the grade separated junction at Little Dunkeld, the large-scale retaining structure opposite Dunkeld Cathedral and the proposed crossing of the River Braan. These elements of the proposed route option would potentially impact the balance of the cultural landscapes and the natural scenery by increasing the presence of man-made features within the NSA. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	Option ST2D would increase the prominence of road infrastructure, structures and earthworks amongst the managed policies, designed landscapes, compact settlements, farmland and forested landscapes of the NSA. In addition, it would reduce the area of woodland and farmland along the road corridor as a result of the road widening. These changes would potentially impact the balance of the cultural landscapes and the natural scenery by increasing the presence of man-made features within the NSA. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight
Potential Mitigation	Mitigation would be designed to minimise the potential effects on the balance of the cultural landscapes and the natural scenery. It could include: The grading of earthworks to reduce their artificial appearance.	Mitigation would be designed to minimise the potential impacts on the balance of the cultural landscapes and the natural scenery. It could include: The grading of earthworks to reduce their artificial appearance.	Mitigation would be designed to minimise the potential impacts on the balance of the cultural landscapes and the natural scenery. It could include: The grading of earthworks to reduce their artificial appearance.	Mitigation would be designed to minimise the potential impacts on the balance of the cultural landscapes and the natural scenery. It could include: The grading of earthworks to reduce their artificial appearance.

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	The careful use of planting to maintain and/or recreate the patchwork of open ground within the woodland to integrate the proposed route option into the landscape. Mitigation planting on top of the tunnel to integrate the tunnel cover into the landscape. While the benefits of mitigation planting would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.	The careful use of planting to maintain and/or recreate the patchwork of open ground within the woodland to integrate the proposed route option into the landscape. While the benefits of mitigation would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.	The careful use of planting to maintain and/or recreate the patchwork of open ground within the woodland to integrate the proposed route option into the landscape. However, there would be limited scope to mitigate impacts associated with the grade separated junction at Little Dunkeld and River Braan crossing.	The careful use of planting to maintain and/or recreate the patchwork of open ground within the woodland to integrate the proposed route option into the landscape. While the benefits of mitigation would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.
Predicted Residual Impact and Effect	The proposed route option would increase the prominence of road infrastructure within the NSA (along the existing route of the A9) and alter the pattern of the landscape along its length resulting from the loss of areas of woodland and introduction of open areas. The retention of a linear open area on top of the tunnel could potentially appear artificial within the densely wooded landscape. These aspects would increase the prominence of road infrastructure within the cultural landscapes. However, in terms of the balance of man-made landscapes and natural scenery, the proposed route option would have the potential for a residual effect of Slight significance as the	The proposed route option would increase the prominence of road infrastructure (more so than Options ST2A and ST2D) resulting from the underpass and new station facility and less scope for mitigation planting along its length. As such the proposed route option would increase the prominence of road infrastructure within the cultural landscapes particularly in the vicinity of Little Dunkeld and Birnam. In terms of the delicate balance of man-made landscapes and the natural scenery, whilst the proposed route option would have local effects, the overall potential significance of residual effect is assessed as Slight as the balance of the cultural and natural	The proposed route option would increase the prominence of road infrastructure (more so than Options ST2A, ST2B and ST2D) resulting from the 9.5m increase in vertical alignment, the grade separated junction at Little Dunkeld, the large-scale retaining structure opposite Dunkeld Cathedral, the proposed crossing of the River Braan and lesser opportunities for mitigation planting. These elements of the proposed route option would result in localised impacts on the balance of the cultural (man-made) landscapes and natural scenery but a lesser overall effect as the balance of the cultural and natural landscapes throughout the NSA would be largely maintained.	The proposed route option would increase the prominence of road infrastructure within the NSA (largely along the existing route of the A9). While there would be greater influence of the road infrastructure on the pattern of the cultural landscapes as a result of Option ST2D's closer alignment to the existing situation there would be minor impacts on the balance of the cultural landscapes and the natural scenery as a result of the proposed route option.

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	balance throughout the NSA would be largely maintained. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	landscapes throughout the NSA would be largely maintained. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	**Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	**Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight
SQ2: The Gateway to the Highlands				
Predicted Impact and Effect	The widening of the carriageway, loss of woodland (including tall roadside trees which enclose sections of the road) and changes to the pattern of the landscape would change how the 'Gateway' is experienced by users of the A9. Impacts on the 'Gateway' experience would arise as a result of the overbridge at Dalpowie (Murthly) and the routing of the dualled A9 through a section of tunnel for a distance of c.1.5km. Both of these elements would result in major impacts on how the SQ is experienced by users of the A9 as they interrupt views of the surrounding landscape. Impacts would also result from the roundabout which would interrupt the experience of the continuous passage through the strath. There would be changes to the roads leading in to the 'Gateway' settlement of Dunkeld as a result of the proposed route option. The proposed route option would not impact the form of Strath Tay, the natures of the River Tay and River Braan, or the	The widening of the carriageway, loss of woodland (including tall roadside trees which enclose sections of the road) and changes to the pattern of the landscape would change how the 'Gateway' is experienced by users of the A9. Of particular note would be changes associated with the lowering of the carriageway which would reduce the opportunities for users of the A9 to experience views of the wider landscape. Impacts would also result from the roundabout which would interrupt the experience of the continuous passage through the strath. There would be changes to the roads leading in to the 'Gateway' settlement of Dunkeld as a result of the proposed route option. The proposed route option would not impact the form of Strath Tay, the natures of the River Tay and River Braan, or the transition of the landscape from highland to lowland.	The widening of the carriageway, loss of woodland (including tall roadside trees which enclose sections of the road) and changes to the pattern of the landscape would change how the 'Gateway' is experienced by users of the A9. Generally, there would be a lessening of 'natural' enclosure of the dualled A9 by woodland. Particularly in the region of the grade separated junction at Little Dunkeld and the River Braan crossing and option would change the sequence of open and restricted views experienced by travellers. There would be changes to the roads leading in to the 'Gateway' settlement of Dunkeld as a result of the proposed route option. The proposed route option would not impact the form of Strath Tay, the natures of the River Tay and River Braan, or the transition of the landscape from highland to lowland.	The widening of the carriageway, loss of woodland (including tall roadside trees which enclose sections of the road) and changes to the pattern of the landscape would change how the 'Gateway' is experienced by users of the A9. Generally, there would be a lessening of 'natural' enclosure of the dualled A9 by woodland. Impacts would also result from the roundabout which would interrupt the experience of the continuous passage through the strath. There would be changes to the roads leading in to the 'Gateway' settlement of Dunkeld as a result of the proposed route option. The proposed route option would not impact the form of Strath Tay, the natures of the River Tay and River Braan, or the transition of the landscape from highland to lowland.

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	transition of the landscape from highland to lowland. **Predicted Magnitude of Impact:** Major **Predicted Effect: Large**	**Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	**Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	**Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**
Potential Mitigation	Mitigation could comprise careful design of roadside planting to create a sequence of views of Dunkeld and the surrounding hills. This sequence could to some extent potentially enhance the views experienced by travellers on the A9. Except for aesthetic design of the tunnel portals there is limited scope to mitigate impacts associated with passage through the tunnel. Careful species selection for roadside trees would partially help to recreate a sense of enclosure along parts of the route. Accessibility of Dunkeld as the 'Gateway to the Highlands' would be maintained via the at-grade roundabout.	Mitigation could comprise careful design of roadside planting to create a sequence of views of Dunkeld and the surrounding hills. This sequence could potentially enhance the views experienced by travellers on the A9. Except for aesthetic design of the retaining structures there is limited scope to mitigate impacts associated with passage through the underpass. Careful species selection for roadside trees would partially help to recreate a sense of enclosure along parts of the route. Accessibility of Dunkeld as the 'Gateway to the Highlands' would be maintained via the at-grade roundabout.	Mitigation could comprise careful design of roadside planting to create a sequence of views of Dunkeld and the surrounding hills. This sequence could potentially enhance the views experienced by travellers on the A9, particularly in the region of the grade separated junction at Little Dunkeld where views would be likely to be of a more open nature due to the increased elevation of the road level and limited scope for roadside planting. However, the openness would be contrary to the existing sequence experienced by road users. Careful species selection for roadside trees would partially help to recreate a sense of enclosure along parts of the route. Accessibility of Dunkeld as the 'Gateway to the Highlands' would be maintained via the grade separated junction.	Mitigation could comprise careful design of roadside planting to create a sequence of views of Dunkeld and the surrounding hills. This sequence could potentially enhance the views experienced by travellers on the A9, and their experience of the 'Gateway'. Careful species selection for roadside trees would partially help to recreate a sense of enclosure along parts of the route. Accessibility of Dunkeld as the 'Gateway to the Highlands' would be maintained via the at-grade roundabout.
Predicted Residual Impact and Effect	There would be no or only negligible impacts on the accessibility of Dunkeld as a result of the proposed route option. Option ST2A would alter the way the 'Gateway' is experienced by travellers on	There would be no or only negligible impacts on the accessibility of Dunkeld as a result of the proposed route option. Option ST2B would adversely alter the way the 'Gateway' is experienced by travellers	There would be no or only negligible impacts on the accessibility of Dunkeld as a result of the proposed route option. Option ST2C would alter the way the 'Gateway' is experienced with potentially	There would be no or only negligible impacts on the accessibility of Dunkeld as a result of the proposed route option. Option ST2D would alter the way the 'Gateway' is experienced by road users, primarily as a result of the

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	the A9, with initial views of the strath impaired by the Murthly Junction and subsequently by the tunnelled section, with only limited scope to mitigate the impacts. Furthermore, there would be limited scope to mitigate impacts associated with the change in passage through the strath resulting from the roundabout. In terms of Dunkeld comprising the 'Gateway to the Highlands' there would be no or only negligible effects as a result of the proposed route option. **Predicted Magnitude of Impact:** Major **Predicted Effect: Large**	on the A9, primarily as a result of the underpass and associated retaining structures with only limited scope to mitigate the impacts. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	less enclosure resulting in a more open experience. However, the combination of openness of some sections of the route and an increase in elevation would allow for additional views of the strath and potentially Option ST2C would result in beneficial impacts for road users. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	widening of the carriageway and the at-grade roundabout. Option ST2D would however remain broadly similar to the existing situation but with opportunities to design/enhance the 'Gateway' experience as experienced by travellers on the A9. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
SQ3: Characterful Rivers, Waterfalls and Kettle-Hole Lochs				
Predicted Impact and Effect	Option ST2A would require widened crossings of the River Braan and the River Tay as a result of the dualling of the A9, however, there would be no new crossings. Views from the riverside walks would be impacted by the increased prominence of road infrastructure, structures and earthworks associated with the widening of the A9. The Sustainable drainage system (SuDS) features would add a new water feature to the landscape which would potentially appear artificial and uncharacteristic of the landscape. The proposed route option would not impact the character of the River Tay or River Braan. Nor would the proposed route option impact the Lunan valley and associated water features. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	Option ST2B would require widened crossings of the River Braan and the River Tay as a result of the dualling of the A9, however, there would be no new crossings. Views from the riverside walks would be impacted by the increased prominence of road infrastructure, structures and earthworks associated with the widening of the A9. The SuDS features would add a new water feature to the landscape which would potentially appear artificial and uncharacteristic of the landscape. The proposed route option would not impact the character of the River Tay or River Braan. Nor would the proposed route option impact the Lunan valley and associated water features. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	Option ST2C would require widened crossings of the River Braan and the River Tay as a result of the dualling of the A9, however, there would be no new crossings. Due to the proposed grade separated junction at Little Dunkeld the bridge over the River Braan would require to be higher than existing which would impact the views experienced from the footpaths along the Tay and the Braan. Views from the riverside walks would be impacted by the increased prominence of road infrastructure, structures and earthworks associated with the widening of the A9. The SuDS features would add a new water feature to the landscape which would potentially appear artificial and uncharacteristic of the landscape. The proposed route option would not impact the character of the River Tay or River Braan. Nor would the proposed route option impact the Lunan valley and associated water features. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	Option ST2D would require widened crossings of the River Braan and the River Tay as a result of the dualling of the A9, however, there would be no new crossings. Views from the riverside walks would be impacted by the increased prominence of road infrastructure, structures and earthworks associated with the widening of the A9. The SuDS features would add a new water feature to the landscape which would potentially appear artificial and uncharacteristic of the landscape. The proposed route option would not impact the character of the River Tay or River Braan. Nor would the proposed route option impact the Lunan valley and associated water features. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight
Potential Mitigation	Mitigation could comprise the grading of earthworks to reduce their artificial appearance and the careful use of planting	As Option ST2A	New structures would be aesthetically designed.	As Option ST2C

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	to minimise the effect of the proposed route option on the views experienced from riverside walks. The SuDS features would be designed to have a more naturalistic appearance to integrate them into the landscape.		The SuDS features would be designed to have a more naturalistic appearance to integrate them into the landscape.	
Predicted Residual Impact and Effect	There would be no or relatively minor impacts on the character of the River Braan and the River Tay. The naturalistic design of the SuDs and associated planting would reduce their effect and help to integrate them into the landscape. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A	There would be no or only negligible impacts on the character of the River Tay. There would however be slightly greater impacts on the character of the River Braan as a result of the higher, wider crossing. The naturalistic design of the SuDS and associated planting would reduce their effect and help to integrate them into the landscape. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	There would be no or only negligible impacts on the character of the River Braan and the River Tay. The naturalistic design of the SuDS and associated planting would reduce their effect and help to integrate them into the landscape. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight
SQ4: Exceptionally Rich, Varied and Beautiful Woodlands				
Predicted Impact and Effect	The proposed route option would result in the loss of woodland (including areas of mixed woodland, coniferous plantation and riparian woodland) along the length of the road corridor. In addition to native species, non-native species within the Murthly Castle GDL, which add to the diversity of the woodlands within the NSA would be impacted. As the loss of woodland within Craigvinean Forest and The Hermitage is relatively small in consideration of the large extent	As Option ST2A, with localised slightly smaller loss of conifer woodland at Murthly and slightly greater loss of mixed woodland at Birnam Junction.		

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	of these woodlands there would be limited impacts on their contribution to the character of the strath. There would be no impacts on the policy woodlands of Craig a Barns and Crieff Hill. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight			
Potential Mitigation	Areas of woodland loss could be re-instated with replacement planting and/or the planting of species which would increase the diversity and richness of the woodlands. This approach would be particularly appropriate where areas of plantation are required to be removed (such as the plantation at Murthly and the plantations of Inver Wood). While native species would generally be used in areas of new tree planting, non-native species to replace specimens lost as a result of the proposed route option and reflective of the species found within the area of Dunkeld could be used to maintain the richness and variety of the woodlands. In addition to woodland planting, open areas would be maintained along the length of the route corridor so that views of the woodlands from the A9 would be maintained.	As Option ST2A		
Predicted Residual Impact and Effect	While the amount of woodland along the length of the road corridor would be likely to be reduced, through careful species selection the richness, variety and beauty	As Option ST2A		

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	of the woodlands would be largely maintained, particularly in the longer term when the planting has established. The majority of woodland throughout the NSA would be unaffected by the proposed route option and views of the woodlands would be maintained. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight			
SQ5: The Picturesque Cathedral Town of Dunkeld				
Predicted Impact and Effect	There are no direct impacts on the cathedral town of Dunkeld. While the arrangement of routes entering the town would be altered by the proposed route option, access would be maintained. It is likely that there would be impacts on the wider setting of Dunkeld which would generally be experienced in views from riverside walks and the grounds of the cathedral (refer to Volume 1, Part 3 – Environmental Assessment (Chapter 13: Visual)). **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A	There are no direct impacts on the cathedral town of Dunkeld. It is predicted that there would be impacts on the wider setting of Dunkeld as a result of the views of the raised A9 and associated large-scale retaining structure which would be sited directly opposite the cathedral. Views of the retaining structure would be experienced in views from the grounds of the cathedral (refer to Volume 1, Part 3 – Environmental Assessment (Chapter 13: Visual)) and from riverside walks. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	As Option ST2A
Potential Mitigation	Mitigation would be designed to minimise the potential impacts on the setting of Dunkeld resulting from the proposed route option. Mitigation could comprise the grading of earthworks to reduce their artificial appearance in addition to planting	As Option ST2A	Mitigation would be designed to minimise the potential impacts on the setting of Dunkeld resulting from the proposed route option. Mitigation could comprise the grading of earthworks to reduce their artificial appearance in addition to planting	As Option ST2A

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	to screen the proposed route option in views from the town. While the benefits of mitigation would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.		to screen the proposed route option in views from the town. Mitigation could also comprise aesthetic design of the retaining structure as far as practicable. While the benefits of mitigation would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.	
Predicted Residual Impact and Effect	There would be no direct impacts on Dunkeld as a result of the proposed route option. There would be impacts on views from the town towards its wider setting, particularly from riverside walks and the cathedral grounds. These impacts would be reduced as mitigation planting establishes and integrates the proposed route option into the wider landscape. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A	There would be no direct impacts on Dunkeld as a result of the proposed route option. There would be impacts on views from the town towards its wider setting, particularly from riverside walks and the cathedral grounds. These impacts would be largely reduced as mitigation planting establishes and integrates the route option into the wider landscape, however, views of the large-scale retaining structure would remain. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A
SQ6: Drama of the Falls of Braan and the Hermitage				
Predicted Impact and Effect	There are no direct impacts on the Falls of Braan. There would be limited impacts on views from the woodland walks close to the river due to the enclosure of the footpaths. There would be no impacts on the	As Option ST2A		

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	movement of people and their experience of features such as Ossian's Hall. There would be no impacts on views of the Falls of Braan. New access to the Hermitage from the A9 would potentially result in felling of small areas of woodland. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight			
Potential Mitigation	Mitigation could include new woodland planting at the entrance to the Hermitage.	As Option ST2A		
Predicted Residual Impact and Effect	Impacts on the SQ would be likely to be relatively minor, establishment of mitigation planting at the entrance to the Hermitage would reduce impacts in the longer term. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A		
SQ7: Dunkeld House Policies				
Predicted Impact and Effect	There are no direct impacts on Dunkeld House Policies, however the views of the wider landscape from footpaths within the policies (including the footpaths by the River Tay) would be impacted by the proposed route option. This would include impacts on views resulting from the earthworks at ch5400 and the large-scale retaining structure at ch5900 close to where the proposed route option crosses the Highland Main Line railway.	As Option ST2A	There are no direct impacts on Dunkeld House Policies, however the views of the wider landscape from footpaths within the policies (including the footpaths by the River Tay) would be impacted by the proposed route option. This would include impacts on views resulting from the large-scale retaining structure at ch4200, earthworks at ch5400 and the large-scale retaining structure at ch5900 close to	As Option ST2A

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	Predicted Magnitude of Impact: Minor **Predicted Effect:** Slight		where the proposed route option crosses the Highland Main Line railway. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	
Potential Mitigation	Mitigation could comprise: The grading of earthworks to reduce their artificial appearance. The sensitive design of the retaining structures. The careful use of planting to integrate the proposed route option into the landscape and reduce its visibility and influence in views from footpaths within the Dunkeld House policies. While the benefits of mitigation planting would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.	As Option ST2A	Mitigation could comprise: The grading of earthworks to reduce their artificial appearance. The sensitive design of the retaining structures. The careful use of planting to integrate the proposed route option into the landscape and reduce its visibility and influence in views from footpaths within the Dunkeld House policies. While the benefits of mitigation planting would be limited in the short term, in the medium to long term, when planting establishes, it is predicted to reduce the impacts of the dualled A9 within the landscape.	As Option ST2A
Predicted Residual Impact and Effect	There would be no direct impacts on Dunkeld House policies. Predicted effects on visual amenity would be reduced by the potential mitigation measures however there are likely to be some residual effects on the views from the footpaths as a result of the retaining structure at ch5900. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A	There would be no direct impacts on Dunkeld House policies. Predicted effects on visual amenity would be reduced by the potential mitigation measures however there are likely to be some residual effects on the views from the footpaths as a result of the retaining structures at ch4200 and ch5900. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
SQ8: Significant Specimen Trees				
Predicted Impact and Effect	No trees of great age or known for their historic or even legendary significance and associations would be directly impacted by the proposed route option. The proposed route option would however potentially impact the setting of Niel Gow's Oak as a result of the widening of the A9 and formation of earthworks onto the floodplain (c. ch5400) which would lead to the loss of the existing roadside trees. The avenue of Grand Firs associated with the western drive to Murthly Castle would be required to be partially felled as a result of Option ST2A. Although these are not 'specimen trees' in the same category as the Birnam Oak, Niel Gow's Oak or the Parent Larch, their presence close to the existing A9 contributes to the travellers' experience of the 'Gateway to the Highlands' SQ and the 'Exceptionally Rich, Varied and Beautiful Woodlands' SQ. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	No trees of great age or known for their historic or even legendary significance and associations would be directly impacted by the proposed route option. The proposed route option would however potentially impact the wider setting of Niel Gow's Oak as a result of the widening of the A9 and formation of earthworks onto the floodplain (c. ch5400) which would lead to the loss of the existing roadside trees. The avenue of Grand Firs associated with the western drive to Murthly Castle would be required to be partially felled as a result of Option ST2B (less so than Option ST2A). Although these are not 'specimen trees' in the same category as the Birnam Oak, Niel Gow's Oak or the Parent Larch, their presence close to the existing A9 contributes to the travellers experience of the 'Gateway to the Highlands' SQ and the 'Exceptionally Rich, Varied and Beautiful Woodlands' SQ. **Predicted Magnitude of Impact:** Moderate **Predicted Effect: Moderate**	As Option ST2B	
Potential Mitigation	The establishment of woodland planting on the embankment would reduce the influence of the proposed route option on the setting of Niel Gow's Oak.	The establishment of woodland planting on the embankment would reduce the influence of the proposed route option on the setting of Niel Gow's Oak.	As Option ST2B	

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	Planting of tall 'avenue' trees could be undertaken, the approach to the planting would be discussed with Historic Environment Scotland and Murthly Estate.	Planting of tall 'avenue' trees to 'enclose' the road could be undertaken. Planting of avenue trees within Murthly Estate would be consulted on with Murthly Estate and Historic Environment Scotland.		
Predicted Residual Impact and Effect	The change to the setting of Niel Gow's Oak would be of short to medium duration until the establishment of the mitigation planting. On establishment of the planting impacts would be reduced. The partial felling of the avenue would reduce its integrity. Potentially there would be associated impacts on other SQs of the NSA as a result of changes to the avenue. There would be no or only negligible impacts on other significant ornamental tree groups. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	The partial felling of the avenue would reduce its integrity. Potentially there would be associated impacts on other SQs of the NSA as a result changes to the avenue. Impacts are predicted to be less than Option ST2A. There would be no or only negligible impacts on other significant ornamental tree groups. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2B	
SQ9: The Iconic View from King's Seat				
Predicted Impact and Effect	From the summit of King's Seat it is predicted that there would be views of Option ST2A (including the proposed Dalguise Junction) where it passes Inver Wood to the north-west. Views would include the clearance of forestry and the formation of earthworks in order to accommodate the junction in addition to the widened A9. **Predicted Magnitude of Impact:** Minor	As Option ST2A		

Assessment of Potential Impacts and Effects on the Special Qualities of the River Tay (Dunkeld) NSA				
	Option ST2A	**Option ST2B**	**Option ST2C**	**Option ST2D**
	Predicted Effect: Slight			
Potential Mitigation	Woodland planting along the road corridor and junction could be undertaken to help integrate the proposed route option into the landscape and reduce its prominence in the wider landscape.	As Option ST2A		
Predicted Residual Impact and Effect	The proposed route option would be visible in a relatively narrow field of view within the strath landscape at a distance in excess of 3km. In the context of the expansive and panoramic view available from the summit, in addition to consideration of the existing views of the A9 (and Highland Main Line railway) that are experienced from the summit of the hill, the widening of the A9 would be a relatively minor element in the view. **Predicted Magnitude of Impact:** Minor **Predicted Effect:** Slight	As Option ST2A		

1.3 References

Reports and Documents

Scottish Natural Heritage (2010). The Special Qualities of the National Scenic Areas. Scottish Natural Heritage Commissioned Report No.374.

Appendix A13.1: Visual Assessment Tables

Table 1: Route Options- Summary of Potential Operational Visual Impacts and Effects on Receptors at Selected Viewpoints (with 'embedded' mitigation)

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
1 West Entrance to Murthly Castle Garden and Designed Landscape (road users, visitors)	High	Medium	Moderate	Notable change to existing view with the introduction of a grade separated junction, overbridge and Sustainable Drainage System (SuDS) with associated loss of woodland and earthworks. M: Major S: **Large**	The introduction of the proposed underbridge and SuDS would result in a limited loss of roadside woodland and opening of views along the A9. M: Moderate S: **Moderate**	As Option ST2B	As Option ST2B
2 A9 Lay-by near Ringwood (road users)	High	Low	Moderate	Offline realignment of the widened A9 and associated cuttings, resulting in the loss of a significant number of mature roadside AWI trees. Visibility to the Murthly Junction to the south and tunnel entrance to the north. M: Major S: **Large**	Offline realignment of the widened A9 and associated cuttings resulting in the loss of a number of mature roadside AWI trees. Visibility to noise barrier at Ringwood. Visibility of the proposed Birnam Junction and associated earthworks to the north. M: Moderate S: **Moderate**	As Option ST2B	As Option ST2B

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
3 A984, near Newtyle Farm (road users)	High	Low	Moderate	Slightly increased visibility of vehicles on the A9 due to loss of intervening AWI woodland resulting from construction of roads and SuDS, particularly where sections of the widened mainline and proposed slip roads run on embankment. M: Minor S: Slight	Slightly increased visibility of vehicles on the A9 and Birnam Junction due to loss of intervening AWI woodland resulting from construction of roads and SuDS, particularly where sections of the widened mainline and proposed slip roads run on embankment. M: Minor S: Slight	As Option ST2B	As Option ST2B
4 B867/NCR 77 (road users, cyclists)	High	Medium	Moderate	Proposed B867 realignment, underbridge and associated earthworks visible, with limited loss of AWI woodland. Proposed tunnel control building visible on top of tunnel. Partial visibility to Murthly overbridge. M: Moderate S: **Moderate**	Proposed B867 underbridge, SuDS and grade separated junctions with associated large- scale earthworks and significant loss of mature AWI woodland. M: Major S: **Large**	As Option ST2B	As Option ST2B

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
5 South-west of Newtyle Hill (walkers)	High	High	High	Increased visibility to the widened A9 and realigned B867. The introduction of the proposed SuDS would result in a noticeable loss of screening AWI woodland. Partial views would be obtained to the Murthly Junction overbridge. M: Minor S: Slight	Increased visibility to the widened A9, side roads and SuDS, particularly at Birnam Junction, where there would be a noticeable loss of screening AWI woodland. M: Moderate S: **Moderate**	As Option ST2B	As Option ST2B
6 Junction of Perth Road/Station Road and Core Path, Birnam (residents, road users, walkers)	High	High	High	Reduced visibility of vehicles on A9, as A9 would be in tunnel/cutting. Loss of trees at southern end of Station Road and views to existing station building and new station car park. M: Moderate S: **Moderate**	As Option ST2A (A9 would travel through an underpass rather than a tunnel where it passes Dunkeld & Birnam Station).	Partial visibility of new station car park and partial loss of trees at southern end of Station Road leading to slightly increased visibility of A9 traffic. M: Moderate S: **Moderate**	As Option ST2C

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
7 Footbridge at Dunkeld & Birnam Station (rail users)	High	Medium	High	New station car park above the proposed tunnel visible from this elevated viewpoint due to the limited separation distance and lack of intervening vegetation. Proposed tunnel would result in traffic associated with the lowered and widened A9 being concealed from view. M: Moderate S: **Moderate**	New station car park above proposed underpass visible from this elevated viewpoint due to the limited separation distance and lack of intervening vegetation. Widened mainline and associated southbound retaining wall and traffic visible to south-east of proposed underpass. M: Moderate S: **Moderate**	Widened A9 carriageway, noise barrier bordering the station car park, pedestrian underpass and associated earthworks clearly visible from this elevated viewpoint due to the close proximity of the road and lack of intervening vegetation. Loss of trees adjacent to southbound carriageway of existing A9 will open views to Birnam and new station car park and SuDS. M: Major S: **Large**	As Option ST2C

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
8 Telford Gardens, Little Dunkeld (residents)	High	High	High	Reduced visibility of vehicles on A9, as A9 would be in tunnel/cutting. Loss of roadside woodland at northern entrance to tunnel would be visible from properties further west on Telford Gardens, and from properties at King Duncan's Place, but not from the viewpoint. M: Moderate S: **Moderate**	Visibility of vehicles on A9 will be reduced with the lowered, widened mainline in cutting. Loss of roadside woodland adjacent to Telford Gardens would be partially visible from the viewpoint but would be directly visible from southern aspects of properties at Telford Gardens and Stell Park Road. M: Moderate S: **Moderate**	Increased visibility of vehicles on the A9 due to loss of roadside woodland. Loss of mature trees due to SuDS at eastern end of Stell Park Road. Southern aspects of properties on Telford Gardens would have increased visibility of A9 and slip roads associated with the new Dunkeld Junction due to the loss of mature roadside vegetation to the south of Telford Gardens, the raised vertical alignment of the mainline above existing grade and the limited separation distance from the viewpoint. Noise barriers would be visible from southern aspects of properties at Telford Gardens and King Duncan's Place. M: Major S: **Large**	Little change with minor loss of roadside vegetation. M: Minor S: Negligible

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
9 Summit of Craig a Barns (walkers)	High	High	High	Limited views to the A9 due to screening from dense coniferous forestry covering Craig a Barns. Long distance views to the scheme would be obtained from this location if felling was undertaken in the future. M: Minor S: Slight	As Option ST2A	As Option ST2A	As Option ST2A
10 Dunkeld Cathedral and Grounds (visitors)	High	High	High	Views to vehicles on the A9 and small-scale embankment to west of river Brann. M: Moderate S: **Moderate**	As Option ST2A	Views to vehicles on the elevated A9 and large-scale embankment to west of river Brann associated with the new Dunkeld Junction. M: Major S: **Large**	As Option ST2A

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
11 Birnam Highland Games Park (visitors)	High	High	High	Introduction of new river Brann crossing and elevated A9/A822 (Old Military Road)/A923 roundabout will increase visibility of traffic and lead to the loss of mature roadside vegetation on southern boundary of park. M: Moderate S: **Moderate**	As Option ST2A	Introduction of new Dunkeld Junction including a large-scale retaining wall on the southern boundary of the park. Increased visibility of vehicles on the A9 and slip roads at the new Dunkeld Junction due to the loss of mature roadside vegetation on the southern boundary of the park, the raised vertical alignment of the mainline above existing grade and the limited separation distance from the viewpoint. M: Major S: **Large**	As Option ST2A
12 A822 (Old Military Road) at Ladywell (residents, road users)	High	High	High	Little change in view from this location due to screening from landform and intervening vegetation. M: Minor S: Negligible	As Option ST2A	Loss of AWI woodland to the north of the viewpoint due to the introduction of realigned Inver slip road and SuDS would result in limited visibility to the new river Braan crossing and traffic on the A9. M: Moderate S: **Moderate**	As Option ST2A

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
13 Inver Bridge and Core Path (road users, walkers)	High	High	High	Slight increase in visibility of vehicles on the A9 due to loss of roadside vegetation and the widened mainline being on slight embankment. M: Minor S: Slight	As Option ST2A	Increased visibility of vehicles on the A9 due to the raised vertical alignment of the widened mainline on embankment and resultant loss of woodland. M: Moderate S: **Moderate**	As Option ST2A
14 A822 (Old Military Road), approaching Little Dunkeld (road users)	High	Low	Moderate	Introduction of access road in the vicinity of Braeknowe, cuttings and associated loss of woodland. M: Moderate S: **Moderate**	As Option ST2A	Slight change to north of the Highland Main Line railway with loss of mature trees due to introduction of new Dunkeld Junction. M: Minor S: Slight	Negligible change in views. M: Minor S: Slight
15 Core Path, northern edge of Inver (residents, walkers)	High	High	High	Widening of A9 and associated earthworks would lead to loss of woodland along the southbound (opposite) carriageway and would increase traffic and give more open views. Realignment of A9 would slightly increase separation distance from Inver properties. M: Moderate S: **Moderate**	As Option ST2A	As Option ST2A	As Option ST2A

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
16 Car park at The Hermitage Garden and Designed Landscape (walkers, visitors)	High	High	High	The realignment and widening of the A9 mainline and car park access would introduce associated earthworks and loss of woodland along the southbound carriageway and at the entrance to the car park. Views would be opened up to the north towards the river following the removal of the vegetation whilst the realignment of the A9 would increase the separation distance from the A9 traffic. M: Minor S: **Moderate**	As Option ST2A	As Option ST2A	As Option ST2A
17 Core Path south of Dunkeld House Hotel Garden and Designed Landscape and NCR 77 (walkers, cyclists)	High	High	High	Views to the existing A9 are currently screened by intervening vegetation but due to the loss of woodland adjacent to the southbound carriageway at ch5100 to ch5450, filtered views may be obtained of the new embankment and to traffic on the realigned A9. M: Minor/Moderate S: **Moderate**	As Option ST2A	As Option ST2A	As Option ST2A

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
18 Pine Cone Viewpoint (walkers, visitors)	High	High	High	Looking north from the Pine Cone Viewpoint the realigned and widened A9, northern section of the B898 link road, the new River Tay Crossing and proposed SuDS to the east of the A9 would be visible along with their associated earthworks, from approximately ch7000 to ch8300. There would also be a loss of existing roadside woodland which was previously visible from this location, but there would be little change to the overall panoramic views. Views to the A9 to the south would be filtered by trees. M: Minor S: Slight	As Option ST2A	As Option ST2A	As Option ST2A
19 Core Path and NCR 77, south of Tay Crossing (walkers, cyclists)	High	High	High	View of new River Tay Crossing structure and embankment at northern end of bridge with a loss of broadleaved trees on the river bank close to the bridge and a limited separation distance. M: Minor S: Slight	As Option ST2A	As Option ST2A	As Option ST2A

Representative Viewpoint (Receptor Type)	Value	Susceptibility	Sensitivity	Description of Potential Impact, Magnitude of Impact (M) and Significance of Effect (S)			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
20 Core Path and NCR 77, north of River Tay Crossing (walkers, cyclists)	High	High	High	View of new River Tay Crossing structure and embankment will replace view of old River Tay Crossing and embankment, with an associated loss of roadside vegetation. M: Moderate S: **Moderate**	As Option ST2A	As Option ST2A	As Option ST2A
21 B898 and NCR 77, Inchmagrannachan Farm (residents, road users, cyclists)	High	High	High	Loss of woodland on lower hill slopes on opposite side of strath due to widening of mainline would result in visibility of new cuttings. M: Moderate S: **Moderate**	As Option ST2A	As Option ST2A	As Option ST2A

Appendix A13.2: View from the Road

1.1 Introduction

1.1.1 This appendix provides the DMRB Stage 2 assessment of the effects of the proposed route options on the View from the Road.

1.1.2 For the purposes of the assessment, the 'View from the Road' is defined as the extent to which vehicle travellers are exposed to different types of scenery while travelling along the proposed route options. In areas of high-quality scenic landscape, the road may allow travellers to appreciate their location in relation to distinctive landscape features by creating appropriate views. Views from a road may potentially help to alleviate driver stress, conversely, where views from a road are restricted by new construction, this may create monotonous conditions for the drivers.

1.1.3 This assessment is linked to *Appendix A12.1: Assessment of Predicted Effects on the Special Qualities of the River Tay (Dunkeld) National Scenic Area*. The assessment of effects on travellers' experience of Special Quality 2 (The 'Gateway to the Highlands') is particularly relevant to the view from the road.

1.2 Approach and Methods

1.2.1 The view from the road assessment was undertaken in accordance with the guidance provided in DMRB Volume 11, Section 3, Part 9: Vehicle Travellers (The Highways Agency et. al., 1993), taking into account the types of scenery or landscape character, the extent to which travellers would be able to view the scene, the quality of the landscape and features of particular interest or prominence in the view. The assessment focusses on the views from the A9. The effects on visual amenity of the proposed route options on users of local roads is addressed in Volume 1, Part 3 – Environmental Assessment (Chapter 13: Visual).

1.2.2 The A9 Dualling Strategic Environmental Assessment (Transport Scotland, 2013) (SEA) recognises the special importance of the views from the A9:

> *"The A9 passes through some of Scotland's finest scenery; the route itself is distinctive and there are some high quality views experienced from the existing road and the route passes through or near three designated national scenic areas. Nevertheless, the A9 dualling process provides an opportunity to improve the quality of the travelling experience and to maximise the value of the views from the road*."

1.2.3 The SEA identifies two key elements that need to be considered:

- views from the road while travelling - enabling decisions to be made regarding the road alignment and roadside vegetation; and
- views from lay-bys and stopping places - enabling the siting and design of lay-bys and stopping places to maximise the appreciation of the available views.

Study Area

1.2.4 The study area for the assessment of changes to views from the road covers the route of the existing A9, the proposed route options and their Zones of Theoretical Visibility (ZTVs), as shown on Figures 13.2 to 13.3.

Baseline Conditions

1.2.5 Baseline data were collected through desk-based studies including review of the following information sources:

- 1:5,000, 1:10,000, 1:25,000 and 1:50,000 Ordnance Survey (OS) maps;
- Google-Earth web-based aerial photography;
- aerial photography provided by Transport Scotland;
- Jacobs Geographic Information Systems (GIS) datasets (obtained through consultation with relevant stakeholders);
- A9 Dualling Programme. Strategic Environmental Assessment (SEA) Report. (Transport Scotland, 2013);
- A9 Dualling Programme. Strategic Environmental Assessment (SEA). Environmental Report Addendum. Appendix F – Strategic Landscape Review Report (Transport Scotland, 2014a; 2014b);
- A9 Route Improvement Strategy – Dualling of Birnam to Tay Crossing, Stage 2 Options Assessment Report, Part 2 Environmental Assessment produced by AECOM, 2011;
- PKC: Landscape Supplementary Guidance (2020);
- The Special Qualities of the National Scenic Areas, Scottish Natural Heritage Commissioned Report No.374 (2010);
- Tayside Landscape Character Assessment: Scottish Natural Heritage Review 122 (1999);
- NatureScot, Landscape Character Assessment in Scotland web page and Landscape Character Types Map and Descriptions, 2019;
- a web-based search to identify key views and areas of scenic quality from the existing A9; and
- consultation with the Environmental Steering Group (including PKC and NatureScot[1]).

1.2.6 The extent to which travellers would be able to perceive the landscape would vary with the relative level of the road, surrounding topography and vegetation. The following categories were used in the assessment:

- no view – road in very deep cutting or contained by earth bunds, environmental barriers or adjacent structures;
- restricted view – road in frequent cuttings, or with deep cuttings across slopes, with frequent environmental barriers or adjacent structures blocking the view;
- intermittent view – road generally at-grade but with shallow cuttings, environmental barriers or structures at intervals; and
- open view – road generally at-grade or on embankment with views extending over the wider landscape or only restricted by existing landscape features.

Site Survey

1.2.7 During the site survey in 2018 for the Landscape (Chapter 12) and Visual assessments, information was also collected in relation to this assessment. The site survey consisted of driving along the existing A9 in both directions to identify areas of likely changes to views for example due to realignment, revised earthworks and removal of existing trees.

[1] In August 2020, Scottish Natural Heritage (SNH) was rebranded to NatureScot.

Assessment of Effects

1.2.8 The significance of effects on views from the road was determined through consideration of both the sensitivity of the existing views from the A9 and the predicted magnitude of change to views as a result of the proposed route options.

Sensitivity Evaluation

1.2.9 The criteria used for evaluation of sensitivity of existing views from the A9 take into account the character and quality of the existing scenery and the degree to which it would be visible, taking into account the categories of views experienced, as detailed in Table 1.

Table 1: Sensitivity Criteria for the Existing Views from the Road

Sensitivity	Criteria
Very High	The traveller experiences extensive views of a very high quality nationally or internationally important landscape, with unique landscape character, and prominent features of special interest.
High	The traveller experiences views of a high quality regionally or nationally important landscape, or area of unique landscape character, or prominent features of special interest.
Moderate	Traveller experiences partial/intermittent views of a high quality landscape (or extensive views of a medium quality landscape), area of unique/distinctive landscape character, or features of interest.
Low	Traveller experiences views of low quality landscape/unremarkable or degraded landscape character or has restricted views of surrounding landscape regardless of quality.
Negligible	Traveller experiences views of very low quality/degraded landscape, or views are confined to the road corridor by cuttings or structures such retaining walls and acoustic barriers.

Magnitude

1.2.10 The magnitude of change to views from the road as result of the alignment of each of the proposed route options in comparison to the existing views from the A9 was evaluated in accordance with the criteria in Table 2. The nature of the change can be adverse or beneficial.

Table 2: Magnitude criteria for view from the road

Magnitude	Criteria
Major	A major alteration in views from the road such that the driving experience is significantly affected.
Moderate	An alteration in views from the road such that the driving experience would be diminished or enhanced – to some extent.
Minor	Minimal alteration in views from the road such that there would be a perceptible change, but this would not significantly affect the driving experience either positively or negatively.
Negligible	Very little appreciable change in views from the road and not considered to have any noticeable effect on the driving experience.
None	No perceptible change to views from the road.

Significance of Effects

1.2.11 Significance of effects has been determined through professional judgement, with reference to the significance matrix set out in Table 3.8.1 of DMRB LA 104, including consideration of both the sensitivity of the existing views and the predicted magnitude of effects as a result of the proposed route options, and defined as being Neutral, Slight, Moderate, Large or Very Large as well as being either adverse or beneficial as shown in Table 3. Effects of Moderate significance or greater are considered significant in the context of this assessment and mitigation would generally be required to reduce these where practicable

Table 3: Significance criteria for view from the road

Level of Effect	Typical Criteria
Very Large	A major deterioration or improvement in views from the road. **Adverse**: The project would cause major deterioration to views or loss of views from the road where travellers currently experience extensive views of a high quality landscape, area of unique landscape character, or a varied sequence of prominent features of particular interest. **Beneficial:** The project would lead to a major improvement in a view where travellers would experience new extensive views of a high quality landscape, area of unique landscape character, or a varied sequence of prominent features of particular interest.
Large	A considerable deterioration or improvement in views from the road. **Adverse**: The project would cause considerable deterioration to views or loss of views from the road where travellers currently experience extensive views of a high quality landscape, area of unique landscape character, or a varied sequence of prominent features of particular interest. **Beneficial**: The project would lead to a considerable improvement in a view where travellers would experience new extensive views of a high quality landscape, area of unique landscape character, or a varied sequence of prominent features of particular interest.
Moderate	A notable deterioration or improvement in views from the road. **Adverse**: The project would cause a noticeable deterioration to, or loss of views from the road where travellers currently experience partial/intermittent views of a high quality landscape (or extensive views of a medium quality landscape), area of unique/distinctive landscape character, or features of interest. **Beneficial**: The proposals would cause a noticeable improvement to views from the road where travellers would experience new partial/intermittent views of a high quality landscape (or extensive views of a medium quality landscape), area of unique/distinctive landscape character, or features of interest.
Slight	Minor deterioration or improvement in views from the road. **Adverse**: The project would cause limited deterioration to, or loss of views from the road where travellers currently experience views of low quality landscape/unremarkable or degraded landscape character or has heavily restricted views no view of surrounding landscape regardless of quality. **Beneficial**: The project would cause limited improvement to views from the road where the traveller would experience new views of unremarkable landscape or has heavily restricted views/no view of surrounding landscape regardless of quality.
Neutral	No discernible deterioration or improvement in views from the road.

1.3 Baseline Conditions

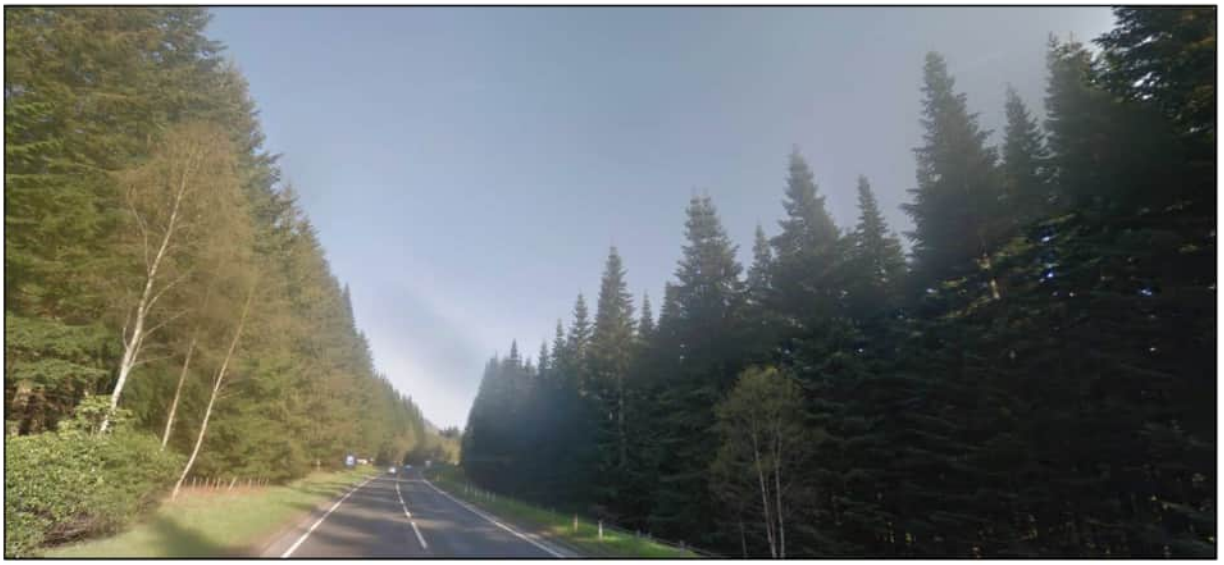
1.3.1 The existing A9 runs through the Lowland River Corridor: Strath Tay Local Landscape Character Area (LLCA) from Byres Wood to the Pass of Birnam and the Strath Tay: Lower Glen LLCA from the Pass of Birnam to Tay Crossing. North of the Tay Crossing, the existing A9 runs through the Strath Tay: Mid Glen LLCA. The existing A9 corridor was previously upgraded in the 1970s with the construction of a new section of road. This section required major engineering works and rock cutting in order to create the existing alignment which has resulted in a high quality landscape corridor and has contributed to the sense of arrival and 'gateway' into the Highland Landscape. Further description of the landscape baseline of the area is contained in Volume 1, Part 3 – Environmental Assessment (Chapter 12: Landscape).

1.3.2 The entire section of the route falls within the River Tay (Dunkeld) National Scenic Area (NSA), the southern extents of the section also passing through the Murthly Castle Gardens and Designed Landscape from Byres Wood to Birnam (Photograph 1). The quality of the landscape for which these designations have been applied are appreciable from the road, particularly in respect of northbound views. For some travellers, including tourists, the landscape seen from the road is the first view of the Highlands, and the Pass of Birnam, with its wooded slopes and narrow 'pinch point' topography, forms a significant gateway into the lower highland landscape. This 'Gateway to the Highlands' experience has been identified by NatureScot as a Special Quality of the NSA, and for users of the A9, is experienced as a sequence of views of very different character, some open, some restricted to the direction of travel by tall, roadside planting. It is first experienced when travelling north on the existing A9 in the descent through the Pass of Birnam towards Dunkeld (on the existing dualled carriageway section). From this stretch of road, northbound travellers gain views of Strath Tay backed by the Highland Hills. It continues on to the narrow pass between Craig a Barns and Craig Vinean where the River Tay, the Highland Main Line railway and the existing A9 are all drawn closely together before the pass opens up again beyond Inver Wood.

Photograph 1: Enclosed, wooded section of A9 between Byres Wood and Birnam *(Image from Google Street View captured April 2019 © 2021 Google)*

1.3.3 Travelling from Byres Wood to the north, as the dualled section of the existing carriageway comes to an end, views to the northbound side are restricted mainly with woodland comprising of tall dense conifers close to the road. Views on the southbound side are intermittent at the start, with travellers gaining glimpses of the hills through roadside planting of birch trees. The approach to the Pass of Birnam is a 'Primary View' as identified in the A9 Dualling SEA (Transport Scotland, 2013, 2014a). This is within the NSA and the views are tightly constrained by tall roadside conifers which create an enclosed atmosphere reinforced by the wooded crags rising above the road corridor. The road twists through the Pass with limited forward visibility.

1.3.4 Travelling from the Pass of Birnam towards Creag na Buire (Photograph 2), views from both sides are restricted, with the Dalpowie Plantation screening the River Tay on the southbound side. The dense woodland corridor on both sides comes close to the road and long views are gained ahead towards distant hills creating a sublime landscape experience and a sense of dramatic enclosure. Direct sunlight is often excluded by the hills and tall dense conifers close to the road. There are some areas where the woodland is further away from the road verge, creating a brief sense of openness, although longer distance views are still restricted.



Photograph 2: Restricted views, curtailed by tall roadside trees, between Pass of Birnam and Creag na Buire *(Image from Google Street View captured April 2019 © 2021 Google)*

1.3.5 Less restricted views towards Birnam Hill occur where the route passes an area of felled woodland on the northbound side on approach to the junction with the B867. As Birnam is approached, the railway line appears and draws close. As the route passes Birnam, views to the northbound side are restricted by woodland on rising hillside with exposed rock cuttings, and woodland belt screening the railway parallel to the road. Views on the southbound side are intermittent, with roadside birch trees and glimpsed views of Birnam and Dunkeld and the surrounding wooded hills. While there are only glimpsed views of the two settlements, the Victorian signal box and station serving Birnam and Dunkeld are clearly visible on the northbound side of the road (Photograph 3).

Photograph 3: View of Dunkeld & Birnam Station *(Image from Google Street View captured April 2019 © 2021 Google)*

1.3.6 The route travels from Dunkeld & Birnam Station alongside the existing railway on the northbound side with intermittent views to both sides, these views being largely restricted by mixed woodland and roadside cuttings. Glimpsed views of Little Dunkeld are gained through roadside birch trees on the southbound side, towards the River Tay, although the river is not visible. Ahead, the looming hill and crags of Craig a Barns closes the vista and there is no immediate indication of how the road proceeds through the hills for the traveller.

1.3.7 After crossing the River Braan, views open up on the northbound side overlooking an area of rough grassland, towards the Tay Forest Park and shelterbelt screening the caravan park at Inver. Views on the southbound side are currently open (and would remain so until recently planted existing woodland matures) (Photograph 4).

Photograph 4: Shelterbelt screening caravan park at Inver and recently planted southbound roadside woodland *(Image from Google Street View captured April 2019 © 2021 Google)*

1.3.8 Ahead, the route through the Pass becomes more evident, with the forested slopes of Craig a Barns and Craig Vinean rising above the A9 and forming the backdrop beyond. Views towards the designed landscape of The Hermitage with its large Douglas firs are briefly experienced, however views are largely screened by roadside trees and only the summit of Craig Vinean is visible, providing a visual reference point.

1.3.9 As the road passes round the bend below Craig Vinean, views on the northbound side are predominantly restricted by woodland and tall exposed rock cuttings. Views on the southbound side are intermittent around Dunkeld House Hotel, with a strip of woodland belt screening the River Tay, opening up to overlook rough grassland towards distant wooded hills. Some views are still obscured intermittently by woodland and the River Tay continues to be screened.

1.3.10 The road travels to the east of Inver Wood parallel to the railway line with restricted views on the northbound side and open views over the woodland valley and railway line on the southbound side.

1.3.11 On approach to Tay Crossing, for northbound travellers, views extend across attractive enclosed fields next to the road, but the trees return to create a pinch-point just before the bridge. Crossing the bridge there are magnificent views over the River Tay curving away through woodland on both the northbound (Photograph 5) and southbound sides of the bridge. Beyond the bridge the road curves to the north, views largely restricted by the woodlands to the west and the wooded slopes to the east, however for northbound travellers, glimpsed views of the River Tay and surrounding hills are occasionally experienced.

Photograph 5: View over the River Tay from the Tay Crossing bridge *(Image from Google Street View captured April 2019 © 2021 Google)*

Views from Existing A9 Lay-bys

1.3.12 The locations of the 6 existing A9 lay-bys in the study area are indicated on Figure 13.5 and described below:

- Two lay-bys (Lay-by 1 (Photograph 6) and Lay-by 2) situated close together on either side of the carriageway between Dalpowie Plantation and Ring Wood offer short distance views, the views restricted by the surrounding woodland.

Photograph 6: Lay-by 1 *(Image from Google Street View captured April 2019 © 2021 Google)*

- Just north of Inver Park, Lay-by 3 has restricted views on the northbound side due to roadside vegetation and open views on the southbound side (until recently planted existing woodland matures). Lay-by 4 offers open views of the neighbouring mixed species woodland between the road and the Highland Mainline railway on the northbound side, while views on the southbound side are restricted by roadside woodland. Distant views of the wooded slopes of Craig Vinean are visible from both lay-bys looking west along the A9.

- Two lay-bys on either side of the carriageway at Inver Wood (Lay-bys 5 and 6 (Photograph 7)) have restricted views along the northbound side due to the dense forestry plantation. Open views of the immediately adjacent railway line and the west-facing wooded slopes of Craig a Barns are available along the southbound side from both lay-bys.

Photograph 7: Lay-by 6 (Image from Google Street View captured April 2019 © 2021 Google)

1.4 Potential Impacts and Effects

Construction

1.4.1 The potential for adverse effects on drivers' views from the road and drivers' experience of the 'Gateway to the Highlands' Special Quality of the NSA are predicted due to the visual impact of construction works, including the works themselves and the associated traffic management and temporary signage. Views may become more open where there is a loss of established planting due to construction, or they may become more enclosed where new earthworks or retaining structures are created. Traffic that is diverted during this period would experience a temporary alternative view from that of the proposed route options.

1.4.2 The potential construction impacts of all proposed route options would be similar between ch0 and ch450 and also from ch4900 to the end of the proposed routes where all route options are broadly similar. Potential effects on visual amenity during construction between ch450 and ch4900 would vary for each of the proposed route options.

1.4.3 For all proposed route options, the potential for significant effects on visual amenity would occur from the construction of structures, earthworks, road surfacing and ancillary works and also the potential for further temporary impacts from construction activities such as works associated with bridge construction, site compounds and storage areas, movement of heavy machinery, night time lighting and traffic management measures.

1.4.4 For Options ST2A and ST2B, the construction programmes for the 1.5km cut-and-cover tunnel and the 150m long underpass respectively, would be complex and phased over several years. Large scale construction compounds and significant traffic management measures would be required during this period and there would be the potential for significant effects on views from the road to occur.

Operation

1.4.5 Earthworks mitigation measures 'embedded' within the design of the proposed route options, include, but are not limited to, grading of cutting and embankment slopes to shallower gradients to improve integration with the surrounding landform, alignment and use of retaining structures to reduce woodland loss are taken into account in the assessment. Without these embedded mitigation measures in place, potential effects would be greater than those reported in Tables 4 – 5. The potential effects with 'embedded' mitigation measures in place are described for those common to all proposed route options in Table 4 followed by those that are specific to each proposed route option in Table 5 below. All potential impacts and their potential resulting effects are considered adverse unless otherwise stated.

Table 4: Potential Impacts and Effects on View from the Road Common to All Proposed Route Options (with 'Embedded' Mitigation)

Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
Lowland River Corridor: Strath Tay LLCA Medium Sensitivity	**Pass of Birnam (ch0 to approx. ch450)** Travelling northbound from the Pass of Birnam (ch0 to ch450), views would remain intermittent along the southbound side of the road and would remain restricted by woodland along the northbound side. Southbound views would also be largely restricted due to woodland to either side of the road.	M: Minor S: Slight
Strath Tay: Lower Glen LLCA High Sensitivity	**Inver (approx. ch4900) to Inver Wood (approx. ch6800)** Northbound travellers would pass through the narrowest part of Strath Tay, passing between Craig Vinean and Craig a Barns, transiting the last section of the road associated with the 'Gateway to the Highlands.' Immediately west of Inver (ch5000 to ch5500), existing intermittent views on the southbound side would become more open due to the removal of woodland, with views towards the Tay available across small fields, though the southbound cutting from ch5050 to ch5230 would locally restrict visibility. Views to the northbound side would remain restricted by roadside vegetation along this stretch. From ch5500 to ch6200, the view from the road would remain largely unchanged, with the view remaining restricted by roadside woodland on the northbound side and by woodland adjacent to the Highland Main Line railway on the southbound side. From approx. ch6200, the proposed route alignment moves to the west of the existing road as the route curves northwards, although views would remain restricted by proposed new steep cuttings into existing woodland on the northbound side (ch6200 to ch6800). On the southbound side views would remain similar to those existing, curtailed by nearby woodland between the Highland Main Line railway and the River Tay, though with longer views to the hills opening up across Strath Tay to the north-east. On approach to the proposed Dalguise Junction, views on the northbound side would become more open due to the loss of woodland, with the large scale cuttings (which would potentially include large rock cuttings) required for the northbound off-ramp, visually prominent and nearby woodland restricting longer visibility.	M: Minor S: Slight
	Inver Wood (approx. ch6800) to ch8280 Views would remain relatively open at the proposed Dalguise Junction, but existing established woodland would restrict longer views on the northbound side. Existing open views on the southbound side of this section of the road would now include proposed slip roads, a mini-roundabout and a SuDS feature in the foreground but would otherwise remain unchanged. North of the Tay Crossing, views would remain the same on both sides of the road, with the exception of the introduction of a proposed SuDS feature resulting in the loss of an area of existing roadside vegetation on the northbound side between ch7900 and ch8000, and a revised cutting along the widened southbound carriageway between ch7900 and ch8280. Here the view from the road would remain restricted.	M: Minor S: Slight

Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
Strath Tay: Lower Glen LLCA High Sensitivity	**Lay-bys** Notable changes to views that would result from alterations to the locations of lay-bys include: § removal of two lay-bys currently offering restricted views between Dalpowie Plantation and Ring Wood (Lay-bys 1 and 2) due to realignment of dualled A9 west of existing road. § removal of two lay-bys north of Inver Park (Lay-bys 3 and 4) due to carriageway widening, which would remove the opportunity for travellers to stop and experience distant views of the wooded slopes of Craig Vinean looking west along the A9. § removal of two lay-bys at Inver Wood (Lay-bys 5 and 6) due to realignment of dualled A9 and introduction of new slip road and mini-roundabout would remove the opportunity for travellers to experience open views towards the west-facing wooded slopes of Craig a Barns.	M: Minor S: Slight
Strath Tay: Mid Glen LLCA Medium/High Sensitivity	**ch8280 to end of project (ch8420)** Views to the northbound side, featuring glimpsed views of the River Tay and surrounding hills, would remain unchanged. Views to the southbound side would remain restricted following the introduction of a revised cutting.	M: Minor S: Slight

Table 5: Potential Impacts and Effects on View from the Road – Proposed Route Option specific (with 'embedded' mitigation)

Proposed Route Option	Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
Option ST2A	Lowland River Corridor: Strath Tay LLCA Medium Sensitivity	**Pass of Birnam (ch450) to Dalpowie Plantation (ch850)** Views to both the northbound and southbound sides of the widened mainline would remain restricted following the introduction of the proposed grade separated junction and associated earthworks and SuDS feature (ch500). The proposed overbridge at ch800 (and associated slip roads and earthworks) would interrupt the views experienced by both northbound and southbound travellers. Northbound travellers would experience a substantial change in the 'gateway experience' encountered within the Pass of Birnam where the existing A9 descends towards Dunkeld, due to the introduction of the overbridge which would interupt the existing rural views. This gateway experience is recognised as one of the Special Qualities of the River Tay (Dunkeld) NSA i.e. 'The Gateway to the Highlands'.	M: Moderate S: **Moderate**

Proposed Route Option	Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
	Strath Tay: Lower Glen LLCA High Sensitivity	**Dalpowie Plantation (ch850) to Tunnel Entrance/Exit (ch2150)** Between ch900 and ch1200, views to both the northbound and southbound sides of the widened mainline would remain restricted by slip road embankments, cuttings and dense woodland following the introduction of the proposed grade separated junction and associated earthworks. Between ch1200 and ch2150, travellers in both directions would experience views similar to the existing situation i.e. views restricted to the direction of travel with glimpses of the surrounding hills, views to either side curtailed by woodland and landform. **Tunnel Entrance/Exit (ch2150) to Dunkeld Junction (ch4000)** Travellers would pass through and exit the proposed tunnel (ch2150 - ch3730), with no views of the surrounding landscape. The introduction of the cut-and-cover tunnel, a large scale element of transport infrastructure, would conflict with the existing context of a rural landscape. Furthermore, the abrupt loss of views and 'underground' experience would disrupt the continuity of the current gradual transitory experience for travellers. The proposed route option would continue to potentially affect northbound travellers' experience of the 'Gateway to the Highlands' associated with this part of the existing A9. North-west of the tunnel exit/entrance (ch3730), new cuttings associated with the widened mainline would result in the loss of existing roadside trees and woodland, thereby slightly opening the views experienced by northbound travellers on approach to Dunkeld Junction. **Dunkeld Junction (ch4000) to Inver (ch4900)** The proposed layout for the Dunkeld Junction roundabout (ch4100) and associated earthworks and SuDS feature (ch4200) would result in the loss of existing roadside woodland between ch4000 and ch4300, thereby slightly opening the views experienced by both northbound and southbound travellers at this location. Existing distant views to the hill and crags of Craig a Barns and the experience of the 'Gateway to the Highlands' would be maintained due to the raising of the mainline 2 to 3m above existing grade at the proposed Dunkeld junction roundabout (ch4100) and at the proposed crossing of the River Braan (ch4350). After crossing the River Braan (ch4350), existing views on the northbound side would remain open (looking south towards the Caravan Site) as far as Inver (ch4900) with views of the proposed SuDS feature between ch4800 and ch4900. The vertical alignment of the road would be up to 2m above existing grade. Views along the southbound side would remain open until recently planted existing woodland north of the proposed route option matures.	M: Major S: **Large**

Proposed Route Option	Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
Option ST2B	Lowland River Corridor: Strath Tay LLCA Medium Sensitivity	**Pass of Birnam (ch450) to Dalpowie Plantation (ch850)** Views to both the northbound and southbound sides of the widened mainline would remain restricted and largely unchanged due to the existing dense woodland corridor.	M: Minor S: Slight
	Strath Tay: Lower Glen LLCA High Sensitivity	**Dalpowie Plantation (ch850) to Birnam (ch3150)** From approx. ch850 to ch1700, views to both the northbound and southbound sides of the widened mainline would remain restricted due to earthworks and the existing dense woodland corridor. The increased road width and the proposed junction at Birnam (approx. ch1700 to ch2400) and associated SuDS feature (ch2250) would result in the loss of existing mature woodland and more open views of the surrounding landscape, with the sense of enclosure reduced at this location. **Birnam (ch3150) to Dunkeld Junction (ch4000)** The introduction of an underpass, a large scale element of transport infrastructure, would conflict with the existing context of a rural landscape. The underpass would result in a sudden loss of views to the wider landscape which would disrupt travellers' transitory experience. Between ch3150 and Birnam Glen (approx. ch3470), views from the widened road would be contained on both sides by the retaining walls of the new underpass at Dunkeld & Birnam Station, reducing the scope for northbound travellers to experience the 'Gateway to the Highlands' at this location. The route would remain enclosed by cuttings on both sides from Birnam Glen (approx. ch3470) to Dunkeld Junction roundabout (approximate ch4000), though views would be opened up to some extent due to loss of existing roadside trees and woodland and widening of the road corridor. More open views would be gained where the road returns to existing grade (ch4000). **Dunkeld Junction (ch4000) to Inver (ch4900)** As per Option ST2A.	M: Moderate S: **Moderate**
Option ST2C	Lowland River Corridor: Strath Tay LLCA Medium Sensitivity	**Pass of Birnam (ch450) to Dalpowie Plantation (ch850)** As per Option ST2B.	M: Minor S: Slight

	Strath Tay: Lower Glen LLCA High Sensitivity	**Dalpowie Plantation (ch850) to Birnam (ch2750)** As per Option ST2B. **Birnam (ch2750) to Birnam Glen (ch3470)** Between ch2750 and ch3170 the widened mainline would be on embankment and removal of roadside trees on both sides of the route would open up views. Between ch3100 and Birnam Glen (approximately ch3470), the widened mainline would be raised approximately 1m above existing grade where it passes Dunkeld & Birnam Station and views would be similar to those experienced from the existing A9. The proposed replacement car parking facility would be visible to the southbound side (ch3250 to ch3370) due to removal of roadside woodland. **Birnam Glen (ch3470) to Inver (ch4900)** From Inchewan Burn to the proposed Dunkeld Junction and beyond to Inver, the road would be widened along the northbound side, and elevated above existing grade, with the proposed bridge over the River Braan (ch4350) 13m higher than the existing bridge. Potential acoustic barriers to either side of the proposed route option would be visible where the road passes Little Dunkeld (one potential acoustic barrier would be up to 100m long). The mainline would be elevated above the diverted A822 (Old Military Road) so the junction earthworks and underbridge structure would not restrict visibility. Travellers on the raised section of the dualled A9 through the junction would gain more open views in both directions and wider appreciation of the narrow glen. On the southbound side, loss of dense woodland would open up views to Little Dunkeld and across a sports ground towards the River Tay. Existing distant views to the hill and crags of Craig a Barns would be improved by the elevation of the mainline at the proposed Dunkeld Junction, although the elevation would result in less enclosure of the road by woodland and for some travellers, potentially affect the sense of passage through the 'Gateway to the Highlands'. As the route crosses the River Braan to the east of Inver (ch4350), existing views on the northbound side towards the caravan site would remain open. Views on the southbound side would become less restricted due to the loss of roadside coniferous woodland as a result of the southbound off-ramp and embankment, with potential glimpses opening up to the River Tay. To the south of the River Braan, the large cuttings for the realignment of the local road to Inver would result in the loss of mature broadleaved trees currently screening the railway line on the northbound side, opening up views of the rising hillside and pasture. A proposed SuDS feature (ch4200) would be visible in the foreground of these views. After crossing the River Braan (ch4350), existing views on the northbound side would remain open (looking towards the Caravan Site) as far as Inver (ch4900) and would include views of the SuDS feature between ch4800 and ch4900. The proposed southbound off-ramp and high embankment would result in the loss of an area of existing newly planted woodland, and views along the southbound side would remain open, until the remaining recently planted existing woodland north of the proposed route option matures.	M: Moderate S: **Moderate**

Proposed Route Option	Local Landscape Character Area (LLCA) and Sensitivity of Views from the Road	View Description	Magnitude (M) Significance (S)
Option ST2D	Lowland River Corridor: Strath Tay LLCA Medium Sensitivity	**Pass of Birnam (ch450) to Dalpowie Plantation (ch850)** As per Option ST2B.	M: Minor S: Slight
	Strath Tay: Lower Glen LLCA High Sensitivity	**Dalpowie Plantation (ch850) to Birnam (ch2750)** As per Option ST2B. **Birnam (ch2750) to Birnam Glen (ch3470)** Between ch2750 and ch3170 the widened mainline would be on embankment and removal of roadside trees on both sides of the route would open up views. Between ch3100 and Birnam Glen (approx. ch3470), the widened mainline would be raised approximately 1m above existing grade where it passes Dunkeld & Birnam Station and views would be similar to those experienced from the existing A9. The proposed replacement car parking facility would be visible to the southbound side due to removal of roadside woodland. **Birnam Glen (ch3470) to Dunkeld Junction (ch4000)** Between Birnam Glen (approx. ch3470) and Dunkeld Junction (approx. ch4000), views to the northbound side of the widened mainline would open up slightly due to the introduction of new cuttings associated with the widened mainline and the resultant loss of existing roadside trees. Views to the southbound side would remain unchanged. **Dunkeld Junction (ch4000) to Inver (ch4900)** As per Option ST2A.	M: Moderate S: **Moderate**

1.5 Summary of Proposed Route Option Assessment

1.5.1 The DMRB Stage 2 assessment of View from the Road has identified a number of potential impacts and effects associated with the route options, as shown in Tables 4 and 5.

1.5.2 Potentially significant effects on View from the Road are associated with all of the proposed route options between Dalpowie Plantation (ch900) and Inver (ch4900).

1.5.3 Option ST2B, Option ST2C and Option ST2D are predicted to result in potential effects of Moderate significance between Dalpowie Plantation (ch850) and Birnam (ch3000), including Birnam Junction (ch2200). With potential mitigation measures in the form of new planting to replace lost areas of woodland and reinstate the sense of enclosure, particularly at the proposed new Birnam Junction, potential effects would be reduced to Slight.

1.5.4 Option ST2A would have potential effects of Moderate significance on the View from the Road as a result of the Murthly Junction and potential effects of Large significance on the View from the Road as a result of the 1.5km cut and cover tunnelled section (and curtailment of all views of the surrounding landscape). Even with a high quality design of the 1.5km cut and cover tunnel, the experience for travellers along this stretch of Option ST2A would be heavily compromised with the road being enclosed on both sides and limited opportunities for mitigation. Given this, the effects after mitigation are expected to remain Large.

1.5.5 Option ST2B would have the potential for Moderate effects between Birnam and Little Dunkeld, largely due to the low elevation of the route, the extensive high retaining walls and the replacement Dunkeld & Birnam Station car park and associated 150m underpass, with limited opportunities for mitigation. Even with high quality design and finishing of the retaining walls and bridge structures, the experience for travellers along this stretch of Option ST2B would be heavily compromised with the road being enclosed on both sides by high retaining walls. Given this and the limited opportunities to improve the views from the road with new planting, the significance of effect is expected to remain Moderate after mitigation.

1.5.6 Between Birnam and Inver the potential for effects of Moderate significance would be expected for Option ST2C. Given that Option ST2C would require retaining walls which would be visible from the road, and that there would be limited opportunities for replacement woodland planting, particularly around Dunkeld Junction, the significance of effect after mitigation is expected to remain Moderate.

1.5.7 All other potential effects associated with the proposed route options (including the section from Inver to ch8280 where all route options share the same alignment) would be Slight and therefore not considered to be significant.

River Tay (Dunkeld) NSA

1.5.8 All of the proposed route options would have the potential to impact the 'Gateway to the Highlands' Special Quality of the NSA and how it is experienced (refer to *Appendix A12.1: Assessment of Predicted Impacts on the Special Qualities of the River Tay (eld) National Scenic Area*). These potential impacts would vary between the proposed route options and largely result from a combination of the widening of the road corridor, the introduction of new structures, changes to the elevation of the road, changes to earthworks, and changes to the woodlands on either side of the carriageway.

1.5.9 Option ST2A would result in major impacts on northbound travellers' experience of the Special Quality. These impacts would primarily result from the proposed junction and associated overbridge at Dalpowie (approx. ch800) interrupting views, and from the proposed tunnel (ch2150 - ch3730). At Dalpowie, the junction and overbridge would interrupt the initial views of the strath that are experienced by northbound travellers as they descend the Pass of Birnam. The 1.5km cut and cover tunnel would result in no views of the surrounding landscape for a distance in excess of 1.5km and reduce the scope to experience the 'Gateway to the Highlands'.

1.5.10 The potential significance of effect on the 'Gateway to the Highlands' Special Quality of the NSA resulting from Option ST2A is predicted to be Large.

1.5.11 Option ST2B would reduce the scope for northbound travellers to experience the Special Quality between ch3150 and Birnam Glen (approx. ch3470) and result in Moderate impacts on the northbound travellers' experience of the 'Gateway. These potential impacts would result from the lowered section of road (up to 8m below existing grade) being contained on both sides by retaining walls associated with the 150m underpass and replacement car park facility at Dunkeld & Birnam Station.

1.5.12 The potential significance of effect on the 'Gateway to the Highlands' Special Quality of the NSA resulting from Option ST2B is predicted to be Moderate.

1.5.13 Option ST2C would potentially increase views across Strath Tay towards the hill and crags of Craig a Barns due to the increased elevation of the widened mainline at the proposed Dunkeld Junction and less enclosure of the road by woodland. While travellers would gain wider views of the surrounding landscape, the openness of the junction would alter the existing sequence and balance of open and restricted views experienced by travellers passing through the 'Gateway'. In addition, the earthworks/structures associated with the Dunkeld Junction would be prominent in views from the road, the visibility of these changing the character with limited opportunity for mitigation or enhancement. However, to some extent the more extensive views of the strath with adoption of mitigation planting where possible can be considered to be beneficial to road users.

1.5.14 The potential significance of effect on the 'Gateway to the Highlands' Special Quality of the NSA resulting from Option ST2C is predicted to reduce to Slight.

1.5.15 Option ST2D would result in the lowest potential impact on northbound travellers' experience of the Special Quality. The lesser magnitude of impacts would result from the proposed route option being more comparable to the existing situation and opportunities to reinstate woodland and potentially enhance' the sequence and way views of the strath and the 'Gateway' are experienced.

1.5.16 The potential significance of effect on the 'Gateway to the Highlands' Special Quality of the NSA resulting from Option ST2D is predicted to reduce to Slight.

1.5.17 A summary of the potential effects resulting from each of the proposed route options in three sections of the route is provided below in Table 6 (and for reference, replicated in Volume 1, Part 3 – Environmental Assessment (Chapter 13: Visual)). Consideration of the potential effects resulting from each of the proposed route options allows for a comparative assessment. This assessment is provided in Table 13.11 of Volume 1, Part 3 – Environmental Assessment (Chapter 13: Visual).

Table 6: Summary of Assessment – Vehicle Travellers (View from the Road) Effects

Chapter/Subcategory			Predicted Potential Residual Effect				Comments
			Option ST2A	Option ST2B	Option ST2C	Option ST2D	
View from the Road Impacts	Operation	View from the Road – Dalpowie Plantation (approx. ch850) to Birnam Junction (approx. ch2200)	**Moderate**	Slight	Slight	Slight	Views from the road would be affected by the proposed Murthly junction and change in the nature of the available view as the road descends the Pass of Birnam. Prior to entry to the 1.5km cut and cover tunnel, views from Option ST2A would be comparable to the existing situation, the proposed route option being slightly more open than at present. Option ST2B, Option ST2C, and Option ST2D would have comparable effects on the view from the road, effects primarily arising from the loss of woodland and increased prominence of road infrastructure at Birnam Junction. Option ST2A would result in a Moderate effect on the view from the road which differentiates this option from Option ST2B, Option ST2C and Option ST2D.
		View from the Road – Birnam Junction (approx. ch2200) to Inver (approx. ch4900)	**Large**	**Moderate**	**Moderate**	Slight	Option ST2A is considered to have the potential for the highest significance of effect (Large), as this route option features a 1.5km cut and cover tunnel structure which would curtail all views of the surrounding landscape (resulting in the highest impact of all the options on northbound travellers' experience of the 'Gateway to the Highlands' Special Quality). The section of 150m underpass associated with Option ST2B would also result in the curtailment of views and affect the 'Gateway' experience, albeit not to the same extent as Option ST2A. The increased elevation of Option ST2C (and junction arrangement at Little Dunkeld) would result in less enclosure of the road by woodland and views of a more open nature. Option ST2D is considered to have the lowest potential effect (Slight and therefore not significant) as this proposed route option would result in the least change to the existing baseline

Chapter/Subcategory		Predicted Potential Residual Effect				Comments
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	
						situation with potentially greater opportunities for mitigation and/or enhancement in respect of the 'Gateway' experience.
	View from the Road – Inver (approx. ch4900) to ch8280	Slight	Slight	Slight	Slight	Significance of potential effects are the same for each proposed route option, therefore the predicted residual effects are not considered sufficient to differentiate between proposed route options.

1.6 References

Reports and Documents

AECOM (2011). A9 Route Improvement Strategy – Dualling of Birnam to Tay Crossing, Stage 2 Options Assessment Report, Environmental Assessment, Volume 1: Environmental Report, Volume 2: Figures and Volume 3: Appendix.

Land Use Consultants (1999). Tayside Landscape Character Assessment. Scottish Natural Heritage Review No 122.

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Highways England, Transport Scotland, Welsh Government, Department for Infrastructure (2020). Design Manual for Roads and Bridges (DMRB): Sustainability & Environment. LA 107 'Landscape and Visual Effects' (Revision 2).

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Transport Scotland (2013). A9 Dualling Programme: Strategic Environmental Assessment (SEA) Environmental Report. TSSEA/PASS01.

Transport Scotland (2014a). A9 Dualling Programme: Strategic Environmental Assessment (SEA) Environmental Report Addendum. Appendix F – Strategic Landscape Review Report. Transport Scotland. March 2014.

Transport Scotland (2014b). A9 Dualling Programme: Strategic Environmental Assessment (SEA) Post Adoption Statement.

The Special Qualities of the National Scenic Areas, Scottish Natural Heritage Commissioned Report No.374 (2010).

NatureScot, Landscape Character Assessment in Scotland web page and Landscape Character Types Map and Descriptions, 2019.

Appendix A14.1: Cultural Heritage Gazetteer

Asset Number	1	**Name**	Byres Of Murthly, Tunnel/Pass Of Birnam Railway Tunnel
Legal Status	None	**NGR**	NO0566539058
Value (sensitivity)	Low	**Condition**	Good
Type	Railway Tunnel	**Period**	19th Century
NMR ref	None	**HER ref**	MPK7978
Canmore ID			

Description

Tunnel [NAT] OS 1:10,000 map, 1982. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural details and features at its entrance that contribute to its limited architectural interest;
- the limited contribution the tunnel itself makes to the technological excellence or innovation demonstrated in this building type;
- its relationship with other elements of railway infrastructure; and
- while it has some historic interest as a tunnel created for the Perth and Dunkeld Railway, railway tunnels of this design are common and widespread building type associated with Victorian railways. [2]

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	2	**Name**	Bee Cottage, Pass Of Birnam
Legal Status	Category B Listed Building	**NGR**	NO0526639166
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	11144	**HER ref**	MPK2269
Canmore ID			

Description

Single-storey asymmetrical, rubble-built in Murthly estate manner with broad-eaved roof, bay window, fanciful finials to gables, diamond bordered glazing c.1840. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features in 'Murthly estate style' and evidence local or regional building traditions through the use of local materials that make a significant contribution to its architectural interest;
- its location within the Murthly estate; and
- a good example of a decorative mid-Victorian estate cottage which contributes significantly to its historic interest. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	3	**Name**	Birnam Burn, Bridge
Legal Status	Category C Listed Building	**NGR**	NO0571139520
Value (sensitivity)	High	**Condition**	Good
Type	Road Bridge	**Period**	18th Century
NMR ref	13737	**HER ref**	MPK13548
Canmore ID			

Description

Single arch, rubble, no parapets, probably 18th cent. [1]

No additional information. [2]

A review of Aerial Photography (2017) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that the setting for this cultural heritage asset comprises its relationship with the western avenue to Murthly Castle and the heavily wooded gorge of the Birnam Burn. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, and evidence regional building traditions through the use of materials that make a significant contribution to its architectural interest;
- surroundings, which comprises a heavily wooded gorge cut by the Birnam Burn and historical relationship with the western drive to Murthly Castle (HLT 14) designed landscape, which contribute to our understanding and appreciation of its function as a bridge and historical context in relation to the development of the design of Murthly Castle (HLT 14) designed landscape; and
- a good example of a common and widespread type of single arched bridge but whose age contributes to its historic interest. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	4	**Name**	Roman Bridge, Over Birnam Burn
Legal Status	Category A Listed Building	**NGR**	NO0570339536
Value (sensitivity)	High	**Condition**	Good
Type	Road Bridge	**Period**	19th Century
NMR ref	11145	**HER ref**	MPK2275
Canmore ID			

Description

6-arch over deep ravine in Roman aqueduct manner: rustic masonry: heavy corbelled refuge at each spandril, crenelated parapet and wide approaches. Mid 19th cent. [1]

No additional information. [2]

September 2011: Inspection finds the bridge overgrown along its top and bushes and plants have taken root at many points largely enveloping the structure. Some stone have been lost from the parapet. The end of the bridge close to the road has been fenced off. The other end is not visible. 19 March 2014: Inspection finds the building remains in much the same condition as seen previously. Access is blocked at both ends of the bridge, the remaining structure appears stable. [3]

A review of Aerial Photography (2017) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that the setting for this cultural heritage resource comprises its relationship with the western avenue to Murthly Castle and the heavily wooded gorge of the Birnam Burn. [4]

The key characterisitcs, features or elements of this cultural heritage resource are:

- high level of authenticity and completeness of design embodied in its surviving architectural detail and features comprising a Roman aqueduct style in rustic masonry, with a heavily corbelled refuge at each spandrel, and crenelated parapet, which make a significant contribution to its architectural interest;

§ the heavily wooded gorge cut by the Birnam Burn and historical relationship with the western drive to Murthly Castle (HLT 14) designed landscape; and § a rare example Roman aqueduct style design dating from the mid-19th century that significantly contribute to its historic interest. [5]
Sources
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Buildings at Risk Register [4] Jacobs setting assessment undertaken 2018 [5] Jacobs assessment undertaken 2021

Asset Number	5	**Name**	Dalpowie Lodge (site of)
Legal Status	None	**NGR**	NO0514039660
Value (sensitivity)	Medium	**Condition**	Poor
Type	Hospital, Country House	**Period**	18th Century
NMR ref	None	**HER ref**	MPK12029; MPK20029
Canmore ID			

Description

NMRS REFERENCE:

Unable to locate at time of upgrade, 30.01.2110. There are two hospitals in the area and one on 1st edition Perthshire OS map, NO03NE, 0514 3966.

EXTERNAL REFERENCE:

SCOTTISH RECORD OFFICE:-

Measure and Valuation of the work done on the hospital.

Valuation amounts to #106.19.3, 179.

Measurer: Thomas Menzies.

GD 121/Box 49/279.

The Hospital.

Request to Sir George Steuart of Grandtully from Lewis Grant.

He asks for 2 rooms at the hospital. He wishes to fit them up at his own expense in lieu of rent and would also like a space of ground before the house for a garden, 1822.

GD 121/Box 100/Vol.xix/100/1.

Building of the Hospital.

Included in the balance of the account between Sir George Steuart of Grandtully and Thomas Halliburton for work done 1735-1737, 1750.

GD121/Box/49/278.

Wright work done at the hospital belonging to Sir George Steuart of Grandtully. Account amounting to #151.6.5 from Thomas Hallyburton, 1736-1737.

GD 121/Box49/278.

NMRS REFERENCE

House depicted on the 1st edition of the OS map (Perthshire, 1854, sheet LXII, 14).

Data import notes - Canmore Monument Type(s): LODGE (18TH CENTURY); Associated Fieldwork Events: 1

Canmore Event ID 1040554 (RECORDING/STANDING BUILDING RECORDING):

NO 052 398 A historic buildings survey was undertaken in May and September 2017 to determine the extent of foundational remains of Dalpowie Lodge, outbuildings and garden. The site had been occupied since 1735 until the lodge was demolished in 1953. Originally known as `The Hospital? It was built to house the 12 poorest men from the Grandtully, Strathbraan, Murthly and Airntully estates. In subsequent years it was the laird?s house, a shooting lodge, a Voluntary Auxiliary Hospital in WW1, a troop billet and munitions store in WW2. It has strong cultural associations through Sir William Drummond Stewart, soldier and adventurer (who kept American bison nearby) with the North American fur trade, and the artist Alfred Jacob Miller acclaimed for his depictions of early encounters between trappers and Native Americans in the Rocky Mountains. Sir John Everett Millais leased the lodge from 1881?90 and it was from where he painted c20 of his finest landscapes. The young Beatrix Potter was a frequent visitor during this period. Dalpowie was often acknowledged as one of the finest Scottish sporting lodges in the Victorian age. Floor plans were drawn in 1886. It contained

diningroom, drawingroom, parlour, 7 bedrooms, bathroom (h and c), 3 WCs, 2 servants room (3 beds) servants? WC, kitchen scullery, pantry, and wash-house. Outside, there is a 3-stalled stable, coach house (with two rooms and kitchen above), garden and tennis lawn. The ruins suffered further destruction when the new A9 was laid through the Birnam Gap in the 1970s, and are threatened again by the dualling of the A9. Subsequent surveys will concentrate on the nature of the largest surviving outbuilding, known locally as the Icehouse, but the true nature and purpose of which has still to be determined.

Archive and report: NRHE (intended)

Paul McLennan ? Murthly History Group/West Stormont Historical Society

(Source: DES, Volume 18) [1]

A historic buildings survey was undertaken in May and September 2017 to determine the extent of foundational remains of Dalpowie Lodge, outbuildings and garden. The site had been occupied since 1735 until the lodge was demolished in 1953. Originally known as 'The Hospital' it was built to house the 12 poorest men from the Grandtully, Strathbraan, Murthly and Airntully estates. In subsequent years it was the laird's house, a shooting lodge, a Voluntary Auxiliary Hospital in WW1, a troop billet and munitions store in WW2. It has strong cultural associations through Sir William Drummond Stewart, soldier and adventurer (who kept American bison nearby) with the North American fur trade, and the artist Alfred Jacob Miller acclaimed for his depictions of early encounters between trappers and Native Americans in the Rocky Mountains. Sir John Everett Millais leased the lodge from 1881–90 and it was from where he painted c20 of his finest landscapes. The young Beatrix Potter was a frequent visitor during this period. Dalpowie was often acknowledged as one of the finest Scottish sporting lodges in the Victorian age. Floor plans were drawn in 1886. It contained diningroom, drawingroom, parlour, 7 bedrooms, bathroom (h and c), 3 WCs, 2 servants room (3 beds) servants' WC, kitchen scullery, pantry, and wash-house. Outside, there is a 3-stalled stable, coach house (with two rooms and kitchen above), garden and tennis lawn. The ruins suffered further destruction when the new A9 was laid through the Birnam Gap in the 1970s. Subsequent surveys will concentrate on the nature of the largest surviving outbuilding, known locally as the Icehouse, but the true nature and purpose of which has still to be determined. [2]

This two acre site was in continuous occupation from about 1740 to 1945. The original building, known as The Hospital, was completed in 1740 to the instructions of John Steuart of Grandtully (c1643 - 1720). He had set up the Grandtully Mortification Trust for ' 12 poor and indigent men of the Episcopal persuasion' from across his estates. In addition to a pension they were to be housed in a special building on land within half a mile of Murthly Castle. This part of the estate had traditionally been known as Dalpowie. (And appears as such on the first national census in 1841.

The original two storey building had a 'grate hall', West Room, East Room, Infirmary, Kitchen, and 12 'cells' for the pensioners. It seems not have been used for long by the pensioners, but the name stuck and it appears as The Hospital on Stobie's map of 1883, and others, even down to the 1st ed. O.S. Map of 1864 (although by then it had been the private residence of Sir William Drummond Stewart for 20 years).

Over the decades the building had been added to, modified and repurposed. It was known at various times as Glen Birnam, Dalpowie Lodge, Birnam Hall (during the 10 years when it was leased by the painter Sir John Everett Millais), and Dalpowie House. In addition to being used by pensioners its occupancy and use has included: church services (when the church at Little Dunkeld was being rebuilt); estate factor's house and offices, shooting lodge, auxiliary hospital (during WW1), and as a billet for Polish troops during WW2.

At some point several additional buildings were constructed, and a large kitchen garden was laid out. The latter was regarded as second only to the castle garden and vinery. One of these buildings is known locally as 'the icehouse', although certain anomalous features continue to puzzle archaeologists. Additional brickwork partitioning of WW2 vintage hint at a wartime purpose as yet unidentified. It was built on to the side of a substantial cottage, and partly into the north facing slope.

Dalpowie Lodge was demolished in 1951. Its foundational ruins were partially obliterated in the 1970s when the 'new' A9 went through the Birnam Gap. All that remain are the 'icehouse', the ruins of a cottage, and the garden. These are now the focus of continuing surveys under the supervision of Archaeology Scotland. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- physical remains of the ancillary buildings and gardens that have the potential to contribute to some understanding and appreciation of Dalpowie Lodge;
- well-documentary history and association with William Drummond Stewart a Scottish adventurer and British military officer who travelled extensively in the American West in the 1830s and nationally important artist John Everett Millais (1829-1896) who paint a number of local landscape scenes;
- woodland and surviving elements of Murthly Castle (HLT 14) designed landscape including the western drive; and
- potential to make some contribution to our understanding of the development of gentry houses and estates in the region, Dowpowie Lodge's strong community interest. [4]

Sources

[1] Perth and Kinross Historic Environment Record

[2] McLennan, P. (2018) Dalpowie Lodge, Standing building recording, Discovery Excav Scot, New, vol. 18, 2017. Cathedral Communications Limited, Wiltshire, England . Pages(s): 160

[3] Additional information provided by the West Stormont Historical Society 25 October 2018
[4] Jacobs assessment undertaken 2021

Asset Number	6	**Name**	Rohallion, Buffalo Hut
Legal Status	Category B Listed Building	**NGR**	NO0444339883
Value (sensitivity)	High	**Condition**	Good
Type	Hut	**Period**	19th Century
NMR ref	50775	**HER ref**	None
Canmore ID			

Description

Probably circa 1840. Tiny, intricately-detailed, circular hut sited high on hill overlooking Buffalo Park, part of Rohallion's designed landscape. Incorporating conical roof, large gabled porch, tall circular stack projecting at rear, and deep-set roundheaded openings with narrow voussoirs, some openings with rubble infill (original), some with boarded timber doors and some appearing as lancets. Mixed rubble construction with larger rubble base and quoin stones, some squared. Overhanging eaves with exposed rafters.

FURTHER DESCRIPTION: 2-leaf boarded timber door with decorative ironwork hinges, and window openings also with timber boarded doors/shutters. Cobbled floor. Grey slate roof.

INTERIOR: rustic half-round timbered walls and low benches to porch and hut interior, latter also with large stone fireplace.

Built for Sir William Drummond Stewart of Murthly Castle, this astonishing, well-detailed hut was erected to house two Native Americans who had accompanied Sir William on his return to Murthly at the end of the 1830s. The Indians were themselves accompanied by Antoine, a `half-breed' trained as a butler, who was intended to restrain them from any savage or wild behaviour. Sir William had so fallen in love with the American Wild West, that he shipped some buffalo across to Scotland, and built the Buffalo Park at Rohallion, bringing the Indians to look after the animals. The buffalo were cared for by Lord Breadalbane at Taymouth until buffalo grass seed had ripened in 'an enclosure ... not far from Rohallion measuring five or six miles in circumference. The area was enclosed by a stone fence topped by several strands of thick wire'. Much of the `stone fence' enclosing Buffalo Park is still evident today (2006), with monumental square-section gatepiers flanking openings. The Buffalo Hut is sited high up on a hill to the NW of the Park, with a crenellated wall forming a lookout with spectacular views across the Perthshire countryside to the River Tay and beyond. When newly built, views of Murthly Castle would have been clearly visible from this location. 'In August, 1842, restless again, Stewart decided on one last farewell expedition to the American west. To the relief of the locals, he took his three savages with him'. However, during his absence 'Stewart found his buffaloes had got out of hand. One had killed a postman and others had broken free to roam the hills. They were reluctantly given to Lord Breadalbane and ended their days at Woburn Abbey's nature park', (Scottish Memories). [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- high level of authenticity and completeness of architectural detail and features, including its intricate detailing, conical roof and large gabled porch which contribute to its significant architectural interest;
- rarity of Asset 6 as an unusual example of estate architecture and historical associations with Sir William Drummond Stewart of Murthly Castle which make a significant contribution to its historic interest; and
- the cultural heritage resource's location and views overlooking the entrance to the Pass of Birnam with long views towards Murthly Castle to the east, which contributes to our understanding and appreciation of its function as an estate building. [2]

Sources

[1] Historic Environment Scotland
[2] Jacobs assessment undertaken 2021

Asset Number	7	**Name**	Ringwood Lodge, Cottage
Legal Status	None	**NGR**	NO0449040200
Value (sensitivity)	Low	**Condition**	Good
Type	Lodge, Cottage	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK2467
Canmore ID			

Description

No additional information. [1]

A former lodge associated with the western drive to Murthly Castle but now divorced from it by the existing A9. The setting of Asset 7 comprises its gardens the woodland surrounding it and the existing A9 approximately 80m to the north-east. Its historical relationship as the western entrance to the Murthly Estate contributes to our understanding of this cultural heritage resource as a Lodge, however, the existing A9 has severed this relationship. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any remaining architectural detail and features of the lodge house that evidence of local or regional traditions in the materials used which make a limited contribution to the building's architectural interest;
- location within Murthly Castle (HLT 14) designed landscape and the western drive; and
- a common building type which has been much altered and therefore makes the building of limited historic interest. [3]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs setting assessment undertaken August 2018

[3] Jacobs assessment undertaken 2021

Asset Number	8	**Name**	Dunkeld, Two Standing Stones 450m WNW of Newtyle
Legal Status	Scheduled Monument	**NGR**	NO0450141067
Value (sensitivity)	High	**Condition**	Good
Type	Standing Stones	**Period**	Early Prehistoric
NMR ref	SM1541	**HER ref**	MPK2482
Canmore ID			

Description

The monument comprises two standing stones of prehistoric date. The monument was first scheduled in 1930 and rescheduled in 1965. It is being rescheduled yet again in order to clarify the extent of the scheduled area.

The monument lies in mixed woodland at about 70m OD. It comprises two standing stones, aligned N-S and set about 3m apart. The N stone is about 2.1m high, and the S stone is approximately 1.6m high. The monument relates to ritual activity of Neolithic or Bronze Age date.

The area proposed for scheduling comprises the remains described and an area around them within which related material may be expected to be found. It is a truncated circle on plan with a maximum diameter of 30m, bounded by the edge of a road to the SW, as marked in red on the accompanying map extract. Above-ground elements of the modern boundary fence are excluded from the scheduling. [1]

This monument comprises a pair of prehistoric standing stones located to the NE of the A984 road, unusually positioned at the foot of a steep slope at the rear of a terrace overlooking the River Tay. The N stone, which leans slightly to the W, rises to a height of 2.1m, and the S stone is 1.6m high. It is unlikely that these standing stones are the remains of a stone circle, as has been suggested in the past.

(NO 0449 4107) Standing Stones (NR) OS 6" map, Perthshire, 2nd ed. (1901)

Two standing stones, possibly the remains of a circle (1).

A pair of standing stones, 9' apart and aligned N-S. "A" measures 7'2" x 4'9" x 1'9" and "B" is 4'9" x 4'2" x 1'6" (4).

A "two-poster" as described. There is no evidence to suggest a stone circle. Surveyed at 1:10560 scale.

Visited by OS (RD) 22 February 1971

This pair of standing stones lies to the NE of the public road (A984) and is unusually situated at the foot of a steep slope at the rear of a terrace overlooking the River Tay. The N stone, which leans slightly to the W, rises to a height of 2.1m, and the S stone is 1.6m high.

Visited by RCAHMS (JRS) 8 October 1986. [2]

A site inspection on 6 July 2015 observed that the setting supports the understanding of the relationship of the monument's chosen location within the wider landscape but is partly compromised by roadside planting associated with the A984. Views towards the existing A9 are partially screened by mature vegetation. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its physical remains including any associated buried archaeological remains that make a significant contribution to our understanding of this monument type;
- rarity and representativeness as an example of this monument type in Scotland;
- potential to contribute to our understanding of prehistoric ritual practices, which relate to national research themes identified in the Scottish Archaeological Research Framework (ScARF) including the arrangement and order of society and its religious systems. [4]

Sources
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Site inspection 6 July 2015 DMRB Stage 2 assessment [4] Jacobs assessment undertaken 2021

Asset Number	9	**Name**	Newtyle Quarries (site of)
Legal Status	None	**NGR**	NO0449441276
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Slate Quarry, Road, Adit	**Period**	19th Century
NMR ref	None	**HER ref**	MPK14525
Canmore ID			

Description

The 1st and 2nd editions of the OS 6-inch maps depict the quarrying complex at Newtyle. It consists of at least five quarries on either side of the modern road. One quarry is accessed by a tunnel or adit. A small rectagular building above this quarry is marked on the 1st edition (1867) as a 'ruin' indicating that quarrying may have ceased by the late 19th century. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ physical remains which make a very limited contribution to our understanding of 19th century minerals industry;

§ a common and widespread monument type. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	10	**Name**	Deancross, Old Tollhouse
Legal Status	Category B Listed Building	**NGR**	NO0428941332
Value (sensitivity)	High	**Condition**	Good
Type	Tollhouse	**Period**	19th Century
NMR ref	5584	**HER ref**	MPK14356
Canmore ID			

Description

Rubble single-storey, gabled over door, semi-octagonal ends, low pitched wide eaved roof: Tudor hood moulds and octagonal chimney stacks. Probably c.1825. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features, including its semi-octagonal ends, low pitched wide eaved roof, with Tudor hood moulds and octagonal chimney stacks which contribute to its significant architectural interest;

§ rarity as a roadside tollhouse dating from the 1820s which makes a significant contribution to its historic interest;

§ the cultural heritage resource's roadside location. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	11	**Name**	Birnam, Gas Works (site of)
Legal Status	None	**NGR**	NO0385941360
Value (sensitivity)	Low	**Condition**	Unknown
Type	Gas Works	**Period**	19th Century
NMR ref	None	**HER ref**	MPK2466
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ any surviving physical remains;

§ potential to contribute to our understanding this monument type and of local energy production. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	12	**Name**	Deanscross, Cross (site of)
Legal Status	None	**NGR**	NO0427041450
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Possible Cross	**Period**	Medieval
NMR ref	None	**HER ref**	MPK2454
Canmore ID			

Description

Newtyle Cottage (On Site of) Cross (NR) OS 25" map (1865).

A cross was erected by one of the deans of Dunkeld in the immediate vicinity of Newtyle Cottage but according to the Ordnance Survey Name Book (ONB), Newtyle Cottage is reputed to be standing on the site. (Newtyle Cottage is now renamed Deanscross - see current 6") (2, 1865). [1]

As the known site of a roadside cross with no known surviving physical remain, this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past and this monument type. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	13	**Name**	Deans Park Buildings and Enclosure
Legal Status	None	**NGR**	NO0429041490
Value (sensitivity)	Low	**Condition**	Good
Type	Building, Enclosure	**Period**	19th Century
NMR ref	None	**HER ref**	MPK9153
Canmore ID			

Description

One unroofed, one partially roofed, one roofed building and one enclosure are depicted on the 1st edition of the OS 6-inch map (Perthshire 1867, sheet lxii). Two roofed buildings, one enclosure and a length of wall are shown on the current edition of the OS 1:10000 map (1983). [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features which evidence local or regional building traditions through the use if local materials which makes a limited contribution to the architectural interest; and
- a common example of this building type. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	14	**Name**	Craigmore House, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0321141499
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11102	**HER ref**	MPK6310
Canmore ID			

Description

Circa 1865. Murthly estate style: small mansionhouse, single-storey and attic rubble with big masonry dormer heads; battered 3-storey pyramid roofed square tower with big chimney and crosslet at S gable; extended in brick at W gable; slated roofs. [1]

No additional information. [2]

A review of Aerial Phtography (2017) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668.) shows that this cultural heritage resource's setting comprises its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with Assets 15, 17, 18, 19 and 22. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features in 'Murthly estate style' includes a pyramid roofed square tower, which make a significant contribution to its architectural interest;
- secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with other simiar houses, which contribute to our understanding and appreciation of it as part of the expansion of Birnam due to the arrival of the Perth and Dunkeld Railway; and
- a typical example of a mid-19th century mansion house. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	15	**Name**	Oakbank House, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0314341535
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11101	**HER ref**	MPK14164
Canmore ID			

Description

Circa 1865. Large plain 2-storey house, 2-gable N front, slated roof piended at back; plain rubble quoin angles, single-storey modernised back wings. [1]

No additional information. [2]

A review of Aerial Phtography (2017) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668.) shows that this cultural heritage resource's setting comprises its secluded

location within woodland at the south-west of the Birnam Conservation Area and its relationship with Assets 14, 17, 18, 19 and 22. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features which make a significant contribution to its architectural interest;
- its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with other simiar houses, which contribute to our understanding and appreciation of it as part of the expansion of Birnam due to the arrival of the Perth and Dunkeld Railway; and
- a typical example of a substantial mid-19th century house. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	16	**Name**	Dunkeld and Birnam Station, Signal Box
Legal Status	Category B Listed Building	**NGR**	NO0323041552
Value (sensitivity)	High	**Condition**	Good
Type	Signal Box	**Period**	19th Century
NMR ref	52055	**HER ref**	MPK16694
Canmore ID			

Description

Highland Railway Company, 1919. 2-storey signal box; brick with weather-boarding and multi-pane glazing to cabin (operating room) accessed by extended timber forestair to half-gabled entrance porch outshot at upper level. 2 small windows to locking room. E elevation: all brick with small window to upper right and tall, wallhead stack to centre, set behind eaves. Forestair with trackside viewing platform extension.

Signal boxes are a distinctive and increasingly rare building type that make a significant contribution to Scotland's diverse industrial heritage. Of more than 2000 signal boxes built across Scotland by 1948, around 150 currently survive (2013) with all pre-1948 mechanical boxes still in operation on the public network due to become obsolete by 2021. The 1919 signal box at Dunkeld is a rare example of a Highland Railway box design. It is intervisible with the 1856 Dunkeld & Birnam Station (see separate listing) adding group Value (sensitivity) and contextual railway interest. One other example of this type of Highland Railway Company signal box is at Boat of Garten Station (see separate listing) on the preserved Strathspey Railway. The Dunkeld box has been altered in recent years including the replacement of its slate roof with corrugated iron. The 1856 Dunkeld & Birnam Station (see separate listing) is an outstanding example of Scottish railway architecture by the renowned architect, Andrew Heiton Junior. The villages of Birnam and Dunkeld are early Highland resorts in a setting of great natural beauty. The Perth & Dunkeld Railway obtained its Act of Parliament on 10 July 1854 for a line between Stanley Junction and Birnam. Dunkeld (originally Birnam) Station was opened on 7 April 1856 and was a terminus until the line was extended to Pitlochry seven years later. The station was first served by the Scottish Midland Railway and then the Scottish North Eastern Railway before becoming part of the Highland Railway. Listed as part of the Scottish Signal Box Review (2012-13). [1]

This signal box, controlling the southern approach to Dunkeld and Birnham Station, does not appear on the first or second edition OS maps. The first edition OS survey shows that the site of the modern signal box was originally occupied by a spur line and it's corresponding engine shed. This structure appears to have been demolished and the line taken up by the time of the second edition. A signal box for this junction is not listed on the first edition OS, but by the time of the second edition one is depicted (marked "SB") around 70 metres ESE of it's modern replacement. [2]

Site inspection on 6 July 2015 for Stage 2 assessment. This cultural heritage resource's setting comprises its relationship and intervisibility with other elements of the Highland Main Line railway including the station (Asset 26) and views north-west and south-east along the rail tracks. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including brick with weather-boarding and multi-pane glazing to cabin, forestair with trackside viewing and elements of the internal signalling mechanism;
- the signal box's trackside setting, functional relationship with the Highland Main Line railway and Dunkeld and Birnam Station including Footbridge (Asset 26); and
- rare 1919 example of a Highland Railway box design, which contributes to its historic interest. [4]

Sources
[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Site inspection 6 July 2015 DMRB Stage 2 assessment
[4] Jacobs assessment undertaken 2021

Asset Number	17	**Name**	Elsey Cottage, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0303341554
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	13733	**HER ref**	MPK14327
Canmore ID			

Description

Late Victorian single-storey and attic 2-window and centre porch cottage, harled with slated roof, timber dormers. [1]

No additional information. [2]

Site inspection on 6 July 2015 for Stage 2 assessment identified the setting of this cultural heritage resource includes its location on the edge of Inchewan Burn its secluded location within woodland at the south-west of Birnam Conservation Area and its relationship with Assets 14, 15, 18, 19 and 22. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3]

The key characterisitcs, features or elements of this cultural heritage resource are; and

§ the architectural detail and features which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest. [4]

Sources
[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Site inspection 6 July 2015 DMRB Stage 2 assessment
[4] Jacobs assessment undertaken 2021

Asset Number	18	**Name**	Birnam Bank Cottage, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0302041566
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	11099	**HER ref**	MPK14332
Canmore ID			

Description

Circa 1860. Small 2-storey cottage with masonry dormer heads, canted bay on right, local rubble, slated roof. [1]

No additional information. [2]

Site inspection on 6 July 2015 for Stage 2 assessment identified the setting of this cultural heritage resource includes its location on the edge of Inchewan Burn its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with Assets 14, 15, 17, 19 and 22. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest.

Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Site inspection 6 July 2015 DMRB Stage 2 assessment [4] Jacobs assessment undertaken 2021			
Asset Number	19	**Name**	The Lodge, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0308641567
Value (sensitivity)	High	**Condition**	Good
Type	Lodge	**Period**	19th Century
NMR ref	11100	**HER ref**	MPK12964
Canmore ID			
Description			
Dated 1859. 2-storey mansion, rubble with ashlar dressings, pyramid-spired dormer heads, slated piended main roof with stone bracketted eaves, octagonal and lozenge plan chimney shafts, 2 N canted bays with octagonal spired roofs, lower single and 2-storey back wings. MacLean, Dunkeld, Its Straths and Glens (1865). Built as Heath Park for James Ross. [1] No additional information. [2] Site inspection on 6 July 2015 for Stage 2 assessment identified the setting of this cultural heritage resource includes its location on the edge of Inchewan Burn its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with Assets 14, 15, 17, 18 and 22. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3] The key characterisitcs, features or elements of this cultural heritage resource are: § its architectural detail and features including ashlar dressings, pyramid-spired dormer heads, slated piended main roof with stone bracketted eaves, which make a significant contribution to its architectural interest; and § its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with other simiar houses, which contribute to our understanding and appreciation of it as part of the expansion of Birnam due to the arrival of the Perth and Dunkeld Railway.			
Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Site inspection 6 July 2015 DMRB Stage 2 assessment [4] Jacobs assessment undertaken 2021			

Asset Number	20	**Name**	St Columba's Roman Catholic Church, Birnam
Legal Status	None	**NGR**	NO0345541586
Value (sensitivity)	Medium	**Condition**	Good
Type	Church	**Period**	20th Century
NMR ref	None	**HER ref**	MPK10875
Canmore ID			
Description			
NMRS REFERENCE Architect: Reginald Fairlie 1932. [1] The key characterisitcs, features or elements of this cultural heritage resource are: § the detail and features, including its simple plain design with small arched windows and apsed nave which contribute to its architectural interest; and § the secluded wooded area off St Mary's road which contributes to how the buildings is experienced as a place of worship. [2]			

Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	21	**Name**	Macbeth Cottage, Perth Road, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0340641603
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	11126	**HER ref**	MPK12967
Canmore ID			

Description

Circa 1845/50. Picturesque low single-storey rubble-built cottage with low pitched broad-eaved slated roofs with elaborate fretwork valances, T-plan front with timber Jacobethan porch in angle. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features in 'Picturesque' style, including low pitched broad-eaved slated roofs with elaborate fretwork valances and Jacobethan porch, that make a significant contribution to its architectural interest; and
- prominent location on Perth Road, Birnam which contributes to our appreciation of it and how it is experienced as an ornate cottage; [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	22	**Name**	Birnam Bank House, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0303641616
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11098	**HER ref**	MPK14333
Canmore ID			

Description

Circa 1860. Single-storey and attic villa, rubble with stugged ashlar dressings, L-plan front with porch in angle, slated roof with masonry dormer heads, simple treatment. MacLean, Dunkeld, Its Straths and Glens (1865). Built for Mrs Pullar. [1]

No additional information. [2]

Site inspection on 6 July 2015 for Stage 2 assessment identified the setting of this cultural heritage resource includes its location on the edge of Inchewan Burn, its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with Assets 14, 15, 17, 18 and 19. These cultural heritage resources form a distinct group severed from the core of the Conservation Area by the exisiting A9. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- high architectural detail and features including its simple design incorporating ashlar dressings, porch and slated roof with masonry dormer heads, which make a significant contribution to its architectural interest; and
- its secluded location within woodland at the south-west of the Birnam Conservation Area and its relationship with other simiar houses, which contribute to our understanding and appreciation of it as part of the expansion of Birnam due to the arrival of the Perth and Dunkeld Railway. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record

[3] Site inspection 6 July 2015 DMRB Stage 2 assessment
[4] Jacobs assessment undertaken 2021

Asset Number	23	**Name**	Erigmore, Torr Hill, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0358241623
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11097	**HER ref**	MPK11825
Canmore ID			

Description

David Smart 1862 and 1867. Large 2-storey Scots baronial mansion of David Bryce school, snecked rubble with turret and bay window features; lower service court on W; slated roofs. MacLean, Dunkeld, Its Straths and Glens (1865). Built for Captain Napier Campbell Tenanted by Sir John Millais in 1880. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features in Scots baronial style including turret and bay window features, which contribute to its architectural interest;
- its location within an area of Birnam associated with the expansion the town following the arrival of the railway contributes to our understanding and appreciation of it as part of the Highland resort; and
- the buildings historical associations with the nationally important artist Sir John Millais. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	24	**Name**	Birchwood House, Torr Hill, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0344041652
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11095	**HER ref**	MPK12965
Canmore ID			

Description

Dated 1858. 2-storey asymmetrical mansion house, harled with rock-faced dressings: 2 gable S front with bay window, single-storey wing also with bay window, tower broached from square to octagonal with spired slated roof. Long N service wing to road terminating in quaint 3-storey circular tower with conical roof. Slated roofs, traceried bargeboards. MacLean, Dunkeld, Its Straths and Glens (1865). Built for Miss McLagan. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features of this asymmetrical mansion including towers and traceried bargeboards, which contribute to its architectural interest;
- its secluded private grounds, relationship with service buildings and location at the base of Torr Hill in an area which was developed after the arrival of the Perth and Dunkeld Railway that contributes to our understanding and appreciation of it as part of the mid-19th century expansion of Birnam, and how it is experienced as a mansion house. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	25	**Name**	Gladstone Terrace, Terrace Block House, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0326541654
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	13732	**HER ref**	MPK13664
Canmore ID			

Description

Circa 1870. 3 units, each 2-storey 3-window rubble with long-and-short dressings at openings, central barge boarded gables with narrow round arched windows, slated. MacLean, Dunkeld, Its Straths and Glens (1865). Built for Captain Napier Campbell Tenanted by Sir John Millais in 1880. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including central barge boarded gables with narrow round arched windows, which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- roadside location and relationship to other houses forming Gladstone Terrace which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	26	**Name**	Dunkeld and Birnam Station Including Footbridge
Legal Status	Category A Listed Building	**NGR**	NO0308441676
Value (sensitivity)	High	**Condition**	Good
Type	Railway Station, Footbridge	**Period**	19th Century
NMR ref	11139	**HER ref**	MPK6637
Canmore ID			

Description

Andrew Heiton, Junior, 1856. Single-storey, 7-bay, near-symmetrical, multi-gabled railway station. Squared and snecked whinstone rubble with sandstone dressings. Open, central porch with pointed arch to front and shouldered arches to sides. Advanced gables flanking with stone mullioned tri-partite glazing. Decorative barge-boards and pendant timber eaves. Tall octagonal and square-cut ridge stacks. Slate roof.

Single storey addition to SE. Roughly 12-bay awning to platform elevation, supported by wall-hung cast-iron brackets with decorative spandrels.

FOOTBRIDGE: (Map Ref: NO 03107 41646): steel and cast-iron lattice-girder footbridge of standard Highland Railway design.

Dunkeld and Birnam Station is an outstanding and well-detailed example of Scottish railway architecture by renowned architect, Andrew Heiton Junior. The villages of Birnam and Dunkeld are an outstanding example of an early to mid 19th century Highland resort in a setting of great natural beauty and the design of the station buildings reflects their resort status. The villages were largely developed following the opening of the railway between 1856 and 1863. The Perth & Dunkeld Railway obtained its Act of Parliament on 10 July 1854 for a line between Stanley Junction and Birnam. Dunkeld (originally Birnam) Station was opened on 7 April 1856 and was a terminus until the line was extended to Pitlochry seven years later. The station was first served by the Scottish Midland Railway and then the Scottish North Eastern Railway before becoming part of the Highland Railway. A 1919 signal box (see separate listing) by the Highland Railway Company, is located to the east and is intervisible with the station adding contextual and group interest. There is one other listed example of this design of signal box, on the preserved Strathspey Railway at Boat of Garten (see separate listing). List description revised as part of Scottish Signal Box Review (2012-13). [1]

(Location cited as NO 031 417). Dunkeld and Birnam Station, opened by 1856 by the Perth and Dunkeld Rly, architect Andrew Heiton. A two-platform through station with the main building on the up platform, a fine single-storey structure with two ornamental gables and a projecting porch at the rear. On the platform side is a bracketted awning with a steeply-pitched roof. There is a small wooden shelter on the up platform. Other features are a rubble goods shed, a neat wooden coal office, and a lattice-girder footbridge.J R Hume 1977.

This intermediate station on the Perth (Stanley Junction) - Inverness main line of the former Highland Rly was opened as Birnam and Dunkeld Station by the Scottish Midland Junction (Perth and Dunkeld) Rly on 7 April 1856. It was sucessively renamed Dunkeld Station on 1 December 1861, Dunkeld and Birnam Station on 1 December 1903, Dunkeld Station on 12 May 1980 and Dunkeld and Birnam Station on 13 May 1991. The station remains in regular passenger use under the last name.Information from RCAHMS (RJCM), 4 September 2000. R V J Butt 1995.

Architect: Andrew Helton, Junior, 1856. [2]

Site inspection undertaken on 6 July 2015 for DMRB Stage 2 assessment, the setting of this cultural heritage resource comprises the public forecourt, now the car park, its relationship with other aspects of railway infrastructure such as the station's signal box, historical connection to Birnam via Station Road and the existing A9 which has partially severed the connection of the station to Birnam. [3]

Capita on behalf of Network Rail carried out a visual survey of Dunkeld & Birnam Station, Dunkeld, Perth and Kinross, Scotland. PH8 0BN in January 2014. At the time of the survey the building was unoccupied. The purpose of the survey was to provide Network Rail with a condition survey, building plans and elevations. The scope of this report was to undertake a visual inspection of the property where practicable, to advise on the current condition, and provide AutoCAD plan and elevation drawings. The investigation comprised a visual inspection only.

Summary of condition survey

This is a grade A listed building. All works should be carried out by tradesmen trained and skilled in Conservation techniques and the local authority Conservation Officer should be consulted prior to any works starting on site.

The external masonry is generally in a good condition for the age of the building. The area to the North west is badly weathered and eroded and a series of render repairs and brick infills is failing.

Stone replacement is required to 5 areas within this area.

1. Internal corner of North West wall and parapet
2. Sandstone ashlar external corner North West wall
3. Whinstone central panel approx 9m2 of North West wall
4. Central panel North East parapet
5. Low level to North West parapet

There is a corrugated steel sheet to the parapet coping which is rusting and a new capping is required. There are no gutters to this wall which is causing frost damage to masonry below. The joint between the render on the parapet and the valley gutter is defective. This requires sealing and investigation into the condition of adjacent timbers. Access to the central roof area valleys was not possible. There are leaks currently to the eaves/valley gutter area of this part of the building which are showing in the kitchen internally. It is recommended these are further investigated with the use of a mobile access platform to determine the repairs

There are currently leaks in the corridor 2 and kitchen area which need repairs completing and investigation into timber damage in the roof space. This is also recommended in the roof space to the North west above storeroom 2 where previous leaks have been. There is some evidence of previous leaks in the ceiling of room 1. It is recommended this area is examined for damage to roof timbers and potential wet/dry rot.

The lean to roof over the platform has 2 timber glazed gables which are rotted. It is recommended these are replaced with white powder coated aluminium glazed screens. The mineral felt roof covering to this area also requires replacement within 2 years.

The slate pitched roofs and zinc flashed ridges appear in good condition with isolated areas of slates to replace/refix after wind damage and valleys and gutters to be cleaned out. The external footpath is uneven and water is ponding. It is recommended this is replaced.

Internally all rooms are in good/fair condition. Plaster lath ceilings need repairing/replacing. The decoration is in good condition with some areas to redecorate following repair of existing leaks. The 2 storerooms are inhabitable and full internal refurbishment would be required to return these to habitable status if required.

The building has an elegant Victorian Railway architecture facade which is partly obscured by 2 cycle racks. It is recommended these are re positioned within the car park to allow this significant view to be appreciated and attract potential tenants. [4]

A non-intrusive structural survey of the building was carried out by John Robson, Jacobs on 7th May 2015 between 11:00 and 15:00 in the presence of Graeme Stewart of Network Rail and Jacobs' architect Philip Levack of Nicoll Russell Studios. The aim of the survey was to determine the condition of the building structure and to better understand the surrounding area, its topography, and any other factors affecting the building.

Internal and external photographs were taken, which are included in Appendix A, and dimensional checks were made to verify the scale of the Capita drawing. [5]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features conceived by Andrew Heiton Junior, comprising its ornate Cottage Tudor decorative scheme, including the central porch with pointed arch to front and shouldered arches to sides, stone mullioned tri-partite glazing, decorative barge-boards and pendant timber eaves and tall octagonal and square-cut ridge stacks;
- the building types rarity as an example of a largely compete early Scottish railway station dating from 1856;
- the stations surroundings including, the public forecourt (now the car park), its relationship with other elements of railway infrastructure such as the signal box and former connection to Birnam via Station Road. [6]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Site inspection 6 July 2015 DMRB Stage 2 assessment
[4] Capita 2014, Condition Survey Dunkeld & Birnam Station. Unpublished Technical Report
[5] Technical Note 002 – Structural Condition Survey Dunkeld & Birnam Station building, Jacobs May 2015
[6] Jacobs assessment undertaken 2021

Asset Number	27	**Name**	Dunsville, Gladstone Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0324141684
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11084	**HER ref**	MPK14328
Canmore ID			

Description

Circa 1870. Pair, each 2-storey 3-window rubble with gablets, Dunsville has had windows altered to bipartites. Slated roof. [1]
No additional information. [2]
This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]
The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including central barge boarded gables with narrow round arched windows, which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Gladstone Terrace which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	28	**Name**	Craigielea, Gladstone Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0322741695
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11084	**HER ref**	MPK14329
Canmore ID			

Description

Circa 1870. Pair, each 2-storey 3-window rubble with gablets, Dunsville has had windows altered to bipartites. Slated roof. [1]
No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including central barge boarded gables with narrow round arched windows, which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Gladstone Terrace which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	29	**Name**	Bheine Mhor, Perth Road Birnam
Legal Status	Category C Listed Building	**NGR**	NO0326541721
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	20th Century
NMR ref	11080	**HER ref**	MPK12966
Canmore ID			

Description

Circa 1900. Late Victorian villa, 2-storey L-plan front, pienided porch with fin-de-siecle glass-work and valanced eaves, octagonal corner bay with slated spired roof, front courses, rest local rubble. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including pienided porch with fin-de-siecle glass-work and valanced eaves, which evidence popular architectural design of the period and local or regional building traditions through the use if local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses of a similar period on Perth Road which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	30	**Name**	Birnam, Perth Road (site of)
Legal Status	None	**NGR**	NO0328041729
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Road	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK10873
Canmore ID			

Description

From NO 0268 4217 to NO 0333 4168 [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains of former road surfaces; and
- common and widespread monument type with very limited contribution to our understanding of earlier forms of road construction and use of materials. [2]

Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	31	**Name**	8 and 9 Birnam Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0319941736
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11083	**HER ref**	MPK13560
Canmore ID			

Description

Circa 1860/70. Long single-storey and attic terrace block on 150 degrees angle, angle rounded, west most house has V-plan oriel bay. Rubble built, slated roof with masonry dormers. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including rubble stone and masonry dormer windows, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	32	**Name**	Merryburn Hotel, Station Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0315041742
Value (sensitivity)	High	**Condition**	Good
Type	Hotel	**Period**	19th Century
NMR ref	11082	**HER ref**	MPK14210
Canmore ID			

Description

Circa 1870. 2 storey single block similar to above with circled corner bay and conical roof, 3 window front with gables, stugged ashlar (recently painted), slated. [1]

No additional information. [2]

The setting of Asset 32 comprises its roadside location within Birnam Conservation Area. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including circled corner bay and conical roof, wooden bargeboards and metail finials, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on to the south of Station Road and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	33	**Name**	The School House, Perth Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0325341742
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11130	**HER ref**	MPK14274
Canmore ID			

Description

Later 19th century. Single-storey and attic L-plan front with cantilevered and gabled timber porch in angle, local rubble, slated roof with bracketted eaves. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including gabled timber porch, rubble stone, plain bargboards and weathervain, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other buildings of a similar period and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	34	**Name**	6 and 7 Birnam Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0318941743
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11083	**HER ref**	MPK13561
Canmore ID			

Description

Circa 1860/70. Long single-storey and attic terrace block on 150 degrees angle, angle rounded, west most house has V-plan oriel bay. Rubble built, slated roof with masonry dormers. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including rubble stone and masonry dormer windows, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	35	**Name**	4 and 5 Birnam Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0317441748
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11083	**HER ref**	MPK13562
Canmore ID			

Description

Circa 1860/70. Long single-storey and attic terrace block on 150 degrees angle, angle rounded, west most house has V-plan oriel bay. Rubble built, slated roof with masonry dormers. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including rubble stone and masonry dormer windows, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2019

[4] Jacobs assessment undertaken 2021

Asset Number	36	Name	2 and 3 Birnam Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0316441749
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11083	**HER ref**	MPK13563
Canmore ID			

Description

Circa 1860/70. Long single-storey and attic terrace block on 150 degrees angle, angle rounded, west most house has V-plan oriel bay. Rubble built, slated roof with masonry dormers. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including rubble stone and masonry dormer windows, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2019

[4] Jacobs assessment undertaken 2021

Asset Number	37	**Name**	1 Birnam Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0315641752
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11083	**HER ref**	MPK13564
Canmore ID			

Description

Circa 1860/70. Long single-storey and attic terrace block on 150 degrees angle, angle rounded, west most house has V-plan oriel bay. Rubble built, slated roof with masonry dormers. [1]

No additional information. [2]

This cultural heritage resource's setting comprises its roadside location, relationship to other as terraced houses and Birnam Conservation Area to the north of the Highland Main Line railway. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including rubble stone and masonry dormer windows, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other houses forming Birnam Terrace and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2019
[4] Jacobs assessment undertaken 2021

Asset Number	38	**Name**	Parkview, Station Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0317341767
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11081	**HER ref**	MPK14378
Canmore ID			

Description

Circa 1870. 2 blocks stepped in slope, 2-storey with dormer heads and ground floor shops, N block 3 pairs of windows with segmentally arched heads, gabled outer dormer heads with quatrefoil bargeboards, swept centre dormer; S part has 1 pair of windows, 2 first floor windows with wrot-iron balcony, single swept dormer and pair of windows on curved angle carried up as conical angle turret. Stugged ashlar, slated. Probably built for let as lodgings for summer visitors as at Tower Buildings and Murthly Terrace. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including windows with segmentally arched heads, quatrefoil bargeboards, swept centre dormer, wrot-iron balcony, single swept dormer and a conical angle turret, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on Station Road and within Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	39	**Name**	Drill Hall (Armoury House), Perth Road, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0322841769
Value (sensitivity)	High	**Condition**	Good
Type	Drill Hall	**Period**	19th Century
NMR ref	11129	**HER ref**	MPK14331
Canmore ID			

Description

Dated 5 VBRH 1895. Cottage style, single-storey hall with single-storey and attic wing of same height, 2-gable front with asymmetrically placed porch. Rubble built with stugged dressings, 3-light hall window has stepped Tudor hoodmould door of porch is shouldered, slated roof with bracketted eaves. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features in cottage style, including rubble stone, with ahslar stone detailing and 3-light hall windows with stepped Tudor hoodmould and date stone, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other buildings of a similar period and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam;
- potential contribution the former drill hall makes to our understanding of the social history; and
- a rare example of a late Victorian drill hall. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	40	**Name**	Birnam, Station Road (site of)
Legal Status	None	**NGR**	NO0314541785
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Road	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK10878
Canmore ID			

Description

From NO 0316 4185 to NO 0315 4178 [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains of former road surfaces; and
- common and widespread monument type with very limited contribution to our understanding of earlier forms of road construction and use of materials. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	41	**Name**	Birnam, Perth Road, Post Office And General Store
Legal Status	None	**NGR**	NO0325041791
Value (sensitivity)	Low	**Condition**	Good
Type	Post Office, Shop	**Period**	20th Century
NMR ref	None	**HER ref**	MPK16697
Canmore ID			

Description

This building appears on neither 1st nor 2nd edition OS maps. Timber fronted general store and Post Office. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including its timber cladding decoration contribution to the architectural interest of this building;
- its roadside location on Perth Road within Birnam Conservation Area which contributes to our understanding and appreciation of it as a modern commercial building servicing the local community. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	42	**Name**	The Bungalow, Perth Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0319941792
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11128	**HER ref**	MPK12963
Canmore ID			

Description

Early 20th century remodelling of previous Victorian bungalow. L-plan front with bay window and 1/2-timber porch in angle, low pitched broad-eaved piended roof: 1-window gable, 2-window back wing. Harled and slated. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location and relationship to other buildings of a similar period and Birnam Conservation Area which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	43	**Name**	Ladywell Milestone
Legal Status	None	**NGR**	NO0190941808
Value (sensitivity)	Low	**Condition**	Unknown
Type	Milestone	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK18287
Canmore ID			

Description

No additional information. [1]

The site of a milestone identified on historic Ordnance Survey mapping 'Crieff 20 4/5 Dunkeld 1'. [2]

As the known site of a roadside milestone this cultural heritage resource can only make a limited contribution to our understanding or appreciation of this common building type. [3]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Ordnance Survey, Perth and Clackmannanshire LXII.9 (Little Dunkeld), 25 inch to the mile, First Edition, surveyed 1863, published 1866.

[3] Jacobs assessment undertaken 2021

Asset Number	44	**Name**	Birnam, Conservation Area
Legal Status	Conservation Area	**NGR**	NO0325641813
Value (sensitivity)	Medium	**Condition**	Good
Type	Conservation Area	**Period**	19th Century
NMR ref	CA566	**HER ref**	None
Canmore ID			

Description

http://www.pkc.gov.uk/conservationareas [1]

Birnam Conservation Area (Asset 44) encompasses buildings either side of Birnam Glen and Oak Avenue, Station Road, Birnam Terrace and Perth Road, as well as the north bank of the River Tay and Torr Hill. To the south-west the Conservation Area extends beyond the existing A9 to include the area of mid-Victorian villas with large secluded wooded gardens which overlook Dunkeld & Birnam Station including Footbridge (Asset 26). This area is linked to the main settlement of Birnam by Birnam Glen which at present passes under the existing A9.

The majority of historic buildings in Birnam Conservation Area characterise a significant period of urban expansion related to the arrival of the Perth and Dunkeld Railway in 1856, and the subsequent growth of the early-mid Victorian Highland tourism industry. These include large mid-19th century villas, such as the Category B Listed Building The Lodge, Birnam (Asset 19) and the Category C Listed Buildings Oakbank House and Birnam Bank House (Assets 15 and 22). Domestic housing of various styles, include cottages such as Elsey and Birnam Bank Cottages (Assets 17 and 18; Category C Listed Buildings; Photograph 14.2) and the Category B Listed Buildings of Murthly Terrace, Birnam (Assets 51, 53, 54 and 55), and Category C Listed Buildings forming Birnam Terrace (Assets 31, 34, 35, 36 and 37), and commercial buildings such as the Birnam Hotel (Asset 64). [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs summary of character of Birnam Conservation Area 2020

Asset Number	45	**Name**	Dunaird House, Torr Hill, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0340341814
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11094	**HER ref**	MPK6418
Canmore ID			

Description

Dated 1865. Baronial mansion house of picturesque outline, 2-storey and attic asymmetrical rubble-built with rock-faced dressings, square and circular turret features, straight skewed gables and slated roofs. [1]

Dunnaird House is one the several mansions built in the mid 19th century between Perth Road and the River Tay. It was constructed in 1865 for David Brodie and is baronial in style. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features of this picturesque baronial style mansion including rubble stone with rock-faced dressings, square and circular turrets, which contribute to its architectural interest;
- its secluded private ground, relationship with service buildings and location at the base of Torr Hill in an area which was developed after the arrival of the Perth and Dunkeld Railway. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	46	**Name**	St. Mary's Episcopal Church, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0323441820
Value (sensitivity)	High	**Condition**	Good
Type	Church, Cemetery	**Period**	19th Century
NMR ref	11141	**HER ref**	MPK10876
Canmore ID			

Description

William Slater to design of Richard Cromwell Carpenter, 1856-58; tower belfry stage by James Ramsay, 1882; low N aisle and baptistery by Norman & Beddoe, 1883; choir stalls by Rev Edward Sugden 1889; organ by Forster and Andrews 1874, rebuilt by John R Miller 1908. Well-detailed gothic church with 3-bay nave, aisle chancel, square 3-stage crenellated tower and unusually fine interior with Burne-Jones windows by William Morris & Co, stencilling remnants and furnishings of note. Squared, coursed and snecked rubble with ashlar dressings. Raked base course, band course and machicolation to tower, angle buttresses, voussoirs, traceried windows and chamfered reveals.

FURTHER DESCRIPTION: entrance tower to SW with 2-leaf timber door and traceried oculus dwarfed by flanking projecting buttresses; aisle with Burne Jones windows and squat buttresses to NW under swept roof with diminutive ventilators; SE elevation of nave and chancel, latter with hoodmoulded recess below 2-light window; large 3-light window to cross-finialled NE gable.

Fine coloured glass or coloured margins to diamond-pattern leaded lights throughout. Grey slates. Shouldered stack raised in brick at vestry; ashlar-coped skews to stepped roof.

INTERIOR: unusually fine interior with good decorative scheme in place, including open timber roof with simple cross bracing, limewashed walls to nave and aisle, evidence of stencilling at chancel, columned N arcade, fixed timber pews and some tiled floors. Moulded chancel arch with carved head corbels and decorative stone septum with inset railings; sanctuary with stone and marble reredos, single seat sedile and piscine. Carved oak pulpit. Carved circular stone font at baptistery.

STAINED GLASS: much fine figurative glass including Alexander and Evelyn Mary Low Memorial Windows in N aisle designed by Edward Burne-Jones and executed by Morris & Co depicting 'King David and St John' of 1890 (designed 1866 and 1869) and 'Ruth and Mary' of 1904, designed 1886. E window Crucifixion by C E Kempe 1895 and chancel's S wall 'Moses and St John the Baptist' by James Ballantine & Son 1864. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§	its architectural detail and features of this Well-detailed gothic church including nave, aisle chancel, square crenellated tower and unusually fine interior with Burne-Jones windows by William Morris & Co, which scientifically contribute to its architectural interest;
§	its roadside location on Perth Road, surrounding churchyard and relationship with Birnam. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	47	**Name**	Tower Buildings, Perth Road And Station Road, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0317541824
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	19th Century
NMR ref	11127	**HER ref**	MPK13642
Canmore ID			

Description

Dated 1859 at weather vane. Victorian gothic, 2-storey basement and attic V-plan corner building with original ground floor shops having 4-centre arched glazing; diagonally set slim square corner tower of 3 storeys with pyramid roof, Tudorish doorway with balcony over 2nd floor gothic window. Snecked rubble, buft sandstone dressings, stop chamfers, slated. MacLean, Dunkeld, its Straths and Glens (1865). Built for let in summer as lodgings for visitors. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features comprising its Victorian gothic style corner building, including diagonally set slim square corner tower with pyramid roof, Tudorish doorway with balcony over gothic window, rubble stone, ashlar stone detailing, decrative bargeboards, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;

§ its roadside location on Station Road and Perth Road within Birnam Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	48	**Name**	Birnam Glen Affric House, Perth Road, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0321041828
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11125	**HER ref**	MPK12908
Canmore ID			

Description

Dated 1862 and 1865. Baronial, long 2-storey and attic terrace block stepped in slope: 24 windows long, cantilevered 1st floor canted bay and corbelled to square with shaped gables 2nd floor at 6th 10th and 19th, corbelled circular angle turrets at ends of composition. Ashlar ground floor with arched openings, snecked local rubble above with ashlar dressings, architraves at no 3, gabled masonry dormers, slated roofs.

Items 68-100 form B group with items 18-20 in original list. An outstanding example of an early-mid Victorian Highland resort in a setting of great natural beauty, built mainly following the opening of the Perth and Dunkeld Railway in 1856. In 1865 it was noted that the trade of Dunkeld and Birnam had suffered with the extension of the Railway. The main development was thus between 1856 and

1863, when Birnam was the terminus. Very completely preserved to date St Mary's Tower and Birnam House being the only serious losses while the only intrusion of any consequence has been a modern bungalow inserted between Birnam Hotel and Oransay.

See MacLean, Dunkeld, its Straths and Glens (1865). Built for let in summer as lodgings for visitors. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features comprising its Scot Baronial style, including cantilevered 1st floor canted bay, corbelled circular angle turrets, ashlar ground floor with arched openings, local rubble with ashlar dressings, architraves and gabled masonry dormers, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on Perth Road within Birnam Conservation Area and relationship with other similar buildings including those forming Murthly Terrace. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	49	**Name**	Ladywell, Cropmarks
Legal Status	None	**NGR**	NO0240641831
Value (sensitivity)	Low	**Condition**	Unknown
Type	Cropmarks, Field Boundarys, Possible Trackways	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK6336
Canmore ID			

Description

Field boundaries, which are depicted on the 2nd edition of the OS 6-inch map (Perthshire 1900, sheet lxii SW), have been recorded as parchmarks on oblique aerial photographs.

Two linear parchmarks have been recorded by aerial photographic survey in the field to the north of the A822 at Ladywell. The parchmarks run E-SW and E-NW respectively and may be traces of former trackways perhaps associated with the construction of the railway or access to 'Claypotts' a settlement shown on 18th century mapping in the vicinity of Ladywell farmsteading. [1]

Aerial photograph clearly shows cropmarks. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the physical remains which have the potential to contribute to our understanding of Victorian construction techniques;
- contribute to this monument type and the construction of Victorian railways in Scotland. [3]

Sources

[1] Perth and Kinross Historic Environment Record
[2] RCAHMS ASS-618-045 043-035 1988 C0241
[3] Jacobs assessment undertaken 2021

Asset Number	50	**Name**	The Rectory, Oak Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0326541834
Value (sensitivity)	High	**Condition**	Good
Type	Vicarage	**Period**	19th Century
NMR ref	11091	**HER ref**	MPK13551
Canmore ID			

Description

Late Victorian villa. 2-storey and attic 2-window (1 bipartite) and canted bay, bracketted eaves piended slated roof. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including its bracketted eaves and piended slated roof, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its location to the north of, and relationship with, St Mary's Church, and Birnam Conservation Area which contributes to our understanding and appreciation of this building as a rectory. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	51	**Name**	Birnam, Murthly Terrace, Old Bakehouse
Legal Status	Category B Listed Building	**NGR**	NO0320341844
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11125	**HER ref**	MPK12907
Canmore ID			

Description

Dated 1862 and 1865. Baronial, long 2-storey and attic terrace block stepped in slope: 24 windows long, cantilevered 1st floor canted bay and corbelled to square with shaped gables 2nd floor at 6th 10th and 19th, corbelled circular angle turrets at ends of composition. Ashlar ground floor with arched openings, snecked local rubble above with ashlar dressings, architraves at no 3, gabled masonry dormers, slated roofs.

Items 68-100 form B group with items 18-20 in original list. An outstanding example of an early-mid Victorian Highland resort in a setting of great natural beauty, built mainly following the opening of the Perth and Dunkeld Railway in 1856. In 1865 it was noted that the trade of Dunkeld and Birnam had suffered with the extension of the Railway. The main development was thus between 1856 and 1863, when Birnam was the terminus. Very completely preserved to date St Mary's Tower and Birnam House being the only serious losses while the only intrusion of any consequence has been a modern bungalow inserted between Birnam Hotel and Oransay.

See MacLean, Dunkeld, its Straths and Glens (1865). Built for let in summer as lodgings for visitors. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features comprising its Scot Baronial style, including cantilevered first floor canted bay, corbelled circular angle turrets, ashlar ground floor with arched openings, local rubble with ashlar dressings, architraves and gabled masonry dormers, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on Perth Road within Birnam Conservation Area and relationship with other similar buildings including those forming Murthly Terrace. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	52	**Name**	Ladyhill House And Outbuildings, St Mary's Road, Torr Hill, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0347741849
Value (sensitivity)	High	**Condition**	Good
Type	House, Outbuilding	**Period**	19th Century
NMR ref	11096	**HER ref**	MPK10872
Canmore ID			

Description

Circa 1860. Idiosyncratic Victorian Scots Jacobean. Irregular plan, 2-storey with dormer heads, rubble-built with patterned dressings, stepped gables. Entrance tower on west has truncated pyramid roof with wrot-iron balustraded platform, segmentally pedimented doorpiece and strapwork window heads: slated. MacLean, Dunkeld, Its Straths and Glens (1865). Built for Rev John MacMillan of St Mary's Episcopal Church. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features of this Scots Jacobean style mansion including rubble stone with patterned dressings and entrance tower with a truncated pyramid roof with wrot-iron balustraded platform, which contribute to its architectural interest;
- secluded private ground, relationship with service buildings and location at the base of Torr Hill in an area which was developed after the arrival of the Perth and Dunkeld Railway. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	53	**Name**	Stonecroft, Murthly Terrace, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0319041853
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11125	**HER ref**	MPK12906
Canmore ID			

Description

Dated 1862 and 1865. Baronial, long 2-storey and attic terrace block stepped in slope: 24 windows long, cantilevered 1st floor canted bay and corbelled to square with shaped gables 2nd floor at 6th 10th and 19th, corbelled circular angle turrets at ends of composition. Ashlar ground floor with arched openings, snecked local rubble above with ashlar dressings, architraves at no 3, gabled masonry dormers, slated roofs.

Items 68-100 form B group with items 18-20 in original list. An outstanding example of an early-mid Victorian Highland resort in a setting of great natural beauty, built mainly following the opening of the Perth and Dunkeld Railway in 1856. In 1865 it was noted that the trade of Dunkeld and Birnam had suffered with the extension of the Railway. The main development was thus between 1856 and 1863, when Birnam was the terminus. Very completely preserved to date St Mary's Tower and Birnam House being the only serious losses while the only intrusion of any consequence has been a modern bungalow inserted between Birnam Hotel and Oransay.

See MacLean, Dunkeld, its Straths and Glens (1865). Built for let in summer as lodgings for visitors. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features comprising its Scot Baronial style, including cantilevered first floor canted bay, circular angle turrets, ashlar ground floor with arched openings, local rubble with ashlar dressings, architraves and gabled masonry dormers, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- roadside location on Perth Road within Birnam Conservation Area and relationship with other similar buildings including those forming Murthly Terrace. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	54	**Name**	4 Murthly Terrace, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0318441859
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11125	**HER ref**	MPK12905
Canmore ID			

Description

Dated 1862 and 1865. Baronial, long 2-storey and attic terrace block stepped in slope: 24 windows long, cantilevered 1st floor canted bay and corbelled to square with shaped gables 2nd floor at 6th 10th and 19th, corbelled circular angle turrets at ends of composition. Ashlar ground floor with arched openings, snecked local rubble above with ashlar dressings, architraves at no 3, gabled masonry dormers, slated roofs.

Items 68-100 form B group with items 18-20 in original list. An outstanding example of an early-mid Victorian Highland resort in a setting of great natural beauty, built mainly following the opening of the Perth and Dunkeld Railway in 1856. In 1865 it was noted that the trade of Dunkeld and Birnam had suffered with the extension of the Railway. The main development was thus between 1856 and 1863, when Birnam was the terminus. Very completely preserved to date St Mary's Tower and Birnam House being the only serious losses while the only intrusion of any consequence has been a modern bungalow inserted between Birnam Hotel and Oransay.

See MacLean, Dunkeld, its Straths and Glens (1865). Built for let in summer as lodgings for visitors. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features comprising its Scot Baronial style, including cantilevered first floor canted bay, circular angle turrets, ashlar ground floor with arched openings, local rubble with ashlar dressings, architraves and gabled masonry dormers, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on Perth Road within Birnam Conservation Area and relationship with other similar buildings including those forming Murthly Terrace. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	55	**Name**	3 Murthly Terrace, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0317741868
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11125	**HER ref**	MPK12904
Canmore ID			

Description

Dated 1862 and 1865. Baronial, long 2-storey and attic terrace block stepped in slope: 24 windows long, cantilevered 1st floor canted bay and corbelled to square with shaped gables 2nd floor at 6th 10th and 19th, corbelled circular angle turrets at ends of composition. Ashlar ground floor with arched openings, snecked local rubble above with ashlar dressings, architraves at no 3, gabled masonry dormers, slated roofs. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features comprising its Scot Baronial style, including cantilevered first floor canted bay, circular angle turrets, ashlar ground floor with arched openings, local rubble with ashlar dressings, architraves and gabled masonry dormers, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its roadside location on Perth Road within Birnam Conservation Area and relationship with other similar buildings including those forming Murthly Terrace. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	56	**Name**	Java House, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0305041879
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11087	**HER ref**	MPK12998
Canmore ID			

Description

Circa 1880, former Police Station. Neat single-storey cottage, 2-window and centre door with panel over, centre gablet. Stugged red ashlar with white sandstone dressings, slated. [1]

No additional information. [2]

The setting of Java House comprises its secluded location with mature trees to the west, residential buildings to the north and a fire station to the south. The principle elevation faces east overlooking its access road, stream and public gardens. The Value (sensitivity) of this cultural heritage resource is derived from its surviving architectural features which contribute to our understanding of it as a former police station. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features some of which may reflect its former function as a police station, including red ashlar with white sandstone dressings, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its secluded location within Birnam Conservation Area;
- as a former police station the social history of this building has the potential to contribute to our understanding of the social history of Birnam. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken November 2018

Asset Number	57	**Name**	Birnam, Perth Road, Beatrix Potter Garden
Legal Status	None	**NGR**	NO0310941880
Value (sensitivity)	Low	**Condition**	Good
Type	Formal Garden	**Period**	20th Century
NMR ref	None	**HER ref**	MPK16695
Canmore ID			

Description

Formal garden containing bronze sculptures of characters from Beatrix Potter's books. Built to celebrate the authors many visits to Dunkeld and Dalguise House. [1]

The key characterisitcs, features or elements of this cultural heritage resource are: § the design details and features of the formal garden and bronze sculptures; and § associations with a local artist.
Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	58	**Name**	Birnam, St Mary's Tower
Legal Status	None	**NGR**	NO0351141881
Value (sensitivity)	Low	**Condition**	Good
Type	Tower	**Period**	19th Century
NMR ref	None	**HER ref**	MPK10877
Canmore ID			
Description			
NMRS REFERENCE Architect: John Carver c. 1860 [1]			
Sources			
[1] Perth and Kinross Historic Environment Record			

Asset Number	59	**Name**	1 Murthly Terrace, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0316841882
Value (sensitivity)	High	**Condition**	Good
Type	Terrace House	**Period**	19th Century
NMR ref	11124	**HER ref**	MPK13636
Canmore ID			
Description			
Early 19th century. 2-storey, ground floor shop, 3 windows above, 3-window gable and 1 window back wing, front courses, gable rubble with droved dressings, slated. Items 68-100 form B group with items 18-20 in original list. An outstanding example of an early-mid Victorian Highland resort in a setting of great natural beauty, built mainly following the opening of the Perth and Dunkeld Railway in 1856. In 1865 it was noted that the trade of Dunkeld and Birnam had suffered with the extension of the Railway. The main development was thus between 1856 and 1863, when Birnam was the terminus. Very completely preserved to date St Mary's Tower and Birnam House being the only serious losses while the only intrusion of any consequence has been a modern bungalow inserted between Birnam Hotel and Oransay.60 Circa 1914. Circular freestone shaft with ball finial on square pedestal with granite bowl, battered base. [1] No additional information. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § the architectural detail and features of this simple plain building, including coursed and rubble stone with droved dressings, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest; § its roadside location on Perth Road and St Mary's Road within Birnam Conservation Area and relationship with other buildings of a similar age including those forming Murthly Terrace. [3]			
Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021			

Asset Number	60	**Name**	Birnam, Murthly Terrace, Fountain
Legal Status	Category C Listed Building	**NGR**	NO0315541891
Value (sensitivity)	High	**Condition**	Good
Type	Fountain	**Period**	20th Century
NMR ref	11088	**HER ref**	MPK13586
Canmore ID			

Description

Circa 1914. Circular freestone shaft with ball finial on square pedestal with granite bowl, battered base.
'In commemoration of two golden days at Birnam 1st December 1863 1st December 1913' [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including ball finial on square pedestal with granite bowl which contribution to the architectural interest;
- its roadside location on Perth Road and St Mary's Road within Birnam Conservation Area;
- the contribution the social historical interest it can make to our understanding of the social history of Birnam as a Highland resort. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	61	**Name**	Ladywell Cottages, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0304941909
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	11086	**HER ref**	MPK14373
Canmore ID			

Description

Circa 1870/80. Cheap row of brick and harl cottages of picturesque outline, central 2-storey gable with narrow round arched 1st floor window single-storey and attic 2-window and centre door with masonry dormers to either side, slated. Restored and internally remodelled 1974. [1]
No additional information. [2]
While the Value (sensitivity) of this cultural heritage resource is largely derived from its surviving architectural features and historical association with the expansion of Birnam following the arrival of the railway, this cultural heritage resource's setting, which comprises its location within Birnam and facing onto Perth Road to the north over gardens contribute to our appreciation of it. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features of these cottages with some picturesque details, including central gable with narrow round and arched first floor window, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its location set back from and facing Perth Road within Birnam Conservation Area which contribute to our understanding and appreciation of it as part of the late Victorian expansion of Birnam. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken November 2018
[4] Jacobs assessment undertaken 2021

Asset Number	62	**Name**	Guthrie Villas Nos 1 And 2, Oak Road/St Mary's Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0318841920
Value (sensitivity)	High	**Condition**	Good
Type	Villa	**Period**	19th Century
NMR ref	11089	**HER ref**	MPK14376
Canmore ID			

Description

Built as New Hotel, circa 1890. 3-storey, 2 windows flanked by 2 2-storey bays, swept dormer heads 2nd floor, snecked local rubble with ashlar dressings, piended slated roof. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including snecked local rubble with ashlar dressings, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its prominent location on St Mary's Road and Oak Road overlooking Perth Road within Birnam Conservation Area and relationship with other buildings of a similar age. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	63	**Name**	Birnam, Glen Tuck Shop and Lindisfarne
Legal Status	Category C Listed Building	**NGR**	NO0307741923
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	19th Century
NMR ref	11085	**HER ref**	MPK12968
Canmore ID			

Description

Circa 1880-90. 2-storey 2-window north and east fronts with 1 window on rounded angle, rubble with red sandstone long-and-short dressings, T-plan window divide, roof has bracketted eaves, patterned slatework and thistle finials. [1]

No additional information. [2]

While the setting of this cultural heritage resource on the corner of Birnam Glen and Perth Road within Birnam Conservation Area contributes to our appreciation of it as part of the mid-Victorian expansion of Birnam following the arrival of the railway, its Value (sensitivity) is largely derived from its surviving architectural features. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including rubble with red sandstone long-and-short dressings, bracketted eaves, patterned slatework and thistle finials, which evidence local or regional building traditions through the use of local materials which contribution to the architectural interest;
- its prominent location on St Mary's Road and Oak Road overlooking Perth Road within Birnam Conservation Area and relationship with other buildings of a similar age. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken November 2018
[4] Jacobs assessment undertaken 2021

Asset Number	64	**Name**	Birnam Hotel, Adjoining Gates and Annexe
Legal Status	Category B Listed Building	**NGR**	NO0311641948
Value (sensitivity)	High	**Condition**	Good
Type	Gates, Hotel	**Period**	19th Century
NMR ref	11140	**HER ref**	MPK10879, MPK15462
Canmore ID			

Description

Large 3-storey and attic rubble with square tower of 4 storeys and 1/2 storey office wings with twin 2-storey and attic towers: Murthly estate style of c.1850 (erected by Sir W.D. Stewart). Gate-piers and cast-iron gates of gargantuan size with large 2-storey lodge (now annexe) added (former drive to Murthly Castle) c.1870. Internal repairs. [1]

Gate-piers and cast-iron gates of gargantuan size with large 2-storey lodge, originally built as gatehouse to Murthly Castle. Converted into apartments. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, in Scots Baronial and Murthly estate style of the main building including the tower with bellcast pyramidal roof, mullioned windows and crowsteps, and the stonework and case iron detailing of the gate-piers and gate, which contribution to the architectural interest;
- its prominent location on Perth Road within Birnam Conservation Area and relationship with other buildings of a similar age. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	65	**Name**	Torwood House, St Mary's Road, Torr Hill, Birnam
Legal Status	Category B Listed Building	**NGR**	NO0325141949
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11093	**HER ref**	MPK14208
Canmore ID			

Description

Circa 1850. Good single-storey and attic mansion house of William Burn Jacobethan type. Single storey and attic, symmetrical W front 2-window and centre gable with canted bay, other fronts asymmetrical, open entrance porch on S later conservatory at SW gable. Local rubble with red sandstone dressings, gables and gablets curvilinear, lying panes, slated roof, octagonal shafted chimneys. Porch unfortunately harshly retooled consequent upon severe weathering. MacLean Dunkeld, Its Straths and Glens (1865). The first of the large villas at Birnam, built for P Wallace of Perth, probably to designs by Andrew Heiton who had been with Burn. In 1865 it belonged to Archibald Burns of Perth. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features of this Jacobethan style mansion including symmetrical west front and centre gable, open entrance porch, conservatory built in local rubble with red sandstone dressings, which contribute to its architectural interest;
- its secluded private ground, relationship with service buildings and location on Torr Hill in an area which was further developed after the arrival of the Perth and Dunkeld Railway. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	66	**Name**	The Hermitage, Quarry (site of)
Legal Status	None	**NGR**	NO0089941982
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Quarry	**Period**	19th Century
NMR ref	None	**HER ref**	MPK18316
Canmore ID			

Description

A quarry is marked on the 1st edition of the OS map. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the physical remains which make a very limited contribution to our understanding of 19th century minerals industry. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	67	**Name**	Birnam, Dove Cottage Cottage
Legal Status	None	**NGR**	NO0307242008
Value (sensitivity)	Low	**Condition**	Good
Type	Cottage	**Period**	Modern
NMR ref	None	**HER ref**	MPK14997
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features which contribute to its limited architectural interest.

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	68	**Name**	Birnam, Burnside House
Legal Status	None	**NGR**	NO0303042020
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	Modern
NMR ref	None	**HER ref**	MPK10871
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features which contribute to its limited architectural interest.

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	69	**Name**	Oransay, Oak Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0317342056
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11090	**HER ref**	MPK12994
Canmore ID			

Description

Late Victorian villa. 2-storey snecked rubble. 2-window (1 tripartite) and 4-window bow, consoled tripartite doorpiece, slated roof with bracketted eaves. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features including snecked rubble and tripartite doorpiece which evidence popular architectural design of the period and local or regional building traditions through the use if local materials which contribution to the architectural interest;
- its secluded private grounds and relationship to other houses of a similar period on Oak Road. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	70	**Name**	Inver Bridge Over River Braan
Legal Status	Category B Listed Building	**NGR**	NO0178542067
Value (sensitivity)	High	**Condition**	Good
Type	Road Bridge	**Period**	18th Century
NMR ref	11136	**HER ref**	MPK2474
Canmore ID			

Description

2 large segmental arches with heavy cut-waters, wide approaches. Rubble, 18th cent. [1]

(Location cited as NO 018 421). Bridge, Inver, c. 1740, mason Thomas Clark, Dunkeld. A 2-span rubble bridge, with segmental arches and triangular cutwater. J R Hume 1977. Inver Bridge (River Braan).O.N.B. Microfilm, (Perthshire Book 50) p.18. (1859-1864). [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including segmental arches with cut-waters of rubble stone which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- relationship with the River Braan which it crosses and the road to Inver which it carries. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	71	**Name**	Inver Railway Viaduct Over River Braan
Legal Status	Category B Listed Building	**NGR**	NO0129142104
Value (sensitivity)	High	**Condition**	Good
Type	Viaduct	**Period**	19th Century
NMR ref	11137	**HER ref**	MPK6866
Canmore ID			

Description

Large single segmental arch, flanked by crenellated refuges. Large masonry approaches pierced for footpaths, octagonal flanking features. Joseph Mitchell, C.E., 1861-3. [1]

For adjacent tunnel, see NO04SW 60

This bridge was designed by Joseph Mitchell to carry the Inverness and Perth Junction Railway. across the River Braan and opened on 9 September 1863; it remains in use.

M Smith 1994. Inver Railway Viaduct. Engineer: Joseph Mitchell 1861-1862.

Plans: Copy of plan in Blair Castle Charter Room. Joseph Mitchell 1861-1862. - 1 photograph plan and elevation. Inventory to plans in Blair Castle Charter Room. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features including crenellated refuges, large masonry approaches and octagonal flanking features designed to compliment The Hermitage (HLT 20) desinged landscape, which contribution to the architectural interest;
- § its association with the designer Joseph Mitchell the leading engineer for the Highland Railway;
- § the relationship with the Highland Main Line railway and other elements of railway infrastructure including the bridge over Hermitage Road and associated tunnel entrance (Asset 75); and
- § its rarity as a specially designed railway viaduct dating from the mid-19th century. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	72	**Name**	Tayview, Oak Road, Birnam
Legal Status	Category C Listed Building	**NGR**	NO0319542117
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11092	**HER ref**	MPK13556
Canmore ID			

Description

Mid-Victorian villa. 2-storey and basement, bay window, single window and bipartite, large gable, small gable. Red snecked rubble, buff ashlar dressings, slated roof. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features of red snecked rubble and buff ashlar dressings which evidence popular architectural design of the period which contribution to the architectural interest;
- § its secluded private grounds and relationship to other houses of a similar period on Oak Road which contributes to our understanding and appreciation of it as part of the late-Victorian expansion of Birnam. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	73	**Name**	Inver Mill Farm, Farmstead and Watermill
Legal Status	None	**NGR**	NO0162942120
Value (sensitivity)	Low	**Condition**	Poor
Type	Watermill, Farmstead	**Period**	19th Century
NMR ref	None	**HER ref**	MPK6862
Canmore ID			

Description

Mill, Inver, early 19th century. An irregular group of 1- and 2-storey rubble buildings, now gutted. The waterwheel, now removed, had a timber launder. On the opposite bank is a former sawmill, also with a timber launder. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving architectural detail and features which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- its location within Inver. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	74	**Name**	Birnam, Park Cottage
Legal Status	None	**NGR**	NO0272042130
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	Modern
NMR ref	None	**HER ref**	MPK10874
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest; and
- its roadside location at the junction of Perth Road at the base of the knoll. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	75	**Name**	Railway Bridge Over Hermitage Road, With Tunnel Entrance Above
Legal Status	Category C Listed Building	**NGR**	NO0124042136
Value (sensitivity)	High	**Condition**	
Type	Railway Bridge, Tunnel Entrace	**Period**	19th Century
NMR ref	11138	**HER ref**	MPK12693
Canmore ID			

Description

Single arch, gablet features above. Rough ashlar. Curved tunnel mouth above. Joseph Mitchell, C.E., 1861-3. B group Of particular Value (sensitivity) in the approach to the Hermitage area. In his paper to the British Association 1867 Mitchell records the care that was taken to avoid injury to the scenery. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including gablet features and curved tunnel mouth in rough ashlar stone designed to compliment The Hermitage (HLT 20) desinged landscape, which contribution to the architectural interest;
- its association with the designer Joseph Mitchell the leading engineer for the Highland Railway;
- the relationship with the Highland Main Line railway and other elements of railway infrastructure including the Inver Railway Viaduct Over River Braan (Asset 71); and
- its rarity as a specially designed railway viaduct dating from the mid-19th century. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	76	**Name**	Tigh-Fhada, Inver, Dunkeld
Legal Status	Category C Listed Building	**NGR**	NO0168242147
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	Modern
NMR ref	11135	**HER ref**	MPK12917
Canmore ID			

Description

Identical with above but now converted to single house. [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 77, 78, 79, 80, 86, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including the large central porch, mullioned windows and sqaured rubble stone which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- the relationship with other buildings of a similar period and its location within the settlement of Inver. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	77	**Name**	Todd's Cottage 3 Inver Square and Beechwood House 3A Inver Square
Legal Status	Category C Listed Building	**NGR**	NO0166642157
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11134	**HER ref**	MPK12919, MPK12941
Canmore ID			

Description

Single-storey rubble with margins, low broad-eaved piend roof, centre porch with broad recess containing 2 dooways. Early 19th cent. [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 78, 79, 80, 86, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features including broad-eaved piend roof and centre porch and rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- § the relationship with other buildings of a similar period and its location within the settlement of Inver. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	78	**Name**	Inver, Telephone Kiosk
Legal Status	Category B Listed Building	**NGR**	NO0165442186
Value (sensitivity)	High	**Condition**	Good
Type	Telephone Box	**Period**	20th Century
NMR ref	11103	**HER ref**	MPK13593
Canmore ID			

Description

Standard K6 Telephone Kiosk. Designed by Sir Giles Gilbert Scott, 1935. [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 79, 80, 86, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § the architectural detail and features of the K6 design which contribution to its architectural interest;
- § its location within the settlement of Inver. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	79	**Name**	1 and 2 Ladeside Cottages, Inver
Legal Status	Category C Listed Building	**NGR**	NO0168242188
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	11132	**HER ref**	MPK12909, MPK12910
Canmore ID			

Description

Circa 1830. Pair of 2-window and centre door cottages. Rubble with margins. Piend roof. 2-over 2-pane timber sash and case windows to No 1 and non-traditional windows to No 2. [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 78, 80, 86, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features including rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- § the relationship with other buildings of a similar period and its location within the settlement of Inver. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018

[4] Jacobs assessment undertaken 2021

Asset Number	80	**Name**	Inver Square, former Inn
Legal Status	Category B Listed Building	**NGR**	NO0163442196
Value (sensitivity)	High	**Condition**	Good
Type	Inn, House	**Period**	18th Century
NMR ref	11133	**HER ref**	MPK11515, MPK10088
Canmore ID			

Description

3 blocks of 2 storeys grouped round court, harled with margins, N. block 5-window and centre door, W. & E. 3 & 4 windows respectively. 18th cent. Former inn associated with Inver Ferry over R. Tay burnt out. Alterations in progress. Roof etc. completely gutted. [1]

The inn at Inver was a popular spot, as travellers would converge on it from Edinburgh and Stirling to cross the ferry, and Niel Gow used to play for guests here at the close of the eighteenth century. Inventory to plans in Blair Castle Charter room. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 78, 79, 86, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § the architectural detail and features including rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- § the relationship with other buildings of a similar period and its location within the settlement of Inver;
- § the buildings contribution to our understanding of the social and economic history of Inver and the wider region as former inn related to the ferry crossing at Inver. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	82	**Name**	Inver, Findspot
Legal Status	None	**NGR**	NO0160042200
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK2460
Canmore ID			

Description

A 9" long stone pestle used for crushing dyes at Inver (NO 016 422) was donated to Perth Museum in May 1920 by C McIntosh (Accession no: 101). [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	83	**Name**	Birnam, Findspot
Legal Status	None	**NGR**	NO0320442202
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	medieval
NMR ref	None	**HER ref**	MPK16748
Canmore ID			

Description

Medieval buckle NO 03 42 Metal detecting by David Cormac in Birnam recovered a zoomorphic copper-alloy buckle, probably 13th-century; 24.9 x 23.2mm. It takes the form of a feline-looking creature (?probably a lion) cast in the round so that the head (with mouth agape, ears flattened and lentoid eyes) and the body (with tightly curled tail arching from the back) form the 'outer' long side of the buckle frame and the creature's two pairs of legs form the short sides. A plain narrow bar links the two pairs of feet and forms the 'inner' long side of the frame. This would have supported the tongue or buckle pin and the buckle plate, which would have formed the attachment to the end of a leather strap. The distinctive form of this buckle is not a commonly found one. Three comparable buckles are known to this writer, of 13th-or 14th century date. These forms of buckle appear to be a development from stylistically variable Romanesque/late Anglo-Saxon forms and demonstrate a persistent interest in such zoomorphic decoration and the symbolic Value (sensitivity) of felines. The attribution to Birnam is sufficient to show that it was probably lost on the S bank of the Tay, opposite Dunkeld, possibly during embarking or disembarking from one of several ferries that plied the Dunkeld stretch of the river.

Claimed as Treasure Trove (TT.80/04) and allocated to Perth Museum & Art Gallery. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	84	**Name**	Royal School Of Dunkeld/Little Dunkeld School
Legal Status	None	**NGR**	NO0279042210
Value (sensitivity)	Low	**Condition**	Good
Type	School	**Period**	Modern
NMR ref	None	**HER ref**	MPK11665
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features;

§ its relationship with the settlements of Little Dunkeld, Birnam and Dunkeld which it serves;

§ the school's contribution to our understanding of the social history of Little Dunkeld, Birnam and Dunkeld as a 1930s state school still in use today. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	85	**Name**	Torrvald, Farmstead 700m SW of Dunkeld House
Legal Status	Scheduled Monument	**NGR**	NO0051942212
Value (sensitivity)	High	**Condition**	Unknown
Type	Farmstead	**Period**	medieval
NMR ref	None	**HER ref**	MPK13484
Canmore ID			

Description

The monument comprises the remains of a farmstead of medieval or later date, situated in mature forestry at about 110m OD.

The farmstead comprises two main ranges of buildings at right angles to each other. The settlement is first mentioned in documents in 1566 and was deserted and in ruins by 1815.

The area proposed for scheduling is triangular and measures a maximum of 60m from its northwesternmost point to its southeasternmost and 50m transversely, to include the visible remains of the farmstead and other features associated with its construction and use which are likely to survive in the vicinity, as marked in red on the attached map.

The monument is of national importance as a well-preserved deserted farmstead, the importance of which is considerably increased by its well-documented history. It has considerable potential to enhance our understanding of agriculture and settlement in the late medieval and early modern period. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its physical remains;

§ the rarity of the surviving late medieval and early modern physical remains with supporting documentary evidence; and

§ potential to significantly enhance our understanding of agriculture and settlement which relate to a number of national research themes. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	86	**Name**	Belvedere Cottage, Inver
Legal Status	Category C Listed Building	**NGR**	NO0163942223
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	Modern
NMR ref	11131	**HER ref**	MPK11623
Canmore ID			

Description

Single-storey rubble, timber porch. [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 78, 79, 80, 88 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including the timber porch and rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- the relationship with other buildings of a similar period and its location within the settlement of Inver. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018

[4] Jacobs assessment undertaken 2021

Asset Number	87	**Name**	Lagbeag, Little Dunkeld
Legal Status	Category C Listed Building	**NGR**	NO0261842230
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	11161	**HER ref**	MPK13000
Canmore ID			

Description

2-storey 3-window, rubble, quoined, wide eaves; perhaps 18th 2-storey 3-window with low 1st floor, harled with margins. 18th cent. L-plan addition 20th cent., remodelled c. 1840. [1]

No additional information. [2]

A review of Aerial Photography (2017), Google Maps (image capture: Sep 2015, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668.) shows that this cultural heritage resource's setting comprises its location at the southern end of Little Dunkeld, surrounded by contemporary housing. While this cultural heritage resource's Value (sensitivity) is largely derived from its surviving architectural features, its setting within Little Dunkeld contributes to our understanding of it as a modest 18th century house. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features from the 18th and 19th century which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- the relationship with other buildings of a similar period and its location within the settlement of Little Dunkeld. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018

[4] Jacobs assessment undertaken 2021

Asset Number	88	**Name**	Niel Gow's Cottage, Inver
Legal Status	Category B Listed Building	**NGR**	NO0159342243
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	18th Century
NMR ref	11163	**HER ref**	MPK11514
Canmore ID			

Description

Single-storey rubble, altered: bronze portrait plaque residence here of Niel Gow (1727-1807) Nathaniel Gow (1766-1831) and Niel Gow, Jun. (1795-1823). [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 78, 79, 80, 86 and 91). Traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ the architectural detail and features including rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;

§ the relationship with other buildings of a similar period and its location within the settlement of Inver;

§ the buildings historical associations with the musician and composer Niel Gow. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs setting assessment undertaken 2018
[4] Jacobs assessment undertaken 2021

Asset Number	89	**Name**	Hermitage Tunnel, The Hermitage
Legal Status	None	**NGR**	NO0106042247
Value (sensitivity)	Low	**Condition**	Good
Type	Railway Tunnel	**Period**	19th Century
NMR ref	None	**HER ref**	MPK7051
Canmore ID			

Description

NO04SW 60 0095 4230 to 0123 4214

For adjacent bridge.

Highland Railway: Perth - Inverness main line. (Undated) information in NMRS. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ any architectural detail and features related to its construction and function;

§ its association with the designer Joseph Mitchell the leading engineer for the Highland Railway; and

§ the relationship with the Highland Main Line railway and other elements of railway infrastructure including Railway Bridge Over Hermitage Road, With Tunnel Entrance Above (Asset 75). [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	90	**Name**	Little Dunkeld, Churchyard
Legal Status	Category C Listed Building	**NGR**	NO0285942249
Value (sensitivity)	High	**Condition**	Good
Type	Churchyard	**Period**	18th Century
NMR ref	11158	**HER ref**	MPK2463
Canmore ID			

Description

The graveyard is a rectangular enclosure, with a front wall and gate. There are some 18th and early 19th century monuments of interest notably 2 'Adam and Eve' stones of 1744 and 1762. [1] [1]

For bronze hand-bell from Little Dunkeld Church, see NO04SW 30.

(NO 028 422. Two 'Adam and Eve' tombstones of 1744 and 1762, in Little Dunkeld churchyard)

HBD No.2

NMRS REFERENCE:

Little Dunkeld (Parish) Church.

Plans: Copy of plan in Blair Castle Charter Room. - 1 photograph plan of sittings.

EXTERNAL REFERENCE:

SCOTTISH RECORD OFFICE.

Repair of the Church and Manse.

Payment by Sir George Stewart of Grandtully of #177.8.6.

Factor's Account (William MacKewan).

1757. GD 121/Box 51/298.

The ruinous condition of the Church and the need to rebuild.

Report by masons and wrights followed by the decision of the Presbytery to ask the Heritors to obtain a plan and estimates for a new Church.

Copies of Presbytery Minutes.

1796. GD 121/Box 66/407.

Parish Church of Little Dunkeld. Mason's receipts.

1772. GD 38/1/1234. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including the enclosure wall and 18th and early 19th century monuments which contribution to the architectural interest; and
- its relationship Little Dunkeld, Parish Church (Asset 94) and the settlement of Little Dunkeld.

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	91	**Name**	Craigview Cottages, Inver
Legal Status	Category C Listed Building	**NGR**	NO0165642251
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11164	**HER ref**	MPK12916
Canmore ID			

Description

Pair of cottages, single storey rubble, dormerless attics. Plaque records residence here of Charles Mackintosh, the Perthshire Naturalist (1839-1922). [1]

No additional information. [2]

A review of Aerial Photography (2017) Google Maps (image capture: Sep 2016, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668) shows that this cultural heritage resource's setting comprises its location within the village of Inver and its relationship with the other listed buildings that make up the historic core of the village (Assets 76, 77, 78, 79, 80 and 86). While views are limited there is intervisibility with the existing A9, and traffic noise from the existing A9 and village roads contributes to the sound environment of this cultural heritage resource. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- architectural detail and features including rubble stone construction which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest;
- the relationship with other buildings of a similar period and its location within the settlement of Inver; and
- the buildings historical associations with Perthshire naturalist Charles Mackintosh. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018

[4] Jacobs assessment undertaken 2021

Asset Number	92	**Name**	Little Dunkeld Church, Findspot
Legal Status	None	**NGR**	NO0286042270
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK5447
Canmore ID			

Description

This bell is of cast bronze and measures 8 1/2" (216mm) in height, including the handle which rises 1 1/2" (38mm) above the body. It measures 7 1/4" by 6 1/8" (184 by 155mm) across the squared mouth, and the handle, which rises almost straight up from the two narrow sides of the bell, exhibits a casting flaw which has been repaired by a subsequent pouring of the metal.

The original provenance of the bell is not recorded, but it was held in Little Dunkeld Parish Church (NO04SW 26) by 1866, at which date 'considerable repairs' were made (2). [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	94	**Name**	Little Dunkeld, Parish Church
Legal Status	Category B Listed Building	**NGR**	NO0286142275
Value (sensitivity)	High	**Condition**	Good
Type	Church	**Period**	18th Century
NMR ref	11157	**HER ref**	MPK15016
Canmore ID			

Description

Large rectangular, harled with margins, bell-cote and angle urns; 4 round-headed windows and 2 blocked doorways on S. flank. Dated '17' '98' at skews. Horseshoe gallery. Fine original pulpit with sounding board surmounted by gilt dove. John Stewart of Dunkeld, architect and contractor. [1]

NMRS REFERENCE: Little Dunkeld (Parish) Church. Plans: Copy of plan in Blair Castle Charter Room. - 1 photograph plan of sittings. EXTERNAL REFERENCE:SCOTTISH RECORD OFFICE. Repair of the Church and Manse. Payment by Sir George Stewart of Grandtully of #177.8.6. Factor's Account (William MacKewan). 1757.

GD 121/Box 51/298. The ruinous condition of the Church and the need to rebuild. Report by masons and wrights followed by the decision of the Presbytery to ask the Heritors to obtain a plan and estimates for a new Church. Copies of Presbytery Minutes. 1796.

GD 121/Box 66/407. Parish Church of Little Dunkeld. Mason's receipts. 1772.

GD 38/1/1234. NMRS ENTRY: 27/01/2005 NO04SW 26.00 02861 42275 For bronze hand-bell from Little Dunkeld Church, see NO04SW 30. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ architectural detail and features including bell-cote and angle urns, round-headed windows, horseshoe gallery and pulpit which contribution to the architectural interest;

§ its relationship with Little Dunkeld, Churchyard (Asset 90) and the settlement of Little Dunkeld which it serves as a place of worship;

§ the churches contribution to our understanding of the social history of Little Dunkeld; and

§ rarity of 18th century buildings of this type. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	95	**Name**	Nursery Cottage, Little Dunkeld
Legal Status	Category C Listed Building	**NGR**	NO0269042276
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	11160	**HER ref**	MPK14211
Canmore ID			

Description

Single-storey and attic rubble with broad-eaved piend roof. Rubble rectangle with bell-cote, segment-headed leaded windows with central mullion, pedimented porch. Simple centre dormers in end walls, porch and gothic windows. (early 19th cent.) interior no gallery, arched ceiling with iron tie-rods and central hangers. Original platform pulpit with couch and velvet arched back. 1854. Vestry added 1969. [1]

No additional information. [2]

A review of Aerial Photography (2017), Google Maps (image capture: Sep 2015, © 2018 Google) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668.) shows that this cultural heritage resource'ssetting comprises its location on the main road (A923) through Little Dunkeld and the mixture of 19th century and later houses surrounding it. Its principle views over the A923. Traffic movement and noise forms part of this cultural heritage resource's setting. While its urban location contributes to our understanding of it a well preserved roadside cottage, its Value (sensitivity) is largely derived from its unusual design and surviving architectural features. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ architectural detail and features with a hint of Gothic style including porch and gothic windows of rubble stone which evidence local or regional building traditions through the use if local materials which contribution to the architectural interest; and

§ the relationship with other buildings of a similar period and its location within the settlement of Little Dunkeld. [4]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018

[4] Jacobs assessment undertaken 2021

Asset Number	96	**Name**	Manse, Little Dunkeld
Legal Status	Category C Listed Building	**NGR**	NO0255942284
Value (sensitivity)	High	**Condition**	Good
Type	Manse	**Period**	19th Century
NMR ref	11162	**HER ref**	MPK11646
Canmore ID			

Description

1 and 2-storey rubble with circular horsemill. 2-storey 3-window, rubble, low broad-eaved piend roof, centre R-doric pilaster doorpiece with pediment and flanking bay windows. Archibald Elliot, archt., 1819-24. [1]

Little Dunkeld Manse.

Architect: Archibald Elliot, 1819-1824.

1 and 2-storey rubble with circular horsemill. 2-storey 3-window, rubble, low broad-eaved piend roof, centre R-doric pilaster doorpiece with pediment and flanking bay windows. Archibald Elliot, archt., 1819-24.

REF: N.S.A. v. x p.1013 Heritors' Records

Scottish Record Office.

Building a New Manse.

Memo from William McAra. He estimates the cost to be #635.

Reciepts for Sir George Stewart of Grandtully's proportion of the cost.

1819-1820. GD 121/Box 64/391 and 392.

Building the Manse.

Payment of Sir John Stewart's proportion of the cost.

Factor's Accounts. (Charles McGlashan).

1771-1772. GD 121/Box 82/311 and 312.

Additional work at the New Manse.

John Stewart has claimed an extra #179.9.3.

Comment on the justice of this claim by Angus and Notman.

(1821?) GD 121/Box 65/405.

Building of a New Schoolhouse.

Letter from William McAra. He requests payment of Sir George Stewart's proportion of the cost.

Account for #125.17.2.

1822. GD 121/Box 65/396. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features including the centre Roman-doric pilaster doorpiece with pediment and bay windows which contribution to the architectural interest; and
- § its enclosed private garden, the relationship with other buildings of a similar period and its location within the settlement of Little Dunkeld. [4]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	97	**Name**	Little Dunkeld/Dunkeld Bridge, Findspot
Legal Status	None	**NGR**	NO0259942300
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK2461
Canmore ID			

Description

A stone mould, 2" in diameter, dug up in making a new plot on the South side of the Dunkeld Bridge, was donated to Perth Museum by Mr. Crombie, Dunkeld. It is thought to have been used for making metal boss-heads and spikes similar to that found in many 15th century and 16th century Scottish targes. New Accession no.119. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	98	**Name**	Dunkeld Bridge, Tollhouse
Legal Status	Category B Listed Building	**NGR**	NO0268842349
Value (sensitivity)	High	**Condition**	Good
Type	Tollhouse	**Period**	19th Century
NMR ref	11159	**HER ref**	MPK6863
Canmore ID			

Description

Single-storey, ashlar. Asymmetrical gable and semi-circular bay window. Diamond-paned glass. Presumably c.1808 by T. Telford. Bridge repaired approx 10 yrs. [1]

(Location cited as NO 027 424). (Bridge) built 1805-9 by engineer Thomas Telford. The tollhouse is a single-storey ashlar building with a semihexagonal projecting bay and Tudor windows; the windows have diamond panes. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- § architectural detail and features including asymmetrical gable, semihexagonal projecting bay in ashlar, which contribution to the architectural interest;
- § its roadside location and historical relationship Dunkeld Bridge (Asset 100);
- § possible historical associations with the nationally important engineer Thomas Telford; and
- § the rarity of this building type. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	99	**Name**	Inver Ferry/River Tay Ferry Crossing
Legal Status	None	**NGR**	NO0154242442
Value (sensitivity)	Low	**Condition**	Unknown
Type	Ferry Crossing	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK6535
Canmore ID			

Description

Until the building of Telford's bridge at Dunkeld in 1808 there was a ferry from Inver to the opposite bank. On both banks the remains of the former jetties are visible. The road from the south terminated at the inn at Inver. (It was here that Robert Burns and Niel Gow met.). [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains associated with the ferry crossing; and
- its functional relationship with the River Tay.

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	100	**Name**	Dunkeld Bridge Over River Tay
Legal Status	Category A Listed Building	**NGR**	NO0267542453
Value (sensitivity)	High	**Condition**	Good
Type	Bridge	**Period**	19th Century
NMR ref	5620	**HER ref**	MPK2468
Canmore ID			

Description

685' long, 7 segmental arches, centre of 90 span, 2 of 84, 2 of 74 and 2 land arches of 90. Ashlar, dated 1809. T. Telford, eng. 1805-09. [1]

Built 1806-8, Thomas Telford, engineer.

L T C Rolt 1958.

Dunkeld Bridge, built 1805-9 by engineer Thomas Telford. A superbly situated 7-span rubble bridge, 685 ft (209m) long, with segmental arches.

J R Hume 1977.

This bridge carries the A 923 public road across the River Tay, and forms a continuation of Bridge Street, Dunkeld. The river here forms the boundary between the parishes of Little Dunkeld and Dunkeld and Dowally.

Information from RCAHMS (RJCM), 8 October 1996.

NMRS REFERENCE:

Earlier Bridge by Alexander Mylne, 1510.

Architect: Thomas Telford, 1810.

John Simpson - Built by John Simpson (1755-1815) under Thomas Telford's direction between 1806-1808.

EXTERNAL REFERENCE:

SCOTISH RECORD OFFICE:-

Building a bridge over the River Tay.

Memorial by noblemen and gentlemen of the County of Peth for assistance from the forfeited estates fund for building a bridge over the Tay at Dunkeld, 1784.

GD 51/5/549/2.

Bridge across the River Tay at Dunkeld.

Letters (2) from the Duke of Atholl to Sir George Steuart. The concern suitable stone and quarries, 1803 and 1804.

GD 121/Box/103/vol xxvii/192 and 213.

NMRS REFERENCE:

Print Room

W Schomberg Scott Photograph Collection, Acc no 1997/39.

2 prints of Cathedral Street from behind the Cathedrgate. [2]

The north and south banks of the River Tay are lined by attractive woodlands and tree belts, enhancing the views into and out of the conservation area and making a significant contribution to the setting of Dunkeld Bridge. Its wider setting comprises the natural amphitheatre of woodlands and forested hills that surround Dunkeld. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its high level of authenticity and completeness of design evidenced by its surviving architectural detail and features including the seven segmental ashlar arches;
- the River Tay which it crosses;
- its association with the nationally important civil engineer Thomas Telford;
- its contribution to our understanding of the social and economic history of Dunkeld and the wider region resulting from the construction of the bridge; and
- the rarity of this building type.

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Perth & Kinross Council Dunkeld Conservation Area Appraisal 2011

[4] Jacobs assessment undertaken 2021

Asset Number	101	**Name**	Coupar Angus To Amulree Military Road (site of)
Legal Status	None	**NGR**	NO0223642473
Value (sensitivity)	Low	**Condition**	Unknown
Type	Military Road	**Period**	18th Century
NMR ref	None	**HER ref**	MPK6534
Canmore ID			

Description

The military road, in the form of a rough track, descends to the A984 on the bend opposite Newtyle farm. At NO 037 422 it branches off to the N again in the shape of a narrow, single-track tarmac road. It then descends into Dunkeld, crossing the main street, passing through the square and to the side of the cathedral (NO04SW 1.00) at NO 0237 4259. The road then utilises the ferry (NO04SW 54) to cross the River Tay to Inver at NO 0162 4240. The inn at Inver was a popular spot, as travellers would converge on it from Stirling and Edinburgh to cross the ferry, and Niel Gow used to play for guests here at the close of the eighteenth century. The military road shares the line of the B898 for approximately half a mile, before branching off to the S. It traverses the Craig Bhinean forest along a forest track which is now well-defined (1).

NO 0499 4099 to NO 0271 4265 on line of present road.

NO 0157 4243 to NO 0160 4234 poorly preserved cutting shown on rough river terrace. Maximum width 3.5m. Revetted on downward side to NE.

NO 0160 4234 to NO 0156 4231 overlaid by private access road.

NO 0156 4231 to NO 0155 4230 overlaid by private garden.

NO 0155 4230 to NO 0154 4230 poorly preserved grass trackway 3.5m wide. Flanked by walls on N and S sides.

NO 0154 4230 to NO 0146 4231 ill-preserved and partly tree-planted trackway 3.5m wide. Flanked by retaining wall on N side.

NO 0146 4231 to NO 0114 4230 probable line of military road. No trace surviving.

NO 0114 4230 to NO 0009 4168 on line of forestry road.

NO 0008 4167 to NO 0004 4162 grass-overgrown trackway 3.5m wide. Flanked on NW by part wall, part fence. Flanked on S by plantation wall.

NO 0004 4162 partially collapsed military culvert 3.5m wide (NN04SW 53.01). Now supports modern footbridge.

NO 0003 4161 to NO 0000 4158 grass-overgrown trackway 3.5m wide.

Visited by OS March and April 1975.

No trace of military road. Modern road probably on line.

Visited by OS (JM) 15 April 1975.

There is a puzzling discrepancy between the report of the OS (JM), dated 15 April 1975, in which no trace of the military road is found, and the detailed observations on the field sheet, dated March and April 1975.

Information from RCAHMS (MW) 24 November 1999.a

Part of Wade's military road between Coupar Angus, Dunkeld and Amulree. This section of the road runs from NO 0499 4099 to NO 0000 4158. Taylor suggests the military road, in the form of a rough track, descends to the A984 on the bend opposite Newtyle farm. The OS suggest that the line of the military road is that of the modern road curving around Newtyle. At NO 037 422 it branches off to the N again in the shape of a narrow, single-track tarmac road. It then descends into Dunkeld, crossing the main street, passing through the square and to the side of the cathedral at NO 0237 4259. The road then utilises the ferry to cross the River Tay to Inver at NO 0162 4240. The military road shares the line of the B898 for approximately half a mile, before branching off to the S. It traverses the Craig Bhinean forest along a forest track which is now well-defined. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ any surviving physical remains of the road;

§ potential to contribute to our understanding of local variations in construction techniques and materials employed by Caulfield; and

§ historical associations and potential to contribute to national research themes relating to military roads. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	102	**Name**	Dunkeld Cathedral, Findspot
Legal Status	None	**NGR**	NO0180042500
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	medieval
NMR ref	None	**HER ref**	MPK18202
Canmore ID			

Description

An assemblage of 158 metal artefacts was recovered through the use of a metal detector. The field in which they were found is adjacent to Dunkeld Cathedral, and the material comprises spindle whorls, buckles, fragments of copper-alloy vessels, buttons, coins and lead shot. The date range of the material spans the medieval to modern periods.

DES 2001, vol 2, pp. 76. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	103	**Name**	Dunkeld Conservation Area
Legal Status	Conservation Area	**NGR**	NO0255542518
Value (sensitivity)	Medium	**Condition**	Good
Type	Conservation Area	**Period**	19th Century
NMR ref	CA587	**HER ref**	None
Canmore ID			

Description

http://www.pkc.gov.uk/dunkeldconservationarea [1]

Sources

[1] Perth and Kinross Historic Environment Record

Asset Number	104	**Name**	Dunkeld, Windmill (site of)
Legal Status	None	**NGR**	NO0211042520
Value (sensitivity)	Low	**Condition**	Unknown
Type	Windmill	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK5446
Canmore ID			

Description

Some 300 yds W of the cathedral, the site of a windmill illustrated in 'Theatrum Scotiae'. It appears to have been a tower mill with four sails of the type common at this time (2,3).

Slezer depicts a tower windmill at Dunkeld, although it is unclear from the perspective whether the mill stood on Bishop's Hill as is suggested by McLaren or on a spur 250m W of Dunkeld Cathedral (NO04SW 1.00). Within woodland on the tip of the latter feature, a spread of unmortared stones up to 9m in diameter possibly indicates its site. On the S the spur is cut by a hollowed trackway.

Visited by RCAHMS (IMS) 5 April 1989. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains;
- potential to contribute to our understanding of this monument type and local. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	105	**Name**	Dunkeld, Bridge (site of)
Legal Status	None	**NGR**	NO0266042525
Value (sensitivity)	Low	**Condition**	Unknown
Type	Bridge	**Period**	Medieval
NMR ref	None	**HER ref**	MPK2478
Canmore ID			

Description

A bridge is said to have been built over the River Tay at Dunkeld in 1469. No trace of it remains. The foundations of a second bridge was laid in 1513 by Bishop Brown, 'near to his own palace', and it was continued and competed by Bishop Gavin Douglas. Part of the arch that sprung from the N bank is still entire, and when the river is low the piles on which the second and third arches were supported, were visible in the early 19th Century. It is not known when this bridge was destroyed(1,2,3). [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	106	**Name**	Dunkeld Findspot (1)
Legal Status	None	**NGR**	NO0263442529
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Medieval
NMR ref	None	**HER ref**	MPK2479
Canmore ID			

Description

A bronze ring-headed pin of the common Viking form, from Dunkeld, is now in the National Museum of Antiquities of Scotland (NMAS Accession no. FC.235). It is about 9 cm. long, the diameter of the ring being 2 cm (1,3). [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	107	**Name**	Bishop's Hill Tower House (site of)
Legal Status	None	**NGR**	NO0225242534
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Tower House, House	**Period**	Medieval
NMR ref	None	**HER ref**	MPK2453
Canmore ID			

Description

The Bishop's Palace originally consisted of several long thatched houses of two storeys. For greater security a castle was erected close to it in 1408, which comprised a great hall, vaulted granaries, etc. In 1508, a wing was added to the palace and, adjoining to it, a private chapel. Nothing now remains.

New Statistical Account (NSA) 1842

The grounds of the Cathedral have been landscaped, and except for a terrace locally believed to have housed a building at NO 0244 4254, and another slight scarp at NO 0233 4253, representing the E and S parts of a large levelled area, there is nothing to indicate the site of the Bishop's Palace nor of the other buildings noted in the NSA.

There are no visible remains of the Bishop's Palace which is on record in the early 15th century; described as 'a rambling structure in the highland fashion', it is said to have stood to the SW of the Cathedral. Slezer, however, depicts a tower to the W of the Cathedral, probably that built by Bishop Robert de Cardeny (1398-1436) who is also credited with having built 'a hall with larder and granaries underneath'; these may have been within the tower, or could have been separate. Bishop George Brown (1483-1514) added a wing on the W and an oratory.

The summit of Bishop's Hill is trapezoidal, 40m SW/NE by 27m at its widest, but this has been reduced by terraced tracks below the summit. A slightly sunken track, which crosses the summit SW/NE, is blocked by mature trees. This dissects several rectangular foundations at the SW end, the main one 17 x 6m, the second at 5m parallel is also 6m broad. The NE edge is an artificial scarp which the track crosses on a later causeway. Off-centre within the summit is a low oval mound 12 x 6m. In 1595 and 1616 there are references to 'lie muthill' here (RCAHMS accession 2008/47 and manuscript MS/5169), and it could indicate the castle erected near the Bishop's Place in 1408 (New Statistical Account). [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	108	**Name**	Dunkeld, Royal School, House
Legal Status	None	**NGR**	NO0248442554
Value (sensitivity)	Low	**Condition**	Good
Type	School, House	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK17995
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ architectural detail and features; and § its location within Dunkeld. [2]
Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	109	**Name**	Dunkeld, Holy Trinity Chapel (site of)
Legal Status	None	**NGR**	NO0256442556
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Chapel	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK2470
Canmore ID			
Description			
There was a chapel of the Holy Trinity in Dunkeld. [1] The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains.			
Sources			
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021			

Asset Number	110	**Name**	Dunkeld House, Terraced Garden
Legal Status	Category C Listed Building	**NGR**	NO0148842559
Value (sensitivity)	High	**Condition**	Good
Type	Terraced Garden	**Period**	18th Century
NMR ref	5608	**HER ref**	MPK12677
Canmore ID			
Description			
A-plan 6-tier terrace on steep embankment. Rubble built, no architectural detail and now neglected. 1754. [1] No additional information. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § its architectural detail and features including the rubble stone retaining walls; § its location within Dunkeld House designed landscape and south-facing position. [3]			
Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021			

Asset Number	111	**Name**	Dunkeld, Gaol (site of)
Legal Status	None	**NGR**	NO0230042575
Value (sensitivity)	Low	**Condition**	Unknown
Type	Gaol	**Period**	18th Century
NMR ref	None	**HER ref**	MPK2452
Canmore ID			

Description

Site of Jail (NR) OS 25" map (1866).

The old prison at Dunkeld was removed c. 1743 when one of the land arches of the bridge was used as a lock-up (1) 1842.

There is nothing visible on the ground nor is there any trace to indicate that a bridge formerly existed here. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains.

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	112	**Name**	Manse, Cathedral Street
Legal Status	Category B Listed Building	**NGR**	NO0249242581
Value (sensitivity)	High	**Condition**	Good
Type	Manse	**Period**	18th Century
NMR ref	5644	**HER ref**	MPK13954
Canmore ID			

Description

2-storey harled with margins: 4-window frontage with twin piends to river; single-storey out-buildings to Cathedral Street. 18th cent. and early 19th cent. and 1887. [1]

2-storey harled with margins: 4-window frontage with twin piends to river; single-storey out-buildings to Cathedral Street. 18th cent. and early 19th cent.

In N.S.A. (v. X p.961) no manse provided. Purchased in 1887 as a manse and reconstructed to designs of J. McIntyre Henry. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features;
- contribution to our understanding of the development of Dunkeld after 1689, relationship with associated service buildings;
- historic association with Dunkeld Cathedral (Asset 116). [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	114	**Name**	Dunkeld, Friary (site of)
Legal Status	None	**NGR**	NO0258842583
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Friary	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK2477
Canmore ID			

Description

Although it has been asserted that there was a house of crutched friars at Dunkeld, no reliable evidence of this alleged foundation has been found. It is highly improbable that this order was represented in Scotland. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains.

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	115	**Name**	Dunkeld, Bridge Street, Pharmacy Shop
Legal Status	Category C Listed Building	**NGR**	NO0265842587
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	19th Century
NMR ref	5621	**HER ref**	MPK13827
Canmore ID			

Description

2-storey painted ashlar, part with attics, bow fronted end at bridge. Early 19th cent., spoiled by recent alteration. Designed by W.M. M'Kenzie 1827 (Plans Blair Castle) and extensively altered later. An ambitious scheme (Plans, Blair) for this area prepared by Robert Reid, but this was abandoned and the present reduced scheme laid out 1809. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including bow fronted end gable;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	116	**Name**	Dunkeld Cathedral
Legal Status	Scheduled Monument; Category A Listed Building	**NGR**	NO0235942588
Value (sensitivity)	High	**Condition**	Good
Type	Cathedral	**Period**	medieval
NMR ref	5631	**HER ref**	MPK2450, MPK2445, MPK2448, MPK2449, MPK5440, MPK61, MPK9150, MPK6196, MPK15459; MPK6886, MPK1871; MPK6512, MPK6887, MPK6512
Canmore ID			

Description

The monument consists of the nave, NW tower and S porch of the medieval cathedral of Dunkeld, together with the parkland immediately around it and an area to the N and W where the chanonry is known to have extended. The choir of the cathedral is excluded.

The parts of the cathedral to be scheduled date from a period of late medieval building campaigns instigated by Bishop Cardeny in 1406. They consist of an aisled nave of seven bays, with a three-storeyed elevation, to which a S porch and NW tower were added by Bishop Lauder before 1483.

Immediately around the cathedral is an area of enclosed parkland, while woodland to the W and parkland and farmland to the N covers the site of the chanonry, although the modern field called St Ninian's Croft also includes the site of Dunkeld House, built by Sir William Bruce for the Marquess of Atholl.

The area to be scheduled includes the nave, S porch and NW tower of the cathedral, but excludes the choir, which acts as the modern parish church. The area to be scheduled also includes the enclosed parkland around the cathedral and part of the woodland to the W plus the E part of St Ninian's Croft to the N, where the chanonry once extended.

The area is iregular on plan, with maximum (diagonal) dimensions of 450m NNE-SSW by 295m NW-SE, as marked in red on the accompanying map.

The monument is of national importance because of its high architectural qualities as one of the most complete Scottish cathedrals, and because of the way in which its construction is documented in written accounts. It has important archaeological potential, not least because of this record which is capable of testing by excavation and analysis, to investigate the completeness of the documentary record. [1]

(NO 0237 4259) Cathedral (NR) (Partly in ruins) Church (NAT) Site of Monastery (NR) Tower (NR) Standing Stone (NR) (Sculptured). OS 25", Perthshire, (1901).

Dunkeld Cathedral, founded before 1337 (D E Easson 1957) on site of the Dark Age See of Alba before removal to St Andrews. (Information from C W Phillips, DA Index)

The choir has been restored and is in use as the parish church. The cathedral possesses several sculptured stones, one which was used as a gatepost at the entrance to the churchyard, and now stands on the S side of the church close to it. Another, which was used as a tombstone of a farmer in 1729, afterwards formed part of the pavement floor of the cathedral. This latter part of a cross-shaft depicts a horse standing on its hind legs. It is illustrated by Stuart (25).

Dunkeld Cathedral is partly under the care of the D o E and is open to the public. The nave is roofless but otherwise in good order, and the choir is now used as the parish church and is in the care of the Church of Scotland. It has no name, being part of the Cathedral, but is locally called the Cathedral Church. The sculptured stone formerly outside the S wall is now preserved inside the choir in the SE corner. Another sculptured stone depicting a horseman, and a hog-backed stone, are in the tower, but there is no trace of the one used as a tombstone in 1729.

Visited by OS (AA) 17 April 1975

Dunkeld has been an ecclesiastical centre since at least 848-9. At that time, Boethius' Scottish Chronicle records that Kenneth MacAlpin 'brought relics of Saint Columba to a church that he built', and, although the name of the church is not given, it is thought to have been at Dunkeld. Apparently, Kenneth intended that Dunkeld should be the primary centre of the church in eastern Scotland, although structural evidence for this early ecclesiastical centre is lacking. Nevertheless, two stones bearing Pictish carvings (NO04SW 1.04 and 1.09) and a large cross-slab (NO04SW 1.03) have been discovered here, and another stone bearing an incised horseman, now at the cathedral, comes from nearby (NO04SW 1.02). Although the ecclesiastical primacy of Dunkeld was subsequently transferred to St Andrews (by 943), some form of church community survived until the revival of the see by Alexander I (1107-24). Work on the present cathedral was not begun until the thirteenth century; the choir was completed in the fourteenth century and work extended to the nave in the fifteenth century. Between 1450 and 1475, the west tower, the south porch and the chapter-house were all added. The see was declared void in 1571 and the roof was removed from the church, but in 1691 the choir was renovated for use as the parish church. Notable monuments within the cathedral include: a coped medieval graveslab (NO04SW 1.05); an effigy of Bishop William Sinclair (14th century); the tomb-chart and effigy believed to be of the Wolf of Badenoch (died 1406) (NO04SW 1.08); and the tomb of Bishop Cardeny (died 1436) (NO04SW 1.09).

Visited by RCAHMS (IMS) 9 February 1990.

Two class I and one class II symbol stones.

Architect: J.G.Lough memorial to Major General Sir Robt. Henry Dick 1847

Sir John Steel memorial to 42nd Black Watch 1871

Dunn & Watson reroofed & refurnished Parish Church 1908

Ternouth, London monument to Lord Charles Murray

urn on plaque in Atholl mausoleum c.1824

pedestrian monument to 4th Duke of Atholl 1834

Patrick Murray monument to Atholl family in mausoleum. Designed by Alexander Edwards 1704. Finished 5.1.1713.

Choir of Cathedral now the Parish Church.

NMRS REFERENCE

Inglis Photograph Collection

'215 Dunkeld Cathedral' print 1930s or 40s Acc No 1994/90

LB DESC: Nave ruined, choir in use as parish church, N.W. tower, no transepts: 260' long. Choir: 4-bay aisleless 103' x 29', 13th cent. altered early 14th cent; interior of parts of N. wall arcaded, sedilia on S. with cingfoil arches. Re-roofed 1600, renovated 1691, repaired 1762: windows retraceried, new pinnacles and parapet, 1814-18, Archibald Elliot, archt. Re-roofed, re-furnished etc., Dunn & Watson, archts., 1908. Nave 7 bays with aisles, 122' long, 1406-64, S. aisle formerly vaulted. Circular piers, traceried semi-circular triforium openings: clerestory. N.W. tower and alterations to W. front c.1469-80: tower 3-stage, 24' square, 96' high, rib-vaulted ground floor with bell opening and mural paintings. Pitched roof replaced by flat 1815. Chapter house: 2-storey on N. side of choir, c.1450-75. Ground floor vaulted in 2 compartments. Monuments etc: Choir-Celtic cross slab with sculptured figures; red sandstone cross slab with hollow rounded angles; effigy of Bishop Sinclair + 1527; effigy of Wolf of Badenoch (?) + 1394; 42nd Highlanders, Steell 1872: Chapter House - 2 Atholl Monuments 17th cent., 4th Duke, marble, 1833, etc.: Nave - Bishop Cardeny + 1420, effigy in segmentally arched recess; Arntully slab, c.1600: Tower - Pictish stone, incised figure of horseman; Alexander Douglas graveslab, 1548; coped gravestone. NOTES: Choir ecclesiastical in use as such. Chapter House burial place of Atholl family. Nave & tower guardianship monument. Guardianship Monument. Scheduled Monument. REF: O.S.A. v. XX p. 418. N.S.A. v. X p. 970. Ecc. Arch. v. III p.28 (il. & plan). Description of the Scenery of Dunkeld and Blair in Atholl (1823) p. 35. F.C. Eccles in Rentale Dunkeldense. Scottish Ecclesiological Soc. 1912-13 p. 21 et seqq: Nicholson and Spooner: Recent English Ecclesiastical Architecture p. 191 (il) Atholl Mss. Plans (Elliot 1814) Blair Castle. Chrons of Atholl & Tullibardine numerous refs.

The monument consists of the nave, NW tower and S porch of the medieval cathedral of Dunkeld, together with the parkland immediately around it and an area to the N and W where the chanonry is known to have extended. The choir of the cathedral is excluded. The parts of the cathedral to be scheduled date from a period of late medieval building campaigns instigated by Bishop Cardeny in 1406. They consist of an aisled nave of seven bays, with a three-storeyed elevation, to which a S porch and NW tower were added by Bishop Lauder before 1483. Immediately around the cathedral is an area of enclosed parkland, while woodland to the W and parkland and farmland to the N covers the site of the chanonry, although the modern field called St Ninian's Croft also includes the site of Dunkeld House, built by Sir William Bruce for the Marquess of Atholl. The area to be scheduled includes the nave, S porch and NW tower of the cathedral, but excludes the choir, which acts as the modern parish church. The area to be scheduled also includes the enclosed parkland around the cathedral and part of the woodland to the W plus the E part of St Ninian's Croft to the N, where the chanonry once extended. The area is iregular on plan, with maximum (diagonal) dimensions of 450m NNE-SSW by 295m NW-SE, as marked in red on the accompanying map. SAM text. [2]

The setting of this cultural heritage resource comprises the atmospheric area around the ruinous cathedral, parish church and heavily-shaded grounds with spectacular mature trees, of which the Dunkeld larches are particularly famous. Views out from this area, over the river Tay to the south and open parkland to the north, show off its spectacular setting of wooded crags. The immediate setting forms picturesque amenity space for the town, with walks and landscaped grounds around Stanley Hill. The area has a sense of physical separation from the town because of the cathedral grounds' walls and gates and property boundaries to the east, which coincide with the historic edge of the Dunkeld House policies. There is also minimal visual connection back towards the built-up parts of town, but its presence is nonetheless essential to its character and immediate setting. The north and south banks of the River Tay are lined by attractive woodlands and tree belts, enhancing the views into and out of the conservation area and making acontribution to the settings of Dunkeld Cathedral and Dunkeld Bridge. Its wider setting comprises a natural amphitheatre of woodlands and forested hills. [3]

Dunkeld Cathedral contains a number of memorials and tombs, such as MPK18701, MPK6512, and to the west a small display of earlier cross-slab , pirctish and hogback stones including MPK2448, MPK5440 and MPK2449. While forming part of the Cathedral's fabric, and large finds displayed in the Cathedral, these cultural heritage resoucess have been included as part of this Asset 116. [4]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including 13th century Norman and Gothic architecture and later building campaigns from the 15th century, and any surviving physical remains;
- its rarity as one of the most complete medieval Cathedrals in Scotland whose high level of authenticity and completeness of design makes a significant contribution to the Cathedral's architectural interest;
- contemporary written accounts of the buildings construction;
- significant contribution to our understanding of religious institutions at a national level;
- the public open space of the Cathedral precinct bordered by mature specimen trees, filter views to the south towards and across the River Tay that create a sense of intimacy and seclusion; and
- important role during the 1689 battle of Dunkeld.

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record
[3] Perth & Kinross Council Dunkeld Conservation Area Appraisal 2011
[4] Jacobs setting assessment undertaken 2018
[5] Jacobs assessment undertaken 2021

Asset Number	117	**Name**	Dunkeld, Tay Terrace, Surgery
Legal Status	Category C Listed Building	**NGR**	NO0271442592
Value (sensitivity)	High	**Condition**	Good
Type	Surgery	**Period**	19th Century
NMR ref	5598	**HER ref**	MPK13555
Canmore ID			

Description

3-storey basement and attic 3-window ashlar with Ionic column porch. Early 19th cent. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including Ionic column porch;
- relationship with other buildings of a similar period on Tay Terrace, contribution to the townscape of Dunkeld and our understanding of the development and economy of the town from the 19th century;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	118	**Name**	Dunkeld Findspot (2)
Legal Status	None	**NGR**	NO0263742593
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK2462
Canmore ID			

Description

Silver-gilt cross brooch found at Dunkeld about 1900. Donated to National Museum of Antiquities of Scotland (NMAS) by Miss W. Banister, St. Andrews. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	119	**Name**	Dunkeld Cathedral, St Ninian's Chapel (site of)
Legal Status	None	**NGR**	NO0237942595
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Chapel	**Period**	medieval
NMR ref	None	**HER ref**	MPK6886
Canmore ID			

Description

Within his cathedral, about 1420, Bishop Robert de Cardney (or Cardeny) founded and enclosed a chapel dedicated to St Ninian; he was interred in the chapel in 1436. Cardney's tomb (NO04SW 1.09) is in the S aisle of the nave and his chapel would seem to have occupied the two eastern bays of this aisle, probably to the E of an altar dedicated to St Katherine. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains.

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	120	**Name**	18 and 20 Cathedral Street
Legal Status	Category B Listed Building	**NGR**	NO0247342595
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5645	**HER ref**	MPK11342
Canmore ID			

Description

2-storey 3-window harled with margins. Early 18th cent. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	121	**Name**	16 Cathedral Street
Legal Status	None	**NGR**	NO0248542596
Value (sensitivity)	Low	**Condition**	Good
Type	Building	**Period**	18th Century
NMR ref	None	**HER ref**	MPK16711
Canmore ID			

Description

Single story range of buildings on the south side of Cathedral Street, Dunkeld. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	122	**Name**	Dunkeld Cathedral, Findspot (1)
Legal Status	None	**NGR**	NO0237342596
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK2446
Canmore ID			

Description

Many foreign, Roman, and Scottish coins were found in 1815 when lowering the floor of the choir. One person who had thirty coins, some Roman, sold them to a travelling jeweller for $1.
New Statistical Account (NSA) 1845. [1]
As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	123	**Name**	Dunkeld Cathedral Gates
Legal Status	Category B Listed Building	**NGR**	NO0246342597
Value (sensitivity)	High	**Condition**	Good
Type	Gate	**Period**	18th Century
NMR ref	5632	**HER ref**	MPK13949
Canmore ID			

Description

Wrought iron, probably mid 18th cent. Atholl Coronet and Cipher. Erected at Cathedral gate c. 1832, following demolition of Dunkeld House, abandonment of Dunkeld Palace and adaptation of St. Adammans (now demolished, S. of Cathedral) as a residence.
Newspaper cutting in Atholl Mss of Jan. 23 1884 states that these came from Nairne (demolished 1764, built c.1743-5). A handwritten note appended comments that this is an error and that prior to 1832 they stood at foot of Avenue near the Duchess's School (now restaurant) as Town Gate of Dunkeld House. [1]
No additional information. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features, including the finely detailed metal work; and
- its position to the west of Cathedral Street, the Cathedral precinct and relationship with the Cathedral.

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	124	**Name**	Masonic Temple, United Lodge Of Dunkeld No. 14-152 (Former Free Church), Boat Road
Legal Status	Category C Listed Building	**NGR**	NO0270142599
Value (sensitivity)	High	**Condition**	Good
Type	Masonic Lodge	**Period**	19th Century
NMR ref	5597	**HER ref**	MPK13088
Canmore ID			

Description

Rubble geometrical facade flanked by twin narrow towers, western 85' with small belfry and pyramid slated spirelet: 1874-5. [1]
No additional information. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including twin narrow towers and belfry;
- relationship with other buildings of a similar period on Tay Terrace, contribution to the townscape of Dunkeld and our understanding of the development and economy of the town from the 19th century;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	125	**Name**	Dunkeld Cathedral, Findspot (2)
Legal Status	None	**NGR**	NO0230042600
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Medieval
NMR ref	None	**HER ref**	MPK12698
Canmore ID			

Description

BULLA (1) (Mid 13th Century - 1243 AD to 1254 AD). [1]
As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	126	**Name**	Dunkeld Findspot (3)
Legal Status	None	**NGR**	NO0210042600
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Medieval
NMR ref	None	**HER ref**	MPK16735
Canmore ID			

Description

Medieval and post-medieval metalwork NO 021 426 Metal detecting by Mr A McCabe in a field adjacent to Dunkeld Cathedral recovered a number of metalwork items comprising six buckles, a chape, two unidentified lead objects, a fitting and three more significant items:

1. 14th-century hollow cast key; copper alloy; L 95mm. It has a lozenge-shaped bow with a flared collar and a flaring squared stem and a complex channelled bit.

2. Seal matrix.

3. Bronze/copper-alloy finger ring in two pieces; plain bezel bearing crudely engraved initials 'MD'.

As with previous finds from this field, given their nature and location, they are likely to relate primarily to the former medieval and post-medieval burgh of Dunkeld, situated in this area but largely destroyed by fire following an attack by Covenanting forces in 1689.

Claimed as Treasure Trove (TT.34/05) and allocated to Perth Museum & Art Gallery. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	127	**Name**	Dunkeld, Tay Terrace, Taybank Hotel
Legal Status	Category C Listed Building	**NGR**	NO0272942600
Value (sensitivity)	High	**Condition**	Good
Type	Hotel	**Period**	19th Century
NMR ref	None	**HER ref**	MPK11871
Canmore ID			

Description

2-storey painted ashlar mid-Victorian with corbelled bay window and large moulded round headed doorway.

NOTES: B group. Group Value only. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features, including the corbelled by window and round headed doorway;

§ relationship with other buildings of a similar period on Tay Terrace, contribution to the townscape of Dunkeld and our understanding of the development and economy of the town from the 19th century;

§ historical relationship with Taybank Hotel, Gazebo (Asset 132)

§ roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	128	**Name**	Dunkeld, 12, 14 Cathedral Street House
Legal Status	None	**NGR**	NO0252042600
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	None	**HER ref**	MPK11343
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features;

- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	130	**Name**	Dunkeld Cathedral, Cross-Slab/Dunkeld No. 2 Cross Slab
Legal Status	None	**NGR**	NO0234742603
Value (sensitivity)	Negligible	**Condition**	Good
Type	Cross Slab	**Period**	Early-medieval
NMR ref	None	**HER ref**	MPK5370
Canmore ID			

Description

This cross-slab fragment has been re-used as a tombstone in 1729 and subsequently formed part of the paved floor of the cathedral. It is now missing. It formed part of the shaft of a cross, infilled with key-pattern decoration which was flanked (on the left) by what has been described as a horse standing on its hind legs. [1]

As the find location of an unstratified object now lost this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	131	**Name**	Atholl Arms Hotel, Bridge Street
Legal Status	Category B Listed Building	**NGR**	NO0268242603
Value (sensitivity)	High	**Condition**	Good
Type	Hotel	**Period**	19th Century
NMR ref	5624	**HER ref**	MPK11327
Canmore ID			

Description

3-storey classic, ground floor painted ashlar, 1st and 2nd harled. 4-window elevation to Boat Road, 5 window elevation to Bridge Street with former doorway framed in unfluted Greek doric columns in antis. Pend arch. 1833. Most of site shown as water and described as 'projected embankment' in 1823. Most of site shown as water and described as 'projected embankment' in 1823. REF: Chrons. IV p.417 laid out 1809 but buildings still not erected in T Stewart's map of 1828. Probably designed by W.M. M'Kenzie. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including simple but elegant design and Greek doric columned doorway;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1828;
- prominent roadside location, views to and from Dunkeld bridge, and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	132	**Name**	Taybank Hotel, Gazebo
Legal Status	Category C Listed Building	**NGR**	NO0272642608
Value (sensitivity)	High	**Condition**	Good
Type	Gazebo	**Period**	19th Century
NMR ref	5600	**HER ref**	None
Canmore ID			

Description

2-storey square rubble gothic, painted tracery. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features, including gothic style in squared rubble stone;
- relationship with other buildings of a similar period on Tay Terrace, contribution to the townscape of Dunkeld and our understanding of the development of the town from the 19th century;
- historical relationship with Dunkeld, Tay Terrace, Taybank Hotel (Asset 127)
- roadside location in the garden of the hotel within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	133	**Name**	Sundial House, Burgess Brae, Off Brae Street
Legal Status	Category B Listed Building	**NGR**	NO0275042609
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5630	**HER ref**	MPK13503
Canmore ID			

Description

3-storey and attic 3-window block with 2-storey wing. Thinly harled. Fine ogee-headed sundial set on angle corbel with inscription: 'JOHN BALLANTINE JANNET STEWART 1757.' Of particular importance to view from river (Boat Brae Group items 53-56). [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the 18th century, including the sundial;
- contribution to the townscape of Dunkeld;
- roadside location within Dunkeld Conservation Area and views of the building from the south. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	134	**Name**	Evan Haxton's Property 6 Cathedral Street
Legal Status	Category B Listed Building	**NGR**	NO0253842609
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5642	**HER ref**	MPK11341
Canmore ID			

Description

2-storey harled with margins irregular fenestration: inscribed lintel 17 JS J.C. 25(?). Probably c.1700-30. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	135	**Name**	Dunkeld, Cathedral Street, Drill Hall Building
Legal Status	None	**NGR**	NO0258042610
Value (sensitivity)	Low	**Condition**	Good
Type	Drill Hall	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK11339
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features;
- its location within the centre of Dunkeld and relationship to other buildings of a similar period and Dunkeld Conservation Area which contributes to our understanding and appreciation of it as a community building;
- potential contribution the former drill hall makes to our understanding of the social history of Dunkeld. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	136	**Name**	8 and 10 Cathedral Street
Legal Status	Category B Listed Building	**NGR**	NO0253042601
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	None	**HER ref**	MPK11338
Canmore ID			

Description

2-storey 5-window block, harled with margins.

NOTES: Nos. 12, 14 Cathedral Street built new on gap site as part of restoration scheme. REF: Probably c.1700-30. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features from the early 18th century;

§ relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;

§ roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Historic Environment Scotland

[3] Jacobs assessment undertaken 2021

Asset Number	138	**Name**	Brae Street, Hillhead Of Dunkeld, Lodge
Legal Status	Category C Listed Building	**NGR**	NO0292442610
Value (sensitivity)	High	**Condition**	Good
Type	Lodge, Gatepiers, Boundary Walls, Gates	**Period**	19th Century
NMR ref	43482	**HER ref**	MPK13951
Canmore ID			

Description

Mid 19th century with later alterations. Single storey, T-plan lodge. Harled with ashlar sandstone cills and dressings to canted window.

W ELEVATION: 3-bay. Gabled bay advanced to left with canted window and finial. Door at centre, flanked by small window, under swept, bracketed porch canopy. Window in bay to right.

Timber sash and case windows, smaller 2- or 3-pane uppers and 2-pane or plate glass lowers. Wallhead and ridge stacks. Grey slate gabled and piended roof.

GATEPIERS, WALLS AND GATES: pink sandstone ashlar piers with pyramidal caps. Decorative, 2-leaf wrought-iron gates. Rubble coped, rubble boundary wall. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features from the19th century;

§ relationship with Beechwood House (Asset 153) which it services as a lodge house and converted stables (Asset 801). [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	139	**Name**	Dean's House (Now Rectory House), Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0246842611
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	17th Century
NMR ref	5640	**HER ref**	MPK2447, MPK11341
Canmore ID			

Description

2-storey and basement 5-window frontage harled with margins, later attic dormers and wooden porch; square rear stair tower. Mediaeval, remodelled to present form early 18th cent. Interiors of interest. [1]

Dean's House (NR) OS 25" map (1866) The house of the Dean of Dunkeld is the oldest house in the town, and the only one now standing of three that escaped the fire of 1689. Its walls are of great thickness (2) 1842. This house, now known as Old Rectory House, is of no outstanding architectural Value (sensitivity). see Illustration Card. It was remodelled to its present form in the early 18th c, and was the manse in 1823. (SDD 1963) Visited by OS (SFS) 5 March 1975. Dean's House is a 17th-century T-plan house which was remodelled to its present form in the early 18th century; it has two storeys, with five bays over a sunken basement, and there is a stair-turret to the rear. Internally, the only original feature seems to be an arched fireplace (chamfer-arrissed) at ground-floor level. It is said to have been the only house to survive the fire of 1689. Visited by RCAHMS (IMS) 5 April 1989. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including any that may survive before 1689 and later periods, including the stair-turret;
- relationship with other buildings on Cathedral Street, contribution to the townscape of Dunkeld;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	140	**Name**	17 Cathedral Street House
Legal Status	None	**NGR**	NO0249942612
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	None	**HER ref**	MPK13356
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	141	**Name**	19 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0249142613
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5638	**HER ref**	MPK11346
Canmore ID			

Description

2-storey 5-window frontage, harled with margins, doorway bowtell-moulded, rear N.E. semi-circular stair tower, probably a survival from a pre-Reformation manse. Probably c.1700-30. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	142	**Name**	21 and 23 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0247642615
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5639	**HER ref**	MPK11345
Canmore ID			

Description

2-storey 5-window frontage to L-plan block, harled with margins. Probably c.1700-30. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	143	**Name**	2 and 4 Cathedral Street
Legal Status	Category B Listed Building	**NGR**	NO0255742615
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5641	**HER ref**	MPK11340
Canmore ID			

Description

2-storey harled with margins, symmetrical elevation with 6 windows and door at ground floor and 5 at 1st. Probably c.1700-30. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	144	**Name**	Bridge Street, Old Post Office
Legal Status	Category C Listed Building	**NGR**	NO0268542616
Value (sensitivity)	High	**Condition**	Good
Type	Post Office	**Period**	19th Century
NMR ref	5625	**HER ref**	MPK11354, MPK13530
Canmore ID			

Description

2-storey ashlar part with attics and ground floor shops. Architraved 1st floor windows, fanlights to some ground floor doorways. Old Post Office section harled at 1st floor and stuccoed at ground floor; elevation to Brae Street rubble. Chrons. IV p.417 laid out 1809 but buildings still not erected in T Stewart's map of 1828. Probably designed by W.M. M'Kenzie. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features, including fanlights;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	145	**Name**	Dunkeld, Bridge Street, 2 Properties, Burns Booksellers and Co-Operative Society
Legal Status	Category C Listed Building	**NGR**	NO0265742616
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	19th Century
NMR ref	5622	**HER ref**	MPK13771, MPK13772
Canmore ID			

Description

Simple 2-storey 5-window blocks with ground floor shops and later attics. Painted rubble with margins. [1]

Simple 2-storey 5-window blocks with ground floor shops and later attics. Painted rubble with margins. Designed by W.M. M'Kenzie 1827 (Plans Blair Castle) and extensively altered later. An ambitious scheme (Plans, Blair) for this area prepared by Robert Reid, but this was abandoned and the present reduced scheme laid out 1809. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	146	**Name**	Dunkeld House (Now Hotel)
Legal Status	Category C Listed Building	**NGR**	NO0108042617
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	20th Century
NMR ref	5601	**HER ref**	MPK6865
Canmore ID			

Description

2-storey harled, symmetrical main frontage to river with twin 3/8 bays with verandahs; 3-storey tower on E. J. McIntyre Henry, archt., dated. 1900.

Original late 17th cent. house stood to N. of Cathedral. By the early 19th cent. This was in bad repair and was demolished. A new palace to the W, was begun by T. Hopper but discontinued 1830 and demolished (plans Blair Castle). [1]

For Pictish symbol stone formerly in the grounds of Dunkeld House (at NO 0104 4273) and now in Dunkeld Cathedral, see NO04SW 1.02.

Originally built as a country house for the Duke and Duchess of Atholl, by Macintyre Henry in 1905, now a hotel.

Original 17th century house to North of cathedral, demolished early 19th century. Dunkeld New Palace to West of cathedral begun 1820, discontinued 1830 due to death of Duke of Atholl and demolished. Dunkeld House Hotel built as house for Duke and Duchess of Atholl 1900, now hotel.

See also:

NO04SW

16:00 Dunkeld House

16:01 Dunkeld House, Ice House

16:02 Dunkeld House, Dunkeld Lodge and Gate

16:03 Dunkeld House, Gazebo

16:04 Dunkeld House, Hot Houses

16:05 Dunkeld House, Grotto

16:06 Dunkeld House, Stables

16:07 Dunkeld House, Gallowhill Lodge and Gate
16:08 Dunkeld House, Kennels
16:09 Dunkeld House, Pulney Lodge and Gate
16:10 Dunkeld House, Walled Garden
29 Dunkeld New Palace
OWNER: Duke of Atholl
ARCHITECTS:
Sir William Bruce, late17th century, old house
James Winter (1744) design for house and offices
Roger Morris (1753) Chinese temple
Robert Adam (1765) designs for gateways
George Steuart (1777) conservatory and design for a bath
Archibald Elliot (1809) gateway and stables
Thomas Hopper (c.1820) New Palace or House
Robert Dickson (1853) kennels and stables
J Macintyre Henry (1898) new house
NMRS REFERENCE
Plans:
I G Lindsay Collection, W/234 (Uncertain if relating to Dunkeld House, New Palace or House Hotel).
EXTERNAL REFERENCES
National Library (Nattes Drawings Vol.2 nos 7/9)
National Archive Of Scotland (Chronicles of Tullibardine 1908 Vol.4). [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features, including veranda;
- historic relationship with the Duke and Duchess of Atholl;
- location with Dunkeld House garden and designed landscape. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	147	**Name**	Dunkeld Findspot (4)
Legal Status	None	**NGR**	NO0268342619
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Findspot	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK5949
Canmore ID			

Description

An arrowhead from Dunkeld, donated by George Sinclair to the National Museum of Antiquities of Scotland (NMAS) in the 19th century, bears the accession number NMS AD 580. [1]

As the find location of an unstratified object now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	148	**Name**	Dunkeld, St George's Hospital (site of)
Legal Status	None	**NGR**	NO0255942620
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Hospital	**Period**	medieval
NMR ref	None	**HER ref**	MPK5441
Canmore ID			

Description

The hospital of St George was founded before 1506. George Browne, bishop of Dunkeld (1484-1514/5), revived and augmented an earlier foundation here (3).

It survived the Reformation, but was destroyed by fire in 1689, and Bede House was built on the site. OS Name Book 1866

No trace now remains of the original building.

There are no visible remains of the hospital of St George, which is said to have stood on the site of 'The Ell House', at the corner of Cathedral Street and High Street. It is on record in 1506, but the foundation may be earlier as Bishop George Brown is credited with having augmented and revived an earlier hospital. From payments discharged in the granitar's accounts of Dunkeld, George Brown's hospital seems to have been of clay-bonded rubble construction and slated. It was burnt in 1689 but seems to have been replaced. In 1798, the hospital houses are recalled as *'low ruinous cottages'*; these were demolished about 1750. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains.

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	149	**Name**	Dunkeld, High Street, Scottish Horse Museum
Legal Status	Category C Listed Building	**NGR**	NO0259842623
Value (sensitivity)	High	**Condition**	Good
Type	Museum	**Period**	18th Century
NMR ref	5618	**HER ref**	MPK13953
Canmore ID			

Description

2-storey 2-window, harled with margins, pend arch. Probably 18th cent. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on the High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location on the High Street within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	150	**Name**	5 and 7 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0252842624
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5635	**HER ref**	MPK11348
Canmore ID			

Description

2-storey, 5-window main frontage, 1-window segmentally arched pend extension: harled with margins. Skewput with grotesque head. Rebuilt. Probably c.1700-30. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	151	**Name**	3 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0254342625
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5634	**HER ref**	MPK12599
Canmore ID			

Description

2-storey 3-window, harled with margins, Sun Fire Insurance plaque. Probably c.1700-30. [1]
No additional information. [2]

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	152	**Name**	13 and 15 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0250342625
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5637	**HER ref**	MPK12038
Canmore ID			

Description

2-storey 4-window frontage to L-plan block, harled with margins. No. 17 Cathedral Street built new on a gap site as part of restoration scheme. Probably c.1700-30. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features from the early 18th century;

§ relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld;

§ roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	153	**Name**	Brae Street, Hillhead Of Dunkeld, Beechwood House
Legal Status	Category B Listed Building	**NGR**	NO0283442625
Value (sensitivity)	High	**Condition**	Good
Type	House, Terrace Wall, Steps	**Period**	19th Century
NMR ref	5605	**HER ref**	MPK2480
Canmore ID			

Description

Style of William Burn, circa 1840. 2-storey, 3-bay square-plan gabled Tudor mansion with lower and single storey L-plan service wing. Rubble with contrasting grey ashlar dressings. Gabled dormerheads. Timber mullions.

S ELEVATION: 3-bay, outer bays gabled, that to left advanced with full-height panel of 4-light windows, that to right with broad ashlar doorcase with parapet coping and lantern, 3-light window at 1st floor above. Bay to centre with narrow single window to each floor.

W ELEVATION: 3-bay with broad gable to right with full-height canted window; canted window at ground bridging centre and bay to left withchimneybreast advanced at 1st floor dividing bays.

N ELEVATION: 3-bay. Broad gabled bay to right with 4-light window to each floor. Bipartite windows to each floor in bays to centre and left.

SERVICE WING: E elevation abutting taller 2-storeys of house with service door in broad gable to left, flanked by 4 windows (2 to centre and 2 to right schoolroom(?). Gabled stone bellcote to N return gable of schoolroom(?) above door and window. W elevation with door and window to schoolroom to left with 2 gabled, slate-hung dormers, roof swept down to right over advanced bays and blocked door, with further dormer as above.

Timber, small-pane glazing pattern in sash and case windows. Gablet coped skews with bracketed skewputts. Graded grey slates and tall, corniced and coped,polygonal and diamond set gablehead and ridge stacks, some grouped.

INTERIOR: not seen, 1996.TERRACE WALLS AND STEPS: ashlar terrace walls running N-S with panelled dies and balustrade, short flights of steps. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features from the19th century in Tudor style, including rubble stone with grey ashlar dressings and timber mullions;

§ its secluded garden and grounds surrounding by mature trees, relationship with associated service buildings including the lodge house (Asset 138) and converted stables (Asset 801). [3]	
Sources	
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021	

Asset Number	154	**Name**	9 and 11 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0251642626
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5636	**HER ref**	MPK11349
Canmore ID			
Description			
L-plan block, 2-storey 3-window frontage harled with margins. Probably c.1700-30. [1] No additional information. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § its surviving architectural detail and features from the early 18th century; § relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689; § roadside location within Dunkeld Conservation Area. [3]			
Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021			

Asset Number	155	**Name**	Dunkeld House, Gazebo To North Of Terraced Garden. ('The Fort')
Legal Status	Category C Listed Building	**NGR**	NO0150742627
Value (sensitivity)	High	**Condition**	Good
Type	Gazebo	**Period**	18th Century
NMR ref	5609	**HER ref**	MPK12676
Canmore ID			
Description			
Square rubble gothic raised on 2-tier bastion, lower tier with crenellated parapet, 1757. Greatly ruined. [1] No additional information. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § its architectural detail and features in gothic design of rubble stone including, the crenellated parapet; § its location within and forming part of Dunkeld House designed landscape. [3]			
Sources			
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021			

Asset Number	156	**Name**	1 Cathedral Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0255242628
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5633	**HER ref**	MPK11347
Canmore ID			

Description

2-storey, 3-window, harled with margins. Formerly part of St. George's Hospital (see item 16) shortly before 1757. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the early 18th century;
- relationship with other buildings of a similar period on Cathedral Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	157	**Name**	Bank Of Scotland, High Street (south side)
Legal Status	Category C Listed Building	**NGR**	NO0263842632
Value (sensitivity)	High	**Condition**	Good
Type	Bank (Financial)	**Period**	19th Century
NMR ref	5616	**HER ref**	MPK13948
Canmore ID			

Description

3-storey 4-window ashlar mid-Victorian Renaissance: arched and rusticated ground floor square column porches, segmental pediments to 1st floor windows: quoin ends. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features including the ornate renaissance style, including rusticated porches;
- relationship with other buildings of a similar period on the High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld;
- roadside location on the High Street within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	158	**Name**	17 and 19 High Street (south side)
Legal Status	Category B Listed Building	**NGR**	NO0260642632
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	83	**HER ref**	MPK14027
Canmore ID			

Description

2 blocks: western 2-storey 4 window harled with margins, eastern 2-storey, partially restored 18th cent. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the 18th century;
- relationship with other buildings of a similar period on High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	159	**Name**	Dunkeld, Bridge Street Surgery
Legal Status	Category B Listed Building	**NGR**	NO0265542632
Value (sensitivity)	High	**Condition**	Good
Type	Surgery	**Period**	Uncertain
NMR ref	5623	**HER ref**	MPK13770
Canmore ID			

Description

2-storey and attic rubble with painted margins, pilastered doorways at ends and consoled windows at ground floor. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	160	**Name**	The Ell House', The Cross, High Street
Legal Status	Category B Listed Building	**NGR**	NO0255642633
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5646	**HER ref**	MPK11337
Canmore ID			

Description

Former St. George's Hospital: 3-storey harled with margins, piended roof, 3 gabled dormer heads to 2nd floor windows; ground floor shops. Described as newly-built in a document of 1757.

Ell or Weaver's measure (metal gauge) fixed to outside of shop. For Cathedral Street wing of the Hospital see Item 3. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the mid-18th century, including the weaver's measure;
- relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- prominent roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	161	**Name**	K. Stanley & Sons, High Street (south side)
Legal Status	Category B Listed Building	**NGR**	NO0264642636
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	19th Century
NMR ref	5615	**HER ref**	MPK13769
Canmore ID			

Description

3-storey 3-window block rubble with margins, original ground floor shops, square headed doorways with fanlights: probably c.1809. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features, including the fanlights;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	162	**Name**	Dunkeld Cathedral Property, Brae Street (south)
Legal Status	Category C Listed Building	**NGR**	NO0269442637
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	Uncertain
NMR ref	5626	**HER ref**	MPK11334
Canmore ID			

Description

2-storey 3-window harled with margins, somewhat altered. [1]
No additional information. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	163	**Name**	Old Post Office, Brae Street (south Side)
Legal Status	Category C Listed Building	**NGR**	NO0268242637
Value (sensitivity)	High	**Condition**	Good
Type	Post Office	**Period**	19th Century
NMR ref	5625	**HER ref**	MPK13530
Canmore ID			

Description

2-storey ashlar part with attics and ground floor shops. Architraved 1st floor windows, fanlights to some ground floor doorways. Old Post Office section harled at 1st floor and stuccoed at ground floor; elevation to Brae Street rubble. Chrons. IV p.417 laid out 1809 but buildings still not erected in T Stewart's map of 1828. Probably designed by W.M. M'Kenzie. [1]
No additional information. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features, including the fanlights;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record

Asset Number	164	**Name**	Dunkeld, Brae Street, Building 1 (south side)
Legal Status	Category C Listed Building	**NGR**	NO0271042638
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	19th Century
NMR ref	5628	**HER ref**	MPK13528
Canmore ID			

Description

3-storey and attics, 2-window rubble with margins c.1840. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	165	**Name**	Dunkeld, Brae Street, Building 2 (south side)
Legal Status	Category C Listed Building	**NGR**	NO0270542638
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	19th Century
NMR ref	5627	**HER ref**	MPK13529
Canmore ID			

Description

3-storey and attics, 2/3-window rubble with margins c.1840. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	166	**Name**	Dunkeld, Brae Street, Building 3 (south side)
Legal Status	Category C Listed Building	**NGR**	NO0271742638
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	Uncertain
NMR ref	5629	**HER ref**	MPK13527
Canmore ID			

Description

Small 2-storey block, rubble with margins. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	167	**Name**	Connacher' The Cross, High Street
Legal Status	Category B Listed Building	**NGR**	NO0255242640
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5647	**HER ref**	MPK13355
Canmore ID			

Description

3-storey block, harled, 2-window gable with margins to street frontage (? c.1750-60). [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features from the 18th century;
- relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	168	**Name**	Dunkeld, Mercat Cross (site of)
Legal Status	None	**NGR**	NO0258342642
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Market Cross, Pillory	**Period**	18th Century
NMR ref	None	**HER ref**	MPK5442
Canmore ID			

Description

The old stone cross was a round stone pillar on which were four round balls supporting a pyramidal top. It stood about 20ft high, the pedestal being 12ft square. On the pillar hung four iron "jougs" for punishing petty offenders.

The cross was extant before 1745, and removed c.1800.

Name Book 1865; NSA 1842

Dunkeld's mercat cross, removed about 1800, consisted of a circular shaft on a square pedestal, supporting four balls and a pyramid finial. The pedestal measured 3.66m square, and in height the cross measured about 6.1m. Attached were four iron 'jongs'.

New Statistical Account (NSA) 1845; OS Name Book. [1]

As the location of a market cross now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	169	**Name**	Monument To 6th Duke Of Atholl, The Cross, High Street
Legal Status	Category B Listed Building	**NGR**	NO0258342642
Value (sensitivity)	High	**Condition**	Good
Type	Monument	**Period**	19th Century
NMR ref	5619	**HER ref**	None
Canmore ID			

Description

Gothic, 1866, with drinking fountain. Short circular granite columns, spired top. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features in gothic style;
- historical associations with a prominent local/regional family;
- prominent location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	170	**Name**	Dunkeld, The Cross/Market Square Building
Legal Status	None	**NGR**	NO0258042650
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Building	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK11350
Canmore ID			

Description

It is possible that the Wrought Iron Gate to Stanley Hill represented in collection item IGL W/234/22 was intended for the arched gap in the wall to the left of 11 The Cross (NO04SW 111). There is no evidence that a gate ever occupied this gap, however. [1]

As the location of a wrought iron gate to Stanley Hill now removed this cultural heritage resource can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	171	**Name**	Dunkeld, Brae Street, Martin's property Shop
Legal Status	Category C Listed Building	**NGR**	NO0268142652
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	19th Century
NMR ref	84	**HER ref**	MPK13518
Canmore ID			

Description

3-storey 4-window block one attic dormer. Harled with margins. 1809 centre date panel at 2nd floor. Laid out 1809 and most buildings erected shortly thereafter. Shown in T. Stewart's map of 1828 and Wood's of 1823. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	172	**Name**	Dunkeld, 1 Atholl Street
Legal Status	Category C Listed Building	**NGR**	NO0265542654
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	5589	**HER ref**	MPK13947
Canmore ID			

Description

2-storey early 19th cent. ground floor shops and fanciful 1st floor stucco detail, c.1860. Laid out 1809 and most buildings erected shortly thereafter. Shown in T. Stewart's map of 1828 and Wood's of 1823. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features, including the first floor stucco detailing;

§ relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;

§ roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	173	**Name**	Perth Arms Hotel, High Street (north side), East Section
Legal Status	Category B Listed Building	**NGR**	NO0264242655
Value (sensitivity)	High	**Condition**	Good
Type	Hotel	**Period**	18th Century
NMR ref	5614	**HER ref**	MPK14021
Canmore ID			

Description

3-storey 3-window harled, no margins, coarse wooden pilaster doorway: ground floor, windows slightly bowed. Probably c.1750-60. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features from the 18th century;

§ relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;

§ roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	174	**Name**	Dunkeld, 15 High Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0262442656
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5612	**HER ref**	MPK13768
Canmore ID			

Description

2-storey 3-window harled with margins. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features from the 18th century;

- relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	175	**Name**	Dunkeld, Brae Street, Springwells House
Legal Status	Category C Listed Building	**NGR**	NO0269842656
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	5585	**HER ref**	MPK13952
Canmore ID			

Description

2-storey 5-window block with original attic dormers, harled with margins: simple vernacular manner.
Laid out 1809 and most buildings erected shortly thereafter. Shown in T. Stewart's map of 1828 and Wood's of 1823. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	176	**Name**	Perth Arms Hotel, High Street (north side), West Section
Legal Status	Category B Listed Building	**NGR**	NO0263342657
Value (sensitivity)	High	**Condition**	Good
Type	Hotel	**Period**	18th Century
NMR ref	5613	**HER ref**	MPK14070
Canmore ID			

Description

3-storey 3-window harled, no margins, old ground floor shops and small square windows at 2nd floor. Probably c.1750-60. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the 18th century;
- relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021

Asset Number	177	**Name**	14 High Street (north side) (National Trust Property)
Legal Status	Category B Listed Building	**NGR**	NO0261242658
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	18th Century
NMR ref	5611	**HER ref**	MPK13354
Canmore ID			

Description
2-storey harled with margins centre wallhead gable with chimney and round arched window. Probably c.1750-60. [1] No additional information. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § its surviving architectural detail and features from the 18th century; § relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689; § roadside location within Dunkeld Conservation Area. [3]

Sources
[1] Historic Environment Scotland [2] Perth and Kinross Historic Environment Record [3] Jacobs assessment undertaken 2021

Asset Number	178	**Name**	Dunkeld, Bishop's Hill, New Palace/Dunkeld House Hotel Country House
Legal Status	None	**NGR**	NO0201442658
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Country House	**Period**	19th Century
NMR ref	None	**HER ref**	MPK2464
Canmore ID			

Description
A large country house was under construction for the Duke of Atholl near Bishop's Hill in 1830, but work stopped on his death in that year 1842. OS 6-inch map, Perthshire, 1st ed.(1864), sheet 62. Cropmarks have revealed traces of the foundations of 'Dunkeld New Palace', which was begun in the 1820s but demolished incomplete on the death of the fourth Duke of Atholl, situated immediately S of the drive from Dunkeld to the Dunkeld House Hotel. Several other features are visible in the vicinity, including what may be a ditch to the E, and an old drive or road to the S. Original 17th century house to North of cathedral, demolished early 19th century. Dunkeld New Palace to West of cathedral begun 1820, discontinued 1830 due to death of Duke of Atholl and demolished. Dunkeld House Hotel built as house for Duke and Duchess of Atholl 1900, now hotel. See also: NO04SW 16:00 Dunkeld House 16:01 Dunkeld House, Ice House 16:02 Dunkeld House, Dunkeld Lodge and Gate 16:03 Dunkeld House, Gazebo

16:04 Dunkeld House, Hot Houses
16:05 Dunkeld House, Grotto
16:06 Dunkeld House, Stables
16:07 Dunkeld House, Gallowhill Lodge and Gate
16:08 Dunkeld House, Kennels
16:09 Dunkeld House, Pulney Lodge and Gate
16:10 Dunkeld House, Walled Garden
59 Dunkeld House Hotel
OWNER: Duke of Atholl
ARCHITECT: Sir William Bruce late 17th century old house
James Winter 1744 design for house and offices
Roger Morris 1753 Chinese temple
Robert Adam 1765 designs for gateways
George Steuart 1777 conservatory and design for a bath
Archibald Elliot 1809 gateway and stables
Thomas Hopper c.1820 New Palace or House
Robert Dickson 1853 kennels and stables
J Macintyre Henry 1898 new house
NMRS REFERENCE
Plans:
I G Lindsay Collection, W/234 Uncertain if relating to Dunkeld House, New Palace or House Hotel.
EXTERNAL REFERENCE
National Archive of Scotland :
Dunkeld New Palace
'Building of offices at Dunkeld House'
Letter from the Duke of Atholl to Sir George Steuart.
Archibald Elliot, the Duke's achitect is using every endeavour to get out all the stone required for the office buildings. The weather has retarded quarrying.
1811GD 121/Box 103/Vol XXVII/212
National Library Nattes Drawings Vol.2 nos 7/9
National Archive Of Scotland Chronicles of Tullibardine 1908 Vol.4. [1]
Resistivity and magnetometry survey were carried out in July 2003 at and around Stanley Hill to assess the nature of the buried remains lying within the park area, and in particular to identify remains of the former Dunkeld House and gardens, much of which lie in the adjacent area to the west.
The resistivity results are impressive, more so in the Hilton field than on the NTS property, where the effects of landscaping and medieval and post-medieval building were evident. Details were found of the house and the garden complex (close to the cathedral), bowling green, drives, carriageway, and other structures, especially on the western side of the survey area. [2]
In July 2003, six small text trenches were excavated in parkland which formerly occupied the grounds of Dunkeld House, the former residence of the Duke of Atholl. The house and outbuildings were demolished in the 19th century. The evaluation was undertaken to investigate features relating to the 18th and 19th century phases of the house and gardens. The excavation followed a week of geophysical survey [1]. Trench A contained nothing of archaeological interest. Trench B was sited along a raised ridge, and a hard-packed deposit of slates and brick confirmed a metalled roadway or track visible on 19th century maps.
Trenches C and D were sited to explore low mounds and a geophysical anomaly within Trench D. The mounds were found to have significant deposits of building debris, probably dating to the 18th century, dumped to create landscaping features. In Trench C this dump, which also included several red deer skulls, covered the remains of a stone structure with associated surfaces. This structure may be the 'Gardener's Cottage' visible on Clark's 1748 map of the outbuildings.
In Trench D, a clay-bonded structure may have been a stone dyke or wall. The trench contained a deep deposit of building debris and 17th/18th century midden material, which was not bottomed. Several fragments of a glass wine bottle, possibly of 17th century date, were recovered from this trench, including a fragment of the neck and hand-blown lip.
In Trench E, the edge of a metalled track or carriageway, running roughly N-S, overlay a deep deposit of garden soils which, at its lowest level, produced a shard of medieval pottery possibly dating to the 13th and 14th century. This cultivation may be related to the back gardens of the manse house on Cathedral Street.
Trench F was cut at the west end by a modern cable, but the remains of a robbed clay-bonded wall were preserved at the east end. Associated finds suggest a 18th and 19th century date. An 18th century post-hole within this trench cut into a layer of concentrated burning, which was not excavated. [3]
The key characterisitcs, features or elements of this cultural heritage resource comprise:

- the physical remains of the house;
- location with Dunkeld House garden and designed landscape and historical associations with a prominent local family. [4]

Sources
[1] Perth and Kinross Historic Environment Record [2] Kellog, D. & Jones, R. (2003), Dunkeld House grounds (Dunkeld & Dowally parish), geophysical survey. Discovery and Excavation in Scotland. Vol 4, 106 [3] Gondek, M. & Driscoll, S. (2003), Dunkeld House grounds (Dunkeld & Dowally parish), evaluation, Discovery and Excavation in Scotland. Vol. 4, 106-7. [4] Jacobs assessment undertaken 2021

Asset Number	179	**Name**	Dunkeld, 1, 2, 3, 4 The Cross, SSHA Houses
Legal Status	None	**NGR**	NO0258942660
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	20th Century
NMR ref	None	**HER ref**	MPK13364
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- the architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld in the 20th century;
- roadside location and Dunkeld Conservation Area. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	180	**Name**	12, 12A The Cross, High St. (north side)
Legal Status	Category B Listed Building	**NGR**	NO0260242660
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5610	**HER ref**	MPK13363
Canmore ID			

Description

2-storey harled with margins, 2 doors and 2 windows at ground floor, 3 windows at 1st. Between these blocks a block built new in traditional manner by S.S.H.A. as part of restoration scheme. Probably c.1750-60. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its surviving architectural detail and features from the 18th century;
- relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	181	**Name**	Duchess Anne Restaurant (Former Duchess Of Atholl Girl's Industrial School) Cross, Dunkeld
Legal Status	Category B Listed Building	**NGR**	NO0255142662
Value (sensitivity)	High	**Condition**	Good
Type	School, Restaurant	**Period**	19th Century
NMR ref	5617	**HER ref**	MPK12059
Canmore ID			

Description

2 storey ashlar, Tudor gothic asymmetrical with spirelet: R.T.R. Dickson; architect. 1853. [1]
Architect: Robert Dickson, 1853-1855.
Inventory to plans in Blair Castle Charter Room - typescript.
2 storey ashlar, Tudor gothic asymmetrical with spirelet: R.T.R. Dickson; architect. 1853.
REF: Plans Blair Castle
EXTERNAL REFERENCE:
Copies of drawings in Blair Castle Charter Room, Robert Dickson, 1853-1855.
NO04SW 126 0256 4266. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features in Tudor gothic style, including mullin windows, bell tower and hexagonal chimneys, and those relating to its former function as a educational institute;
- contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld in the mid-19th century;
- roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	182	**Name**	Dunkeld, 5 Atholl Street
Legal Status	Category B Listed Building	**NGR**	NO0265442669
Value (sensitivity)	High	**Condition**	Good
Type	Restaurant	**Period**	19th Century
NMR ref	5590	**HER ref**	MPK13514
Canmore ID			

Description

2-storey 5-window harled with margins, ground floor shops. Laid out 1809 and most buildings erected shortly thereafter. Shown in T. Stewart's map of 1828 and Wood's of 1823. These buildings vary somewhat in detail but rooflines, cornices and string courses all lined up. [1]
No additional information. [2]
The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	183	**Name**	Dunkeld, The Cross, Tourist Information Centre Building
Legal Status	None	**NGR**	NO0258042670
Value (sensitivity)	Low	**Condition**	Good
Type	Building	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK13415
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features;

§ relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld;

§ roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	184	**Name**	11 The Cross, High Street (north side)
Legal Status	Category B Listed Building	**NGR**	NO0257542670
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	18th Century
NMR ref	5648	**HER ref**	MPK11353
Canmore ID			

Description

2-storey 4-window harled without margins, forestair; S.W. corner splayed, wall with archway adjoins on W. Early 18th cent. Between these blocks a block built new in traditional manner by S.S.H.A. as part of restoration scheme. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its surviving architectural detail and features from the 18th century;

§ relationship with other buildings of a similar period on The Cross/High Street, contribution to the townscape of Dunkeld and our understanding of the development of Dunkeld after 1689;

§ roadside location within Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	185	**Name**	Dunkeld House/Policies; Garden Features Country House, Tower, Country House
Legal Status	None	**NGR**	NO0241942680
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Country House, Tower, Country House	**Period**	17th Century
NMR ref	None	**HER ref**	MPK5439 MPK18700 MPK7139
Canmore ID			

Description

Recent tree planting in what were once the grounds of Dunkeld House was thought to have affected underlying archaeological deposits, notably a 17th-century tower recorded at one time as holding the library. A team of NTS Conservation Volunteers assisted in an assessment of this threat. A trench across a prominent mound discovered this to be a landscape feature, but a second trench, located through the careful analysis of old maps and plans, led to the discovery of a wall trench and internal floor levels of what is thought to have been the tower. The trees affecting these deposits have now been removed, and it is hoped that funds can be found for a geophysical survey of the whole area.

Sponsor: NTS. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise any physical remains.

Sources

[1] Perth and Kinross Historic Environment Record

[2] Jacobs assessment undertaken 2021

Asset Number	186	**Name**	Dunkeld, Atholl Street, Building 1 (east side)
Legal Status	Category C Listed Building	**NGR**	NO0267642685
Value (sensitivity)	High	**Condition**	Good
Type	Building	**Period**	19th Century
NMR ref	5587	**HER ref**	MPK13520
Canmore ID			

Description

2-storey block, ground floor partly shops, rubble-built partially stuccoed with architraves. Irregular spacing of fenestration. Some doorways have original fanlights. Laid out 1809 and most buildings erected shortly thereafter. Shown in T. Stewart's map of 1828 and Wood's of 1823. [1]

No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland

[2] Perth and Kinross Historic Environment Record

[3] Jacobs assessment undertaken 2021

Asset Number	187	**Name**	Inch Cottage, Water Pump
Legal Status	None	**NGR**	NO0014244266
Value (sensitivity)	Low	**Condition**	Unknown
Type	Pump	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK7876
Canmore ID			

Description

No additional information. [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise its architectural detail and features. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	188	**Name**	King's Seat Fort
Legal Status	Scheduled Monument	**NGR**	NO0083943006
Value (sensitivity)	High	**Condition**	Good
Type	Fort	**Period**	Later Prehistoric
NMR ref	None	**HER ref**	None
Canmore ID			

Description

The monument comprises the substantial upstanding remains of a later prehistoric or early historic fort. This defended settlement survives as a series of up to four concentric ramparts and terraces, enclosing a central walled citadel on the summit of a craggy hill known as King's Seat. The fort occupies a commanding position overlooking the River Tay at approximately 150m above sea level, with excellent views to the north, south and west. The monument was first scheduled in 1960, but the documentation does not meet modern standards: the current rescheduling rectifies this.

The area to be rescheduled is a 'clipped' circle in shape, truncated along its NE and NW sides, to include the remains described above and an area around them within which evidence relating to the monument's construction, use and abandonment may survive, as shown in red on the accompanying map. Specifically excluded from the scheduling are the upstanding remains of all later boundary features, including the stone walling and modern fencing, to allow for their maintenance.

The fort is located in a naturally defensive position on a prominent hill, overlooking the River Tay and at the southern edge of the Highland boundary fault line. The maximum extent of the fort is defined by the outermost rampart which encloses an area approximately 180m by 140m. A central walled enclosure or citadel, measuring approximately 35m by 22m, is situated at the highest point of the hill and over its summit. The fort appears reasonably intact which, coupled with its remote location, suggests that the remains of occupation and related activities may survive relatively undisturbed. Up to four terraces and ramparts are formed around most of the western circuit of the fort, whilst around most of the NE, E and S sides, the steep craggy landform precludes any need for significant structural works. There is a break in the circuit at the N end of the monument, indicating the likely position of an entrance, from where a trackway drops down to a lower terrace on the west. There are traces of an enclosed terrace on the eastern side of the outermost circuit. One researcher has suggested there is also evidence of a circular enclosure 10m in diameter at the N end of the summit, but this area is obscured by vegetation and it cannot be determined on the ground today. In places the ramparts are up to four metres wide. Occasional stretches of internal quarry-scoops are visible along the western ramparts and terraces.

Excavation of later prehistoric and early historic forts elsewhere has indicated the wealth of material that may be recovered from both the defensive works and the fort interior, relating to its construction, function, occupation and abandonment, as well as the prevailing environmental conditions and land uses at various times in its lifecycle. The presence of archaeological material may well extend beyond the visible extent of the fort, including structures, artefacts, palaeoenvironmental evidence and, possibly, human remains.

This fort forms part of the woodland policies of Dunkeld House, whose designed landscape is included in the Inventory of Gardens and Designed Landscapes (although this area lies just outwith the boundary of the designated area). As a result the site has been planted with

mature coniferous and deciduous trees and is overgrown with rhododendrons at its centre and along parts of its defence works. Today this woodland and shrubbery obscures much of the fort's structural and upstanding remains.

Contextual characteristics:

Similar later prehistoric and early historic defended settlement sites are widely distributed across mainland eastern Scotland, especially south of the Firth of Forth, while isolated examples such as King's Seat occur elsewhere. King's Seat is not a particularly large example of its class. The comparatively low density of forts in this area, at least when viewed against the backdrop of their general distribution further south, suggests that sites such as this might have had increased significance as the strongholds of an elite element in the local population.

Dunkeld emerged as the centre of Atholl in the early historic period, probably because of its prime geographical location at the foot of the Highland Edge, dominating the lines of communication northwards and westwards by way of the valley of the Tay, and marking the transition between fertile lowlands and more marginal upland. It has been suggested that the fort at King's Seat may have been the seat of royal power in Atholl during the early historic period. Its location just above the Roman legionary fortress and other Roman works at Inchtuthil may also be significant in this respect.

Associative characteristics:

Researchers have suggested that this site could be a seat of early historic royal power which originated as a prehistoric (earlier) tribal centre. The evidence of the place name, King's Seat, may support this.

The site is partly surrounded (to the west, south and east) by the garden and designed landscape of Dunkeld House and lies within the woodland policies of Dunkeld House. The woodlands date largely from the mid 19th to early 20th century and it is likely that trees were planted around the fort in this period. Researchers have suggested that the modern form of the monument may in part be the product of landscape design works when the policies of Dunkeld House were laid out.

National Importance

This monument is of national importance because it has an inherent potential to make a significant contribution to our understanding of the past, in particular, the later prehistoric and early historic landscape of Scotland, and the economy and material wealth of the people of the time. Despite the presence of trees and rhododendrons, the field remains at King's Seat survive to a marked degree, which means there is probably high potential for the survival of structural, artefactual and ecofactual remains across the site. These can help us understand how and why the fort was built here, its layout and function, the activities of the people who used or lived in the fort, and their contacts with the wider world. Its loss would significantly diminish our ability to investigate these issues and would detract from the historic character of the Perthshire landscape. [1]

No additional information. [2]

Located on a low summit to the north of the River Tay, it is likely that this position was chosen for its commanding views over the Tay valley to the north-west, south and east. While these views make a significant contribution to the understanding of the monument, they are now limited by its setting within woodland.

The asset's location still contributes to the understanding of the King's Seat Fort as a defensive structure with strategically important views. [3]

Fieldwork, including topographical survey and archaeological excavation undertaken as part of the King's Seat Archaeological Project, a three-year community project managed by the Perth and Kinross Heritage Trust and undertaken by AOC Archaeology and community volunteers, has provided an abundance of new information about this cultural heritage asset. The three seasons of fieldwork (2017 to 2019) have identified that the King's Seat was an important high-status centre during the early historic/Pictish period (c.600 - 900AD), with influence over trade and the production. The archaeological excavations identified the form and structure of the defended enclosure, evidence of domestic activity, and extensive iron and precious metal working and textile production. Finds included fragments of crucibles, moulds, iron objects including knife blades and whetstones, used during metal working, and spindlewholes for processing raw materials for textile production. In addition, finds of imported continental pottery and Anglo-Saxon glass beads, suggest international trade, providing further evidence of the King's Seat as a high status site. [4], [5] and [6]

The excavations at the hillfort of King's Seat have produced a good basis for understanding the use, construction and occupation of the site, in addition to later remodelling of some of the features.

The excavation revealed the character and differing construction of several of the enclosing ramparts on the west of the site and the low wall enclosing the upper central section of the site. The upper two of three ramparts on the west of the hill were substantial earth and stone banks with rough large boulders forming major elements of the construction material. The upper rampart had a timber component

at the back, demonstrated by two substantial postholes. One of these postholes contained material that was radiocarbon dated to the 5th-7th centuries AD, implying an early historic phase of construction on the site. The mid rampart had slumped off the hill obscuring an outer stone face which had collapsed beneath it. Later construction or modifications to the lowest rampart or terrace on the west of the hill was noted, it is possible this structure was built primarily as a kerbed trackway to access the site in the Victorian period. The central upper enclosure was a much lower less substantial structure with a more defined stone face on the inner edge, forming a more coherent formal wall. This differing construction could suggest a level of phasing in the construction of the site.

The excavations within the central enclosure in 2017 highlighted the shallow nature of the deposits on the upper terrace and the significant impact that the rhododendron growth has had on these areas at the summit of the hill. The lack of stratigraphy on the site around the upper terrace and the rock cut features in the bedrock could indicate that at one time this upper area of the hillfort had exposed bedrock and the thin deposits there in the modern day are more recently formed. The rock cut features, quarrying and stone setting at the base of the slope all indicate activity on the site. Additionally, metal working waste, crucible fragments and stone moulds, including ingot moulds, indicate both iron and precious metal working was taking place on the site. Two of the stone moulds, with a mirror shape, bear similarities in form to stone moulds found at sites such as Portmahomack, Tarbat (Carver 2016 275) and Garranes, Ireland, (O'Riordain 1942) amongst other locations. These could indicate early historic activity on the site which would be in keeping with the two radiocarbon dates and other more diagnostic artefacts. Several of the stone mould fragments were discarded and reused as bank material in the central enclosure, indicating a level of reworking of the banks occurred during or after some of this metalworking activity took place.

Further work in 2018-19 at Trench 4 on the interior of the central enclosure revealed structural evidence on a small flat terrace on the east of the hill. The features identified included a kerbed hearth setting packed with animal bone and multiple ash rich burning events. The lower fill of this hearth was radiocarbon dated to the 6th-7th centuries AD, confirming an early historic phase of use. A small revetted platform with a burning event
on it was also identified nearby. These features likely form components of larger structures present on this part of the site perhaps related to metalworking and prove that an open area excavation strategy on the interior has been important. The work in 2019 confirmed the presence of a line of stone settings, likely relating to a large rectangular structure on the upper central enclosure and remnants of a possible turf wall or bank were identified. Later disturbance through rig and furrow cultivation have truncated a large element of this structure and resulted in a thick deposit of undifferentiated material overlying everything in this area of the site. The work on the interior of the site has enabled the identification of both structures and craft production activities taking place within the fort and confirmed an early historic phase of activity on the site, covering several of the main objectives in hillfort studies identified by SCARF (2015 HES).

The quantity of material culture from this area also highlights the concentration of a range of activities involving precious metal working, iron working: particularly production of blades, textile processing and possible animal butchery. Animal bones and horns indicate animals were being processed on the site, whether this was for domestic purposes, feasting or related to craft activities taking place remains to be seen. Post-excavation work on the animal bone assemblage will address this. Evidence of prestige items such as E-ware table ware including jar and bowl vessels, several Anglo-Saxon glass beads and a fragment of an Anglo-Saxon drinking vessel could demonstrate broken fragments or casual losses from a community with wide ranging trade links to east, west and south. The E-ware, particularly the bowl form, indicates a high status site and pushes the distribution of Eware in Scotland further northeast than previously recognised. A significant number of sherds have been identified from both Trench 4 and 6 and so the final numbers of sherds will be higher than 11, more than many sites in Scotland. The quantity and type of this continental import also prompts a reconsideration of the trade of this material, perhaps indicating trading further afield than previously thought from the sources in the western seaboard or even identifying 'new' trade routes coming up from the south/east by land or sea. The Anglo- Saxon material including a fragment of Kempston glass drinking beaker combined with this high status table ware indicates consumption on the site, either related to important people settled on the site or transitory activities including feasting. The number of metal blades identified around the hearth packed with animal bone could be related to these activities. Identification and a better characterisation of the structural evidence on the site has indicated a large structure was present in the upper central enclosure, in contrast to the smaller ephemeral structures and multiple hearths identified in the western enclosure. It is possible the upper central enclosure housed some sort of gather place and hall in contrast with the western enclosure which seems to have had a particular focus on metalworking and small workshop/craft production areas. In addition to the extensive evidence for iron and precious metalworking there are a notable number of spindlewhorls indicating possible textile production, fragments of leather, animal bone and some of the metal objects may be related to leather working and other crafts taking place on the site. In contrast the area of the eastern enclosure investigated in 2019 was limited but confirmed the presence of metalworking at the base of the hill as well as occupation deposits, indicating activity extends beyond the immediate upper central enclosure. Dating of material from the workshop hearths in the western enclosure and the metalworking waste from the eastern enclosure should clarify the chronology in relation to the western bank and the upper hearth. The glass items on the site indicate both trade and contact with the Anglo-Saxon kingdoms to the south in the form of the unusual beads and also a reuse or recycling of perhaps locally available materials such as Roman glass items being converted into gaming pieces.

Considered together, the material culture recovered from site, is hugely important and clearly indicates in situ high status early historic activity on site. While it seems obvious to the modern archaeologist that some sort of elite would have controlled if not occupied hillfort sites, it is still rare for such sites to produce such a wealth of evidence (Heald 2010). That evidence for ferrous and non-ferrous metal working was identified in every trench across the site in 2017-19 certainly suggests that the site was hugely important in the production of prestige metalwork, and similarly to sites such as Dunadd, may have been a centre of production. The metal working assemblage from the site so far has strong parallels in other significant Scottish Early Historic sites such as nearby Dundurn and Clatchard Craig. Clatchard Craig in Fife is a site with similarities to King's Seat in both structural and material culture terms. It is a multi-vallate prehistoric fort with later early historic reworking and reuse involving precious metalworking. Clay moulds and crucible fragments from this Clatchard Craig,

as well as a silver ingot, could indicate similarities with metal-working activities at King's Seat. Further afield sites such as Buiston crannog, Dunadd and Mote of Mark, among others, have strong parallels in terms of finds

assemblages, in particular those demonstrating metalworking and production and the presence of E-ware. It is worth bearing in mind that a lot of the metal working debris has been recovered from across the site in an upper disturbed layer. The likelihood is that this originates from a central place or places of production on the site, and indeed material appeared more concentrated around the hearth settings. The recovery of material from across the site is a product of the substantial disturbance of tree and rhododendron roots encouraging and creating erosion combined with spade dug cultivation from more recent times contributing to mixing of deposits.

Early historic occupation or activity is a definite likelihood on this site and would fit with the site's reputation as the King's Seat or the site of the 'Fort of the Caledonians' (ie Dun-keld). This is supported by both the material culture recovered from the site, but also the type of hilltop used. Very generally, early historic forts appear to favour such limited outcrops, where occupation and activity is difficult. This is apparent at known dated examples such as Dunadd (Lane and Campbell 2000) and Dundurn (Alcock et al 1989). Comparisons can also be drawn with the feature on Dundurn known as St Fillan's Chair, where a wide ledge has been sculpted from an outcrop. Alcock describes the "effect is that of a rock seat" and "given that the eminence is widely visible from the valley floor, it is not fanciful to suggest that we have here an inauguration seat for the rulers of Strathearn (Alcock 1989, 198)." This feature could be mirrored in the glacial erratic with holes drilled into it at the summit of King's Seat. Dundurn, Dunadd and King's Seat all share similar characteristics including topographic location, hilltop morphology, working and utilisation of exposed bedrock outcrops. An early historic use of the site can therefore be suggested and dating will aim to further substantiate this. However that does not preclude an earlier origin for the site in the prehistoric period. While Early Historic forts do contain multi-vallate banks, this is more common to Iron Age forts. The King's Seat is similar in that respect to Moredun, where the majority of dates fall between 4th to 3rd centuries BC (Cook at el 2017), and represent a site type perhaps more typical of this period (Halliday pers comm). Dating material from the base of the banks would allow a more refined chronology to be created to better understanding the phasing and use of the site over time however this can only be done if suitable material is recovered from the samples. Dating of the hearth in the upper central enclosure has been valuable to confirm that the internal activity is early historic and further dating of the other hearths and the discrete metalworking deposit on the interior of the eastern enclosure will aid in understand the phasing of this activity in relation to the construction of the enclosures themselves.

SCARF highlights that the lack of evidence for activities within enclosed sites, due to limited work in enclosure interiors, is a severe constraint in hillfort studies, as are the difficulties in connecting interior activity to enclosure sequences. At Kings Seat there has been a valuable opportunity to better understand the interior activities using Trench 2 and 4 to explore the upper central enclosure and Trench 6 to explore the mid-terrace enclosure interior. Excavation of deposits in these areas and characterisation of structural components and material culture has clarified the nature of structures, activities and chronology of activities taking place at King's Seat. SCARF also highlights that there is no overall picture regarding the role of 'hillforts', whether as tribal capitals, (seasonal) meeting places, elite residences, or other functions and it is likely that their role varied across time and space. At King's Seat the work undertaken between 2017-2019 will elucidate the role of King's Seat hillfort through exploring both the sequence of the structural enclosures and characterisation of activities taking place in different zones and at different times within the hillfort. This information will feed into regionally based models and aim to confirm whether proto-historic people are re-using this hillfort for defence or legitimising and are 'making reference' to earlier loyalties.

The site has clearly been impacted in more modern times during a phase of Victorian remodelling. The evidence for this includes some potential modification of ramparts, construction of a kerbed trackway up the west of the hill and the spade dug cultivation furrows identified in the upper layers of the central enclosure. The site has been heavily impacted by the introduction of rhododendrons and planted woodland which is now very mature. Previous attempts to clear or manage the site have been made. More recent vegetation clearance by volunteers was limited to removal of rhododendron above the ground and careful excavation around roots to understand any surviving deposits. Deposits underneath the King's Seat glacial erratic consisted of thin hillwash directly over bedrock with no in situ deposits.

It is clear that although a better understanding of the nature of the site has been gained in 2017-19 that further post-excavation work is required to better understand the site and the interplay between different features. Investigation in different areas of the site has aided in a more comprehensive understanding of how the site works as a whole, elucidating some phasing and clarifying the variation in the impact that the vegetation and later Victorian remodelling has had on the site. Most of the material culture from this site demonstrates a significant high status site, used in the early historic period so further investigation has great potential and post-excavation work is essential to clarify the full results of this work. At this stage there has been no evidence for prehistoric activity on the site so it is possible that the site is relatively unique in a Scottish context, representing a high status site, constructed, used and abandoned within the early historic period.' [6]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its physical remains;
- its significant contribution to our understanding of early historic Scotland, its social structures, economy and the material wealth of the people of the time; and
- long distance views and prominent position. [7]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record

[3] Jacobs setting assessment undertaken 2018
[4] AOC Archaeology, 2017, King's Seat, Dunkeld, Perth and Kinross: Archaeological Evaluation Phase 1 Data Structure Report, AOC 23917
[5] AOC Archaeology, 2018, King's Seat, Dunkeld, Perth and Kinross: Archaeological Evaluation Phase 2 Data Structure Report, AOC 23917-2
[6] AOC Archaeology, 2019, King's Seat, Dunkeld, Perth and Kinross: Archaeological Evaluation Phase 3 Data Structure Report, AOC 23917-3
[7] Jacobs assessment undertaken 2021

Asset Number	189	**Name**	Farnyhaugh, Military Bridge
Legal Status	None	**NGR**	NO0049744253
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Military Bridge	**Period**	18th Century
NMR ref	None	**HER ref**	MPK16158
Canmore ID			

Description

A Wade bridge reported by historian Colin Lidell. [1]

The setting of this cultural heritage resource comprises woodland on the east bank of the River Tay, the small stream it crosses and its historical relationship with Dunkeld To Inverness Military Road (Asset 192). Its relationship with the military road it carried over the stream contributes to the appreciation and understanding of it as a Wade era military bridge. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural details and features; and
- its historic associations with Dunkeld To Inverness Military Road (Asset 192) and possible associations with General Wade.

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs setting assessment undertaken 2019
[3] Jacobs assessment undertaken 2021

Asset Number	190	**Name**	Inchmagrannachan, Cropmark
Legal Status	None	**NGR**	NO0016044460
Value (sensitivity)	Low	**Condition**	Unknown
Type	Cropmark	**Period**	Uncertain
NMR ref	None	**HER ref**	MPK16922
Canmore ID			

Description

A surviving cropmark of unknown origin has been recorded on oblique aerial photographs (RCAHMSAP 2001) on level ground about 60m E of Inchmagrannachan. [1]

Cropmark shown on aerial photograph. [2]

The key characterisitcs, features or elements of this cultural heritage resource comprise any physical remains.

Sources

[1] Perth and Kinross Historic Environment Record
[2] RCAHMS 041 2001 E11041
[3] Jacobs assessment undertaken 2021

Asset Number	191	**Name**	Inchmagrannachan Farmstead
Legal Status	None	**NGR**	NO0008944527
Value (sensitivity)	Low	**Condition**	Good
Type	Farmstead, Horse Engine House	**Period**	19th Century
NMR ref	None	**HER ref**	MPK16328
Canmore ID			

Description

Standing building survey of a 19th-century farmsteading was undertaken by Scotia Archaeology in advance of conversion to holiday units to fulfill the archaeological condition on planning consent. The east side of the steading which fronts the B898 was being redeveloped and formed the focus of the survey. The roofs of these buldings were removed prior to the survey because of the their parlous state.

Standing building survey of a 19th-century farmsteading was undertaken by Scotia Archaeology in advance of conversion to holiday units to fulfill the archaeological condition on planning consent. The east side of the steading which fronts the B898 was being redeveloped and formed the focus of the survey. The roofs of these buldings were removed prior to the survey because of the their parlous state.

The layout of this 19th-century farm has been masked by a large six-bay portal shed which now covers the area of an early yard. Originally, the steading appears to have been U-shaped with open access to the yard and steading area on its south side with ranges of buildings on its other three sides.

The east range of the steading consists of three separate buildings which have been joined to form a formal frontage to the farm. The single storey central building, latterly used as a byre, is set back some 300mm from the flanking, two-storey north and south wings. At ground level the south wing comprised a cart shed with a deep litter hen house at mezzanine level. The upper storey has been used as a storage loft either for fodder or grain and was covered with a slated, pyramidal roof. The north flanking building has been a stable with a hay loft at first-floor level.

In common with most farm buildings of this period, Inchmagrannachan was built with random schist rubble brought to course with all the quoins and openings formed of squared dressings, also of schist. The pyramidal and pitched roofs of the south and north ranges are covered with standard Pitlochry blue slates set onto sarking boards supported on rough, sawn trusses measuring 150mm by 50mm at 500mm centres. The linking byre is of similar construction.

In 2009 the East range of the steadings was converted to holiday units. An archaeological standing building survey took place in advance of redevelopment at the recommendation of PKHT.

A Standing Building Survey was undertaken of the East range of the steading by Scotia Archaeology in advance of conversion to holiday units. Inchmagrannachan Farm Steading is situated on the west side of the B898 Dunkeld to Aberfeldy road, approximately 1km north of its junction with the A9. It is centred on NO 00094 44505. The east side of the steading which fronts the road was redeveloped to form holiday accommodation. Because of their parlous states, the roofs of these buildings were removed prior to the commencement of the survey.

The layout of the 19th-century farm has been masked by a large six-bay portal shed which now covers the area of an early yard. Originally, the steading appears to have been U-shaped with open access to the yard and steading area on its south side with ranges of buildings on its other three sides.

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In common with most farm buildings of this period, Inchmagrannachan was built with random schist rubble brought to course with all the quoins and openings formed of squared dressings, also of schist. The pyramidal and pitched roofs of the south and north ranges are covered with standard Pitlochry blue slates set onto sarking boards supported on rough, sawn trusses measuring 150mm by 50mm at 500mm centres. The linking byre is of similar construction.

A copy of the DSR is held at PKHT. [1]

The key characterisitcs, features or elements of this cultural heritage resource comrpise its surviving architectural detail and features, including those related to its former function as agricultural buildings. [3]
Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	192	**Name**	Dunkeld To Inverness Military Road
Legal Status	None	**NGR**	NO0042845031
Value (sensitivity)	Medium	**Condition**	Fair
Type	Military Road	**Period**	18th Century
NMR ref	None	**HER ref**	MPK9285
Canmore ID			

Description

The military road commences at the former West Ferry point across the river from Inver (NO 0165 4240), connecting with the Amulree to Coupar Angus military road (MR16). It is well-defined and maintained as an estate road, traversing the private grounds of Dunkeld House Hotel and following alongside the river for about 2 and a half miles. Culverts and bridges are modernised, but traces of older military construction can be seen at a bridge at NO 005 440 (NO04SW 74.01).

J B Salmond 1938; W Taylor 1976.

The military road from Dunkeld to Inverness has been investigated in the grounds of Dunkeld House from NO 0100 4251 to NO 0047 4400. The course through the grounds undoubtedly followed a line now occupied by a metalled carriage drive. More than half of this course is along a terrace 4.5 m to 5.5 m wide with a stone revetment wall on the uphill side. There is a stone-built piped culvert along the course but no sign of a bridge.

Visited by OS (J P) 1 February 1972.

Military road N of the ferry over the Tay mainly overlaid by later roads and tracks.

NO 0160 4243 to NO 0133 4251 overlaid by winding trees.

NO 0133 4251 to NO 0121 4252 probable line of military road. No surface indications.

NO 0121 4252 to NO 0114 4252 poorly preserved grass trackway c.4m wide. Revetted for c.50m along river edge at W end.

NO 0114 4252 to NO0105 4252 probable line of military road. No surface indications.

NO 0105 4252 to NO 0080 4267 on line of poorly preserved carriage drive.

NO 0080 4267 to NO 0043 4499 on line of carriage drive N part of which now threatened by modern road construction.

Visited by OS (J M) 15 April 1975. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains of the road;
- potential to contribute to our understanding of local variations in construction techniques and materials employed by Wade; and
- historical associations and potential to contribute to national research themes relating to military roads. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	193	**Name**	Dunkeld To Inverness Military Road, Ledpetty Lodge To Dowally (site of)
Legal Status	None	**NGR**	NO0042945021
Value (sensitivity)	Low	**Condition**	Poor
Type	Military Road	**Period**	18th Century
NMR ref	138237	**HER ref**	MPK9283
Canmore ID			

Description

NO04NW 21.00 0043 4500 to 0000 4859 MR 2 (formerly Lin 501 [part of]). NO04NW 21.01 005 456 bridge. The military road follows the estate road by the river before it joins the modern road at Ledpettie (NO 0057 4551). Bridges and culverts have been modernised, although traces of older military construction can be seen at a bridge at NO 005 456 (NO04NW 21.01). The Wade road follows approximately the line of the modern road from Ledpettie northwards, although it probably goes straight on through Dowally rather than bearing left. J B Salmond 1938; W Taylor 1976. NO 0043 4500 to NO 0051 4569 on line of carriage drive now partly disused and threatened by modern road construction. NO 0051 4569 to NO 0027 4707 on general line of present main road. NO 0027 4707 to NO 0026 4713 on line of later main road, now disused. NO 0026 4713 to NO 0000 4859 on general line of present main road. Visited by OS (J M) 2 April 1975. [1]

No further information. [2]

This cultural heritage resource underlies the current road surface. It is thought unlikely that any buried archaeological remains associated with the military road will survive and any that do are likely to have been severely trucated by later road construction. [3]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving physical remains of the road;
- potential to contribute to our understanding of local variations in construction techniques and materials employed by Wade; and
- historical associations and potential to contribute to national research themes relating to military roads. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] National Record of the Historic Environment
[3] Jacobs walkover survey 30 January 2017
[4] Jacobs assessment undertaken 2021

Asset Number	497	**Name**	Birnam, War Memorial
Legal Status	None	**NGR**	NO0267042027
Value (sensitivity)	Low	**Condition**	Good
Type	War Memorial	**Period**	20th Century
NMR ref	Canmore ID 338770	**HER ref**	MPK18781
Canmore ID			

Description

20th century war memorial. No further information. [1]

A review of Aerial Phtography (2017) and Ordnance Survey Live mapping (© Crown copyright and database right 2018. All rights reserved. Ordnance Survey Licence number 100046668.) shows this cultural heritage resource's setting comprises it elevated location above the A923, the public open space and woodland that surround and and designed views north down Perth Road towards Dunkeld Bridge parallel with the Tay crossing. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features, including the rubble stone cairn;
- prominent position, public open space and maintained views; and
- commemorative function. [3]

Sources

[1] RCAHMS Canmore

[2] Jacobs setting assessment undertaken 2018
[3] Jacobs assessment undertaken 2021

Asset Number	498	**Name**	The Hermitage, Allotments (site of)
Legal Status	None	**NGR**	NO0119142027
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Allotment	**Period**	20th Century
NMR ref	Canmore ID 347644	**HER ref**	MPK18919
Canmore ID			

Description

Immediately west of the railway bridge (N004SW218) is an area of birchwood, approximately 200m by 50m. This is marked on the 2nd edition OS map as allotments. It is now overgrown. [1]
Site located in an area of mature woodland. No evidence of allotments can be identified from aerial photographs. [2]
The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains. [3]

Sources

[1] RCAHMS Canmore
[2] Jacobs setting assessment undertaken September 2018
[3] Jacobs assessment undertaken 2021

Asset Number	499	**Name**	The Hermitage, Dykes
Legal Status	None	**NGR**	NO0102041923
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Dyke	**Period**	Uncertain
NMR ref	Canmore ID 339682	**HER ref**	MPK18713
Canmore ID			

Description

Dyke(s). No further information. [1]
The key characterisitcs, features or elements of this cultural heritage resource comprise any physical remains. [2]

Sources

[1] RCAHMS Canmore
[2] Jacobs assessment undertaken 2021

Asset Number	793	**Name**	Auchlou, Inver
Legal Status	None	**NGR**	NO0157042310
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	None	**HER ref**	None
Canmore ID			

Description

This building is depicted on the 1st edition Ordnance Survey 6" to the mile. [1]

At this period it is depicted as being on the northern edge of Inver's village green and it retained this relationship with the village of Inver at least until 1957 where it is depicted on the Ordnance Survey 1:25,000 NO 04 published in 1957. [2] It is currently severed from the village of Inver by the existing A9. [3] The key characterisitcs, features or elements of this cultural heritage resource comrpisre its surviving architectural detail and features, including those from the 19th century. [3]
Sources
[1] Ordnance Survey 6" to the mile 1st edition Perthshire, Sheet LXII (includes: Caputh; Dunkeld and Dowally; Little Dunkeld), published 1867 [2] Ordnance Survey 1:25,000 NO 04, published 1957 [3] Jacobs setting assessment undertaken October 2018 [4] Jacobs assessment undertaken 2021

Asset Number	794	**Name**	Birnam Quarry
Legal Status	None	**NGR**	NO0379040437
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Quarry	**Period**	Post-medieval
NMR ref	None	**HER ref**	MPK18331
Canmore ID			
Description			
A quarry is marked on the 1st edition of the OS map. [1] The key characterisitcs, features or elements of this cultural heritage resource comrpise any physical remains which make a very limited contribution to our understanding of 19th century minerals industry. [2]			
Sources			
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021			

Asset Number	795	**Name**	Dunkeld, Gasworks And House (site of)
Legal Status	None	**NGR**	NO0259642695
Value (sensitivity)	Low	**Condition**	Unknown
Type	Gas works	**Period**	Post-medieval
NMR ref	27186	**HER ref**	MPK2465
Canmore ID			
Description			
No information. [1] Photograph and plans of this and Birnam gasworks. [2] The key characterisitcs, features or elements of this cultural heritage resource are: § any surviving physical remains; § research potential to contribute to our understanding of local energy production. [3]			
Sources			
[1] Perth and Kinross Historic Environment Record [2] RCAHMS Canmore [3] Jacobs assessment undertaken 2021			

Asset Number	796	**Name**	Craig Chattan, Birnam
Legal Status	None	**NGR**	NO0327241816
Value (sensitivity)	Low	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	350893	**HER ref**	MPK19123
Canmore ID			

Description

HOUSE (19-20TH CENTURY). [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features;

§ relationship with other buildings of a similar period and type which contribution to our understanding of the development of Birnam. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	797	**Name**	Pass Of Birnam, Milestone (site of)
Legal Status	None	**NGR**	NO0531639388
Value (sensitivity)	Negligible	**Condition**	Good
Type	Milestone	**Period**	Post-medieval
NMR ref	1013911	**HER ref**	MPK19223
Canmore ID			

Description

This milestone, which is depicted standing on the SW verge of what is now the B867 public road at the Pass of Birnam on the 1st edition of the OS 6-inch map (Perthshire 1867, Sheet LXXII), has been removed. [1]

As the location of a milestone now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	798	**Name**	Birnam Pass, Milestone (site of)
Legal Status	None	**NGR**	NO0414440429
Value (sensitivity)	Negligible	**Condition**	Destroyed
Type	Milestone	**Period**	Post-medieval
NMR ref	1013911	**HER ref**	MPK19224
Canmore ID			

Description

This milestone, which is depicted standing on the SW verge of what is now the B867 public road at Birnam Toll Point on the 1st edition of the OS 6-inch map (Perthshire 1867, Sheet LXXII), has been removed. [1]

As the location of a milestone now removed this cultural heritage resources can only make a very limited contribution to our understanding or appreciation of the past. [2]

Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	799	**Name**	Birnam Pass, Toll House
Legal Status	None	**NGR**	NO0414240420
Value (sensitivity)	Negligible	**Condition**	Poor
Type	Toll house	**Period**	Post-medieval
NMR ref	1016809	**HER ref**	MPK19226
Canmore ID			

Description
This remains of this toll house, which is depicted roofed on the 1st edition of the OS 6-inch map (Perthshire 1867, Sheet LXXII), lie to the S of what is now the B867 public road. The building has been set back into a railway embankment and here the rear wall and parts of the NW and SE ends stand over 1m in height. The front of the building however, has been reduced to little more than grass-grown amorphous piles of rubble. [1] The key characterisitcs, features or elements of this cultural heritage resource comprise any surviving physical remains. [2]
Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	800	**Name**	Birnam, Milestone
Legal Status	None	**NGR**	NO0373441517
Value (sensitivity)	Low	**Condition**	Good
Type	Milestone	**Period**	Post-medieval
NMR ref	1016809	**HER ref**	MPK19225
Canmore ID			

Description
This milestone stands on the SW verge of what is now the B867 public road in Birnam, where it is depicted on the 1st edition of the OS 6-inch map (Perthshire 1867, Sheet LXXII). The stone, which stands 0.56m high, has a rounded back (0.45m broad) and top, and two faces (each 0.33m broad) that front on to the road. Attached to each face and set into a shallow rebate is a cast iron plate measuring 0.24m in breadth and at least 0.35m in height. That on the NW indicates the distance in miles (14) 'FROM PERTH'; that on the NE indicates the distance in miles (1) 'FROM DUNKd' [Dunkeld]. [1] The key characterisitcs, features or elements of this cultural heritage resource are: § its architectural detail and features, comprising the stone itself and cast iron plate; § roadside location. [2]
Sources
[1] Perth and Kinross Historic Environment Record [2] Jacobs assessment undertaken 2021

Asset Number	801	**Name**	Stables Cottage, Hillhead Of Dunkeld, Brae Street, Dunkeld
Legal Status	Category C Listed Building	**NGR**	NO0297042615
Value (sensitivity)	High	**Condition**	Good
Type	Cottage	**Period**	19th Century
NMR ref	43483	**HER ref**	MPK13950
Canmore ID			

Description

Mid 19th century with later alterations. U-plan, single storey cottage group with single storey stable range to E. Harled with ashlar dressings.N RANGE: door at centre to S elevation (French doors) with window flanking each side and 3 metal ridge ventilat. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features from the19th century, including any relating to the buildings former function as a stable;

§ relationship with Beechwood House (Asset 153) which it serviced as a stable and the adjacent lodge house (Asset 138). [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	802	**Name**	West Grotto, Dunkeld House, Dunkeld
Legal Status	Category B Listed Building	**NGR**	NO0079442680
Value (sensitivity)	High	**Condition**	Good
Type	Grotto	**Period**	Post-medieval
NMR ref	5573	**HER ref**	MPK10051
Canmore ID			

Description

Domed elliptical building with front to river. Gothic arches composed of rustic boulder masonry and rear part sunk into embankment. Probably designed by Robert Morris. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ its architectural detail and features in gothic design of rubble stone including, rustic boulder masonry;

§ its riverside location within and forming part of Dunkeld House designed landscape. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	804	**Name**	Old Post Office, 9 Atholl Street, Dunkeld
Legal Status	Category B Listed Building	**NGR**	NO0265342689
Value (sensitivity)	High	**Condition**	Good
Type	Post Office	**Period**	Post-medieval
NMR ref	5591	**HER ref**	MPK13512
Canmore ID			

Description

2-storey 5-window rubble with margins, part painted fanlight doorway. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	806	**Name**	East Grotto, Dunkeld House, Dunkeld
Legal Status	Category B Listed Building	**NGR**	NO0205042448
Value (sensitivity)	High	**Condition**	Poor
Type	Grotto	**Period**	Post-medieval
NMR ref	5607	**HER ref**	MPK12932
Canmore ID			

Description

No information. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving architectural detail and features;
- its riverside location within and forming part of Dunkeld House designed landscape. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	807	**Name**	Robert Menzies, Atholl St
Legal Status	Category C Listed Building	**NGR**	NO0265542654
Value (sensitivity)	High	**Condition**	Good
Type	House	**Period**	19th Century
NMR ref	5589	**HER ref**	MPK13947
Canmore ID			

Description

2-storey and attic 3-window, wood pilastered ground floor, stucco 1st floor. [1]
No additional information. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [3]

Sources

[1] Historic Environment Scotland
[2] Perth and Kinross Historic Environment Record
[3] Jacobs assessment undertaken 2021

Asset Number	808	**Name**	M. & M. Black, Atholl St
Legal Status	Category C Listed Building	**NGR**	NO0326742685
Value (sensitivity)	High	**Condition**	Good
Type	Shop	**Period**	Post-medieval
NMR ref	5588	**HER ref**	MPK11332
Canmore ID			

Description

2-storey block formerly part of preceding, now detached. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its architectural detail and features;
- relationship with other buildings of a similar period and type which contribution to our understanding of the development of Dunkeld after 1809;
- roadside location and Dunkeld Conservation Area. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	889	**Name**	Craig Ruenshin, Stock Enclosure And Shieling Hut
Legal Status	None	**NGR**	NO0383340012
Value (sensitivity)	Low	**Condition**	Unknown
Type	Shieling	**Period**	Post-medieval
NMR ref		**HER ref**	MPK2484
Canmore ID			

Description

M'Laren reported a mound of earth and stones between Rohallion Castle and Craig Ruenshin (1). Surveyors from the Ordnance Survey describe the site as the remains of an old stock enclosure and a small group of shielings, dating to the post medieval period. Neither the shielings or the stock enclosure are marked on the 1st and 2nd editions of the OS map.

NO04SW 9 0383 4009.

A rectangular formation with rounded corners, 46' long and 19' wide from centre to centre of the enclosing mound, is situated between the cup-marked rocks and Rohallion Castle (NO04SW 21 & 22) and slightly to the N. The mound, of earth and stones, averages c. 5' wide and 2' high, and the level inside the enclosure corresponds with the level of the ground to the N. There appears to be no local knowledge or tradition concerning it.

This appears to be the remains of an old stock enclosure associated with a few nearby shielings. Not an antiquity.

Visited by OS (RD) 22 February 1971

A rectangular formation with rounded corners, 46' long and 19' wide from centre to centre of the enclosing mound, is situated between the cup-marked rocks and Rohallion Castle (NO04SW 21 & 22) and slightly to the N. The mound, of earth and stones, averages c. 5' wide and 2' high, and the level inside the enclosure corresponds with the level of the ground to the N. There appears to be no local knowledge or tradition concerning it.

This appears to be the remains of an old stock enclosure associated with a few nearby shielings. Not an antiquity.

Visited by OS (RD) 22 February 1971 [1]

The key characterisitcs, features or elements of this cultural heritage resource comprise its physical remains and upland location.

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	890	**Name**	The Hermitage, Gate
Legal Status	None	**NGR**	NO0072141876
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Gate	**Period**	Post-medieval
NMR ref		**HER ref**	MPK18920
Canmore ID			

Description

Canmore
Statutory number :347638
End date :
https://canmore.org.uk/site/search/result?SITECOUNTRY=1&NUMLINK=347638 [1]

A small gate, c.0.9m in width, is set into the roadside wall connecting to [the Hall] and bounding the property at NO. No path is apparent within the Hermitage boundary. No ironwork remains. The wall runs alongside the forest road, and is about 25% upstanding, with about 80% of the stonework remaining along its length. (HER99 11) Information from NTS (SCS) June 2015 [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- any surviving architectural detail and features;
- location within and possible association with The Hermitage garden and designed landscape. [2]

Sources

[1] Perth and Kinross Historic Environment Record
[2] Jacobs assessment undertaken 2021

Asset Number	HLT 1	**Name**	17th to 19th Century Rectilinear Fields and Farms
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Low	**Condition**	Unknown
Type	Historic Landscape	**Period**	17th Century to 19th Century
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Rectilinear field boundaries and associated farm steadings and other buildings are typical of agricultural improvements since the 1700s. Recent amalgamation of these fields is common. Agricultural improvements in the 18th and 19th centuries involved the enclosure of arable land as well as the building of slate roofed farm steadings and associated buildings. Field boundaries were designed to be rectilinear wherever possible, because it improved the efficiency of agriculture, tending to reduce unworkable corners. Recent amalgamation of these fields is common. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- rectangular or straight field boundaries some of stone walls now largely reinfored by moden post and wire fencing;
- assiocaited farm steadings and other agricultural buildings the majority of which date from the 19th century. [2]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)
[2] Jacobs assessment undertaken 2021

Asset Number	HLT 2	**Name**	Managed Woodland
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Low	**Condition**	Unknown
Type	Historic Landscape	**Period**	Unknown
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Much managed woodland is 'ancient', generally consisting of broad-leaved species or native pine woods, characterised by space between the trees. The wood used to be taken by coppicing or other traditional means. Managing deciduous woodlands used to be a traditional craft. Poles were taken, as well as lengths of wood for charcoal burning and large branches for roofing timbers. Trees weren't felled; they were coppiced or pollarded so that they would recover and throw up new growth. Trees did, however, have to be felled for long lengths of timber for floorboards, panelling, carpentry and ship-building. Nowadays woodlands are managed for the long term production of fine timber as well as for recreation.

Many of these woodlands are classed as ancient, and consist of a range of broad-leaved species or native pine woods. There is a variety in age and height, texture and colour in these woods. The trees have not been planted in ploughed ridges but by hand or by mounding. [1]

These areas are depicted as woodland on the 1st edition Ordnance Survey map of 1867. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- mixed broadleaved and native pine woodland;
- evidance of woodland management such as coppice balls and pollarded trees, and timber processing including charcoal platforms and saw pits;
- woodland boundary features. [3]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)

[2] 1st edition Ordance Survey, Perthshire, Sheet LXI (includes: Little Dunkeld), Publication date: 1867; 1st edition Ordnance Survey, Perthshire, Sheet LXII (includes: Caputh; Dunkeld And Dowally; Little Dunkeld), Publication date: 1867

[3] Jacobs assessment undertaken 2021

Asset Number	HLT 3	**Name**	19th Century to Present Coniferous Plantation
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Historic Landscape	**Period**	19th Century to Present
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Most plantations are of coniferous species and tend to be densely packed within clearly defined boundaries. Recently, natural tree regeneration and native tree planting have also been encouraged. Modern plantations have been a feature of Scotland's landscapes since the establishment of the nation's Forestry Commission in 1919. Some have their origins in private estate plantings of the 18th and 19th centuries, such as those of the Dukes of Atholl who concentrated on the creation of extensive plantations of larch.

Densely planted, single age, coniferous species, within clearly defined straight boundaries, with regular, linear firebreaks, are characteristic of commercial forestry. However, some plantations are now being restructured, leaving larger clearings and encouraging the planting of native species. Since 1989 woodland plantings have become increasingly common, with sinuous edges and more open spaces. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- single species, single age, coniferous plantations;
- straight boundaries with drives/firebreaks. [2]

Sources
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018) [2] Jacobs assessment undertaken 2021

Asset Number	HLT 4	**Name**	19th Century to Present Urban Area
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Negligible	**Condition**	Unknown
Type	Historic Landscape	**Period**	19th Century to Present
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Cities, towns and large villages with their housing, individual shops and places of education or worship, as well as prisons and hospitals, municipal buildings and hotels are noted as urban areas. Very small clusters of houses in the countryside are also included. Villages, towns and cities cover extensive areas of Scotland, and include housing, schools, shops, hotels and churches, as well as prisons, hospitals, universities and various other municipal buildings. Some extend around planned villages or crofting townships, others are satellite urban developments beyond the edge of larger centres. This name has also been applied to quite small clusters of houses which nowadays have little or no specific link to rural land use, although they are sited in the countryside.

Some 'urban areas' have grown since the early 1800s, others have been created quite recently. In some instances suburban street plans reflect the previous pattern of field boundaries, while 'urban' Victorian hospitals that were originally out of town have been closed and redeveloped. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- urban or village charactero;
- mixture of domestic, commercial and other buildings and street. [2]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)
[2] Jacobs assessment undertaken 2021

Asset Number	HLT 5	**Name**	17th to 18th Century Industrial Planned Village
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Low	**Condition**	Unknown
Type	Historic Landscape	**Period**	17th to 18th Century
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Built for fishing or industrial workers in the 18th and 19th centuries, this type of planned village may be located beside a harbour or close to new works for industries like milling, distilling or mining. Landowning entrepreneurs of the 18th and 19th centuries solved their labour problems by building planned villages for significant numbers of industrial workers and fishermen. Such settlements were built close to new large-scale industrial works for weaving (as at New Lanark), distilling or mining. They were also laid out around enlarged harbours, as at the Fishertown in Nairn.

Where industrial production ceased these villages have not always survived. Some fell into ruin and were demolished, reducing the buildings to their foundations. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its built components including, buildings associated with domestic accommodation or buildings and structures relating to the associated industry;
- associated street patten. [2]

Sources
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018) [2] Jacobs assessment undertaken 2021

Asset Number	HLT 6	**Name**	Recreation Area
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Low	**Condition**	Unknown
Type	Historic Landscape	**Period**	Unknown
NMR ref	None	**HER ref**	None
Canmore ID			

Description

There is a great variety of leisure and recreational facilities, including sports grounds, caravan parks, historic buildings now open to the public, racing circuits and council allotments. A vast range of recreational facilities have been created during the last 200 years, as leisure time has gradually increased. They include race-courses and sports grounds, camping and caravanning sites, public parks, council allotments and marinas, visitor centres and historic sites open to the public. HLA data records more extensive areas separately, such as golf courses and ski centres.

With an increasing urban population, land used for recreation is increasingly being redeveloped, for housing and other uses. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its built components including associated facilities such as games pavilions and club houses or buildings and structures relating to the associated activities;
- areas of open space including playing fields and parks;
- trees which form part of the design of the recreational area. [2]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)
[2] Jacobs assessment undertaken 2021

Asset Number	HLT 7	**Name**	Medieval Village
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Historic Landscape	**Period**	Medieval
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Some villages developed in medieval times as a cluster of houses and adjacent plots at a road junction, around a church or in a row along a street. The layout survives in some places, despite expansion in modern times. Some villages have their origins in the medieval period. The original plan of these small settlements usually consisted of a number of adjacent building plots of similar size arranged along either side of a street or green. A back lane around the rear of the plots may survive. It is not unusual for roads entering what was once a medieval village to change direction sharply, to follow the line of the buildings. In other instances the houses and plots clustered around a church or road junction with little evidence of order. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

- possible early street patten;
- potential for archaeologcal remains dating to medieval period. [2]

Sources
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018) [2] Jacobs assessment undertaken 2021

Asset Number	HLT 10	**Name**	Rough Grazing
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Low	**Condition**	Unknown
Type	Historic Landscape	**Period**	Unknown
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Hill ground or lower-lying land that shows no evidence of recent agricultural improvement can be used for rough grazing. Such areas are largely heather moorland or rough grassland. Most of Scotland's hills, mountains and moorlands are used as areas of rough grazing and, in some instances, are managed for sporting activities such as stalking and grouse shooting. They may be heather moorlands or rough grasslands, and they may have been drained in the past. However, this land use type excludes those areas of hill ground that have recently been improved by fertilising, ploughing or direct drilling with clover or grass seed.

Rough grazing lands have evolved to their present extent as a result of woodland clearance, grazing and episodes of farming over some 6,000 years. These marginal areas bear witness to pre-19th century agriculture and settlement, and contain other remains that can date back to the prehistoric period. [1]

This type is depicted as uncultivated ground on the 1st edition Ordnance Survey map of 1867 and remains so today. [2]

The key characterisitcs, features or elements of this cultural heritage resource are:

- its built components associated with the improvement era such as field boundaries and drainage features, and later use such as grouse butts;
- open character. [3]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)

[2] 1st edition Ordance Survey, Perthshire, Sheet LXI (includes: Little Dunkeld), Publication date: 1867; 1st edition Ordnance Survey, Perthshire, Sheet LXII (includes: Caputh; Dunkeld And Dowally; Little Dunkeld), Publication date: 1867

[3] Jacobs assessment undertaken 2021

Asset Number	HLT 11	**Name**	Dunkeld Battlefield
Legal Status	Listed on the Inventory of Historic Battlefields	**NGR**	NO0229242854
Value (sensitivity)	High	**Condition**	Good
Type	Historic Landscape	**Period**	17th century
NMR ref	BTL32	**HER ref**	None
Canmore ID			

Description

Overview and Statement of Significance

Dunkeld is an incredibly significant battle in the history of 17th century Scotland, occurring at a time when King William was yet to wholly solidify his position on the throne and on the back of a significant Jacobite victory at Killiecrankie. Had the Jacobites won at Dunkeld, the path would have been open to them to advance on a weakly defended and strongly Jacobite Perth and subsequently continue to Stirling, a situation for which the Privy Council had already made preparations to flee should it occur and which would have been a great boost to the Jacobite cause. The Cameronian's unyielding defence of the town prevented the Jacobites advancing any further south and turned the tide of a Rising which had thus far gone badly for the Government into one of increasing difficulty for the Jacobites, whose numbers dwindle drastically after Dunkeld and who essentially cease to present the threat they had after Killiecrankie, confined to skirmishing and minor actions in the Highlands until finally being utterly dispersed at Cromdale in May 1690.

The first Jacobite Rising occurred in 1689, in the wake of the ousting of the Stuart King, James VII and II and his replacement by William of Orange in the so-called Glorious Revolution. The Jacobites (from the Latin for James) were led by Viscount Dundee, John Graham of Claverhouse and won a decisive early victory at the Battle of Killiecrankie on 17 July 1689, although Dundee was killed in the battle. It was followed a month later by the Battle of Dunkeld, fought on 21 August 1689.

Dunkeld was an urban battle, with the town held by a garrison of Government troops from the Cameronian Regiment under Lieutenant-Colonel William Cleland's command. After a long and bitter struggle, which saw much of the town burned to the ground, the Jacobites withdrew, leaving the Government force the surprised victors.

Inventory Boundary

The Inventory boundary defines the area in which the main events of the battle are considered to have taken place (landscape context) and where associated physical remains and archaeological evidence occur or may be expected (specific qualities). The landscape context is described under battlefield landscape: it encompasses areas of fighting, key movements of troops across the landscape and other important locations, such as the positions of camps or vantage points. Although the landscape has changed since the time of the battle, key characteristics of the terrain at the time of the battle can normally still be identified, enabling events to be more fully understood and interpreted in their landscape context. Specific qualities are described under physical remains and potential: these include landscape features that played a significant role in the battle, other physical remains, such as enclosures or built structures, and areas of known or potential archaeological evidence.

The Inventory boundary for the Battle of Dunkeld is defined on the accompanying map and includes the following areas:

- The north bank of the River Tay, stretching to the east and west of the town to accommodate the routes of the Jacobite advances to attack and the fighting which took place as they did.
- The level ground to the north of the Cathedral, much of which was occupied by Dunkeld House and elements of the town in 1689.
- The hills to the north of the town, including Gallow Hill which provided an important vantage point for the Jacobites and was the location of their cannon.
- Hills to the west of the town, which again provided important vantage points for the Jacobites as they advanced.
- Ground to the east and north-east including Shiochies Hill, the location of some of the early stages of the battle prior to the Cameronians withdrawal into the town.
- Historical Background
- With their victory at the Battle of Killiecrankie on 27 July 1689 tempered by the loss of John Graham of Claverhouse, the newly appointed Jacobite commander, Alexander Cannon, led his army through Braemar, pursued by General Mackay and a mounted column of Government troops. The Jacobites finally evaded this pursuit when they doubled back into the hills at Kincardine o' Neil, where Mackay was unwilling to follow. The Jacobites then advanced south toward Dunkeld.

The town of Dunkeld was defended by the Cameronians, recently raised from the ranks of the Covenanters. As a regiment they had yet to be blooded and were commanded by Lieutenant-Colonel William Cleland, who had been involved in both the battles of Drumclog and Bothwell Bridge in 1679. Cannon ordered the Jacobite army into the assault on the town of Dunkeld on the morning of 21 August 1689.

The engagement, which was to involve brutal street and house to house fighting was to rage for several hours and saw the Cameronian defenders gradually pushed back toward the cathedral in the face of a Jacobite assault on all side. Cleland was killed early on in the battle, though it is said that he survived long enough to make sure that he did not expire within sight of his men. By the end of the battle most of the buildings in the town were on fire and both sides were running extremely low on ammunition. For reasons which remain obscure the still stronger Jacobites eventually withdrew from the action, leaving the all but beaten Government troops victorious.

The Armies

Colonel Alexander Cannon, an Irish officer who was described by Lt. Col. Blackader as *'destitute of the resolution and military talents of his predecessor* [Viscount Dundee]' (Crichton 1824) commanded an army of Highlanders, some on horseback, while the army was laden with baggage. McLean (1857, 23) sensibly suggests that many of the horses and much of the baggage represented booty from Killiecrankie. The Jacobite army consisted of most of the clans who had fought at Killiecrankie. In addition, the Stuarts of Appin supplied 120 men. There were also Frasers, McFarlanes, and Gordons of Strathdon and Glenlivet. Alexander Steuart brought 600-1000 men from Atholl and Strathtay. There was a contingent of Macgregors under Glengyle (Rob Roy's father), along with a contingent of Glencoe men and some islanders - Macdonald of Sleat's men from North Uist, Clanranald men under the Tutor of Benbecula and MacNeil of Barra's men. Last but not least there were additional men from the north-east, who strengthened the cavalry to four troops.

William Cleland, a veteran of Drumclog and Bothwell Bridge in 1679, commanded a newly formed regiment of Covenanters deployed at Dunkeld in the defence of the town. It was formed just four months before the Battle of Dunkeld on 16 April 1689, and took its name from the Covenanter Reverend Richard Cameron. The men were enlisted from the United Societies, which also tended to be known at that time as Cameronians. The troops supplied by Colonel Ramsey and led by Lord Cardross consisted of two troops of cavalry and three of dragoons (although Blackader's account suggests one troop and four troops respectively) and these forces were withdrawn prior to the main battle. The Cameronian's were largely staunch Covenanters, motivated by religious belief as much as any other factor, and some

were veterans of the Covenanter rebellion of 1679. There is some evidence that the Cameronian's were not expected to survive their deployment to Dunkeld, and indeed the strongly independent nature of the regiment seems to have been of concern to the authorities of the time. To further compound the Cameronian's troubles, when they had received equipment in May, they had only been provided 400 outdated matchlock muskets, with a further 100 to be sent, along with 400 pikes and 40 halberds for the regiment's sergeants.

Numbers

Jacobites: 4,000 to 5,000 men, including 1,000 on horseback. However, Episcopalian accounts, which sought to undermine the Cameronian achievement, estimate the number of Jacobite men at 2,500, while Balhadie states 3,000. Other sources, including prisoners and the report prepared by Mackay, quote 5,000 including the 1,000 Atholl men.

Government (Cameronians): 700-800 men. The initial strength of the regiment when raised was 1200, but at the time of Dunkeld 400 men of the regiment had been dispatched to *"Lorn and Cantire, to guard the west coast*" (Crichton, 1824).

Losses

Jacobites: c. 300.

Cameronians: c. 50. However, Blackader's diary documents 15 men killed and thirty injured in addition to the following officers: Lt. Col. Cleland, Lt. Stuart, Major Henderson, Captain Caldwal.

Action

The battle of Dunkeld is characterised by violent street fighting in multiple simultaneous locations, as the Jacobites assaulted the town from every available direction. At seven o'clock on the morning of 21 August, the battle began with four Jacobite cannon (probably the leather guns the Jacobites are likely to have captured at Killiecrankie) positioned on the Gallow Hill north of Dunkeld. Soon after, one hundred of Sir Alexander Maclean's shock troops armed with swords and protected by helmet, half armour and targes, charged Shiochies Hill, followed by the rest of the regiment with firelocks offering covering fire. More men (possibly Maclean's) joined the assault, with two horse troops advancing to their left. Cleland had placed Captain Hay in charge of a group of men defending Shiochies Hill and in support Ensign Lockhart advanced to a stone dyke at the foot of the hill with 28 men. Cleland could not defend the east of the town on account of an overhanging hill and a wood close to the houses so these buildings were burned when attacked and the outposts pulled back to a barricade at the Cross.

Only one hour into the battle, Lt. Col. Cleland was mortally wounded close to Dunkeld House by shots to the head and the liver. Command passed to Major James Henderson as second-in-command, only for Henderson to be killed as well almost immediately. Captain George Munro, commanding the defence of the barricades at the Cross, then took overall command, after leaving command of the barricades to Lt. Henry Stewart of Livingstoune. This position was itself later rushed by the Jacobites, with Stewart killed as he attempted to withdraw his men.

Hay and the men on Shiochies Hill were driven back to Dunkeld House and he and Sir Alexander Maclean suffered broken legs. The western detachment retreated to the cathedral which held 100 of the Cameronian's, along with those Dunkeld inhabitants who had not evacuated. A number of Government troops were trapped in houses during the retreat and killed.

The Jacobite attack then developed along the riverbank, to the south of the cathedral, where barricaded houses were stormed and against the cathedral itself, where the assault was led by the Appin Stewarts.

In the face of this onslaught, the Cameronians were gradually driven back, soon holding only Dunkeld House, the cathedral and three other houses. Their pikemen and halberdiers were attacked by Jacobites armed with swords and targes, while some musketeers who had neither swords nor bayonets entered houses and began to opened fire on the Jacobites from the cover they provided:

"The rebels advanced most boldly upon the yard-dykes all round, even upon those parts which stood within less than 40 paces from the river, where they crowded in multitudes without regard to the shot liberally pour'd in their faces" (Crichton 1824, 95).

From inside the houses, Jacobite snipers harassed the Cameronians and Munro responded by sending out small parties with blazing faggots to set fire to the houses, killing some of the Jacobites and locking others in to burn to their deaths:

"which raised a hideous noise from these wretches in the fire" (Crichton 1824, 97).

The Jacobites also set fire to houses in order to push back the Cameronian defenders and by the end of the battle only three houses survived unburned. The thick smoke from the burning buildings also hindered the efforts of both sides as it shrouded the embattled town.

By the end of the battle, the Cameronians' powder was running extremely low and, with no further retreat possible, they prepared to make a final stand. Then, just as they prepared to meet their fate the Jacobites withdrew. It is unclear whether this unexpected move was due to a lack of ammunition, a fear of their Cameronian opponents or concern that reinforcements would soon arrive. Whatever the reason, the Jacobites retreated to hills to the north-west of Dunkeld while the Cameronians, unsure what was happening, re-fortified their defences.

One element of the action over which there remains significant debate is the length of the engagement. While the sources seem to agree that the battle begins between around 6am and 7am, there is debate over whether it concluded at 11am or 11pm. General Hugh Mackay's own account of the battle does not give any indication of the length of the battle, but Blackader's eyewitness account states that the enemy is first sighted at around 6am and he describes the worst of the hand to hand fighting as: *"in this hot service we continued above three hours*." (Crichton, 1824).

Finally, an officer is despatched to Perth with news of the victory at 12 o' clock (Blackader does does not say if this is 12am or 12pm). This account of the duration of the battle is taken by others such as Macaulay and Hume-Brown as entirely within the morning, giving a total length of the combat as around four hours. However, John Mackay in 1836 gives a time of 11pm for the end of the battle, giving a total of 16 hours for the length of the battle. This is supported by Burton and Grant among others. While 16 hours seems like an excessively long period of time for a battle such as this, the evidence is currently insufficient to completely rule out either possibility. In

August 1689, the last of the daylight would be around 11pm, and if night was falling it would certainly be a valid reason for the Jacobite withdrawal. While Blackader's account states that the worst of the fighting lasts for more than 3 hours, he does not clearly say if this stage of the battle begins early in the day (around 8am if the 11am conclusion is to be taken) or after several hours of fighting have already occurred (late afternoon or evening if we take the 11pm conclusion). We do know that whether the battle lasted for four hours or sixteen, by its close both sides were essentially out of ammunition and powder and the Cameronian's were steeling themselves for a desperate last stand when the Jacobites withdrew, highlighting that regardless of its length it was a violently intense engagement.

Aftermath & Consequences

The Jacobite tactic of firing single volleys before charging in close with the sword proved disastrous in the built up environment of Dunkeld, where the Cameronian's seemingly outdated pikes and halberds proved more than a match for the Jacobite broadswords. Cannon has also been criticised for being ill-prepared and not making effective use of his artillery in close-range attacks on Dunkeld House or the dykes (Stevenson 1942).

After Dunkeld, the Jacobites retired to Blair Castle and on the following Saturday the Laird of Bellachan arrived at Dunkeld seeking a treaty. Major-General Mackay hindered the Jacobite army's attempts to recruit more supporters and remained in the Highlands with an army in order to contain the rebels. Having emerged victorious with very few casualties, the Cameronian Regiment *"was everywhere commended for their intrepid conduct. Their unparalleled courage was the subject of universal admiration*" (Crichton 1824, 100).

The Cameronians marched to Aberdeen then Montrose and remained there for much of the time they were stationed in Scotland. Their reputation preceded them, as a group of Highlanders who attempted to plunder Montrose took flight upon hearing of the imminent arrival of the Cameronians, and they also defeated a small group of Jacobites at Cardross.

After the battle of Dunkeld, the Jacobite army reduced in size and Col. Cannon's reputation is said by Blackader to have suffered badly (Crichton 1824), to the extent that he was thereafter unable to entice his force to launch any large-scale attacks. Despite this downturn in Jacobite fortunes much of the region continued to oppose William's rule and skirmishes did occur.

The Jacobite army struggled on through the winter, only suffering their final defeat at Cromdale in May 1690, when they were surprised in camp and routed. Not long after the suppression of this first Jacobite Rising in Scotland, MacKay constructed Fort William on the site of another fort originally built for Cromwell by General Monck in 1654. By July that year, William of Orange had emerged victorious over James VII of Scotland in the Battle of the Boyne in Ireland, delivering a near fatal blow to the Jacobite Risings ' the coup de gras came at Aughrim on 12 July 1691. By 17th August 1691 William had offered a pardon to all Highlanders who would swear allegiance to him, and the clans sent representatives to France, where James was now exiled, asking his permission to take the oath. His slow response combined with severe wintry conditions meant that some, including the MacDonald's of Glencoe, could not take the oath before the January 1st deadline, invoking a brutal government response in the form of the Massacre of Glencoe on 13 February 1692. Thereafter all remaining clans were persuaded to swear allegiance to William by the spring of that year.

However, the Jacobite cause itself remained strong, leading to further Risings in Scotland in 1715 ('The Fifteen'), 1719 ('The Nineteen') and 1745 ('The Forty-Five') until the final defeat on 16 April 1646 at the Battle of Culloden.

Events & Participants

Fighting under the command of Lt. Col. William Cleland, a veteran of Drumclog and Bothwell Brig, a garrison of ex-Covenanters defended Dunkeld (derived from the Gaelic Dun Chailleainn, Fort of the Caledonians), 15 miles to the north of Perth, on behalf of the Government against a group of Jacobites led by Colonel Alexander Cannon, testifying to a decisive shift in the Scottish political climate after the Glorious Revolution, or the Revolution of 1688. This was a defining period in Scottish history as a group of English parliamentarians from the Whig party of opposition, unwilling to accept James VII's newborn Roman Catholic son, James, as heir to the English throne, invited William of Orange to take the throne in his stead, thereby terminating the Stuart dynasty. Determined to return James VII and his later House of Stuart descendents to the throne, John Graham of Claverhouse, Viscount Dundee, raised an army, the so-called Jacobites (after the Latin for James, Jacobus) and launched the first of a series of rebellions known as the Jacobite Risings.

Lt. Col. William Cleland was the commander of the Cameronian regiment deployed to Dunkeld in August 1689. By the time of Dunkeld he was an experienced combatant although General Mackay considered Cleland to be: *"a sensible, resolute man though not much of a souldier."*

He had been present at Drumclog in 1679, and indeed can claim much of the credit for the victory there. At one point during the battle Cleland had hold of John Graham of Claverhouse's own bridle, and Graham was lucky to avoid being killed when Cleland slipped, and this started a lasting animosity between them until their deaths in 1689. Cleland also served as a captain in the subsequent defeat at Bothwell Bridge, after which he was forced into exile on the continent. He served as a spy for both the Monmouth Rebellion in 1685 and the arrival of William in 1688. Outside of his military life, he studied both medicine and law during his exile in the Netherlands, with his legal thesis addressing legal abuses against the Covenanters published at Utrecht in 1684, and was also a poet, with a collection of his works published posthumously in 1697.

Major James Henderson was second in command of the Covenanter regiment at Dunkeld and had more military experience than Cleland. He too had been present at Bothwell Bridge and spent time in exile after the battle, undertaking military service on the continent before serving as a major under Argyll in the Monmouth Rebellion of 1685.

Captain George Munro was the commander of the 18th Company of the Cameronians at Dunkeld and following the loss of both Cleland and Henderson early in the battle he took overall command of the ultimately successful defence of the town.

Lord Cardross was another of the Covenanter commanders. He had previously been imprisoned for his beliefs, before he was banished to the Carolinas with Cleland's brother-in-law John Steel. He subsequently continued his exile in the Netherlands, from where he returned with William in 1688.

Colonel Alexander Cannon was the commander of the Jacobite army. He had assumed command following the death of John Graham of Claverhouse at the battle of Killiecrankie. However, he was far from Claverhouse's equal as a commander, with defeat at Dunkeld by the heavily outnumbered Cameronian's being probably the most prominent event of his tenure. Over the winter the numbers of his force dwindled, and he was replaced as commander of the Jacobite army in April 1690 by Major-General Thomas Buchan.

Context

Seventeenth century Scotland was in a state of political and religious turmoil. Presbyterianism had spread across much of the country and in 1637 Archibald Johnston (Lord Warriston) orchestrated the revision of the National Covenant of 1581. Signed by James VI and adopted by the Church of Scotland, the Covenant was initially drawn up by John Craig as a means of countering the Roman Catholic Church's attempts to regain control of Scotland. In 1638, Warriston's revision of the Covenant was used as symbol of defiance against the attempts by Charles I to bring the Church of Scotland into alignment with the Church of England. As the de facto government of Scotland, the Covenanters defeated Charles I in the Bishop's Wars, damaging the Stuart monarchy and contributing directly to the outbreak of the English Civil War. Led by Archibald Campbell, 1st Marquess of Argyll, the Covenanters were the leading political party in Scotland; however, they were defeated in battle by Oliver Cromwell and Scotland was ultimately annexed under Cromwell's Commonwealth and the General Assembly of the Kirk lost all civil powers (Cowan 1968).

Following the Restoration of 1660 when Charles II was restored to his father's throne (having been crowned in Scotland in 1650), the Covenanters had become the oppressed, cast out of political power and surviving largely as a popular movement, particularly in south-west Scotland. During the 1660s, 1670s and 1680s, there were repeated efforts by Charles II's government to stamp out the Covenanters as a social and religious movement. The repression sparked off several rebellions, most notably in 1666, which ended in the battle of Rullion Green, and in 1679, where an initial Covenanter victory at Drumclog was followed by a decisive Government victory at Bothwell Bridge. The Covenanters were scattered and posed little further threat. In this atmosphere, Charles II died in 1685 and was succeeded by his Catholic brother, James VII & II. This marked a fundamental turning point in the balance of power in Britain as a whole and was to have a major impact in Scotland.

Shortly after the accession of James VII & II in 1685, the Duke of Monmouth led the abortive Monmouth Rebellion with the Duke of Argyll; both men were subsequently captured and executed. James' rule grew ever more unpopular and the birth of James' son, who was Catholic and whose birth meant a Catholic dynasty on the British throne, gave an excuse for a group of English parliamentarians from the Whig party of opposition to invite William of Orange to take the throne. William's arrival drove James to flee to Ireland and he was declared deposed, with William and his wife Mary (James' eldest living child) crowned as the new monarchs. This brought the situation in Scotland back to that of the Wars of the Three Kingdoms; Scotland's monarch had been deposed in England, and the Scottish political establishment accepted the fait accompli. Others amongst the nobility were less prepared to accept the new regime, instead taking up arms to restore the king, echoing the efforts of James Graham, the Marquis of Montrose in the 1640s. Determined to return James VII to the throne, John Graham of Claverhouse, Viscount Dundee, raised an army and launched a rebellion. He and his supporters were known as Jacobites (after the Latin for James, Jacobus). The first battle of Dundee's Rising was at Killiecrankie in July 1689, where the Jacobites defeated a larger government army under General Hugh MacKay, Unfortunately Dundee was himself killed during the fighting. This meant that, ten years after the Covenanter rebellion had been destroyed at Bothwell Bridge in 1679, two of the main commanders of the Government forces present had subsequently been killed in rebellion against the Government: Monmouth in 1685 and Dundee in 1689.

With the loss of John Graham of Claverhouse at the Battle of Killiecrankie on 27 July 1689, the Jacobites appointed a new commander, Col. Alexander Cannon. He ordered the Jacobite army into the assault on the town of Dunkeld on the morning of 21 August 1689. The town was defended by the Cameronians, a regiment recently raised from the ranks of the Covenanters and taking its name from Richard Cameron, one of the leading Covenanter preachers of the Killing Times who had been killed in a skirmish at Airdsmoss on 22 July 1680. Initially fighting under the command of Lt. Col. William Cleland, a veteran of Drumclog and Bothwell Brig, the Covenanters preparing to defend Dunkeld seemed to have an almost impossible task before them.

Prior to the engagement at Dunkeld, General Mackay, the commander of the Government army, which had suffered so badly at the hands of the Jacobites at Killiecrankie, had been tracking the Jacobites through Braemar into Strathbogie with a mounted column for over a month, but was out-manoeuvred when Cannon and his men doubled back south into the hills at Kincardine o' Neil near Aboyne. Mackay, unwilling to follow them into the hills, advanced via Aberdeen and by 22 August, the day after the Battle of Dunkeld took place, had only managed to reach Drumlithie. Meanwhile Cannon, unaware of the presence of the Cameronians, had turned south-west and advanced towards Dunkeld.

The Cameronians had arrived in Dunkeld on 17 August under orders from the Privy Council in Edinburgh to defend the place, despite Mackay's warning that they were an inappropriate choice of regiment to send into the Episcopalian Highlands due to their staunchly Covenanter background. Despite the next day being Sunday, which was usually held sacrosanct by the Presbyterians, they commenced building defences, which was no mean feat given that the town lacked an encircling wall. Ditches were dug and the lead was stripped from Dunkeld house and melted down to bolster low ammunition reserves.

The Jacobites were convinced that the Cameronians intended to plunder and burn Dunkeld down and most of the townsfolk fled the area. Cannon's men gathered around the town and sent a messenger under a flag of truce to Cleland with a letter stating:

"We, the gentlemen assembled, being informed that ye intend to burn the town, desire whether ye come for peace or war, and to certify you that if ye burn any one house, we will destroy you."

Unmoved by this threat and aware that Crann Tara (the Fiery Cross) had been sent out across the area summoning all clan members to come together in defence of their lands, Cleland replied with the following:

"*We are faithful subjects to King William and Queen Mary, and enemies to their enemies; and if you, who send those threats, shall make any hostile appearance, we will burn all that belongs to you, and otherwise chastise you as you deserve*" (Crichton 1824, 90-1).

Cleland then sent for ammunition and provisions, although he received very little from Colonel Ramsay in Perth. On the 19th August Ramsay did send reinforcements in the form of two troops of horse and three of dragoons with Lord Cardross.

As the Jacobites moved into position around the town, forward parties of Cleland's force were engaged in skirmishing in the days before the battle, including the capture of a small group of Jacobites. On 20 August, Ramsay recalled Cardross to Perth. Initially he refused this order and continued to engage in the ongoing skirmishes around the town, however, with the order repeated in no uncertain terms the night before the battle, Cardross had no choice but to comply.

With the withdrawal of the cavalry, many of the Cameronian's appear to have intended to follow suit. Cleland prevailed upon them to stay with the assistance of Alexander Shields, the chaplain. In particular, some of the soldiers were concerned of the presence of the officer's horses, giving them a means of escape while leaving the rest of the regiment behind. To reassure his men this would not happen, Cleland *"ordered to draw out all their horses and to be shot dead. The souldiers then told them they needed not that pledge of their honour, which they never doubted; and seeing they found their stay necessar, they would run all hazards with them."* (Crichton, 1824).

The next day, the full strength of the Jacobite army appeared on the hills around the town and after Cleland refused an invitation to surrender battle commenced. He had positioned his troops around the town, including at the cathedral, at Dunkeld House, the Cross and in gardens and the park.

Battlefield Landscape

Dunkeld is a highly unusual Scottish battle because it took place in an urban environment, a form of combat which was generally avoided in the seventeenth and eighteenth centuries. Most of the town was burned to the ground during the battle, with only three houses reportedly left standing. When the town was rebuilt the area to the north of the cathedral, which had been occupied by Scots Raw - a street which integrated Dunkeld House ' was left open, so as to provide an open aspect between the house and the cathedral. Further buildings associated with the cathedral were found to the south, between the river and the cathedral itself, and this area also exists as open ground today.

Location

Dunkeld sits on the northern bank of the River Tay, overlooked by a circle of hills to the north, including Gallows Hill, with lower hills, including Schiochies Hill, closer to the town. The town contained a main street running westward to the Cross and then skirting the southern side of the cathedral (Canon's Houses). Another street (Scots Raw) branched north-westward from the Cross, creating a 'Y' shaped street plan. This street integrated Dunkeld House, though this was a free standing structure. Built in 1679 for the Marquess of Atholl, Dunkeld House was an impressive mansion designed by the architect Sir William Bruce. Atholl had been buying up plots of land around this mansion for some years prior to the Battle of Dunkeld, including part of Scots Raw and another group of dwellings on the south-west boundary of the town (Hopkins 1986, 183). After the town was destroyed in the Battle of Dunkeld its location was altered, allowing the Marquess an uninterrupted view of the Cathedral.

Terrain

The town occupied the flood plain to the north of the River Tay, at the site of a ford, and later a bridge (to the south of the cathedral). Being hemmed in by the river (which in other locations would have been a blessing to a defending force) and surrounded on all quarters by hills made the town a difficult place to defend, not least because the place lacked a town wall. What the Cameronians did quite successfully was use the built-up environment to their advantage, drawing themselves into the core of the town and forcing the Jacobites to advance slowly through the narrow streets. The burning of buildings with men trapped inside added a further unpleasant dimension to an already bitter struggle.

Condition

As previously noted, an interesting feature of the site is that the ground occupied by Scots Raw was never redeveloped after the destruction wrought by the battle, with much of the rebuilding taking place to the east. Additionally, Dunkeld House itself was demolished in the early 19th Century, though the stable block and court offices remained extant until after 1858. Tree planting may well have damaged elements of buried archaeology. However, archaeological investigation has confirmed the location of a tower associated with Dunkeld House, as well as roadways, walls and landscaping features (Gondek and Driscoll 2003) and further to this, geophysical and resistivity survey located a possible laundry, a slaughterhouse and granary (Kellog and Jones 2003).

The slopes of Gallow Hill and Shiochies Hill are afforested, with the latter partly landscaped. The houses of the new town of Dunkeld are located to the east of these topographic features.

Archaeological & Physical Remains and Potential

Given that the battle occurred in a built up area and resulted in the destruction of buildings in an area which, in places at least, has not been redeveloped, it is probable that archaeological evidence remains. Indeed, impact scars from musket fire are visible on the eastern wall of the Cathedral.

According to Blackader's diary, when the Jacobite army fled the town of Dunkeld after their defeat at the hands of the Cameronians, they left "*a number of their dead carcasses behind them*" (Crichton 1824, 48), though it is likely these dead would have been buried thereafter. The town, which previously lay around the Cathedral, was almost completely destroyed in the battle and a new town was built to the east, a rather convenient location which gave the Duke of Atholl a clear line of sight to the Cathedral from his house. The Cathedral is now semi-ruined and many of the houses are owned by the National Trust for Scotland which rescued them from demolition in 1953 and has restored and preserved the centre of the town. The area occupied by the town at the time of the battle is now an open field and a recent geophysical survey by Glasgow University (Kellog and Jones 2003) revealed that despite intensive foundation robbing there do seem to be traces of the settlement surviving as archaeological features beneath the surface.

Cultural Association

The preferred Jacobite tactic of firing one round then charging with swords was unsuccessful in the confined streets of Dunkeld town and the bodies of fallen men hindered the advance. The shock of this plus the requirement to take cover behind walls, a fighting style counter to the warrior virtues held dear by many Highlanders, prompted the Glencoe poet to lament:

"They were not accustomed to stand against a wall for protection, as was done at Dunkeld. The stalwart young men fell..... felled by bullets from cowherds" (Maclean 1939, 316).

Commemoration & Interpretation

It is not clear whether the eventual retreat of the Highlanders was as a result of a lack of ammunition, as Cannon claimed, or whether, as a prisoner commented according to Lt Blackader, the officers' attempts to force the clans to re-engage were rejected on the basis that their troops no longer wanted to fight against 'mad and desperate men', or 'devils', or whether they were afraid that Lanier would arrive imminently with cavalry reinforcements as commemorated in the song You're welcome, Whigs, from Bothwell Brigs, of which the following is one verse:

"You lie, you lust, you break your trust,
And act all kinds of evil,
Your covenant makes you a saint,
Although you live a devil.
From murders, too, as soldiers true,
You are advanced well, boys;
You fought like devils, your only rivals,
When you were at Dunkeld, boys."

Dunkeld was also memorialized with the other battles of the Jacobite Risings in the writings of Sir Walter Scott, who anonymously wrote his first novel, Waverley, as a fictitious tale about the Jacobite Risings of 1745.

The National Trust for Scotland has taken ownership of and preserved many of the houses in Dunkeld and maintains the Ell Shop. A Tourist Information Centre is located at The Cross in the centre of the town, while the area around the town is included in a popular walking route.

There is also a National Trust for Scotland information panel in the grounds of Dunkeld Cathedral, along with a small museum within the Cathedral which provides some information on the battle. Also, within the cathedral is a stone commemorating Lt. Col. Cleland.

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RCAHMS. Dunkeld House. Site Number NO04SW 16.00 canmore.rcahms.gov.uk/en/site/27169/details/dunkeld+dunkeld+house/ [Last accessed: 23/08/2011] [1]
The key characterisitcs, features or elements of this cultural heritage resource are articulated as the key landscape characteristics and special qualities identified in the Inventory of Historic Battlefield. [2]
Sources
[1] Historic Environment Scotland Inventory of Historic Battlefields – The Battle of Dunkeld available online from: http://portal.historicenvironment.scot/designation/BTL32 (Accessed August 2018) [2] Jacobs assessment undertaken 2021

Asset Number	HLT 12	**Name**	19th Century to Present Quarry
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Negligible	**Condition**	Good
Type	Historic Landscape	**Period**	19th Century
NMR ref	None	**HER ref**	None
Canmore ID			
Description			
Quarries can vary in size from a single hectare to the removal of an entire hill, taking fine building stone or crushed rock aggregate for construction industries. Stone for building has been quarried for millennia, but it is only since the 1800s that large quarries have been opened for extensive extraction. Some quarries are removing entire hills, using the crushed rock for major construction projects. Others are taking masonry for major new buildings or repairing historic structures. Once no longer economically viable or worked out, quarries are usually abandoned. However, some, like the slate quarries at Ballachulish, have been landscaped so that the areas can take on an alternative land use. [1] The key characterisitcs, features or elements of this cultural heritage resource include any built components associated with quarrying activities, including the physical remains of the quarries themselves. [2]			
Sources			
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018) [2] Jacobs assessment undertaken 2021			

Asset Number	HLT 14	**Name**	Murthly Castle
Legal Status	Listed on the Inventory of Gardens and Designed Landscape	**NGR**	NO0709739060
Value (sensitivity)	High	**Condition**	Good
Type	Historic Landscape	**Period**	17th century to 19th century
NMR ref	GDL00292	**HER ref**	None
Canmore ID			
Description			
An outstanding landscape which makes a major contribution to the surrounding Tay Valley scenery and provides an attractive setting for several category A listed buildings. Today's early 19th century layout overlays an early 17th century one, and some early trees can still be seen. **Location and Setting** Murthly Castle is situated on the south bank of the River Tay, a bend of which encloses the policies to the north. The Castle stands on a knoll with long views northwards from east to west, across to the foothills of the Highlands above Dunkeld, which lies some 4 miles (6km) away. The A9(T) now runs through the western section of the park. The east entrance is off the B9099 which forms the eastern boundary at Gellyburn. To the south, beyond the main railway line, lie the extensive woodlands of the Muir of Thorn. The soils are mainly light sandy loam over the deep gravels of glacial moraines, except in the lower areas where the ground is generally marshy. Murthly dominates the southern bank of the Tay for several miles and thus there are many views into the site from the surrounding roads.			

Murthly Castle lies in the centre of the policies which extend over some 2,130 acres (862 ha). The designed landscape has dominated this southern bank of the River Tay since the early 17th century and its extent can be seen on General Roy's plan of c.1750, which shows a formal pattern of avenues and shelterbelts. The layouts of the 19th century designs are shown on the 1st edition OS plan dated 1868 and the 2nd edition of c.1900. Comparison of these maps indicates that the extent of the landscape has remained consistent since the 18th century. There are archives and plans held at the Scottish Record Office which have not been seen during the course of this study, but there are pictures and photographs of the garden at the Castle.

Site History

The Abercrombie family acquired Murthly in the mid-15th century and built the original castle. Sir William, 11th of Grantully, was a page of James VI (I) and high in Royal favour. Known as 'William the Ruthless', he bought the extensive Murthly estates from his Abercrombie cousin in 1615 and began remodelling the castle and gardens. His son, Sir Thomas, built the enchanting garden house in 1669 and is credited with the magnificent Dutch garden created at that time. Sir Thomas may have been influenced by the designs of Sir William Bruce who was building Dunkeld House for the Duke of Atholl at this time. John inherited Murthly and he was succeeded in 1720 by Sir George, 2nd Baronet.

The family continued to live at Murthly and there were no dramatic changes until Sir John Steuart, 18th of Grantully, inherited the Logiealmond estates from his mother. Between 1829-1832 James Gillespie Graham designed a magnificent Elizabethan House for Sir John which was never finished and was later demolished. In 1828 John Wallace was recalled from Forest Hill, Windsor, to lay out the 'gardens and pleasure-grounds'. He was the fourth generation of his family to be a gardener at Murthly. His "*great-grandfather was a journeyman of the Duke of Atholl at Blair, when larch was treated as a greenhouse plant*". (Gardeners' Magazine 1828).

Sir John's brother, William, inherited in 1838. He was a colourful figure who had spent some time travelling especially in America. He brought back two Native Americans who lived in the Garden House for several years. He built the large Arch (in honour of his son, William George) although this was demolished in 1950. In 1890 the estate passed to a distant cousin Colonel Walter Fothringham of Pourie who assumed the additional surname of Steuart. His great-grandson, Thomas, the current owner of the Castle, recently inherited from his father Robert.

Landscape Components

Architectural Features

Murthly Castle, listed category A, was originally a Royal Hunting Lodge built by David II in the second quarter of the 12th century. The current castle dates from the 15th century and was remodelled in the 17th century by Sir William Steuart. Futher additions were completed in the manner of William Adam c.1725-40 and more were added c.1800 and c.1855. The middle wing was rebuilt in 1893 by A. Duncan although it is thought that the design may be based on sketches by Leadbetter and Fairley. The Chapel of St. Anthony the Eremite is listed category B. Originally it was built in the 16/17th century and was remodelled with a large addition in 1843-46 by James Gillespie Graham. The Walled Garden, Garden House etc. is listed category A and was built between 1669-1713. The Roman Bridge over Birnam Burn is listed category A and was built of six arches over a deep ravine in the mid-19th century; it is in poor condition. Ringwood Lodge is listed category C and was originally the West Lodge but is now cut off by the A9. Other listed buildings include: the Bridge at Colryden Lodge drive, listed category C; Colryden Lodge listed category B; East Gates listed category C. Other buildings include the Dairy, Murthly Kitchen Gardens and Broadarthur Lodge and East Lodge. Demolished significant architectural features include Murthly New Castle built between 1828-36 by James Gillespie Graham; it was unfinished and demolished in 1949. The Arch to George Steuart VC who died in 1868 was sited at the end of the southern vista from the New Castle and was demolished in 1950.

Parkland

The Parkland was first laid out in the 17/18th century and was enlarged and completely remodelled by John Wallace in 1830. In his massive scheme, parkland was created throughout the policies and is clearly shown on the 1st edition OS plan of 1867. The Parkland divides into two main parts separated by the Castle and Avenue which form an almost north/south division. The eastern park, edged along the river bank by a long ha-ha wall, contains some of the oldest trees including some very fine old sweet chestnuts, the remnants of the original planting. The majority of the park trees are beech, oak, horse chestnut, and sycamore and their ages range from the 1600s to 1850, and c.1890. A curling pond was created in the late 19th century on Meadow Bog in the south-east corner of the park. The pavilion, built adjacent to it between 1895-1900, is now disused. The western park is smaller and is further subdivided into two by Branders Hill Wood. The parkland trees here only date from the later 19th century periods of planting, although the oak avenue is older. Outwith these two areas, the pastures extend west along the banks of the Tay towards Birnam Hill. Sir William, 7th Baronet, kept a herd of buffalo on the 230 acre Duncan's Hill. John Wallace threaded many winding drives throughout the policies and exploited the dramatic qualities of the site, particularly the panoramic views, and the rugged quality of Birnam Burn. Many avenues were created through the park and these remain significant features today. Of these, one of the most impressive was a magnificent avenue of limes (Tilia x europaea), with yew (Taxus baccata) between them, leading up to the Gillespie Graham House. They are said to have been planted c.1711. Others included an Oak Avenue planted c.1800, and a second Oak Avenue planted c.1870, a good Beech Avenue planted c.1800 and a fine Cedar Avenue (Cedrus atlantica glauca), running along the western drive by the A9(T) (that dates to the 1680s [2]). A Wellingtonia Avenue flanks part of eastern drive. A particular feature of the 19th century design was the riverside drive which extended from Birnam in the west to Victoria Bridge at Gellyburn in the east. A new Beech Avenue (1977-78) was planted by the River Tay along a section of this drive to commemorate Queen Elizabeth II's Silver Jubilee, replacing one of Abies nobilis, planted for Queen Victoria's Diamond Jubilee, (felled because of disease in the 1950s).

Woodland

Murthly has always been famous for its woodland and originally it was part of Birnam Wood. It is said to still have one or two ancient deciduous trees. In the late 19th century, many of its famous trees were said to be the biggest in the country. Conifer planting throughout the 19th century has ensured that Murthly's fame for trees continues and now it grows some very fine plantations as well as specimen trees. Today there are over 400 acres of amenity woodland, mainly replanted from the 1850s, with a mixture of conifers and broadleaf

trees such as beech, oak, Scots pine and larch and there are at least 2,000 acres of commercial forestry growing mainly conifers, mostly replanted since 1950. The garden is laid out on a strong north/south axis between the Castle and the Chapel. It is thought to have been created by John Wallace, and much of the planting was carried out under the influence of Sir William, 7th Baronet. Three parallel walks follow the axis. The western walk was framed by an avenue of Monkey puzzles which were removed during World War II; the central walk is lined by an ancient avenue of yew about 300 years old; and the eastern walk as a dramatic sunk terrace built 1852-53. This terrace was approached by a flight of steps with a grotto underneath. The banks of the terrace were lined with colourful hybrid Rhododendron and backed by magnificent Cupressus varieties. The rhododendrons were replanted with advice from Peter Cox of Glendoick, and whitebeams have replaced the Cupressus which were felled in World War II. Beyond the sunken terrace walk is a lower terrace cut into the escarpment of a knoll and it is planted with a range of conifers in large single species groups. Alan Mitchell measured over 155 of the trees in 1983. They include firs, Abies alba and Abies grandis (one over 180' high); spruce, such as Picea glehnii over 84' high; several fine Picea omorika; some magnificent Douglas fir, Pseudotsuga menziesii, (the tallest over 180' high) ; other Tsuga including several Tsuga heterophylla (the tallest 170' tall) ; and some large Tsuga memertensiana planted in 1862. An avenue of Thuja plicata has an average height of over 100'.

The Gardens

The American Garden was planted by Sir William, 7th Baronet, with many of the American trees and plants he obtained during his travels. It lay to the south of the east drive near Keppie Wood and several ponds were made out of the small burn. The garden was abandoned in 1936 and is now derelict.

Walled Gardens

The south wing of the castle, built in the late 17th century, overlooks the enclosed walled garden. The castle sits above the garden on a high terrace with borders along its walls mainly filled with shrubs and ground cover plants including one magnificent Magnolia. Several flights of steps lead down to the formal garden. In the south-east corner stands the delightful hipped-roofed garden house with its date, 1669, carved on it. It is said to have been used as a model for revival houses by architects including Sir Robert Lorimer. Mature yew trees are remnants of the original planting and are sited in the north-west corner of the garden. The garden was remodelled during the 1850s when extravagant parterres were laid out. Photographs record the ornate topiary, most of which became neglected after c.1936. The garden was again remodelled in 1977 to designs by Russell and Greer. The layout followed the traditional four compartments and has created an attractive garden. The topiary has been simplified, a vegetable garden enclosed by existing yew and box hedges was introduced, some of the larger yews were removed, and a rose garden and several herbaceous borders were planted near the house. The old bowling green is entirely grassed.

The kitchen garden is situated at the south-west corner of the policies. It was built c.1840 probably under the direction of John Wallace. Greenhouses were attached and fruit trees trained up the long, curving south-facing wall. In c.1936 all production stopped and it was grassed over. The remaining walls are deteriorating. [1]

Early photograph taken in 1876 from a forestry album of 117 photographs compiled by an unknown Forestry Commission officer. No other information provided.

The date of the photograph is remarkably early and one must assume the negative or the original print was given by the owner of Murthly Estate to the Forestry Commission officer who compiled the photograph album in 1919-1934. The owner of the Estate in the period was Col Walter Steuart- Fotherington and served as a Commissioner with the Forestry Commission from its inception in 1919 until his death in 1936.

The PDF shows another view of the Douglas fir with outline of a building in the background. Some of the fir must have been planted at least 20 years prior to 1876. [2]

The key characterisitcs, features or elements of this cultural heritage resource are articulated as the key landscape features and special features identified from the Inventory of Gardens and Designed Landscapes. [3]

Sources

[1] Historic Environment Scotland Inventory of Gardens and Designed Landscapes – Murthly Castle available online from:
http://portal.historicenvironment.scot/designation/GDL00292 (Accessed August 2018)
[2] http://www.forestry-memories.org.uk/picture/number3532.asp (Accessed August 2018)
[3] Jacobs assessment undertaken 2021

Asset Number	HLT 15	**Name**	Transport
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Negligible	**Condition**	Good
Type	Historic Landscape	**Period**	19th century to modern
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Motorways, service stations and park-and-rides are included as HLA data as they cover considerable areas of land; only major junctions and dual carriageways are shown for other roads. Modern transport systems have focussed on the construction and extension of multi-

laned motorways, with their associated service stations. Providing links between major cities, they cover considerable areas of land. Dual carriageways, major junctions and associated park-and-rides are also recorded as HLA data but other roads are excluded because they are too small and narrow. [1] The key characterisitcs, features or elements of this cultural heritage resource include the built components, including the road infrastructure such as bridges, association with programmes of historic road building and historic routeways. [2]
Sources
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018) [2] Jacobs assessment undertaken 2021

Asset Number	HLT 17	**Name**	Freshwater Area
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Negligible	**Condition**	N/A
Type	Historic Landscape	**Period**	N/A
NMR ref	None	**HER ref**	None
Canmore ID			
Description			
Lochs or rivers over 50m wide are recorded as HLT data. [1]			
Sources			
[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)			

Asset Number	HLT 19	**Name**	Dunkeld House
Legal Status	Listed on the Inventory of Gardens and Designed Landscape	**NGR**	NO0181942840
Value (sensitivity)	High	**Condition**	Good
Type	Historic Landscape	**Period**	18th century to 19th century
NMR ref	GDL00157	**HER ref**	None
Canmore ID			
Description			

The designed landscape at Dunkeld has existed for more than 250 years, as a formal 18th century design which was then informalised in the 19th century. It plays an important role in the surrounding scenery and hosts an interesting collection of conifers.

Location and Setting

Dunkeld House is situated on the north bank of the River Tay approximately 1 mile (1.5km) west of the city of Dunkeld. The A9(T) road follows the valley south of the river at Dunkeld and crosses to the north bank some 1.5 miles (2.5km) to the west of the city. The Grampian Mountains rise up to the west and east of the valley, much of the lower slopes of which are afforested. Craig a Barns Hill 1,106' (337m) rises to the north of the house; to the west and south, beyond the River Tay, rise Craigvinean 1,535' (468m) and Birnam Hill 1,325' (404m). South of the River Tay, the River Braan and the A822 follow the north-east/south-west direction of the Strathbraan valley which joins the Tay Valley west of Dunkeld Bridge. The River Tay is important in the setting of the designed landscape around Dunkeld House, and the policies on the north bank are highly significant from the riverside although the coniferous woodlands and mountains beyond on either side of the Tay and Braan valleys dominate the overall landscape. Views into the policies are gained from the A923, north of Dunkeld, and the minor road which links it with the A9, south of Dowally. The Dunkeld Estate lies within the River Tay (Dunkeld) National Scenic Area.

The present Dunkeld House stands on the north bank of the River Tay at the western end of the policies, which extend east to Dunkeld Cathedral and the A923 in the city. To the north and west, the designed landscape extends to the woodlands on Craig a Barns which were part of the original design but are now commercially forested. The OS Gazetteer of 1885 describes some 18,500 acres of plantations. Plans of c.1750 by General Roy, of 1812 by Macnaughton, and the 1st & 2nd edition OS maps of 1861 and 1910 indicate that the designed landscape was considerably extended between 1750-1861. It was during this period of development that the earlier formal landscape was improved and remodelled into an extensive 'picturesque' landscape of some considerable importance and size. Most of

the follies were built and the whole valley, including the River Braan and The Hermitage, was used in the design. At this time, Dunkeld was one of the earliest and most significant 'natural' landscapes in Scotland. The OS Gazetteer of 1885 describes "*50 miles of walks and terraces and 30 miles of carriage drive*", of which many have since been lost. Pulney Loch is situated on the edge of Craig a Barns Wood. An obelisk on Craigvinean Hill has now been obscured by woodland. Bishop's Hill and Stanley Hill remain within the policies, the latter a modified natural mound which served as a key viewing point for the designed landscape. Conflicting reports of its origins are documented in historical descriptions of the estate. A series of footpaths spiral up Stanley Hill through woodland vegetation which has become partly overgrown.

The reduction in the policy area to its present extent largely arose with the break-up of the estate in the 1930s and '40s. Hermitage Wood, which lies along the bank of the River Braan to the south of the River Tay where Ossian's Cave and The Hermitage are situated is now outwith the policy area and is the subject of an individual report (q.v.). The designed landscape at Dunkeld House today includes 294 acres (119ha).

Site History

The extensive formal designed landscape laid out around the original house as indicated on the plan of c.1750 by General Roy was informalised in the 18th century. Further improvements were made in the late 19th century and after the construction of the new (third) house between 1900-04.

Documentary map evidence of the development of the designed landscape is provided by several design plans including a plan of 1748 by William Clark showing the layout of a formal garden on the banks of the River Tay to the east of Bishop's Hill. A plan of 1759 by Matthew Stobie and a plan of 1780 by J. Stobie are known to exist although their whereabouts are unknown. In addition, evidence is also provided by General Roy's map of c.1750, the 1st edition OS map of c.1861, and the 2nd edition OS map of c.1910.

The lands of Dunkeld originally belonged to the Church but were acquired by the Atholl Estate in the 17th century. The Dunkeld Estate was subsequently enlarged by the acquisition of land from surrounding crofters. The first Dunkeld House was built between 1676-84 to the design of Sir William Bruce. In 1703, the son of the 2nd Earl of Atholl was created Duke of Atholl. The 2nd Duke, James, succeeded in 1724 and he commissioned the layout of the formal landscape indicated on General Roy's plan of c.1750 and planted the first European larch in the policies.

The 2nd Duke's nephew and heir, John, took a keen interest in the policies and is said to have built The Hermitage for his uncle in 1753. On his succession to the title of 3rd Duke in 1764, he continued his improvements, including laying out the woodland walks on Craig a Barns Hill. Lady Charlotte's Cave is said to have been created as a birthday surprise for his wife and cousin, who was the daughter of the 2nd Duke and whom he had married in 1753.

The 4th Duke succeeded in 1774. Over the next 25 years, he was responsible for the remodelling of the walks and terraces, and extensive work carried out along the riverside. He became known as the 'Planter Duke' in view of the acres of woodland which he planted. He commissioned Thomas Hopper to design a new house, to be built in the parkland to the west of the original house during which time the family resided at Adamnan's cottage near the Cathedral. It was a large cottage ornee which has since been demolished. Work on this new house began in 1828 but ceased on the 4th Duke's death in 1830. In later years, the 7th Duke of Atholl noted that it was a gross error of judgement on the part of the 4th Duke to build a new house so close to Blair Castle in view of the considerably improved communications systems by that time.

The 6th Duke succeeded in 1846 and, again, improved the estate between then and his death in 1864. The 7th Duke was responsible for the construction of the present Dunkeld House between 1899-1901. The 19th century Dunkeld House had been demolished by the time of the 2nd edition OS map of c.1910, by which time new driveways had been formed to Dunkeld House from Pulney Lodge in the north and Dunkeld Lodge to the east. In the 1930s, the house was sold to the Lyall family. In 1943 the Duchess of Atholl, wife of the 8th Duke, donated Ossian's Hall, together with some land which now comprises The Hermitage, to the National Trust for Scotland.

The house has been managed as a hotel since World War II and has recently been acquired by Stakis plc with some 114 acres (46.2ha) of policy land. They plan to continue to run the house as a hotel.

Landscape Components

Architectural Features

Dunkeld House was built c.1900 to the design of architect E.J. McIntyre Henry. It is presently managed as an hotel. The Terraced Walled Garden was built in 1754 on a steep south-facing embankment on the east boundary of the site. The Gazebo stands in the centre of the north wall of the Terraced Gardens and is thought to have been built c.1757. Plans by Robert Morris, dated 1753, exist at Blair for the Chinese temple which stood at the foot of the Terraced Garden.

The East Grotto is a domed chamber dating from the 18th century sunk into a bank by the River Tay. West Grotto, built in 1756, is a domed elliptical grotto with a Gothic arched frontage built of rustic boulder masonry which is thought to be to the design of Robert Morris. Gallowhill Lodge stands on what is now the northern boundary of the policies. It is thought to have been built to the design of architect A. Elliot who also designed Dunkeld Lodge, built in 1809, and the Stables which stand ruined near Dunkeld Lodge. Lady Charlotte's Cave stands on Craig a Barns Hill; it was built in 1774, shortly after the walks to it were completed. The Rocking Stone also stands on Craig a Barns Hill. Dunkeld Cathedral, listed A, was begun in 1318. It was reduced to a ruin in the Reformation. The choir, now a parish church, was re-roofed in 1660. The Main Gates were erected at the entrance to Dunkeld Cathedral in 1832; they were cast in 1732 as the gates for the first Dunkeld House.

Parkland

The parkland is situated to the north and south of the east drive which was constructed in the early 19th century through the earlier 18th century parkland. The site of the second Dunkeld House indicated on the 1st edition OS map of 1861 lies nearby the junction of the north and east drives.

A 19th century account ('Duke of Atholl's Grounds') of the parkland notes that 'it would not be easy to find a lawn more favourably disposed or better proportioned and from which all appearance of Art is so completely banished'. The same account also describes the beautiful weeping horse chestnuts, copper and common beeches and two or more fine evergreen oaks. Some of these trees remain, others were planted more recently.

Woodland

The remaining policy woodlands are much reduced in acreage from those of the original layout, of which only the King's Seat Wood, west of the present Dunkeld House remains. Through this area, the site of an old Pictish stronghold, and the other policy woodlands ran rides which extended north around Pulney Loch and beyond to the follies on Craig a Barns. The remaining woodland trees are predominantly beech, many planted c.1840-60. On the east drive stand eleven larch trees (Larix decidua) planted in 1750 although the first trees of this species were planted on the estate in 1738 and were some of the first of their kind in Britain. Japanese larch was planted in the woods in 1887 and hybrid larch around 1900. The Bishop's Walk extends along the riverside form the east end of the American Garden to the Cathedral. A woodland canopy of mainly Douglas fir lines the steep escarpment between the park and the River Tay. A description of trees in the gardens is provided in 'The Duke of Atholl's Grounds' but many of the interesting conifers described in it have since gone. Those remaining were measured by Alan Mitchell in 1983. The Bishop's Walk extends around the beeches on Bishop's Hill to the Cathedral lawn where several fine specimens of yew, hemlock, larch and fir which were also measured in 1983.

The Gardens

The American Garden was laid out in the mid-19th century, amid oak and beech species which had been planted c.1780. Initially, a variety of Rhododendrons, Azaleas, Kalmias and other flowering shrubs were established. According to measurements of the conifer varieties within the woodland, it would appear that those remaining today were later additions, many planted since 1867. There are particularly large specimens of Abies alba, *A.procera*, *Picea smithiana* and *P. breweriana*. The understorey is now dominated by tall hybrid Rhododendrons. Seedling birch and sycamore have colonized on either side of the riverside path.

A plan of 1748 by William Clark indicates the presence of a formal garden to the south-east of Bishop's Hill but this was subsequently lost and, in the 1st edition OS map of 1861, only a Bowling Green is indicated in this area.

Stanley Hill, situated to the north-east of the site of the first Dunkeld House is a modified natural mound, landscaped and terraced in the 1720s and used as a viewing point and mock fortification in the 18th and 19th centuries (information courtesy of C. Dingwall). A 19th century account ('The Duke of Atholl's Grounds') describes it as *'a beautiful wooded knoll, mounded and terraced in the formal style; and as a specimen of a former age it is a curiosity. There is a battery of small cannon on it for firing salutes*'.

Lawns surround the immediate vicinity of the present house.

Walled Gardens

The Walled Garden is situated on a south-facing slope to the north of the east drive close to the Dunkeld Lodge entrance. A complete view of it is gained across the park from the east drive. It is thought to have been built c.1740. The Gazebo on the curved north wall may be a later addition. The outer wall is constructed of a double skin of brick. The overall shape of the garden is of particular interest. An account in 'The Garden' of 1885 describes the extensive array of stocked glasshouses and records the recent addition of two orchid houses. Fruit was grown in the open and there was a rose garden. Another 19th century account describes the "*Centre Walk with beautiful borders of standard roses, shrubs and flowers. Its fountain and flight of steps is worthy of admiration.*" These two latter features have since been vandalised and the steps are in a dangerous condition. Pear trees, planted in c.1900, remain by the centre path. [1]

The key characterisitcs, features or elements of this cultural heritage resource are articulated as the key landscape features and special features identified from the Inventory of Gardens and Designed Landscapes. [2]

Sources

[1] Historic Environment Scotland Inventory of Gardens and Designed Landscapes – Dunkeld House available online from: http://portal.historicenvironment.scot/designation/GDL00157 (Accessed August 2018)

[2] Jacobs assessment undertaken 2021

Asset Number	HLT 20	**Name**	The Hermitage
Legal Status	Listed on the Inventory of Gardens and Designed Landscape	**NGR**	NO0102841916
Value (sensitivity)	High	**Condition**	Good
Type	Historic Landscape	**Period**	18th century
NMR ref	GDL00157	**HER ref**	None
Canmore ID			

Description

An outstanding example of the 18th century picturesque landscape style, comprising buildings, paths, trees and viewpoints, which exploit the naturally dramatic Highland gorge setting.

Location and Setting

The Hermitage is situated on the west bank of the River Braan approximately 0.5 miles (lkm) south-west of its confluence with the River Tay, to the south of the city of Dunkeld. It was designed as part of the designed landscape of Dunkeld House but is considered here as a

separate report, since it is now outwith the Dunkeld Estate. The A9(T) separates The Hermitage from Dunkeld today. The afforested slopes of Craigvinean rise to a height of 1,535' (468m) to the north of the site, and to the south, across Strathbraan, Birnam Wood covers the lower slopes of the Obney Hills.

The natural landscape along the riverside is dramatic; the River Braan flows in torrents over waterfalls and cascades, through a deep gorge. The Hermitage was built in this setting to exploit the natural picturesque landscape as part of an 18th century 'sublime' experience. The afforested setting of Strathbraan is such that views can only be gained from the river banks but the sound of water pounding over the Falls of Braan can be heard from the walks which run through the woodland to the north of the river. 'The Hermitage' lies within the Dunkeld National Scenic Area.

The 18th century landscape of The Hermitage was designed as part of the designed landscape of Dunkeld to extend from the River Tay along the River Braan to Rumbling Bridge, a distance of approximately 1 mile (1.5km). It included the woodland known as Hermitage Wood which extended between the western bank of the River Braan and a minor road to Craigvinean Cottage which ran off the main Perth/Aberfeldy road. The woodland given to the National Trust for Scotland extends over 33 acres (13.3ha) along the banks of the River Braan from the present A9(T), in which several miles of woodland walks are incorporated. Ossian's Hall, Hermitage Bridge and Ossian's Cave are significant designed features within the woodland. The designed landscape extends over 71 acres (29ha) today.

Site History

The lands of Dunkeld originally belonged to the church but were acquired by the Atholl Estate in the 17th century. The Dunkeld Estate was subsequently enlarged by the acquisition of land from surrounding crofters by successive members of the Atholl family. Dunkeld House was first built in the late 17th century. In 1703 the son of the 2nd Earl of Atholl was created Duke of Atholl. The 2nd Duke, James, who succeeded in 1724, laid out the original formal landscape at Dunkeld on the north bank of the River Tay. His nephew and heir, John, took a keen interest in the policies and built The Hermitage for the 2nd Duke in 1758 as an addition to the Dunkeld policies. Its design attracted a considerable variety of conflicting comments from notable members of society who came to look at it. A description of The Hermitage of 1762 by Bishop Robert Forbes told how entry was made through a small garden *'with two basins of water and small rocks on it with the additional beauty of fruit trees and flower-shrubs*'. A grotto was situated beneath The Hermitage from where views to the Falls of Braan could be gained. Coloured glass was added to the windows of The Hermitage between 1762 and 1783 but was removed within that short time, possibly as a result of strong criticism from people such as W.S. Gilpin who visited in 1776, who thought them *'below the dignity of scenes like this*.'

In 1783 the 3rd Duke's son redecorated The Hermitage and renamed it Ossian's Hall. The redecoration was intended to evoke features of 'shock' and 'amazement' in the viewers' minds; the room from where views of the waterfall were taken was lined with mirrors which made the spectator imagine that the water was appearing from all angles. William Wordsworth composed a poem which described the *'World of Wonder' in this room. Dorothy Wordsworth was more informative as to the landscape which lay around Ossian's Hall; in a description of the garden written in 1803 she noted that 'the walks are quaintly intersected, here and there, by a baby garden of fine flowers among rocks and stones'*. These small-scale gardens have since gone.

By the late 18th century, the landscape along the banks of the River Braan was being frequently visited as part of guided tours from Dunkeld; the rugged dramas of the waterfalls and cascades provided a sharp contrast to the parkland landscape which had been laid out around Dunkeld by the 4th Duke. He was ultimately responsible for such extensive planting on the estate that on his succession to the title of 4th Duke in 1805, he became known as the 'Planter Duke'. It was he who planted up much of Craigvinean Hill to the extent shown on the 1st edition OS map of 1861.

In 1869 vandals blew up part of Ossian's Hall and the area was left to decay. In 1943 the 8th Duchess of Atholl donated it and 33 acres (13.3ha) of, by then, coniferous woodland along the banks of the River Braan to the National Trust for Scotland in accordance with the wishes of the late Duke. The NTS has since restored the building for the use and enjoyment of the public.

Landscape Components

Architectural Features

Ossian's Hall, a single-storey gazebo listed category B, is situated on a precipice above the River Braan. Built in 1758 at a cost of £38, it was extensively remodelled in 1783. The architect of this remodelling is thought to be George Steuart. The elaborate detail of the interior, described in many 18th century accounts, was lost by two phases of vandalism in 1821 and 1869. The fabric of the building was restored by the NTS in 1952 and again in 1986. Ossian's Cave, listed category B, is a carefully constructed folly, formed partly of rock and partly of dry rubble. It is shaped like a hermit's cave and has a round-headed doorway and windows. It lies upstream from Ossian's Hall on the north bank of the River Braan. Hermitage Bridge, listed category A, is a single semi-circular arch bridge which spans the River Braan beneath Ossian's Hall; built c.1785, the architect is thought to be George Steuart.

Woodland

The woodland, planted in the 18th century with exotic species, is now largely mixed conifers of Scots pine, Douglas fir and Norway spruce established on the shallow, rocky soil of the banks of the River Braan. One of the four trees in Britain over 200' in height (1986) is a Douglas fir growing on the right bank of the Braan on Forestry Commission land. It can best be seen from The Hermitage side of the river. A few of the beech trees planted in the early 19th century remain as well as yew, Monkey puzzle and Silver fir. Walks are marked through the woodland along the routes of the original paths shown on the early Ordnance Survey maps. [1]

The key characterisitcs, features or elements of this cultural heritage resource are articulated as the key landscape features and special features identified from the Inventory of Gardens and Designed Landscapes. [2]

Sources

[1] Historic Environment Scotland Inventory of Gardens and Designed Landscapes – The Hermitage available online from: http://portal.historicenvironment.scot/designation/GDL00363 (Accessed August 2018)

[2] Jacobs assessment undertaken 2021

Asset Number	HLT 25	**Name**	Medieval Town
Legal Status	None	**NGR**	Multiple
Value (sensitivity)	Medium	**Condition**	Unknown
Type	Historic Landscape	**Period**	Medieval
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Medieval street plans, with adjacent narrow building plots of similar length and breadth as well as a market place, church and tolbooth, survive in most places that were once medieval burghs. Certain towns and cities have their origins in the medieval period. The original plan of these medieval centres is often reflected in the street pattern, focused around a broad market place and its tolbooth, with a church or castle in the immediate vicinity. Ancient property boundaries may also survive, narrow and set at right angles to the main street(s), being all of similar breadth and extending for a considerable distance into the backlands of the burgh. Not all medieval burghs survive. Some were deserted and are visible only as earthworks or cropmarks, as at Roxburgh in the Scottish Borders. [1]

The key characterisitcs, features or elements of this cultural heritage resource are:

§ possible early street patten where it survived after the battle of Dunkeld;

§ potential for archaeologcal remains dating to medieval period. [2]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)

[2] Jacobs assessment undertaken 2021

Asset Number	HLT 26	**Name**	Industrial or Commercial Area
Legal Status	None	**NGR**	NO0316541689
Value (sensitivity)	Negligible	**Condition**	Good
Type	Historic Landscape	**Period**	Modern
NMR ref	None	**HER ref**	None
Canmore ID			

Description

Industrial estates, large office developments and shopping centres, carparks or storage facilities, as well as factories and mills, are located in and around urban areas. Districts with sprawling buildings, storage areas, extensive car-parks, yards and access roads can be extensive. Mainly built since the beginning of the 19th century, they can include large office developments, shopping centres and open-air markets, as well as factories, mills, and industrial estates. Such sites tend to be located in and around urban areas. In some instances, factories and mills have closed down, and have either been demolished or refurbished to provide housing or recreational facilities. [1]

The key characterisitcs, features or elements of this cultural heritage resource the industrial character of the HLT and associated buildings. [2]

Sources

[1] Historic Environment Scotland Historic Landuse Assessment Map available from: https://map.hlamap.org.uk/#zoom=4&lat=741998.11955&lon=303258.18324&layers=BTFFFTTTTTTT (Accessed August 2018)

[2] Jacobs assessment undertaken 2021

Appendix A14.2: Criteria to inform the assessment of value (sensitivity) and the identification of key characteristics, features or elements of cultural heritage resources.

1. Introduction

1.1.1 This appendix presents the criteria used to inform the assessment of value (sensitivity) and the identification of key characteristics, features or elements of cultural heritage resources (comprising archaeological remains, historic buildings and historic landscapes) for the cultural heritage assessment for the A9 Dualling Programme: Pass of Birnam to Tay Crossing project.

2. Background

2.1.1 In the absence of guidance in the Design Manual for Roads and Bridges (DMRB) LA 106 'Cultural heritage assessment' Revision 1 (hereafter 'DMRB LA 106') (Highways England et al., 2020), this criteria has been developed to inform professional judgement in the assessment of importance, rarity and geographical scale for cultural heritage resources which are required to inform the assessment of value (sensitivity), and the identification of key characteristics, features or elements of cultural heritage resources that is required to inform the magnitude of impact.

2.1.2 The criteria presented in Tables 1 – 3 have been developed based on:

- Cultural criteria from UNESCO's World Heritage List Criteria for Selection (UNESCO, 2021). These criteria are used to inform the assessment of cultural heritage resources (archaeological remains, historic buildings, historic landscapes) of very high importance and rarity, which are important at an international scale (and therefore cultural heritage resources of very high value (sensitivity)), and the key characteristics, features or elements of such cultural heritage resources.
- Selection Guidance for Determining National Importance for Scheduled Monuments provided in Annex 1 of Designation Policy and Selection Guidance (HES, 2019, page 10). These criteria are used to inform the assessment of archaeological remains of high importance and rarity, which are important at a national scale (and therefore of high value (sensitivity)) and have been adapted to inform the assessment of archaeological remains of medium, low and negligible importance. These criteria have also been used to aid the identification of key characteristics, features or elements of archaeological remains where these have not been previously identified.
- Selection Guidance for Deciding the Special Architectural or Historic Interest of Listed Buildings provided in Annex 2 of Designation Policy and Selection Guidance (HES, 2019, pages 12-13). These criteria are used to inform the assessment of historic buildings of high importance and rarity, which are important at a national scale (and therefore of high value (sensitivity)) and have been adapted to inform the assessment of historic buildings of medium, low and negligible importance. These criteria have also been used to aid the identification of key characteristics, features or elements of historic buildings where these have not been previously identified.

- Selection Guidance for Deciding if a Garden and Designed Landscape is of National Importance provided in Annex 3 of Designation Policy and Selection Guidance (HES, 2019, pages 14-16). These criteria are used to inform the assessment of historic landscapes of high importance and rarity, which are important at a national scale (and therefore of high value) and have been adapted to inform the assessment of historic landscapes of medium, low and negligible importance. Along with the guidance provided by Managing Change in the Historic Environment: Gardens and Designed Landscapes (HES, 2020a), these criteria have also been used to aid the identification of key characteristics, features or elements of historic landscapes where these have not been previously identified.
- Selection Guidance for Deciding if a Battlefield is of National Importance provided in Annex 4 of Designation Policy and Selection Guidance (HES, 2019, pages 18-19). These criteria are used to inform the assessment of battlefields of high importance and rarity, which are important at a national scale (and therefore of high value (sensitivity)) and have been adapted to inform the assessment of battlefields of medium, low and negligible importance. Along with the guidance provided by Managing Change in the Historic Environment: Historic Battlefields (HES, 2020b), these criteria have also been used to aid the identification of key characteristics, features or elements of historic battlefields where these have not been previously identified.

2.1.3 In a letter of of 25 March 2021 PKHT and in an email of X March 2021 HES confirmed that they were content with the use of the criteria in Tables 1 -3 to inform professional judgement as part of the cultural heritage assessment for the A9 Dualling Programme: Pass of Birnam to Tay Crossing project.

3. References

Reports and Documents

Highways England, Transport Scotland, Welsh Government, Department for Infrastructure (2020). Design Manual for Roads and Bridges (DMRB): Sustainability & Environment. LA 106 'Cultural heritage assessment' (Revision 1).

Historic Environment Scotland, 2019. Designation Policy and Selection Guidance. [Online] https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b [Accessed March 2021]

Historic Environment Scotland, 2020a. Managing Change in the Historic Environment: Gardens and Designed Landscapes [Online]. https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=83214207-c4e7-4f80-af87-a678009820b9 [Accessed March 2021].

Historic Environment Scotland, 2020b. Managing Change in the Historic Environment: Historic Battlefields [Online]. https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=b7a05b45-f2a9-4c71-8450-a60b0094c62e [Accessed March 2021].

UNESCO, 2021. The Criteria for Selection. [Online] https://whc.unesco.org/en/criteria/ [Accessed March 2021].

Table 1: Criteria to inform the assessment of the value (sensitivity) of archaeological remains

Value (sensitivity)	Criteria
Very High	**World Heritage Sites (including Nominated Sites).** **Archaeological remains that:** i. represent a masterpiece of human creative genius; ii. exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design; iii. bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared; iv. are an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; v. are an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change; vi. are directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance[1].
High	**Scheduled Monuments.** **Non-designated archaeological remains that:** a) Make a significant contribution to our understanding or appreciation of the past, or have the potential to do so. It may do so in itself, or as part of a monument type, or as a geographical group of related monuments. b) Retain structural, architectural, decorative or other physical remains to the extent that it makes a significant contribution to our understanding or appreciation of the past. The remains can be upstanding fabric, evidence of buried archaeological structures and deposits, scatters of artefacts or a combination of these. c) Are a rare example of a monument type when assessed against current knowledge of Scotland's history, archaeology and/or architecture, and of the region in which the monument is found. d) Are a particularly representative example of a monument type when assessed against knowledge of Scotland's history, archaeology and/or architecture and of the region in which the monument is found. e) Have research potential which could significantly contribute to our understanding or appreciation of the past[2]. f) Make a significant contribution to the landscape and/or our understanding of the historic landscape. This may include the relationship of the monument to other monuments or natural features in the landscape, and/or the significance of its setting in understanding the monument or the monument type. g) Have significant associations with historical, traditional, social or artistic figures, events, movements and/or practices that are of national importance.
Medium	**Non-designated archaeological remains that:** a) Make some contribution to our understanding or appreciation of the past, or have some potential to do so. It may do so in itself, or as part of a monument type, or as a geographical group of related monuments.

[1] These are the cultural criteria from UNESCO's World Heritage List Criteria for Selection https://whc.unesco.org/en/criteria/. UNESCO consider that criterion (vi) should preferably be used in conjunction with other criteria.
[2] This criterion should be assessed against national archaeological research frameworks such as Scottish Archaeological Research Framework (ScARF) (https://www.socantscot.org/research-projects/scarf/) and regional archaeological research frameworks where these are available.

Value (sensitivity)	Criteria
	b) Retain structural, architectural, decorative or other physical remains to the extent that it makes some contribution to our understanding or appreciation of the past. The remains can be upstanding fabric, evidence of buried archaeological structures and deposits, scatters of artefacts or a combination of these. c) Are an uncommon example of a monument type when assessed against current knowledge of a Scotland's history, archaeology and/or architecture, and of the region in which the monument is found. d) Are a representative example of a monument type when assessed against knowledge of Scotland's history, archaeology and/or architecture and of the region in which the monument is found. e) Have research potential which could contribute to our understanding or appreciation of the past. f) Make some contribution to the landscape and/or our understanding of the historic landscape. This may include the relationship of the monument to other monuments or natural features in the landscape, and/or the significance of its setting in understanding the monument or the monument type. g) Have associations with historical, traditional, social or artistic figures, events, movements and/or practices that are of regional importance.
Low	**Non-designated archaeological remains that:** a) Make a limited contribution to our understanding or appreciation of the past, or have limited potential to do so. It may do so in itself, or as part of a monument type, or as a geographical group of related monuments. b) Retain structural, architectural, decorative or other physical remains to the extent that it makes a limited contribution to our understanding or appreciation of the past. The remains can be upstanding fabric, evidence of buried archaeological structures and deposits, scatters of artefacts or a combination of these. c) Are a common example of a monument type when assessed against current knowledge of Scotland's history, archaeology and/or architecture, and of the region in which the monument is found. d) Are a poorly representative example of a monument type when assessed against knowledge of Scotland's history, archaeology and/or architecture and of the region in which the monument is found. e) Have limited research potential which could contribute to our understanding or appreciation of the past. f) Make a limited contribution to the landscape and/or our understanding of the historic landscape. This may include the relationship of the monument to other monuments or natural features in the landscape, and/or the significance of its setting in understanding the monument or the monument type. g) Have associations with historical, traditional, social or artistic figures, events, movements and/or practices that are of local importance.
Negligible	**Non-designated archaeological remains that:** a) Make a very limited contribution to our understanding or appreciation of the past, or have very limited potential to do so. It may do so in itself, or as part of a monument type, or as a geographical group of related monuments. b) Retain structural, architectural, decorative or other physical remains to the extent that it makes a very limited contribution to our understanding or appreciation of the past. The remains can be upstanding fabric, evidence of buried archaeological structures and deposits, scatters of artefacts or a combination of these. c) Are a very common example of a monument type when assessed against current knowledge of Scotland's history, archaeology and/or architecture, and of the region in which the monument is found. d) Are a very poorly representative example of a monument type when assessed against knowledge of Scotland's history, archaeology and/or architecture and of the region in which the monument is found.

Value (sensitivity)	Criteria
	e) Have a very limited research potential which could contribute to our understanding or appreciation of the past. f) Make a very limited contribution to the landscape and/or our understanding of the historic landscape. This may include the relationship of the monument to other monuments or natural features in the landscape, and/or the significance of its setting in understanding the monument or the monument type. g) Have very limited associations with historical, traditional, social or artistic figures, events, movements and/or practices that are of local importance.

Criteria to inform the identification of key characteristics, features or elements of archaeological remains

For World Heritage Sites the key characteristics, features or elements should be defined with refence to the information contained in the Statements of Outstanding Universal Value.

For Scheduled Monuments key characteristics, features or elements should be identified with reference to information contained in the Statements of National Importance. Where required to supplement the information in the Statements of National Importance the criteria identified below will be used to inform the identification of key characteristics, features or elements for Scheduled Monuments. They will also be used to inform the identification for key characteristics, features or elements for non-designated archaeological remains:

a) The contribution that the archaeological remains make to our understanding or appreciation of the past, or the potential to do so. It may do so in itself, or as part of a monument type, or as a geographical group of related monuments.

b) The archaeological remains' retention of structural, architectural, decorative or other physical remains which can contribute to our understanding or appreciation of the past. Physical remains can be upstanding fabric, evidence of buried archaeological structures and deposits, scatters of artefacts or a combination of these.

c) The rarity of the archaeological remains when assessed against current knowledge of Scotland's history, archaeology and/or architecture, and of the region in which the monument is found.

d) The representativeness of the archaeological remains when assessed against knowledge of Scotland's history, archaeology and/or architecture and of the region in which the monument is found.

e) The research potential of the archaeological remains which could contribute to our understanding or appreciation of the past. This should be informed by national archaeological research frameworks such as the Scottish Archaeological Research Framework (ScARF) (https://www.socantscot.org/research-projects/scarf/) and regional archaeological research frameworks, where these are available.

f) The contribution that the archaeological remains make to the landscape and/or our understanding of the historic landscape. This may include the relationship of the monument to other monuments or natural features in the landscape, and/or the significance of its setting in understanding the monument or the monument type.

g) The association of the archaeological remains with historical, traditional, social or artistic figures, events, movements and/or practices.

Table 2: Criteria to inform the assessment of the value (sensitivity) of historic buildings

Value (sensitivity)	Criteria
Very High	**World Heritage Sites (including Nominated Sites).** **Historic buildings that:** i. represent a masterpiece of human creative genius; ii. exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design; iii. bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared; iv. are an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; v. are an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change; vi. are directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance[3].
High	**Category A Listed Buildings, Category B Listed Buildings, Category C Listed Buildings.** **Non-designated historic buildings:** a) That retain a level of authenticity and completeness of design, comprising artistic skill and/or architectural detail or features, interest of the designer in relation to the building's design, interior design and fixed interior decorative scheme, the plan form of the building, materials used in the building, technological excellence or innovation demonstrated in the building type or its design, local or regional traditions that might be demonstrated in the building type, material or form that make a significant contribution to the building's architectural interest. b) That have surroundings that make a significant contribution to its setting and how other features both built and natural relate to it, such as the building's relationship with its immediate and wider surroundings, including views to and from it, the buildings relationship with its landscape, townscape or other buildings which may form a group, the degree to which the immediate and wider setting of the building significantly contributes to our understanding and appreciation of its function or its historical context, and how it is experienced. c) Whose age and rarity of a building type or design make a significant contribution to its historic interest. d) Whose social historical interest significantly contributes to our understanding of how people lived in the past, and how our social and economic history is shown in the building and/or its setting. e) That are associated with people or events of national importance which have had a significant impact on Scotland's cultural heritage.
Medium	**Non-designated historic buildings**: a) That retain a level of authenticity and completeness of design, including artistic skill and/or architectural detail or features, interest of the designer in relation to the building's design, interior design and fixed interior decorative scheme, the plan form of the building, technological excellence or innovation demonstrated in the building type or its design, local or regional traditions that might be demonstrated in the building type, material or form that make some contribution to the building's architectural interest.

[3] These are the cultural criteria from UNESCO's World Heritage List Criteria for Selection https://whc.unesco.org/en/criteria/. UNESCO consider that criterion (vi) should preferably be used in conjunction with other criteria.

Value (sensitivity)	Criteria
	b) Whose surroundings make some contribution to its setting and how other features both built and natural relate to it, including the building's relationship with its immediate and wider surroundings, the buildings relationship with its landscape, townscape or other buildings which may form a group, the degree to which the immediate and wider setting of the building makes some contribution to our understanding and appreciation of its function or its historical context, and how it is experienced. c) Whose age and rarity of building type or design makes some contribution to its historic interest. d) Whose social historical interest makes some contribution to our understanding of how people lived in the past, and how our social and economic history is shown in a building and/or its setting. e) That are associated with people or events of regional importance.
Low	**Non-designated historic buildings**: a) That retain a level of authenticity and completeness of design, including artistic skill and/or architectural detail or features, interest of the designer in relation to the building's design, interior design and fixed interior decorative scheme, the plan form of the building, technological excellence or innovation demonstrated in the building type or its design, local or regional traditions that might be demonstrated in the building type, material or form that make a limited contribution to the building's architectural interest. b) Whose surroundings make a limited contribution to its setting and how other features both built and natural relate to it, including the building's relationship with its immediate and wider surroundings, the buildings relationship with its landscape, townscape or other buildings which may form a group, the degree to which the immediate and wider setting of the building makes a limited contribution to our understanding and appreciation of its function or its historical context, and how it is experienced. c) Whose age of and rarity of building type or design makes a limited contribution to its historic interest. d) Buildings whose social historical interest makes a limited contribution to our understanding of how people lived in the past, and how our social and economic history is shown in a building and/or its setting. e) That are associated with people or events of local importance.
Negligible	**Non-designated historic buildings**: a) That retain a level of authenticity and completeness of design, including artistic skill and/or architectural detail or features, interest of the designer in relation to the building's design, interior design and fixed interior decorative scheme, the plan form of the building, technological excellence or innovation demonstrated in the building type or its design, local or regional traditions that might be demonstrated in the building type, material or form that make a very limited contribution to the building's architectural interest. b) Whose surroundings make a very limited contribution to its setting and how other features both built and natural relate to it, including the building's relationship with its immediate and wider surroundings, the buildings relationship with its landscape, townscape or other buildings which may form a group, the degree to which the immediate and wider setting of the building makes a very limited contribution to our understanding and appreciation of its function or its historical context, and how it is experienced. c) Whose age and rarity of building type or design makes a very limited contribution to its historic interest. d) Whose social historical interest makes a very limited contribution to our understanding of how people lived in the past, and how our social and economic history is shown in a building and/or its setting. e) That have limited associations with people or events of local importance.

Criteria to inform the identification of key characteristics, features or elements of historic buildings

For World Heritage Sites the key characteristics, features or elements should be defined with refence to the information contained in the Statements of Outstanding Universal Value. For Listed Buildings key characteristics, features or elements should be identified with reference to information contained in the Statements of Special Interest while for Conservation Areas information from Conservation Area Appraisals should be used.

Where required to supplement the information contained in the Statements of Special Interest and Conservation Area Appraisals the criteria identified below will be used to inform the identification of key characteristics, features or elements for Listed Buildings and Conservation Areas. They will also be used to inform the identification for key characteristics, features or elements for non-designated historic buildings:

a) The level of authenticity and completeness of design, including artistic skill and/or architectural detail or features, interest of the designer in relation to the building's design, interior design and fixed interior decorative scheme, the plan form of the building, technological excellence or innovation demonstrated in the building type or its design, local or regional traditions that might be demonstrated in the building type, material or form that contribute to the building's architectural interest.

b) The building's setting and how other features both built and natural relate to it, including the building's relationship with its immediate and wider surroundings, the buildings relationship with its landscape, townscape or other buildings which may form a group, the degree to which the immediate and wider setting of the building contributes to our understanding and appreciation of its function or its historical context, and how it is experienced.

c) The contribution that the age and rarity of a building's type or design makes to a building's historic interest.

d) The contribution that the social historical interest of the building makes to our understanding of how people lived in the past, and how our social and economic history is shown in a building and/or its setting.

e) Associations with people or events that have had an impact on Scotland's cultural heritage.

Table 3: Criteria to inform the assessment of the value (sensitivity) of historic landscapes

Value (sensitivity)	Criteria
Very High	**World Heritage Sites (including Nominated Sites).** **Historic landscapes that:** i. represent a masterpiece of human creative genius; ii. exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design; iii. bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared; iv. are an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; v. are an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change; vi. are directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance[4].
High	**Inventory Gardens and Designed Landscapes.** **Non-designated historic landscapes of:** a) Outstanding or high artistic interest due to: § it being highly appreciated as a work of art in its own right, in terms of aesthetics and any other experiential qualities; § where the historic landscape was formally designed, the high degree to which the design set the trend for later gardens and designed landscapes, or marked a shift in landscape design history; § where the historic landscape was formally designed, high quality and excellent survival of any planned visual relationships (such as vistas or sightlines) from within the designed landscape towards landscape features beyond its boundaries (either built or naturally occurring); and § where the historic landscape was formally designed, the design was by an important gardener or landscape designer and it being a rare, highly representative, highly intact or highly important work. b) Outstanding or high historic interest due to: § high quantity and high quality of associated documentary or other evidence for the history of the historic landscape, including maps, plans, written accounts, tree surveys, research reports, excavation reports, photographs, film, letters and any other kind of record; § the high degree to which the historic landscape as a whole represents a particular period in the history of garden or landscape design (where formally designed), and/or the degree to which one or more of the historic landscape's components form an outstanding example of a particular period or style, or sequence of styles over time; § its relationship with historic individuals, communities, events, traditions and/or historic and social movements. These are reflected in the physical elements of the historic landscape to a high degree; and

[4] These are the cultural criteria from UNESCO's World Heritage List Criteria for Selection https://whc.unesco.org/en/criteria/. UNESCO consider that criterion (vi) should preferably be used in conjunction with other criteria.

Value (sensitivity)	Criteria
	§ the evidence of the role that the historic landscape plays for communities in connecting people with the past, comprising a high degree of access and recreation, interpretation and education, or other forms of engagement. c) Outstanding or high horticultural interest due to: § the presence of horticultural or arboricultural collections which are in good condition and are being renewed, and which contain a wide range of species and/or unusual species or rarities; § the presence of individual trees recognised for their age, significant cultural associations or 'champion' status; § the presence of scientific collections which are in good condition, documented, propagated and made available to others; and § its outstanding contribution to the history of horticulture, arboriculture or silviculture. d) Outstanding or high architectural interest due to: § the presence of buildings and structures that are listed in recognition of their special architectural and historic interest; and § the high degree to which the buildings or structures within the historic landscape contribute to the character of the landscape, either through their own intrinsic interest, through their interest as a group or through their relationship with other aspects of the historic landscape. e) Outstanding or high archaeological interest due to: § evidence of the survival of an early form of historic landscape; a high degree of survival of historic landscape elements which are legible; § high research potential and/or contribution of archaeological evidence to our understanding of the development and history of the historic landscape; and § presence of known archaeological sites or monuments which make an outstanding contribution to the character of the historic landscape either by virtue of their own intrinsic interest, or through their relationship with other aspects of the historic landscape. f) Outstanding or high scenic interest due to: § the size, location and/or overall character, including any combination of its built, landscaped, planted, water or natural components, making a special contribution to the quality of the surrounding landscape; and § a high degree of rarity and contrast with the surrounding landscape. g) Outstanding or high nature conservation interest due to: § the presence of sites recognised at an international, national or local level for their flora (plants), fauna (animals), geology (rock types and forms), geomorphology (landforms) or a combination of these features; and § a wide range of different habitats, or one or more habitats, which appear at the time of assessment to be managed to support nature conservation principles, or to support protected species.
	Battlefields recorded on the Inventory of Historic Battlefields. **Non-Inventory historic battlefields with:** a) Historical associations that make a significant contribution to history and to modern society and culture, including military history, strategy and tactics, such as significant military innovations or occurrences associated with the battle, associations with nationally significant historical individuals or groups and their interactions, or with a nationally significant event or

Value (sensitivity)	Criteria
	campaign, documentary and historic map evidence that may significantly enhance our understanding of historical events, and the battle has a place in the national history and consciousness as reflected through literature, oral tradition and evidence of the role that battlefield plays for communities. b) Special qualities comprising significant physical remains, including built structures that were present at the time of the battle, such as field walls or buildings, route ways like roads, bridges and paths, or elements resulting from the battle itself, or elements resulting from the battle itself, including earthworks or graves, archaeological evidence that can support and enhance documentary records and provide, details about events, weaponry and combatants that are not available through other sources and the potential for buried archaeological deposits, such as the remains of earthworks, camps, burials or entrenchments, and/or archaeological potential which can contribute significantly to our understanding of the broader archaeology and history of Scotland. c) Landscape characteristics including features of terrain such as hills and other high ground, or valleys, natural obstacles such as watercourses, bogs and cliffs, areas providing concealment such as slopes, ditches and woodland routes of movement and manoeuvre such as paths and narrow passes, historic settlements and memorials which are often located to relate to elements of the battlefield landscape and significantly contribute to our understanding and appreciation of a battle and its associations, which significantly contribute to understanding why events unfolded as they did, to our sense of place and how battlefields are remembered today.
Medium	**Non-designated historic landscapes of:** a) Some artistic interest due to: § it being appreciated as a work of art in its own right, in terms of aesthetics and any other experiential qualities; § where the historic landscape was formally designed, some degree to which the design set the trend for later gardens and designed landscapes, or marked some shift in landscape design history; § where the historic landscape was formally designed, good quality and survival of any planned visual relationships (such as vistas or sightlines) from within the designed landscape towards landscape features beyond its boundaries (either built or naturally occurring); and § where the historic landscape was formally designed the design was by a regionally important gardener or landscape designer and is an uncommon, representative, intact or important work. b) Some historic interest due to: § some quantity and good quality of associated documentary or other evidence for the history of the historic landscape, including maps, plans, written accounts, tree surveys, research reports, excavation reports, photographs, film, letters and any other kind of record; § the degree to which the historic landscape as a whole represents a particular period in the history of garden or landscape design (where formally designed), and/or the degree to which one or more of the historic landscape's components form a good example of a particular period or style, or sequence of styles over time; § some relationship with historic individuals, communities, events, traditions and/or historic and social movements. These are reflected in the physical elements of the historic landscape to some degree; and § some evidence of the role that the historic landscape plays for communities in connecting people with the past, including some access and recreation, interpretation and education, or other forms of engagement. c) Some horticultural interest due to: § the presence of horticultural or arboricultural collections which are in a fair condition with some renewal, and which contain a range of species and/or may have some unusual species or rarities; § the presence of some individual trees which are recognised for their age, and cultural associations. Some may be of 'champion' status;

Value (sensitivity)	Criteria
	§ the presence of scientific collections which are in a fair condition, some documentation, propagation and availability to others; and § some contribution to the history of horticulture, arboriculture or silviculture. d) Some architectural interest due to: § the presence of historic buildings and structures, some of which may be listed; and § the degree to which the buildings or structures within the historic landscape contribute to the character of the landscape, either through their own intrinsic interest, through their interest as a group or through their relationship with other aspects of the historic landscape. e) Some archaeological interest due to: § some evidence of the survival of an early form of historic landscape; some historic landscape elements survive and are legible; § some research potential and/or contribution of archaeological evidence to our understanding of the development and history of the historic landscape; and § the presence of known archaeological sites or monuments which make some contribution to the character of the historic landscape either by virtue of their own intrinsic interest, or through their relationship with other aspects of the historic landscape. f) Some scenic interest due to: § the size, location and/or overall character, including any combination of its built, landscaped, planted, water or natural components, which make some contribution to the quality of the surrounding landscape; and § some degree of rarity and contrast with the surrounding landscape. g) Some nature conservation interest due to: § the presence of some sites recognised at a national or local level for their flora (plants), fauna (animals), geology (rock types and forms), geomorphology (landforms) or a combination of these features; and § a range of different habitats, or one or more habitats, which appear at the time of assessment to be managed to support nature conservation principles, or to support protected species.
	Non-Inventory historic battlefields with: a) Historical associations that make a contribution to history and to modern society and culture, including military history, strategy and tactics, such as military innovations or occurrences associated with the battle, associations with regionally significant historical individuals or groups and their interactions, or with a regionally significant event or campaign, documentary and historic map evidence that may enhance our understanding of historical events, and the battle has a place in the regional history and consciousness as reflected through literature, oral tradition and evidence of the role that battlefield plays for communities. b) Special qualities comprising physical remains, including built structures that were present at the time of the battle, such as field walls or buildings, route ways like roads, bridges and paths, or elements resulting from the battle itself, or elements resulting from the battle itself, including earthworks or graves, archaeological evidence that can support and enhance documentary records and provide, details about events, weaponry and combatants that are not available through other sources and the potential for buried archaeological deposits, such as the remains of earthworks, camps, burials or entrenchments, and/or archaeological potential which can contribute to the archaeology and areas in which the battlefield is located. c) Landscape characteristics including features of terrain such as hills and other high ground, or valleys, natural obstacles such as watercourses, bogs and cliffs, areas providing concealment such as slopes, ditches and woodland routes of movement and manoeuvre such as paths and narrow passes, historic settlements and memorials which are often located to relate to

Value (sensitivity)	Criteria
	elements of the battlefield landscape and significantly contribute to our understanding and appreciation of a battle and its associations, which contribute to understanding why events unfolded as they did, to our sense of place and how battlefields are remembered today.
Low	**Non-designated historic landscapes of:** a) Limited artistic interest due to: § limited appreciation as a work of art in its own right, in terms of aesthetics and any other experiential qualities; § where the historic landscape was formally designed, the limited degree to which the design set the trend for later gardens and designed landscapes, or marked a limited shift in landscape design history; § where the historic landscape was formally designed, poor quality and limited survival of any planned visual relationships (such as vistas or sightlines) from within the designed landscape towards landscape features beyond its boundaries (either built or naturally occurring); and § where the historic landscape was formally designed was by a locally important gardener or landscape designer and is a common, poorly representative, fragmentary or unimportant work. b) Limited historic interest due to: § limited quantity and poor quality of associated documentary or other evidence for the history of the historic landscape, including maps, plans, written accounts, tree surveys, research reports, excavation reports, photographs, film, letters and any other kind of record; § the limited degree to which the historic landscape as a whole represents a particular period in the history of garden or landscape design (where formally designed), and/or the degree to which one or more of the historic landscape's components form a poor example of a particular period or style, or sequence of styles over time; § limited relationship with historic individuals, communities, events, traditions and/or historic and social movements. Limited reflection of these in the physical elements of the historic landscape to a limited degree; and § limited evidence of the role that the historic landscape plays for communities in connecting people with the past, including limited access and recreation, interpretation and education, or other forms of engagement. c) Limited horticultural interest due to: § the presence of horticultural or arboricultural collections which are in poor condition, with limited renewal and a limited range of species and/or limited unusual species or rarities; § a limited number of individual trees which are recognised for their age, and cultural associations. A limited number likely to be of 'champion' status; § the presence of scientific collections which are in a poor condition, with limited documentation, propagation and availability to others; and § a limited contribution to the history of horticulture, arboriculture or silviculture. d) Limited architectural interest due to: § the limited presence of historic buildings and structures; and § the limited degree to which the buildings or structures within the historic landscape contribute to the character of the landscape, either through their own intrinsic interest, through their interest as a group or through their relationship with other aspects of the historic landscape. e) Limited archaeological interest due to: § limited evidence of the survival of an early form of historic landscape; limited survival of historic landscape elements with limited legibility;

Value (sensitivity)	Criteria
	§ the limited research potential and/or contribution of archaeological evidence to our understanding of the development and history of the historic landscape; and § the limited presence of known archaeological sites or monuments which make a limited contribution to the character of the historic landscape either by virtue of their own intrinsic interest, or through their relationship with other aspects of the historic landscape. f) Limited scenic interest due to: § the size, location and/or overall character, including any combination of its built, landscaped, planted, water or natural components, that make a limited contribution to the quality of the surrounding landscape; and § the limited degree of rarity and contrast with the surrounding landscape. g) Limited nature conservation interest due to: § the limited presence of sites recognised at a local level for their flora (plants), fauna (animals), geology (rock types and forms), geomorphology (landforms) or a combination of these features; and § the limited range of different habitats, or one or more habitats, with limited evidence for management to support nature conservation principles, or to support protected species.
	Non-Inventory historic battlefields with: a) Historical associations that make a limited contribution to history and to modern society and culture, including military history, strategy and tactics, such as military innovations or occurrences associated with the battle, associations with locally significant historical individuals or groups and their interactions, or with a locally significant event or campaign, documentary and historic map evidence that may result in a limited enhancement to our understanding of historical events, and the battle has a place in the local history and consciousness as reflected through literature, oral tradition and evidence of the role that battlefield plays for communities. b) Special qualities comprising physical remains, including built structures that were present at the time of the battle, such as field walls or buildings, route ways like roads, bridges and paths, or elements resulting from the battle itself, or elements resulting from the battle itself, including earthworks or graves, archaeological evidence that can support and enhance documentary records and provide, details about events, weaponry and combatants that are not available through other sources and the potential for buried archaeological deposits, such as the remains of earthworks, camps, burials or entrenchments, and/or archaeological potential which can provided a limited contribution to the archaeology and areas in which the battlefield is located. c) Landscape characteristics including features of terrain such as hills and other high ground, or valleys, natural obstacles such as watercourses, bogs and cliffs, areas providing concealment such as slopes, ditches and woodland routes of movement and manoeuvre such as paths and narrow passes, historic settlements and memorials which are often located to relate to elements of the battlefield landscape and significantly contribute to our understanding and appreciation of a battle and its associations, which provide a limited contribution to understanding why events unfolded as they did, to our sense of place and how battlefields are remembered today.
Negligible	**Non-designated historic landscape of:** a) Very limited artistic interest due to: § very limited appreciation as a work of art in its own right, in terms of aesthetics and any other experiential qualities; § where the historic landscape was formally designed, the very limited degree to which the design set the trend for later gardens and designed landscapes, or marked a very limited shift in landscape design history; § where the historic landscape was formally designed, very poor quality and very limited survival of any planned visual relationships (such as vistas or sightlines) from within the designed landscape towards landscape features beyond its boundaries (either built or naturally occurring); and

Value (sensitivity)	Criteria
	§ where the historic landscape was formally designed the design was by a locally important gardener or landscape designer and it being a very common, very poorly representative, very fragmentary or a very unimportant work. b) Very limited historic interest due to: § very limited quantity and very poor quality of associated documentary or other evidence for the history of the historic landscape, including maps, plans, written accounts, tree surveys, research reports, excavation reports, photographs, film, letters and any other kind of record; § the very limited degree to which the historic landscape as a whole represents a particular period in the history of garden or landscape design (where formally designed), and/or the degree to which one or more of the historic landscape's components form a very poor example of a particular period or style, or sequence of styles over time; § the very limited relationship with historic individuals, communities, events, traditions and/or historic and social movements. Very limited reflection of these in the physical elements of the historic landscape; and § very limited evidence of the role that the historic landscape plays for communities in connecting people with the past, including very limited access and recreation, interpretation and education, or other forms of engagement. c) Very limited horticultural interest due to: § the presence of horticultural or arboricultural collections which are in a very poor condition with very limited renewal, and a very limited range of species and/or very limited unusual species or rarities; § very few individual trees which are recognised for their age, and cultural associations, and none of 'champion' status; § the presence of scientific collections which are in a very poor condition, with very limited documentation, propagation and availability to others; and § a very limited contribution to the history of horticulture, arboriculture or silviculture. d) Very limited architectural interest due to: § the very limited presence of historic buildings and structures, none of which may be listed; § the very limited degree to which the buildings or structures within the historic landscape contribute to the character of the landscape, either through their own intrinsic interest, through their interest as a group or through their relationship with other aspects of the historic landscape. e) Very limited archaeological interest due to: § very limited evidence of the survival of an early form of historic landscape; very limited survival of historic landscape elements with very limited legibility; § the very limited research potential and/or contribution of archaeological evidence to our understanding of the development and history of the historic landscape; and § the very limited presence of known archaeological sites or monuments which make a very limited contribute to the character of the historic landscape either by virtue of their own intrinsic interest, or through their relationship with other aspects of the historic landscape. f) Very limited scenic interest due to: § the size, location and/or overall character, including any combination of its built, landscaped, planted, water or natural components, making a very limited contribution to the quality of the surrounding landscape; and § the very limited degree of rarity and contrast with the surrounding landscape. g) Very limited nature conservation interest due to:

Value (sensitivity)	Criteria
	§ the very limited presence of sites recognised at a local level for their flora (plants), fauna (animals), geology (rock types and forms), geomorphology (landforms) or a combination of these features; and § a very limited range of different habitats, or one or more habitats, with very limited evidence for management to support nature conservation principles, or to support protected species.
	Non-Inventory historic battlefields with: a) Historical associations that make a very limited contribution to history and to modern society and culture, including military history, strategy and tactics, such as military innovations or occurrences associated with the battle, associations with locally significant historical individuals or groups and their interactions, or with a locally significant event or campaign, documentary and historic map evidence that may result in a very limited enhancement to our understanding of historical events, and the battle has a limited place in the local history and consciousness as reflected through literature, oral tradition and evidence of the role that battlefield plays for communities. b) Special qualities comprising physical remains, including built structures that were present at the time of the battle, such as field walls or buildings, route ways like roads, bridges and paths, or elements resulting from the battle itself, or elements resulting from the battle itself, including earthworks or graves, archaeological evidence that can support and enhance documentary records and provide, details about events, weaponry and combatants that are not available through other sources and the potential for buried archaeological deposits, such as the remains of earthworks, camps, burials or entrenchments, and/or archaeological potential which can provided a very limited contribution to the archaeology and areas in which the battlefield is located. c) Landscape characteristics including features of terrain such as hills and other high ground, or valleys, natural obstacles such as watercourses, bogs and cliffs, areas providing concealment such as slopes, ditches and woodland routes of movement and manoeuvre such as paths and narrow passes, historic settlements and memorials which are often located to relate to elements of the battlefield landscape and significantly contribute to our understanding and appreciation of a battle and its associations, which provide a very limited contribution to understanding why events unfolded as they did, to our sense of place and how battlefields are remembered today.

Criteria to inform the identification of key characteristics, features or elements of historic landscapes

For World Heritage Sites the key characteristics, features or elements should be defined with refence to the information contained in the Statements of Outstanding Universal Value.

For Inventory Gardens and Designed Landscapes, the identification of key characteristics, features or elements (articulated as key landscape features and special features) should be based on the information contained in the Inventory of Gardens and Designed Landscapes. Where required to supplement this information the criteria identified below can be used to inform the identification of key characteristics, features or elements for Inventory Gardens and Designed Landscapes. They will also be used to inform the identification for key characteristics, features or elements for non-designated historic landscapes:

a) Artistic interest (the design of a garden and designed landscape as is currently evident) including:
   - § appreciation of the landscape as a work of art in its own right, in terms of aesthetics and any other experiential qualities;

- the quality and survival of any planned visual relationships (such as vistas or sightlines) from within the designed landscape towards landscape features beyond its boundaries (either built or naturally occurring);
- the degree to which the design set the trend for later gardens and designed landscapes, or marked a shift in landscape design history; and
- whether it was designed by an important garden or landscape designer and is a rare or particularly representative, intact or important work.

b) Historic interest (the historical context, the survival of evidence for its development and the relationship of the historic landscape with people, both past and present) including:

- the amount and quality of associated documentary or other evidence for the history of the historic landscape, including maps, plans, written accounts, tree surveys, research reports, excavation reports, photographs, film, letters and any other kind of record;
- the degree to which the historic landscape as a whole represents a particular period in the history of garden or landscape design (where formally designed) and/or the degree to which one or more of the historic landscape's components form an outstanding example of a particular period or style, or sequence of styles over time;
- its relationship with historic individuals, communities, events, traditions and/or historic and social movements, and the degree to which these can be reflected in the physical elements of the historic landscape; and
- evidence of the role that the historic landscape plays for communities in connecting people with the past – this can be reflected through access and recreation, interpretation and education, or other forms of engagement.

c) Horticultural interest (the plants, trees, shrubs and woodlands in a garden and designed landscape or historic landscape). It covers any important associations with the history of horticulture, arboriculture (the cultivation of trees and shrubs) or silviculture (the cultivation of forest trees, or forestry) including:

- the presence of horticultural or arboricultural collections, their condition and renewal, and range of species and/or unusual species or rarities;
- the presence of individual trees recognised for their age, significant cultural associations or 'champion' status;
- the presence of scientific collections, their condition, documentation, propagation and availability to others; and
- the site's overall place in the history of horticulture, arboriculture or silviculture.

d) Architectural interest (the built features within a garden and designed landscape or historic landscape) including:

- the presence of buildings and structures that are listed in recognition of their special architectural and historic interest; and
- the degree to which the buildings or structures contribute to the character of the historic landscape, either through their own intrinsic interest, through their interest as a group or through their relationship with other aspects of the landscape.

e) Archaeological interest (archaeological features contained within the garden and designed landscape or historic landscape) including:
   - evidence of the survival of an early form of historic landscape, surviving historic landscape elements and their legibility;
   - the research potential and/or contribution of archaeological evidence to our understanding of the development and history of the historic landscape; and
   - other known archaeological sites or monuments which contribute to the character of the historic landscape either by virtue of their own intrinsic interest, or through their relationship with other aspects of the historic landscape.

f) Scenic interest (the special contribution that the garden and designed landscape or historic landscape makes to the quality of the surrounding landscape) including:
   - size, location and/or overall character, including any combination of its built, landscaped, planted, water or natural components; and
   - rarity and contrast with the surrounding landscape.

g) Nature conservation interest (the quality and diversity of the environments and habitats within the garden and designed landscape of historic landscape) including:
   - the presence of sites recognised at an international, national or local level for their flora (plants), fauna (animals), geology (rock types and forms), geomorphology (landforms) or a combination of these features; and
   - the degree to which it contains a range of different habitats, or one or more habitats, which appear at the time of assessment to be managed to support nature conservation principles, or to support protected species.

Assessments should also be undertaken based on the guidance provided by Managing Change in the Historic Environment: Gardens and Design Landscapes (HES, 2020b).

For Inventory Battlefields, the starting point for the identification of key characteristics, features or elements of historic battlefields (articulated as special qualities and key landscape characteristics) will be the information contained in the Inventory of Historic Battlefields. Where required to supplement this information the criteria identified below will be used to inform the identification of these. They should also be used to inform the identification for key characteristics, features or elements for non-designated historic battlefields. Based on the criteria identified in Table 3, the key characteristics, features or elements of historic battlefields will be considered with reference to:

a) Historical associations;

b) Significant physical remains and/or archaeological potential (special qualities); and

c) Battlefield landscape (Key landscape characteristics).

Assessments should be undertaken based on the guidance provided by Managing Change in the Historic Environment: Historic Battlefields (HES, 2020c).

Appendix A15.1: Air Quality Annexes

1.1 Introduction

1.1.1 This air quality technical appendix supports Volume 1, Part 3 – Environmental Assessment (Chapter 15: Air Quality) of this DMRB Stage 2 assessment and includes the following annexes:

- Annex A Key Air Quality Legislation;
- Annex B Background Mapping Adjustment;
- Annex C Project Specific Air Quality Monitoring Results;
- Annex D Verification;
- Annex E Detailed Human-Health Results; and
- Annex F Designated Habitat Results.

1.2 Annex A - Key Air Quality Legislation

1.2.1 The key air quality legislation is summarised in Table 1.

Table 1: Key Legislation for Air Quality

Legislation	Description
Environment Protection Act 1990, amended by the Pollution Prevention and Control Act 1999.	Part III Provides statutory nuisance provisions for nuisance dust.
Environment Act 1995, Part IV.	Defines requirements for Local Air Quality Management (LAQM).
The Air Quality (Scotland) Regulations, 2000 and Air Quality (Amended) Regulations, 2002	Legislates for the limit values for pollutants set out in the 2007 Air Quality Strategy.
The National Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland, 2007.	Updates the 2000 Air Quality Strategy, and sets out how local air quality is managed, through the application of Air Quality Objectives (AQO) based on the Air Quality (England) Regulations 2000 and 2002 Amendments.
The Air Quality Standards Regulations (Scotland) 2010.	Transpose formalised limit values set out in the EU ambient air quality directive 2008/50/EC to Scottish law.
Air Quality (Scotland) Regulations 2000, the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016.	Set out the objectives adopted in Scotland for the purpose of Local Air Quality Management.

1.3 Annex B - Background Mapping Adjustment

1.3.1 As the background NO_x and PM_{10} maps provide data for individual pollutant sectors (e.g. motorway, trunk A-roads, primary A-roads, minor roads and industry), the components relating to road traffic that were explicitly modelled have been removed to avoid double counting of road emissions for the prediction of pollutant concentrations.

1.3.2 Table 2 shows the ratio between the background concentration of local measurement (Falkirk urban background monitor and Jacobs' background monitoring results) and the Scotland Air Quality background map, note these data are used for all the A9 Pass of Birnam to Glen Garry projects. For the four background locations the average of ratios is 1.5; this indicates the background map is underestimating concentrations by approximate 50% compared to the actual measurement at the continuous monitor and diffusion tube monitoring.

1.3.3 Although the background map is underestimating concentrations, it is anticipated that background concentrations at the receptors remain well below the objectives and the risk of exceedance is unlikely. The average NO_2 annual mean background at the assessed receptors is 2.1 µg/m^3. The adjustment of the background would have an insignificant effect on the results and therefore it is anticipated that the adjustment is not necessary for this DMRB Stage 2 assessment.

Table 2: Background Mapping vs Local Background Monitoring

Site Location	Site Location Projected 2015 Annual Mean (µg/m^3)	Scotland Air Quality Background Grid Reference	Scotland AQ 2015 Background Map (µg/m^3)	2015 Site Measurement to Scotland AQ Background Map Factor
Falkirk Grangemouth MC	18.5	292500, 682500	11.2	1.7
Diffusion Tube Location 1	5.2	301500, 742500	4.5	1.2
Diffusion Tube Location 4	4.7	300500, 749500	3.2	1.5
Diffusion Tube Location 15	5.8	289500, 764500	3.7	1.6
Average				**1.5**

1.4 Annex C - Project Specific Air Quality Monitoring Results

1.4.1 A six-month monitoring programme using diffusion tubes was undertaken (February 2015 to August 2015) at 25 selected locations for the A9 Pass of Birnam to Glen Garry projects. The details of monitoring sites are presented in Table 3 with those within the study area (1, 2 and 3) highlighted in grey. The locations of the monitoring sites within the study area are also presented on Figure 15.9.

Table 3: Scheme Specific Monitoring Location Details

Name	Description	X	Y	Height (cm)	A9 Project Location	Type
1	Give way sign at junction before bridge	301794	742051	230	P2	Background
2	Bus stop on A9 SB c/way	301716	742296	280	P2	Kerbside
3	Bus stop on A9 NB c/way	301627	742283	290	P2	Kerbside
4	Wooden telegraph pole across from bins	300056	749192	260	P3	Background
5	Parking sign preceding lay-by 28	299718	749202	160	P3	Roadside
6	Give way sign at junction with A9	299468	749766	230	P3	Roadside
7	Parking sign preceding lay-by 39	294309	757006	240	P4	Roadside
8	Silver pole near average speed camera adjacent to SB c/way	294307	757028	270	P4	Roadside
9	Lamppost next to national speed limit signs	293933	757525	290	P4	Background
10	Lamppost	293888	757643	360	P4	Background
11	No stopping sign A9 SB c/way	291761	762837	175	P5	Roadside
12	Bridge inspection stairwell railing	291608	763070	90	P5	Roadside
13	Fence post preceding lay-by 44	290595	763746	210	P5	Roadside
14	Hazard road sign	289259	764207	260	P5	Roadside

Name	Description	X	Y	Height (cm)	A9 Project Location	Type
15	Passing place	289188	764082	240	P5	Background
16	Road sign A9 SB c/way Killiecrankie turn off	288916	764293	130	P5	Roadside
17	Parking sign preceding lay-by 46	288882	764285	160	P5	Roadside
18	Parking sign preceding lay-by 49	286952	764924	160	P5	Roadside
19	Parking sign preceding lay-by 51	285565	765243	160	P5	Roadside
20	Maintenance bay behind safety barrier	283906	765683	240	P5	Roadside
21	No stopping sign A9 SB c/way	283067	765516	160	P5	Kerbside
22	Metal pole near wooden telegraph pole	280540	765883	460	P5	Roadside
23	Wooden telegraph pole beside petrol station price sign	280489	765759	310	P5	Roadside
24	No parking sign in deceleration lane	280474	765910	190	P5	Roadside
25	Give way sign junction Calvine to A9 NB c/way	280149	765947	160	P5	Roadside

1.4.2 Six months of monitoring data available are presented in Table 4. Those sites within the study area are highlighted in grey. The other monitoring sites relate to the other A9 Pass of Birnam to Glen Garry projects.

Table 4: Average Measured NO_2 Concentration (µg/m^3) for the monitoring periods

Site	A9 Project Location	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
1	P2	6.7	5.8	4.5	2.9	4.9	4.8
2	P2	35.1	30.4	26.9	25.8	28.6	28.3
3	P2	46.3	47.1	38.8	34.1	44.0	45.2
4	P3	6.6	5.1	3.6	3.3	4.1	3.9
5	P3	-	29.5	25.3	20.3	26.2	29.5
6	P3	-	18.6	13.8	14.2	16.8	17.7
7	P4	26.6	27.5	22.4	22.2	29.5	31.2
8	P4	22.9	19.7	14.4	14.3	14.3	16.8
9	P4	13.4	10.5	6.7	5.0	7.7	5.3
10	P4	11.2	9.0	5.7	3.5	5.4	8.2
11	P5	-	30.2	30.9	30.8	36.1	34.1
12	P5	-	19.6	16.6	16.3	19.2	20.3
13	P5	-	25.5	24.5	23.6	20.8	27.9
14	P5	12.9	11.5	9.3	7.7	7.7	8.6
15	P5	8.6	6.9	5.5	3.9	4.2	4.0
16	P5	28.1	24.8	22.7	21.3	24.2	27.5
17	P5	20.7	19.9	15.9	16.5	15.8	19.6
18	P5	25.8	24.4	22.5	18.6	21.6	27.7

Site	A9 Project Location	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
19	P5	33.4	32.3	27.2	26.7	28.0	32.7
20	P5	23.2	21.1	15.3	15.1	14.1	15.3
21	P5	29.3	25.5	19.6	19.3	19.5	25.1
22	P5	22.4	20.3	14.5	16.2	15.4	16.9
23	P5	9.2	9.3	6.7	4.1	5.0	5.8
24	P5	29.4	28.3	21.3	23.5	24.2	28.9
25	P5	28.0	30.5	23.7	23.1	24.7	27.4

1.4.3 Diffusion tubes were co-located with a continuous monitor at Atholl Street, Perth (Site 26) in order to enable appropriate bias adjustments to be made. The 2015 national bias factor (0.87) was used for the purposes of the DMRB Stage 2 Assessment. The 2015 national bias factor was the bias adjustment factors determined from Local Authority co-location studies throughout the UK and has been collated by the Local Air Quality Management Helpdesk. Using orthogonal regression combined bias adjustment factors have been calculated for each laboratory, year and preparation method combination for which data are available.

1.4.4 As the Baseline Year is 2015 and the monitoring campaign was undertaken in 2015 for a short period of 6 months, the monitoring campaign results had to be adjusted to be able to represent the 2015 Annual Mean NO_2 concentrations at each of the locations sampled. This adjustment allowed a comparison to be made between monitoring data and Air Quality Standards or Objectives on an Annual Mean basis. The calculation of the annualization/seasonal adjustment factors are shown below in Table 5 in accordance with LAQM.TG(16) Box A7.10 (Defra, 2018).

Table 5: Annualisation/Seasonal Adjustment

NO_2 concentration ($\mu g/m^3$)	Falkirk Grangemouth MC	Grangemouth Moray	Average ratio (A/B) of sites considered for annualisation
Period 1	17.2	11.2	
Period 2	21.9	15.8	
Period 3	17.5	15.0	
Period 4	10.3	8.0	
Period 5	12.1	11.9	
Period 6	10.8	10.5	
Average Period Mean (A)	15.8	12.2	
2015 Annual Mean (B)	18.5	14.9	
Annual Mean/Period Mean ratios (A/B)	**1.17**	**1.22**	**1.19**

1.4.5 The estimated annual mean NO_2 concentrations for 2015 base year is presented in Table 6. Those sites within the study area are highlighted in grey. The other monitoring sites relate to the other A9 projects.

Table 6: Estimated 2015 Annual Mean NO_2 Concentrations

Site	A9 Scheme Location	6 Month Period Mean (µg/m³)	Data Capture (100% = 6 months)	Annualisation /Seasonal Adjustment Ratio	Bias Adjustment Ratio	Estimated 2015 Annual Mean (µg/m³)
1	P2	4.9	100	1.19	0.87	5.1
2	P2	29.2	100	1.19	0.87	30.3
3	P2	42.6	100	1.19	0.87	**44.2**
4	P3	4.5	100	1.19	0.87	4.6
5	P3	26.2	83	1.19	0.87	27.1
6	P3	16.2	83	1.19	0.87	16.8
7	P4	26.5	100	1.19	0.87	27.6
8	P4	17.1	100	1.19	0.87	17.7
9	P4	8.1	100	1.19	0.87	8.4
10	P4	7.1	100	1.19	0.87	7.4
11	P5	32.4	83	1.19	0.87	33.5
12	P5	18.4	83	1.19	0.87	19.0
13	P5	24.5	83	1.19	0.87	25.3
14	P5	9.6	100	1.19	0.87	10.0
15	P5	5.5	100	1.19	0.87	5.7
16	P5	24.8	100	1.19	0.87	25.7
17	P5	18.1	100	1.19	0.87	18.8
18	P5	23.4	100	1.19	0.87	24.3
19	P5	30.1	100	1.19	0.87	31.2
20	P5	17.4	100	1.19	0.87	18.0
21	P5	23.0	100	1.19	0.87	23.9
22	P5	17.6	100	1.19	0.87	18.3
23	P5	6.7	100	1.19	0.87	6.9
24	P5	25.9	100	1.19	0.87	26.9
25	P5	26.2	100	1.19	0.87	27.2
Exceedances are highlighted in **Bold and Underlined**						

1.5 Annex D - Verification

1.5.1 The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy for the method used to model the concentrations (i.e. the dispersion equation in DMRB HA207/07):

- estimates of background pollutant concentrations;
- traffic data uncertainties;

- model input parameters, such as distance from the road centreline to monitoring location and road width; and
- overall limitations of the dispersion equation.

Model Precision

1.5.2 Residual uncertainty may remain after systematic error or 'model accuracy' has been accounted for in the final predictions. Residual uncertainty may be considered synonymous with the 'precision' of the model predictions, i.e. how wide the scatter or residual variability of the predicted values compare with the monitored true value, once systematic error has been allowed for. The quantification of model precision provides an estimate of how the final predictions may deviate from true (monitored) values at the same location over the same period.

1.5.3 Suitable local monitoring data for the purpose of verification is available for concentrations of NO_2 at the locations shown on Figure 15.9. This monitoring data have been used to validate the dispersion calculation prediction and obtain adjustment factors which can be applied to predictions of pollutant concentrations in the base and future years.

Model Performance

1.5.4 An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG(16) identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. The statistical parameters used in this assessment are:

- root mean square error (RMSE);
- fractional bias (FB); and
- correlation coefficient (CC).

1.5.5 A brief for explanation of each statistic is provided in Table 7, and further details can be found in LAQM.TG(16) Box A7.13.

Table 7: Model Performance Statistics

Statistical Parameter	Comments	Ideal value
Root Mean Square Error (RMSE)	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40 µg/m^3, if an RMSE of 10 µg/m^3 or above is determined for a model it is advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4 µg/m^3 for the annual mean NO_2 objective.	0.01
Fractional Bias (FB)	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.00

Statistical Parameter	Comments	Ideal value
Correlation Coefficient (CC)	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.	1.00

1.5.6 These parameters estimate how the model results agree or diverge from the observations.

1.5.7 These calculations have been carried out prior to, and after, adjustment and provide information on the improvement of the model predictions as a result of the application of the verification adjustment factors.

Assessment Verification Methodology

1.5.8 The verification process involves a review of the annual mean modelled pollutant concentrations against corresponding monitoring data to determine how well the air quality model has performed. Depending on the outcome it may be considered that the model has performed adequately and that there is no need to adjust any of the modelled results (LAQM.TG(16)).

1.5.9 Alternatively, the model may perform poorly against the monitoring data. The acceptable limits of model verification performance are set out in Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16), 2018). There is then a need to check all the input data to ensure that it is reasonable and accurately represented in the air quality modelling process.

1.5.10 Where all input data, such as traffic data, emissions rates and background concentrations have been checked and considered to be reasonable, then the modelled results require adjustment to best align with the monitoring data. This may either be a single verification adjustment factor to be applied to the annual mean modelled concentrations across the study area, or a range of different adjustment factors to account for different zones in the study area, e.g. motorways, local roads.

1.5.11 The model verification review identified a range of adjustment factors to be applied to the modelled concentrations to achieve a realistic representation of the monitored NO_2 concentrations.

1.5.12 The non-adjusted modelled versus monitored NO_2 concentrations are presented in Table 8 for those sites used in the verification.

Table 8: Non-Adjusted Modelled vs Monitored NO_2

Monitor ID	X(m)	Y(m)	A9 Scheme Location	Monitored Annual Mean NO_2 (µg/m^3)	Non-Adjusted Modelled Annual Mean NO_2 (µg/m^3)	Monitored versus Modelled (% Difference)
8	294307	757028	P4	17.7	12.7	-28%
12	291608	763070	P5	19.0	11.8	-38%
20	283906	765683	P5	18.0	11.0	-39%
22	280540	765883	P5	18.3	9.8	-46%

1.5.13 The initial comparison between the predicted concentrations and monitoring data illustrates that the model tends to under predict annual mean NO_2 concentrations over the modelled area.

1.5.14 Model verification was therefore undertaken in accordance with LAQM.TG(16). Data were collected from a number of suitable diffusion tube monitoring sites in the vicinity of the scheme.

1.5.15 The results suggested that the model was under-predicting NO_x concentrations. The ratio between monitored and modelled NO_x was 1.842. The adjusted modelled versus monitored annual mean NO_2 concentrations are presented in Table 9. Modelled road-component NO_x concentrations predicted at sensitive receptors in the base and opening year scenarios were multiplied by the verification factor (1.842) to account for the under-prediction of Road NO_x by the model.

Table 9: Adjusted Modelled vs Monitored NO_2 for verification sites

Monitor ID	X(m)	Y(m)	A9 Scheme Location	Monitored Annual Mean NO_2 ($\mu g/m^3$)	Adjusted Modelled Annual Mean NO_2 ($\mu g/m^3$)	Monitored versus Modelled (% Difference)
8	294307	757028	P4	17.7	19.9	12%
12	291608	763070	P5	19.0	19.1	0%
20	283906	765683	P5	18.0	17.9	-1%
22	280540	765883	P5	18.3	15.7	-14%

1.5.16 The summary results and model performance statistics defined in LAQM.TG(16) are provided in Table 10.

Table 10: Model Performance Statistics

Model Parameters and Statistics	No Adjustment	NO_x Roads Adjustment
Adjustment a	-	1.842
Correlation Co-efficient	0.58	0.54
RMSE	7.58	1.52
Fractional Bias	0.51	0.05
Within +10%	0	1
Within -10%	0	1
Within +-10%	0	2
Within +10 to 25%	0	1
Within -10 to 25%	0	1
Within +-10 to 25%	0	2
Over +25%	0	0
Under -25%	4	0
Greater +- 25%	4	0
Within +- 25%	0	4

1.5.17 A comparison of the performance of the annual mean modelled concentrations from the air quality model against the annual mean monitoring data was undertaken. The results show that all of the four modelled concentrations are within +/-25% of monitored concentrations. The model performance statistics show that the uncertainty in the predictions of adjusted total annual mean NO_2 was considered acceptable as the RMSE is less than $2\mu g/m^3$ (5%) for the study area.

1.6 Annex E – Detailed Human-Health Results

Table 11: Results at Selected Human-Health Receptors likely to experience the Greatest Changes across the Study Area – Annual Mean NO_2 Concentrations (µg/m³)

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
1	5.0	5.3	5.8	6.1	5.8	0.3	0.8	1.1	0.8
2	4.5	7.1	7.9	7.7	7.9	2.6	3.4	3.2	3.4
3	4.3	5.1	5.6	5.3	5.6	0.8	1.3	1.0	1.3
4	10.5	11.7	13.6	15.9	13.6	1.3	3.1	5.5	3.1
5	3.3	3.4	3.7	3.4	3.3	0.0	0.3	0.0	-0.1
6	3.9	4.6	5.9	4.7	4.8	0.7	2.0	0.8	1.0
7	10.8	10.9	12.3	13.0	11.9	0.1	1.6	2.3	1.1
8	3.5	5.3	3.5	3.8	3.4	1.8	0.0	0.3	-0.1
9	10.1	15.8	10.2	11.8	10.1	5.7	0.1	1.6	-0.1
10	11.2	11.5	10.2	11.9	10.1	0.3	-1.0	0.7	-1.1
11	7.6	8.3	8.5	7.8	8.4	0.7	0.9	0.2	0.8
12	3.5	3.6	3.3	7.2	3.2	0.0	-0.3	3.7	-0.3
13	3.6	3.7	3.3	7.0	3.3	0.0	-0.3	3.4	-0.3
14	5.3	6.0	5.8	6.2	5.8	0.8	0.5	0.9	0.5
15	3.6	3.4	3.1	4.4	3.1	-0.2	-0.4	0.8	-0.5
16	9.4	7.4	7.4	8.7	7.4	-2.1	-2.0	-0.7	-2.0
17									
18	3.3	3.6	3.5	3.4	3.5	0.3	0.3	0.1	0.3
19	12.0	16.1	15.3	13.4	15.3	4.0	3.3	1.3	3.3
20	2.7	3.0	3.0	3.1	3.0	0.3	0.3	0.4	0.3
21	16.3	15.4	29.4	19.1	17.5	-0.9	13.0	2.7	1.1
22	9.1	9.7	10.8	11.4	10.8	0.5	1.7	2.3	1.7
23	8.7	7.5	7.3	8.1	7.3	-1.2	-1.5	-0.6	-1.5
24	2.8	3.0	2.9	2.8	2.9	0.2	0.2	0.1	0.2
25	3.5	4.1	4.0	3.8	4.0	0.6	0.6	0.3	0.6

[1] Do Minimum scenario

Table 12: Results at Selected Human-Health Receptors likely to experience the Greatest Changes across the Study Area – Annual Mean NO_2 Concentrations (LAQM.TG16) (µg/m³)

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
1	3.6	3.8	4.2	4.4	4.2	0.2	0.6	0.8	0.6
2	3.2	5.1	5.7	5.5	5.7	1.9	2.5	2.3	2.5
3	3.3	3.9	4.2	4.0	4.2	0.6	1.0	0.8	1.0
4	6.3	7.1	8.2	9.6	8.2	0.8	1.9	3.3	1.9

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
5	2.8	2.8	3.1	2.8	2.7	0.0	0.3	0.0	-0.1
6	3.1	3.6	4.7	3.7	3.8	0.6	1.6	0.7	0.8
7	6.4	6.5	7.4	7.8	7.1	0.1	0.9	1.4	0.7
8	3.0	4.5	2.9	3.2	2.8	1.5	0.0	0.2	-0.1
9	6.0	9.4	6.1	7.0	6.0	3.4	0.0	1.0	0.0
10	6.7	6.9	6.1	7.2	6.1	0.2	-0.6	0.4	-0.6
11	5.0	5.5	5.6	5.2	5.6	0.5	0.6	0.1	0.5
12	3.0	3.0	2.7	6.0	2.7	0.0	-0.2	3.1	-0.2
13	3.0	3.1	2.7	5.8	2.7	0.0	-0.3	2.8	-0.3
14	3.7	4.2	4.1	4.4	4.0	0.5	0.4	0.7	0.3
15	3.0	2.8	2.6	3.7	2.6	-0.2	-0.4	0.7	-0.4
16	5.9	4.6	4.6	5.4	4.6	-1.3	-1.2	-0.5	-1.3
17									
18	2.7	3.0	3.0	2.8	3.0	0.3	0.2	0.1	0.2
19	7.0	9.3	8.9	7.7	8.8	2.3	1.9	0.8	1.9
20	2.4	2.6	2.6	2.7	2.6	0.3	0.3	0.4	0.3
21	9.4	8.9	16.9	11.0	10.1	-0.5	7.5	1.6	0.7
22	5.7	6.0	6.7	7.1	6.7	0.3	1.1	1.4	1.1
23	5.6	4.8	4.6	5.2	4.6	-0.8	-0.9	-0.4	-0.9
24	2.5	2.7	2.6	2.5	2.6	0.2	0.2	0.1	0.1
25	2.9	3.3	3.3	3.1	3.3	0.5	0.5	0.3	0.5

[1] Do Minimum scenario

Table 13: Results at Selected Human-Health Receptors likely to experience the Greatest Changes across the Study Area – Annual Mean PM_{10} Concentrations (µg/m³)

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
1	7.8	7.8	7.8	7.9	7.8	0.0	0.0	0.1	0.0
2	7.5	8.0	8.0	8.0	8.0	0.5	0.5	0.5	0.5
3	7.3	7.5	7.4	7.4	7.4	0.2	0.1	0.1	0.1
4	8.2	8.3	8.3	8.7	8.3	0.1	0.1	0.5	0.1
5	7.1	7.2	7.2	7.1	7.1	0.1	0.1	0.0	0.0
6	7.2	7.4	7.5	7.4	7.4	0.2	0.3	0.2	0.2
7	7.8	7.8	7.7	7.9	7.7	0.0	-0.1	0.1	-0.1
8	7.4	7.7	7.4	7.4	7.3	0.3	0.0	0.0	-0.1
9	7.7	8.3	7.6	7.7	7.6	0.6	-0.1	0.0	-0.1
10	8.5	8.5	8.2	8.4	8.2	0.0	-0.3	-0.1	-0.3
11	7.8	8.0	8.0	7.8	8.0	0.2	0.2	0.0	0.2

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
12	7.3	7.3	7.3	8.0	7.3	0.0	0.0	0.7	0.0
13	7.4	7.4	7.3	7.9	7.3	0.0	-0.1	0.5	-0.1
14	6.9	7.1	7.1	7.1	7.1	0.2	0.2	0.2	0.2
15	7.4	7.3	7.3	7.5	7.3	-0.1	-0.1	0.1	-0.1
16	8.0	7.7	7.7	7.9	7.7	-0.3	-0.3	-0.1	-0.3
17									
18	7.0	7.0	7.0	7.0	7.0	0.0	0.0	0.0	0.0
19	8.3	8.5	8.4	8.2	8.4	0.2	0.1	-0.1	0.1
20	6.9	6.9	6.9	6.9	6.9	0.0	0.0	0.0	0.0
21	9.0	8.9	10.0	9.1	8.8	-0.1	1.0	0.1	-0.2
22	8.0	8.0	8.1	8.2	8.1	0.1	0.1	0.2	0.1
23	8.0	7.8	7.7	7.9	7.7	-0.2	-0.3	-0.1	-0.3
24	6.7	6.7	6.7	6.7	6.7	0.0	0.0	0.0	0.0
25	6.3	6.4	6.4	6.4	6.4	0.1	0.1	0.1	0.1

[1] Do Minimum scenario

Table 14: Results at Selected Human-Health Receptors likely to experience the Greatest Changes across the Study Area – Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
1	4.2	4.3	4.3	4.3	4.3	0.1	0.1	0.1	0.1
2	4.1	4.4	4.4	4.4	4.4	0.3	0.3	0.3	0.3
3	4.0	4.1	4.1	4.1	4.1	0.1	0.1	0.1	0.1
4	4.5	4.6	4.6	4.8	4.6	0.1	0.1	0.3	0.1
5	3.9	3.9	3.9	3.9	3.9	0.0	0.0	0.0	0.0
6	3.9	4.0	4.2	4.0	4.0	0.1	0.3	0.1	0.1
7	4.3	4.3	4.3	4.3	4.2	0.0	0.0	0.0	-0.1
8	4.0	4.4	4.0	4.1	4.0	0.4	0.0	0.1	0.0
9	4.2	5.3	4.2	4.2	4.2	1.1	0.0	0.0	0.0
10	4.7	4.7	4.5	4.6	4.5	0.0	-0.2	-0.1	-0.2
11	4.3	4.4	4.4	4.3	4.4	0.1	0.1	0.0	0.1
12	4.0	4.0	4.0	4.4	4.0	0.0	0.0	0.4	0.0
13	4.0	4.0	4.0	4.3	4.0	0.0	0.0	0.3	0.0
14	3.8	3.9	3.9	3.9	3.9	0.1	0.1	0.1	0.1
15	4.0	4.0	4.0	4.1	4.0	0.0	0.0	0.1	0.0
16	4.4	4.2	4.2	4.3	4.2	-0.2	-0.2	-0.1	-0.2
17									
18	3.8	3.8	3.8	3.8	3.8	0.0	0.0	0.0	0.0

Receptor	DM[1]	Do-Something				Change			
		Option ST2A	Option ST2B	Option ST2C	Option ST2D	Option ST2A	Option ST2B	Option ST2C	Option ST2D
19	4.6	4.7	4.6	4.5	4.6	0.1	0.0	-0.1	0.0
20	3.8	3.8	3.8	3.8	3.8	0.0	0.0	0.0	0.0
21	5.0	4.9	6.1	5.0	4.8	-0.1	1.1	0.0	-0.2
22	4.4	4.4	4.4	4.5	4.4	0.0	0.0	0.1	0.0
23	4.4	4.3	4.2	4.3	4.2	-0.1	-0.2	-0.1	-0.2
24	3.6	3.7	3.7	3.6	3.6	0.1	0.1	0.0	0.0
25	3.5	3.5	3.5	3.5	3.5	0.0	0.0	0.0	0.0

[1] Do Minimum scenario

Table 15: Magnitude Changes of Annual Mean NO_2 Concentrations at Selected Human-Health Receptors across the Study Area

Receptor	DS – Option ST2A	DS – Option ST2B	DS – Option ST2C	DS – Option ST2D
1	Adverse Imperceptible	Adverse Small	Adverse Small	Adverse Small
2	Adverse Medium	Adverse Medium	Adverse Medium	Adverse Medium
3	Adverse Small	Adverse Small	Adverse Small	Adverse Small
4	Adverse Small	Adverse Medium	Adverse Large	Adverse Medium
5	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Benefit Imperceptible
6	Adverse Small	Adverse Medium	Adverse Small	Adverse Small
7	Adverse Imperceptible	Adverse Small	Adverse Medium	Adverse Small
8	Adverse Small	Benefit Imperceptible	Adverse Imperceptible	Benefit Imperceptible
9	Adverse Large	Adverse Imperceptible	Adverse Small	Benefit Imperceptible
10	Adverse Imperceptible	Benefit Small	Adverse Small	Benefit Small
11	Adverse Small	Adverse Small	Adverse Imperceptible	Adverse Small
12	Adverse Imperceptible	Benefit Imperceptible	Adverse Medium	Benefit Imperceptible
13	Adverse Imperceptible	Benefit Imperceptible	Adverse Medium	Benefit Imperceptible
14	Adverse Small	Adverse Small	Adverse Small	Adverse Small
15	Benefit Imperceptible	Benefit Small	Adverse Small	Benefit Small
16	Benefit Medium	Benefit Small	Benefit Small	Benefit Medium
17				
18	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
19	Adverse Large	Adverse Medium	Adverse Small	Adverse Medium
20	Adverse Imperceptible	Adverse Imperceptible	Adverse Small	Adverse Imperceptible
21	Benefit Small	Adverse Large	Adverse Medium	Adverse Small
22	Adverse Small	Adverse Small	Adverse Medium	Adverse Small
23	Benefit Small	Benefit Small	Benefit Small	Benefit Small
24	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
25	Adverse Small	Adverse Small	Adverse Imperceptible	Adverse Small

Table 16: Magnitude Changes of Annual Mean PM_{10} Concentrations at Selected Human-Health Receptors across the Study Area

Receptor	DS – Option ST2A	DS – Option ST2B	DS – Option ST2C	DS – Option ST2D
1	No change	No change	Adverse Imperceptible	No change
2	Adverse Small	Adverse Small	Adverse Small	Adverse Small
3	Adverse Small	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
4	Adverse Imperceptible	Adverse Imperceptible	Adverse Small	Adverse Imperceptible
5	Adverse Imperceptible	Adverse Imperceptible	No change	No change
6	Adverse Small	Adverse Small	Adverse Small	Adverse Small
7	No change	Benefit Imperceptible	Adverse Imperceptible	Benefit Imperceptible
8	Adverse Small	No change	No change	Benefit Imperceptible
9	Adverse Small	Benefit Imperceptible	No change	Benefit Imperceptible
10	No change	Benefit Small	Benefit Imperceptible	Benefit Small
11	Adverse Small	Adverse Small	No change	Adverse Small
12	No change	No change	Adverse Small	No change
13	No change	Benefit Imperceptible	Adverse Small	Benefit Imperceptible
14	Adverse Small	Adverse Small	Adverse Small	Adverse Small
15	Benefit Imperceptible	Benefit Imperceptible	Adverse Imperceptible	Benefit Imperceptible
16	Benefit Small	Benefit Small	Benefit Imperceptible	Benefit Small
17				
18	No change	No change	No change	No change
19	Adverse Small	Adverse Imperceptible	Benefit Imperceptible	Adverse Imperceptible
20	No change	No change	No change	No change
21	Benefit Imperceptible	Adverse Medium	Adverse Imperceptible	Benefit Small
22	No change	Adverse Imperceptible	Adverse Small	Adverse Imperceptible
23	Benefit Small	Benefit Small	Benefit Imperceptible	Benefit Small
24	No change	No change	No change	No change
25	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible

Table 17: Magnitude Changes of Annual Mean $PM_{2.5}$ Concentrations at Selected Worst-Case Human-Health Receptors across the Study Area

Receptor	DS – Option ST2A	DS – Option ST2B	DS – Option ST2C	DS – Option ST2D
1	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
2	Adverse Small	Adverse Small	Adverse Small	Adverse Small
3	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
4	Adverse Imperceptible	Adverse Imperceptible	Adverse Small	Adverse Imperceptible
5	No change	No change	No change	No change
6	Adverse Imperceptible	Adverse Small	Adverse Imperceptible	Adverse Imperceptible
7	No change	No change	No change	Benefit Imperceptible
8	Adverse Small	No change	Adverse Imperceptible	No change
9	Adverse Large	No change	No change	No change
10	No change	Benefit Small	Benefit Small	Benefit Small

Receptor	DS – Option ST2A	DS – Option ST2B	DS – Option ST2C	DS – Option ST2D
11	Adverse Small	Adverse Small	No change	Adverse Small
12	No change	No change	Adverse Small	No change
13	No change	No change	Adverse Small	No change
14	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible	Adverse Imperceptible
15	No change	No change	Adverse Imperceptible	No change
16	Benefit Small	Benefit Small	Benefit Small	Benefit Small
17				
18	No change	No change	No change	No change
19	Adverse Small	No change	Benefit Imperceptible	No change
20	No change	No change	No change	No change
21	Benefit Imperceptible	Adverse Large	No change	Benefit Small
22	No change	No change	Adverse Imperceptible	No change
23	Benefit Small	Benefit Small	Benefit Small	Benefit Small
24	Adverse Imperceptible	Adverse Imperceptible	No change	No change
25	No change	No change	No change	No change

Table 18: Significance of effect for Local Air Quality Human-Health Receptors

Total Number of Receptors with:	Magnitude of Change	Option ST2A	Option ST2B	Option ST2C	Option ST2D
Annual Mean NO_2 ($\mu g/m^3$)					
Worsening of air quality objective or creation of a new exceedance	Large	0	0	0	0
	Medium	0	0	0	0
	Small	0	0	0	0
Improvement of an air quality objective already above the objective or the removal of an existing exceedance	Large	0	0	0	0
	Medium	0	0	0	0
	Small	0	0	0	0
Annual Mean PM_{10} /$PM_{2.5}$ ($\mu g/m^3$)					
Worsening of air quality objective or creation of a new exceedance	Large	0	0	0	0
	Medium	0	0	0	0
	Small	0	0	0	0
Improvement of an air quality objective already above the objective or the removal of an existing exceedance	Large	0	0	0	0
	Medium	0	0	0	0
	Small	0	0	0	0

1.7 Annex F – Designated Habitat Assessment Results

Table 19: Nitrogen deposition rates (kg N/ha/yr) at transects assessed – Option ST2A

The full list of results at every transect, in line with Table 15.16 in Chapter 15 (Air Quality) is available on request. They are not presented due to the size of the data table.

Table 20: Nitrogen deposition rates (kg N/ha/yr) at transects assessed – Option ST2B

The full list of results at every transect, in line with Table 15.17 in Chapter 15 (Air Quality) is available on request. They are not presented due to the size of the data table.

Table 21: Nitrogen deposition rates (kg N/ha/yr) at transects assessed – Option ST2C

The full list of results at every transect, in line with Table 15.18 in Chapter 15 (Air Quality) is available on request. They are not presented due to the size of the data table.

Table 22: Nitrogen deposition rates (kg N/ha/yr) at transects assessed – Option ST2D

The full list of results at every transect, in line with Table 15.19 in Chapter 15 (Air Quality) is available on request. They are not presented due to the size of the data table.

1.8 References

Reports and Documents

Defra (2018). Technical Guidance on Local Air Quality Management (LAQM.TG(16)).

Appendix A16.1: Detailed Baseline Noise Survey Results and Notes

1.1 Introduction

1.1.1 This appendix provides additional details of the baseline noise surveys which were undertaken as part of the noise assessment of the proposed route options.

1.1.2 Noise monitoring was undertaken between 5 September 2016 and 10 October 2016 and consisted of noise level measurements at the following locations:

- Measurement Location R2.01 – West Ringwood Cottage, Birnam, Dunkeld, PH8 0DW;
- Measurement Location R2.02 – Hollybank, Perth Road, Birnam, Dunkeld, PH8 0DN;
- Measurement Location R2.03 – Oakbank, Birnam, Dunkeld, PH8 0BW;
- Measurement Location R2.04 – The Old Bakehouse, 12 Birnam Terrace, Birnam, Dunkeld, PH8 0DR;
- Measurement Location R2.05 – 9 Telford Gardens, Birnam, Dunkeld, PH8 0QB;
- Measurement Location R2.06 – Braeknowe, Birnam, Dunkeld, PH8 0DU;
- Measurement Location R2.07 – Corbiere, Little Dunkeld, Dunkeld, PH8 0AD; and
- Measurement Location R2.08 – Craigview, Inver, Dunkeld, PH8 0JR.

1.1.3 The following equipment were used when undertaking noise measurements. Calibration certificates for this equipment are provided at the end of this appendix:

- Rion NC-74 Calibrator serial number (s/n 00830793);
- Rion NL-32 Class 1 Sound Level Meter (s/n 00482601);
- Rion NL-32 Class 1 Sound Level Meter (s/n 00482602);
- Rion NL-32 Class 1 Sound Level Meter (s/n 00751323);
- Rion NL-32 Class 1 Sound Level Meter (s/n 00642983);
- Cirrus Optimus Green CR: 171C (s/n G061732); and
- Cirrus Optimus Green CR: 171C (s/n G061733).

1.1.4 Regular site visits and additional short-term spot measurements were undertaken at all measurement locations.

1.1.5 For each measurement location, two tables have been provided to detail the measured daily noise levels for the following time periods:

- The 18-hour daytime period (between 06:00 and 00:00), which is the time period that is used to describe road traffic noise in CRTN and the daytime period in DMRB LA 111.
- The 16-hour daytime period (between 07:00 and 23:00), which corresponds to the time period used in World Health Organisation (WHO) guidance when describing the daytime period. This is not used in the DMRB LA 111 noise assessment, but is presented for information.
- The eight-hour night-time period (between 23:00 and 07:00), which corresponds to the time period used in DMRB LA 111 and WHO guidance when describing the night-time noise period.

1.1.6 The measured daily noise levels, both with and without periods of rainfall and high wind speeds, are presented for each monitoring location. To minimise the effect of rainfall on noise levels measured during unattended measurements, noise levels measured during periods of rainfall have been removed from the data set. For each 15-minute time period where rainfall has been measured, the noise levels corresponding to that time period and the following 30 minutes have been discarded. The following 30 minutes have been excluded to help mitigate effects of standing water on road traffic noise on nearby roads. To minimise the effect of wind generated noise on noise levels measured during unattended measurements, noise levels measured during periods of high wind speeds (peak wind speeds of greater than $5ms^{-1}$) have been removed from the dataset. Each 15-minute period where peak wind speeds of greater than $5ms^{-1}$ have been measured, the noise levels corresponding to that time period have been discarded.

1.1.7 Daily noise levels are presented only for periods where noise levels were measured for the full duration of the period, i.e. the full 18 (06:00 to 00:00), 16 (07:00 to 23:00) or eight (23:00 to 07:00) hours. The exception to this is where data for the full 18-hour (06:00 to 00:00) period is not available; in these instances, where possible, the shortened measurement procedure (defined in CRTN) has been used to calculate the $L_{A10,18h}$. It should be noted that the measurement locations do not necessarily meet the CRTN shortened measurement procedure requirements in terms of microphone position relative to roads and therefore the $L_{A10,18h}$ levels calculated using this method should be considered as estimates. The shortened measurement procedure has been used where there are three consecutive hours, between 10:00 and 17:00, which have at least 15 minutes (and the following 30 minutes if rainfall has occurred) free of rain and peak wind speeds greater than $5ms^{-1}$ per hour.

1.2 Summary of Unattended Long-Term Measurements

Measurement Location R2.01 – West Ringwood Cottage, Birnam, Dunkeld, PH8 0DW

1.2.1 The measurement location was as shown in Photograph 1. A Rion NL-32 Class 1 sound level meter (s/n 00482601) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 18m from the north-eastern façade of the building, at the eastern corner of the property line.

Photograph 1: Noise Monitoring Equipment at West Ringwood Cottage

1.2.2 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.3 At this location the noise climate primarily consisted of road traffic noise on the existing A9 (north-east of the measurement location), road traffic noise from the surrounding local road (B867), birdsong, and occasional train passes by on the Highland Main Line railway located to the south-west. Also, occasionally audible at this location were dogs barking, human activity and aircraft.

1.2.4 Throughout the monitoring period, 15-minute average wind speeds did not exceed 1.2ms^{-1} and gusts did not exceed 4.6ms^{-1}. Total 15-minute rainfall did not exceed 1.8mm. No rainfall was recorded on 5 September, 7 September, 10 September and 11 September 2016.

1.2.5 Table 1 and Table 2 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 1: Daily Summarised Noise Levels at West Ringwood Cottage, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	48.7	51.8	31.5
06/09/2016	Tuesday	54.8	56.8	43.8	55.1	57.2	44.7	48.0	51.3	32.6
07/09/2016	Wednesday	53.9	56.8	43.8	54.2	57.2	45.0	48.2	51.9	33.1
08/09/2016	Thursday	54.6	57.2	45.3	55.0	57.6	46.6	48.6	51.7	29.0
09/09/2016	Friday	55.3	57.7	47.8	55.6	58.0	49.0	48.6	52.0	30.8
10/09/2016	Saturday	54.7	57.1	45.6	55.0	57.5	46.9	45.8	49.3	28.3
11/09/2016	Sunday	63.6	57.7	45.7	64.1	58.3	47.0	49.3	51.9	33.9
12/09/2016	Monday	-	57.3*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 2: Daily Summarised Noise Levels at West Ringwood Cottage, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	48.7	51.8	31.5
06/09/2016	Tuesday	54.8	56.8	43.8	54.9	57.2	44.7	48.0	51.3	32.6
07/09/2016	Wednesday	53.9	56.8	43.8	54.2	57.2	45.0	-	-	-
08/09/2016	Thursday	-	-	-	-	-	-	48.0	51.7	29.0
09/09/2016	Friday	-	57.7*	-	-	-	-	48.6	52.0	30.8
10/09/2016	Saturday	54.7	57.1	45.6	55.0	57.5	46.9	45.8	49.3	28.3
11/09/2016	Sunday	63.6	57.7	45.7	64.1	58.3	47.0	-	-	-
12/09/2016	Monday	-	57.3*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.6 It should be noted that in Table 1 and Table 2 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.7 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 3. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions approximately 18m away from the north-western façade of the building. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 3: Additional Attended Noise Level Measurements at West Ringwood Cottage

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/09/2016	09:36	00:15	57.4	56.2	47.0	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. Train pass by at 09:43. Dogs barking and resident activity audible between 09:51 and 09:52.
	14:27	00:15	53.0	55.5	46.5	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
07/09/2016	16:18	00:15	53.4	56.1	47.2	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
	19:33	00:15	51.6	55.0	42.6	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
09/09/2016	19:35	00:15	53.9	56.9	45.7	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.

Measurement Location R2.02 – Hollybank, Perth Road, Birnam, Dunkeld, PH8 0DN

1.2.8 The measurement location was as shown in Photograph 2. A Cirrus Optimus Green CR: 171C Class 1 sound level meter (s/n G061733) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 20m from the south-eastern façade of the building, in the back garden.

Photograph 2: Noise Monitoring Equipment at Hollybank

1.2.9 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.10 At this location the noise climate primarily consisted of road traffic noise on existing A9 (southwest of the measurement location), birdsong, noise from the nearby filling station (pump noise) and road traffic noise from the surrounding local roads. Also audible at this location was human activity, particularly from the nearby filling station. Aircraft were also occasionally audible.

1.2.11 Throughout the monitoring period, 15-minute average wind speeds did not exceed 1.2ms^{-1} and gusts did not exceed 4.6ms^{-1}. Total 15-minute rainfall did not exceed 1.8mm. No rainfall was recorded on 5 September, 7 September, 10 September and 11 September 2016.

1.2.12 Table 4 and Table 5 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 4: Daily Summarised Noise Levels at Hollybank, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	46.8	49.3	34.3
06/09/2016	Tuesday	57.4	54.0	43.5	57.9	54.4	44.1	47.2	49.5	41.1
07/09/2016	Wednesday	52.0	54.3	43.5	52.2	54.6	43.7	48.4	51.0	41.3
08/09/2016	Thursday	54.1	55.8	45.3	54.4	56.2	46.4	45.6	48.6	26.5
09/09/2016	Friday	55.1	56.4	47.5	55.5	56.8	48.8	46.0	49.4	33.0
10/09/2016	Saturday	51.5	53.8	42.8	51.8	54.2	43.9	42.3	45.7	27.3
11/09/2016	Sunday	51.1	53.1	42.1	51.6	53.7	43.6	45.7	48.0	31.3
12/09/2016	Monday	-	56.3*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 5: Daily Summarised Noise Levels at Hollybank, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	46.8	49.3	34.3
06/09/2016	Tuesday	57.4	54.0	43.5	57.8	54.4	44.2	47.2	49.5	41.1
07/09/2016	Wednesday	52.0	54.3	43.5	52.2	54.6	43.7	-	-	-
08/09/2016	Thursday	-	-	-	-	-	-	44.8	48.5	26.3
09/09/2016	Friday	-	54.8*	-	-	-	-	46.0	49.4	33.0
10/09/2016	Saturday	51.5	53.8	42.8	51.8	54.2	43.9	42.3	45.7	27.3
11/09/2016	Sunday	51.1	53.1	42.1	51.6	53.7	43.6	-	-	-
12/09/2016	Monday	-	56.3*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.13 It should be noted that in Table 4 and Table 5 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

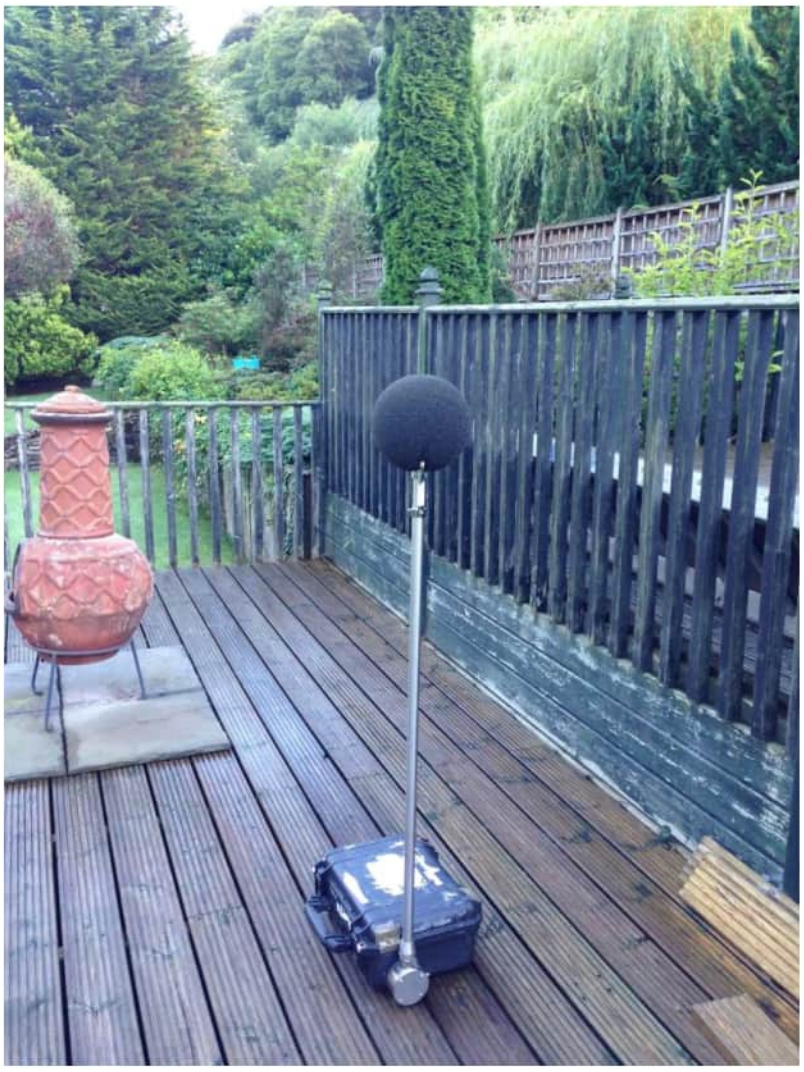
1.2.14 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 6. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in façade conditions 1m from the north-western façade of the building. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 6: Additional Attended Noise Level Measurements at Hollybank

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/09/2016	10:10	00:15	53.7	56.3	46.4	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong, music in the background, workshop noise (hammering, drilling), pump noise from the filling station and people talking.
	14:54	00:15	54.2	57.0	45.6	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, noise from the garage within the filling station and music in the background. Pump noise from the filling station audible at 15:08.
07/09/2016	16:43	00:15	60.6	58.0	45.5	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong, pump noise, people talking at the filling station and residents' activity. Lawn mower audible from the start of the measurement till 16:47. Movement of lawn mower audible at 16:48. Car horn audible at 16:45.
	20:00	00:15	52.9	54.9	38.3	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. Residents talking at 20:01.
08/09/2016	19:11	00:15	54.8	57.2	43.9	Rain as noted prior to measurements, but weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and people talking at the filling station. Motorcycle clearly audible at 19:14, 19:17 and 19:18.
09/09/2016	13:03	00:15	55.4	57.7	49.1	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.

Measurement Location R2.03 – Oakbank, Birnam, Dunkeld, PH8 0BW

1.2.15 The measurement location was as shown in Photograph 3. A Rion NL-32 Class 1 sound level meter (s/n 00482602) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 6m from the north-eastern façade of the building.



Photograph 3: Noise Monitoring Equipment at Oakbank

1.2.16 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.17 At this location the noise climate primarily consisted of road traffic noise on the existing (north-east of the measurement location), birdsong and occasional dog barking. Also, occasionally audible at this location, were human activity and aircraft.

1.2.18 Throughout the monitoring period, 15-minute average wind speeds did not exceed 1.2ms^{-1} and gusts did not exceed 4.6ms^{-1}. Total 15-minute rainfall did not exceed 1.8mm. No rainfall was recorded on 5 September, 7 September, 10 September and 11 September 2016.

1.2.19 Table 7 and Table 8 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 7: Daily Summarised Noise Levels at Oakbank, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	47.9	51.5	37.3
06/09/2016	Tuesday	60.7	54.7	44.9	61.2	55.0	45.5	47.3	50.9	38.3
07/09/2016	Wednesday	54.4	55.5	45.8	54.8	55.9	46.6	47.8	51.4	38.0
08/09/2016	Thursday	53.9	55.8	47.3	54.2	56.2	48.1	47.9	51.4	37.2
09/09/2016	Friday	55.5	56.8	49.6	55.8	57.1	50.6	48.0	51.8	37.6
10/09/2016	Saturday	57.9	56.0	46.8	58.3	56.4	47.8	45.6	49.5	35.9
11/09/2016	Sunday	54.1	55.4	46.3	54.5	55.8	47.3	48.5	51.1	38.7
12/09/2016	Monday	-	55.7*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 8: Daily Summarised Noise Levels at Oakbank, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/09/2016	Monday	-	-	-	-	-	-	47.9	51.5	37.3
06/09/2016	Tuesday	60.7	54.7	45.0	61.1	55.0	45.5	47.3	50.9	38.3
07/09/2016	Wednesday	54.4	55.5	45.8	54.8	55.9	46.6	-	-	-
08/09/2016	Thursday	-	-	-	-	-	-	47.5	51.4	37.1
09/09/2016	Friday	-	58.1*	-	-	-	-	48.0	51.8	37.6
10/09/2016	Saturday	57.9	56.0	46.8	58.3	56.4	47.8	45.6	49.5	35.9
11/09/2016	Sunday	54.1	55.4	46.3	54.5	55.8	47.3	-	-	-
12/09/2016	Monday	-	55.7*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.20 It should be noted that in Table 7 and Table 8 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.21 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 9. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions approximately 8m west of the building. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 9: Additional Attended Noise Level Measurements at Oakbank

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/09/2016	11:03	00:15	47.8	50.8	42.9	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. People talking was also audible.
	15:35	00:10	53.7	52.2	46.0	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise source include road traffic. Dogs barking at 15:34.
07/09/2016	17:21	00:15	48.7	50.9	44.4	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
08/09/2016	18:34	00:15	48.1	50.9	43.1	Very light rain started at 18:43, but weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. People talking was also audible.
09/09/2016	09:48	00:15	49.0	50.9	44.1	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.

Measurement Location R2.04 – The Old Bakehouse, 12 Birnam Terrace, Birnam, Dunkeld, PH8 0DR

1.2.22 The measurement location was as shown in Photograph 4. A Rion NL-32 Class 1 sound level meter (s/n 00482602) was positioned at a height of approximately 1.5m in façade conditions. The equipment was approximately 1m from the south-eastern façade of the building.

Photograph 4: Noise Monitoring Equipment at The Old Bakehouse, 12 Birnam Terrace (Sound Level Meter Circled in Red)

1.2.23 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.24 At this location the noise climate primarily consisted of road traffic noise on the existing A9 (south-west of the measurement location) and birdsong. Also, occasionally audible at this location, were human activity and aircraft.

1.2.25 Throughout the monitoring period, 15-minute average wind speeds did not exceed 0.8ms^{-1} and gusts exceeded 5ms^{-1} in one 15-minute period (a gust of 5.1ms^{-1} was measured on 5 October). Total 15-minute rainfall did not exceed 0.4mm. No rainfall was recorded on 5 October, 6 October and 9 October 2016.

1.2.26 Table 10 and Table 11 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 10: Daily Summarised Noise Levels at The Old Bakehouse, 12 Birnam Terrace, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	-	-	-	-	-	46.3	47.6	30.6
06/10/2016	Thursday	53.0	54.3	45.2	53.2	54.8	46.3	44.1	46.6	31.4
07/10/2016	Friday	55.0	53.8	44.9	55.5	54.3	46.1	44.8	46.7	27.3
08/10/2016	Saturday	57.6	54.2	43.6	58.0	54.6	44.7	44.0	45.5	28.2
09/10/2016	Sunday	52.0	52.7	42.2	52.3	53.1	43.5	45.5	46.2	28.9
10/10/2016	Monday	52.5	53.0	43.1	52.7	53.5	44.1	44.7	46.6	28.9
11/10/2016	Tuesday	-	55.2*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 11: Daily Summarised Noise Levels at The Old Bakehouse, 12 Birnam Terrace, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	-	-	-	-	-	46.3	47.6	30.6
06/10/2016	Thursday	53.0	54.3	45.2	53.2	54.8	46.3	44.1	46.6	31.4
07/10/2016	Friday	55.1	53.8	44.9	55.3	54.3	46.1	44.8	46.7	27.3
08/10/2016	Saturday	-	58.8*	-	-	-	-	44.0	45.5	28.2
09/10/2016	Sunday	52.0	52.7	42.2	52.3	53.1	43.5	45.5	46.2	28.9
10/10/2016	Monday	-	53.4*	-	-	-	-	44.7	46.6	28.9
11/10/2016	Tuesday	-	54.1*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.27 It should be noted that in Table 10 and Table 11 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.28 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 12. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in facade conditions adjacent to the long-term monitoring equipment. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 12: Additional Attended Noise Level Measurements at The Old Bakehouse, 12 Birnam Terrace

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/10/2016	14:08	00:15	52.9	55.0	48.1	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
	17:49	00:15	54.3	57.0	49.3	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and wind in vegetation.

Measurement Location R2.05 – 9 Telford Gardens, Birnam, Dunkeld, PH8 0QB

1.2.29 The measurement location was as shown in Photograph 5. A Rion NL-32 Class 1 sound level meter (s/n 00751323) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 5m from the south-western façade of the building in the back garden.

Photograph 5: Noise Monitoring Equipment at 9 Telford Gardens

1.2.30 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.31 At this location the noise climate primarily consisted of birdsong, road traffic noise on the A9 to the south-west of the measurement location and occasional dog barking and aircraft.

1.2.32 Throughout the monitoring period, 15-minute average wind speeds did not exceed 0.8ms^{-1} and gusts exceeded 5ms^{-1} in one 15-minute period (a gust of 5.1ms^{-1} was measured on 5 October). Total 15-minute rainfall did not exceed 0.4mm. No rainfall was recorded on 5 October, 6 October and 9 October 2016.

1.2.33 Table 13 and Table 14 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 13: Daily Summarised Noise Levels at 9 Telford Gardens, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	57.0*	-	-	-	-	47.9	52.0	30.1
06/10/2016	Thursday	53.9	56.8	44.6	54.2	57.1	45.5	47.8	51.8	31.5
07/10/2016	Friday	56.9	56.7	45.8	57.3	57.0	47.2	47.2	51.6	29.1
08/10/2016	Saturday	53.2	55.8	44.3	53.6	56.1	45.4	45.7	48.9	28.7
09/10/2016	Sunday	53.3	55.8	43.3	53.7	56.3	44.8	48.4	51.6	32.0
10/10/2016	Monday	53.7	56.4	44.7	53.9	56.7	45.7	47.6	51.3	30.1
11/10/2016	Tuesday	-	57.3*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 14: Daily Summarised Noise Levels at 9 Telford Gardens, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	57.0*	-	-	-	-	47.9	52.0	30.1
06/10/2016	Thursday	53.9	56.8	44.6	54.2	57.1	45.5	47.8	51.8	31.5
07/10/2016	Friday	56.9	56.7	45.8	57.1	57.0	47.2	47.2	51.6	29.1
08/10/2016	Saturday	-	56.1*	-	-	-	-	45.7	48.9	28.7
09/10/2016	Sunday	53.3	55.8	43.3	53.7	56.3	44.8	48.4	51.6	32.0
10/10/2016	Monday	-	56.3*	-	-	-	-	47.6	51.3	30.1
11/10/2016	Tuesday	-	-	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.34 It should be noted that in Table 13 and Table 14 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.35 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 15. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions adjacent to the long-term monitoring equipment. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 15: Additional Attended Noise Level Measurements at 9 Telford Gardens

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/10/2016	13:38	00:15	55.5	58.4	49.2	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
	17:23	00:15	56.0	58.7	48.7	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. A dog barking was also audible during the survey.

Measurement Location R2.06 – Braeknowe, Birnam, Dunkeld, PH8 0DU

1.2.36 The measurement location was as shown in Photograph 6. A Rion NL-52 Class 1 sound level meter (s/n 00642983) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 5m from the north-western façade of the building.

Photograph 6: Noise Monitoring Equipment at Braeknowe

1.2.37 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.38 At this location the noise climate primarily consisted of birdsong, road traffic noise on the existing A9 to the north of the measurement location and occasional train pass-by on the Highland Main Line railway to the north of the measurement position. Aircraft were also occasionally audible at this location.

1.2.39 Throughout the monitoring period, 15-minute average wind speeds did not exceed 0.8ms^{-1} and gusts exceeded 5ms^{-1} in one 15-minute period (a gust of 5.1ms^{-1} was measured on 5 October). Total 15-minute rainfall did not exceed 0.4mm. No rainfall was recorded on 5 October, 6 October and 9 October 2016.

1.2.40 Table 16 and Table 17 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 16: Daily Summarised Noise Levels at Braeknowe, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)	LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)	LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)
05/10/2016	Wednesday	-	-	-	-	-	-	51.5	51.1	31.9
06/10/2016	Thursday	55.3	56.8	47.4	55.2	57.0	48.3	50.5	50.8	33.3
07/10/2016	Friday	57.4	56.2	47.4	57.7	56.6	48.7	51.7	49.4	30.8
08/10/2016	Saturday	54.3	55.3	46.0	54.2	55.8	47.1	44.3	47.5	31.4
09/10/2016	Sunday	53.8	55.6	44.9	54.2	56.2	46.4	49.4	50.1	32.9
10/10/2016	Monday	54.5	55.9	45.7	54.7	56.3	46.7	51.0	50.1	31.8
11/10/2016	Tuesday	-	55.9*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 17: Daily Summarised Noise Levels at Braeknowe, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)	LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)	LAeq,T (dB)	LA10,T (dB)	LA90,T (dB)
05/10/2016	Wednesday	-	-	-	-	-	-	51.5	51.1	31.9
06/10/2016	Thursday	55.3	56.8	47.4	55.2	57.0	48.3	50.5	50.8	33.3
07/10/2016	Friday	57.4	56.2	47.4	57.5	56.6	48.7	51.7	49.4	30.8
08/10/2016	Saturday	-	56.3*	-	-	-	-	44.3	47.5	31.4
09/10/2016	Sunday	53.8	55.6	44.9	54.2	56.2	46.4	49.4	50.1	32.9
10/10/2016	Monday	-	55.7*	-	-	-	-	51.0	50.1	31.8
11/10/2016	Tuesday	-	-	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.41 It should be noted that in Table 16 and Table 17 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.42 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 18. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions adjacent to the long-term monitoring equipment. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 18: Additional Attended Noise Level Measurements at Braeknowe

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
06/10/2016	11:11	00:15	54.7	57.0	50.9	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and wind in vegetation.
	15:44	00:15	62.2	57.7	51.6	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources are road traffic and wind in vegetation. Freight train (around 24 cars) pass-by at 15:54.
	18:27	00:15	57.3	57.5	52.0	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. Train (11 cars) pass-by at 18:30.

Measurement Location R2.07 – Corbiere, Little Dunkeld, Dunkeld, PH8 0AD

1.2.43 The measurement location was as shown in Photograph 7. A Rion NL-32 Class 1 sound level meter (s/n 00751323) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 4m from the southern façade of the building.

Photograph 7: Noise Monitoring Equipment at Corbiere

1.2.44 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.45 At this location the noise climate primarily consisted of road traffic noise on the existing A9 to the (located south-west of the measurement location) and from surrounding local roads. Other noise sources include birdsong and children playing in the nearby school yard. Also audible at this location was human activity and the occasional aircraft.

1.2.46 Throughout the monitoring period, 15-minute average wind speeds did not exceed 1.0ms-1 and gusts exceeded 5ms-1 in one 15-minute period (a gust of 5.5ms-1 was measured on 29 September). The most rainfall was recorded on 1 October, with a peak total 15-minute rainfall of 1.2mm; total 15-minute rainfall did not exceed 0.3mm on all other days. No rainfall was recorded on 2 October to 4 October 2016.

1.2.47 Table 19 and Table 20 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 19: Daily Summarised Noise Levels at Corbiere, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
29/09/2016	Thursday	-	59.7*	-	-	-	-	48.9	50.5	32.4
30/09/2016	Friday	56.3	58.5	46.5	56.6	59.0	47.6	47.7	49.2	30.4
01/10/2016	Saturday	56.1	58.0	45.6	56.5	58.6	46.9	47.7	49.0	31.8
02/10/2016	Sunday	55.3	57.3	44.9	55.7	58.0	46.3	48.7	49.2	30.8
03/10/2016	Monday	57.9	58.3	45.4	58.3	58.9	46.6	48.1	49.9	32.0
04/10/2016	Tuesday	56.6	58.3	44.6	57.0	58.9	45.7	48.8	50.1	31.3
05/10/2016	Wednesday	-	-	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 20: Daily Summarised Noise Levels at Corbiere, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
29/09/2016	Thursday	-	59.9*	-	-	-	-	48.9	50.5	32.4
30/09/2016	Friday	56.5	58.6	46.5	56.2	59.0	47.5	47.7	49.2	30.4
01/10/2016	Saturday	-	59.2*	-	-	-	-	47.7	49.0	31.8
02/10/2016	Sunday	55.3	57.3	44.9	55.7	58.0	46.3	48.7	49.2	30.8
03/10/2016	Monday	57.9	58.3	45.4	58.3	58.9	46.6	48.1	49.9	32.0
04/10/2016	Tuesday	56.6	58.3	44.6	57.0	58.9	45.7	48.8	50.1	31.3
05/10/2016	Wednesday	-	-	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.48 It should be noted that in Table 19 and Table 20 the reported LAeq,T level is the logarithmically averaged noise level, whereas the LA10,T and LA90,T levels are the arithmetically averaged noise levels.

1.2.49 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 21. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions adjacent to the long-term monitoring equipment. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 21: Additional Attended Noise Level Measurements at Braeknowe

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
03/10/2016	13:26	00:15	57.0	60.3	48.4	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, children playing in the school yard and birdsong. Cars passing the sound level meter were also audible throughout the monitoring period.
	18:11	00:15	55.6	58.4	47.6	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
04/10/2016	10:42	00:15	58.7	60.1	51.0	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong, a lawn mower in the distance, children playing in the school yard, people talking and a car running idle. Cars passing the sound level meter were also audible throughout the monitoring period.
	15:15	00:15	57.4	59.4	48.7	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong, children playing in the school yard and people talking. Cars passing the sound level meter were also audible throughout the monitoring period.
	18:13	00:15	54.5	57.8	44.3	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong. Cars passing the sound level meter were also audible throughout the monitoring period.

Measurement Location R2.08 – Craigview, Inver, Dunkeld, PH8 0JR

1.2.50 The measurement location was as shown in Photograph 8. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061733) was positioned at a height of approximately 1.5m in free-field conditions. The equipment was approximately 4m from the eastern façade of the building.

Photograph 8: Noise Monitoring Equipment at Craigview

1.2.51 The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

1.2.52 At this location the noise climate primarily consisted of birdsong and road traffic noise on the existing A9, to the north of the measurement location. Also, occasionally audible at this location were human activity and aircraft.

1.2.53 Throughout the monitoring period, 15-minute average wind speeds did not exceed 0.8ms-1 and gusts exceeded 5ms-1 in one 15-minute period (a gust of 5.1ms-1 was measured on 5 October). Total 15-minute rainfall did not exceed 0.4mm. No rainfall was recorded on 5 October, 6 October and 9 October 2016.

1.2.54 Table 22 and Table 23 provide the measured daily noise levels at this location, with and without noise levels measured during periods of rainfall and high wind speeds.

Table 22: Daily Summarised Noise Levels at Craigview, Including Periods of Rainfall and High Wind Speeds

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	65.0*	-	-	-	-	55.7	59.4	37.7
06/10/2016	Thursday	65.9	64.9	49.0	66.3	65.3	50.3	55.4	58.9	34.0
07/10/2016	Friday	63.1	64.5	51.0	63.5	64.8	52.3	55.2	59.3	35.5
08/10/2016	Saturday	61.9	64.0	49.3	62.2	64.4	50.6	53.4	56.0	35.5
09/10/2016	Sunday	61.2	63.4	48.5	61.6	64.0	50.1	54.4	57.7	33.5
10/10/2016	Monday	60.8	63.7	47.9	61.1	64.1	48.9	55.3	58.9	36.7
11/10/2016	Tuesday	-	68.5*	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

Table 23: Daily Summarised Noise Levels at Craigview, With Periods of Rainfall and High Wind Speeds Removed

Date	Day	18-hour daytime period (between 06:00 and 00:00)			16-hour daytime period (between 07:00 and 23:00)			8-hour night-time period (between 23:00 and 07:00)		
		$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
05/10/2016	Wednesday	-	65.0*	-	-	-	-	55.7	59.4	37.7
06/10/2016	Thursday	65.9	64.9	49.0	66.3	65.3	50.3	55.4	58.9	34.0
07/10/2016	Friday	63.2	64.5	51.0	63.3	64.8	52.3	55.2	59.3	35.5
08/10/2016	Saturday	-	64.3*	-	-	-	-	53.4	56.0	35.5
09/10/2016	Sunday	61.2	63.4	48.5	61.6	64.0	50.1	54.4	57.7	33.5
10/10/2016	Monday	-	63.3*	-	-	-	-	55.3	58.9	36.7
11/10/2016	Tuesday	-	-	-	-	-	-	-	-	-

* Estimated level using CRTN shortened measurement procedure period

1.2.55 It should be noted that in Table 22 and Table 23 the reported $L_{Aeq,T}$ level is the logarithmically averaged noise level, whereas the $L_{A10,T}$ and $L_{A90,T}$ levels are the arithmetically averaged noise levels.

1.2.56 In addition to long-term measurements, a series of short-term attended measurements were also undertaken, and the results are provided in Table 24. A Cirrus Optimus Green CR: 171C sound level meter (s/n G061732) was positioned at a height of approximately 1.5m in free-field conditions near the gate of the property. The monitoring equipment was calibrated both before and after the measurement period using a Rion NC-74 acoustic calibrator (s/n 00830793), which has itself been calibrated against a reference set traceable to National and International Standards. There was no significant shift in the observed calibration level.

Table 24: Additional Attended Noise Level Measurements at Craigview

Date	Start Time (hh:mm)	Duration (hh:mm)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)	Comments
03/10/2016	14:09	00:15	62.5	65.6	55.2	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
	18:45	00:15	60.5	64.3	49.8	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
04/10/2016	11:13	00:15	61.0	64.7	50.2	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources are road traffic and birdsong. Someone working in the woods was also audible throughout the survey.
	16:11	00:15	62.1	65.2	54.0	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and dogs barking.
	18:41	00:15	59.4	63.0	49.7	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and a distant lawn mower.
06/10/2016	11:39	00:15	62.2	65.4	52.9	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic, birdsong and wind in vegetation.
	16:13	00:15	61.5	64.8	52.9	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.
	18:56	00:15	60.1	63.5	45.2	Weather conditions remained conducive for noise monitoring throughout the monitoring period. Noise sources include road traffic and birdsong.

1.3 Calibration Certificates

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Date of Issue: 30 August 2016

Certificate Number: TCRT16/1233

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

M. Breslin [ ] K. Mistry [ ] J. Harriman [✓]

Customer	Jacobs UK Limited 95 Bothwell Street Glasgow G2 7HX
Order No.	UK/B3553T36/00000001
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-74	00830793

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	TRAC16/08145	
Date Received	25 August 2016	
Date Calibrated	30 August 2016	
Previous Certificate	*Dated*	08 Sept 2014
	Certificate No.	1409421
	Laboratory	AV Calibration

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505286

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Fax: +44 (0)1462 638601
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Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/03
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0873) Sound level meter Rion type NL-32 serial No 00482601 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27705 to a half-inch microphone type UC-53A serial No 321276 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1093 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505286

Page 2 of 4 Pages

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

9.3 dB (A) 15.5 dB (C) 22.2 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505286

Page 3 of 4 Pages

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00873" and "SKM GB-A03515"

7 The combination of microphone response and WS-03 windshield corrections was causing a FAIL result at 8kHz - instrument fitted with new replacement UC-53A microphone for this verification.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505286

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges

Measurement range for various "LEVEL" range settings (dB) *
Frequency weighting A-, C- and Lin.

"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505285

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Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/04
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	Sound level meter Rion type NL-32 serial No 00482602 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27706 to a half-inch microphone type UC-53A serial No 321107 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 14 March 2014, Certificate No. TCRT14/1092 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505285

Page 2 of 4 Pages

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

8.7 dB (A) 14.3 dB (C) 21.9 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505285

Page 3 of 4 Pages

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00875"

7 The combination of microphone response and WS-03 windshield corrections was causing a FAIL result at 8kHz - instrument fitted with new replacement UC-53A microphone for this verification.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505285

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges

Measurement range for various "LEVEL" range settings (dB) *
Frequency weighting A-, C- and Lin.

"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505281

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Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/02
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0871) Sound level meter Rion type NL-32 serial No 00751323 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 23663 to a half-inch microphone type UC-53A serial No 308645 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1094 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505281

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NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00871" and "SKM GB-A03516"

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505281

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The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges

Measurement range for various "LEVEL" range settings (dB) *
Frequency weighting A-, C- and Lin.

"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

Date of Issue: 31 August 2016

Certificate Number: TCRT16/1234

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

M. Breslin [ ] K. Mistry [ ] J. Harriman [✓]

Customer	Jacobs UK Limited 95 Bothwell Street Glasgow G2 7HX
Order No.	UK/B3553T36/00000001
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	00642983
	Rion	Firmware		1.7
	Rion	Pre Amplifier	NH-25	43011
	Rion	Microphone	UC-59	06690
	Rion	Calibrator	NC-74	00830793
		Calibrator adaptor type if applicable		NC-74-002

Performance Class	1		
Test Procedure	TP 2.SLM 61672-3 TPS-49		
	Procedures from IEC 61672-3:2006 were used to perform the periodic tests.		
Type Approved to IEC 61672-1:2002	YES	Approval Number	21.21 / 13.02
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003		
Date Received	25 August 2016	ANV Job No.	TRAC16/08145
Date Calibrated	31 August 2016		

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT16/1234
Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52	
SLM instruction manual ref / issue		11-03	
SLM instruction manual source		Manufacturer	
Internet download date if applicable		N/A	
Case corrections available		Yes	
Uncertainties of case corrections		Yes	
Source of case data		Manufacturer	
Wind screen corrections available		Yes	
Uncertainties of wind screen corrections		Yes	
Source of wind screen data		Manufacturer	
Mic pressure to free field corrections		Yes	
Uncertainties of Mic to F.F. corrections		Yes	
Source of Mic to F.F. corrections		Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes	
Specified or equivalent Calibrator		Specified	
Customer or Lab Calibrator		Customers Calibrator	
Calibrator adaptor type if applicable		NC-74-002	
Calibrator cal. date		30 August 2016	
Calibrator cert. number		TCRT16/1233	
Calibrator cal cert issued by		ANV Measurement Systems	
Calibrator SPL @ STP		94.03 dB	Calibration reference sound pressure level
Calibrator frequency		1002.01 Hz	Calibration check frequency
Reference level range		25 - 130 dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.24	22.58	± 0.20 °C
Humidity	41.8	40.5	± 3.00 %RH
Ambient Pressure	100.90	100.93	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.1	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise	This test is currently not performed by this Lab.		
Microphone installed (if requested by customer) = Less Than		N/A dB	A Weighting
Uncertainty of the microphone installed self generated noise ±		N/A dB	

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	12.2	dB	UR	16.3	dB	UR	22.0	dB	UR
Uncertainty of the electrical self generated noise ±							0.12	dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: A Patel R 1

Additional Comments
None

http://stan:8080/Tracker/faces/pages/search/viewInstrument.xhtml

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:171C
Description	Sound Level Meter
Serial Number	G061732

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K 4192	Serial Number	1920791	Calibration Ref.	S6450
Pistonphone Type	B&K 4220	Serial Number	613843	Calibration Ref.	S6388

Calibrated by T.A. Goodhill

Calibration Date 03 September 2015

Calibration Certificate Number 231584

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Cirrus Research plc

Calibration Chart for Electret Microphone

Type: MK:224 **Serial No.:** 20045595

Open Circuit Sensitivity at 1kHz:
-24.6 dB rel.1V/Pa
58.7 mV/Pa

Conditions of Tests:
Barometric Pressure 1008 mBar
Relative Humidity 40 %
Temperature 24 °C

Signature: **Date:** 20/08/2015

Cirrus Research plc
Acoustic House, Hunmanby YO14 0PH UK
www.cirrusresearch.co.uk

Specifications:

Outside Diameter:
13.2mm with protecting grid
12.7mm without protecting grid

Mounting Thread:
11.7mm 60 UNS 2

Ambient Pressure Coefficient:
-0.02 to +0.02 dB/kPa for
±10% pressure change at 250Hz

Temperature Coefficient:
-10°C to +50°C
Approx. -0.015dB/k at 250Hz

Dynamic Range:
SPL below which total harmonic distortion is <1%: 130dB

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:171C
Description	Sound Level Meter
Serial Number	G061733

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K 4192	Serial Number	1920791	Calibration Ref.	S6450
Pistonphone Type	B&K 4220	Serial Number	613843	Calibration Ref.	S6388

Calibrated by T. A. Goodhill

Calibration Date 03 September 2015

Calibration Certificate Number 231592

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Cirrus Research plc

Calibration Chart for Electret Microphone

Type: MK.224 **Serial No.:** 606473B

Open Circuit Sensitivity at 1kHz:
-25.2 dB rel.1V/Pa
54.8 mV/Pa

Conditions of Tests:
Barometric Pressure 1004 mBar
Relative Humidity 32 %
Temperature 22 °C

Signature: **Date:** 03/09/2015

Cirrus Research plc
Acoustic House, Hunmanby YO14 0PH UK
www.cirrusresearch.co.uk

Specifications:

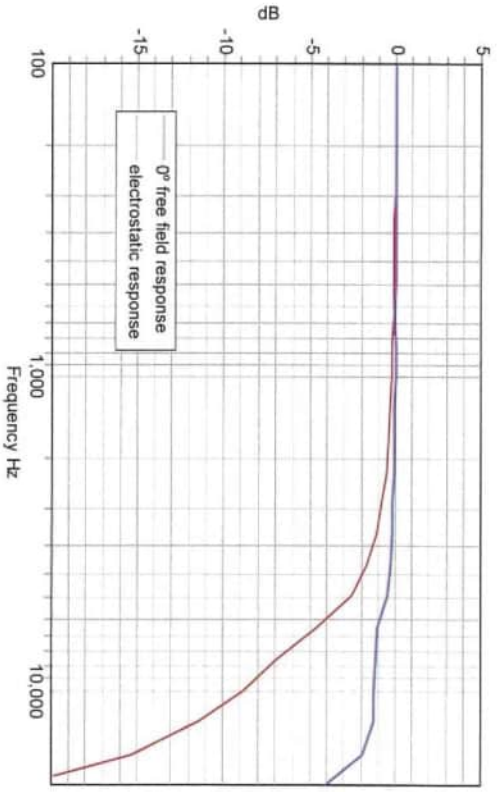
Outside Diameter:
13.2mm with protecting grid
12.7mm without protecting grid

Mounting Thread:
11.7mm 60 UNS 2

Ambient Pressure Coefficient:
-0.02 to +0.02 dB/kPa for
±10% pressure change at 250Hz

Temperature Coefficient:
-10°C to +50°C
Approx. -0.015dB/k at 250Hz

Dynamic Range:
SPL below which total harmonic distortion is <1%: 130dB



Appendix A16.2: Noise Assessment Tables

1.1 Introduction

1.1.1 This Appendix provides the road traffic noise assessment summary tables.

Option ST2A

Table 1: Route Option Assessment Summary Table – Option ST2A – Short-term (Daytime)

Project/Option:		Option ST2A		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-0.9**	163	14	Negligible Adverse
	1.0-2.9	66	6	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	34	5	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-0.9**	131	10	Negligible Beneficial
	1.0-2.9	118	2	Minor Beneficial
	3.0-4.9	64	1	Moderate Beneficial
	5.0 +	206	7	Major Beneficial

Table 2: Route Option Assessment Summary Table – Option ST2A – Long-term (Daytime)

Project/Option:		Option ST2A		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-2.9**	313	27	Negligible Adverse
	3.0-4.9	1	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	24	2	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-2.9**	190	8	Negligible Beneficial
	3.0-4.9	58	1	Minor Beneficial
	5.0-9.9	73	3	Moderate Beneficial
	10.0 +	123	4	Major Beneficial

Table 3: Route Option Assessment Summary Table – Option ST2A – Short-term (Night-time)

Project/Option:		Option ST2A		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-0.9**	165	15	Negligible Adverse
	1.0-2.9	64	5	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	37	5	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-0.9**	138	11	Negligible Beneficial
	1.0-2.9	130	1	Minor Beneficial
	3.0-4.9	58	2	Moderate Beneficial
	5.0 +	190	6	Major Beneficial

Table 4: Route Option Assessment Summary Table – Option ST2A – Long-term (Night-time)

Project/Option:		Option ST2A		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-2.9**	313	27	Negligible Adverse
	3.0-4.9	0	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	25	2	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-2.9**	206	8	Negligible Beneficial
	3.0-4.9	59	2	Minor Beneficial
	5.0-9.9	72	2	Moderate Beneficial
	10.0 +	107	4	Major Beneficial

Option ST2B

Table 5: Route Option Assessment Summary Table – Option ST2B – Short-term (Daytime)

Project/Option:		Option ST2B		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-0.9**	191	13	Negligible Adverse
	1.0-2.9	101	6	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	38	8	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-0.9**	175	10	Negligible Beneficial
	1.0-2.9	177	5	Minor Beneficial
	3.0-4.9	52	0	Moderate Beneficial
	5.0 +	48	3	Major Beneficial

Table 6: Route Option Assessment Summary Table – Option ST2B – Long-term (Daytime)

Project/Option:		Option ST2B		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-2.9**	402	34	Negligible Adverse
	3.0-4.9	1	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	14	1	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-2.9**	275	7	Negligible Beneficial
	3.0-4.9	49	0	Minor Beneficial
	5.0-9.9	33	2	Moderate Beneficial
	10.0 +	8	1	Major Beneficial

Table 7: Route Option Assessment Summary Table – Option ST2B – Short-term (Night-time)

Project/Option:		Option ST2B		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-0.9**	197	14	Negligible Adverse
	1.0-2.9	93	5	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	43	8	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-0.9**	191	10	Negligible Beneficial
	1.0-2.9	168	5	Minor Beneficial
	3.0-4.9	52	1	Moderate Beneficial
	5.0 +	38	2	Major Beneficial

Table 8: Route Option Assessment Summary Table – Option ST2B – Long-term (Night-time)

Project/Option:		Option ST2B		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-2.9**	400	34	Negligible Adverse
	3.0-4.9	0	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	17	1	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-2.9**	286	7	Negligible Beneficial
	3.0-4.9	45	1	Minor Beneficial
	5.0-9.9	30	1	Moderate Beneficial
	10.0 +	4	1	Major Beneficial

Option ST2C

Table 9: Route Option Assessment Summary Table – Option ST2C – Short-term (Daytime)

Project/Option:		Option ST2C		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-0.9**	321	18	Negligible Adverse
	1.0-2.9	164	8	Minor Adverse
	3.0-4.9	4	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	31	5	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-0.9**	157	6	Negligible Beneficial
	1.0-2.9	91	5	Minor Beneficial
	3.0-4.9	14	2	Moderate Beneficial
	5.0 +	0	1	Major Beneficial

Table 10: Route Option Assessment Summary Table – Option ST2C – Long-term (Daytime)

Project/Option:		Option ST2C		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-2.9**	570	34	Negligible Adverse
	3.0-4.9	4	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	18	0	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-2.9**	180	8	Negligible Beneficial
	3.0-4.9	10	2	Minor Beneficial
	5.0-9.9	0	1	Moderate Beneficial
	10.0 +	0	0	Major Beneficial

Table 11: Route Option Assessment Summary Table – Option ST2C – Short-term (Night-time)

Project/Option:		Option ST2C		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-0.9**	337	20	Negligible Adverse
	1.0-2.9	148	6	Minor Adverse
	3.0-4.9	4	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	31	6	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-0.9**	172	6	Negligible Beneficial
	1.0-2.9	80	4	Minor Beneficial
	3.0-4.9	10	2	Moderate Beneficial
	5.0 +	0	1	Major Beneficial

Table 12: Route Option Assessment Summary Table – Option ST2C – Long-term (Night-time)

Project/Option:		Option ST2C		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-2.9**	568	34	Negligible Adverse
	3.0-4.9	4	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	20	0	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-2.9**	185	10	Negligible Beneficial
	3.0-4.9	5	1	Minor Beneficial
	5.0-9.9	0	0	Moderate Beneficial
	10.0 +	0	0	Major Beneficial

Option ST2D

Table 13: Route Option Assessment Summary Table – Option ST2D – Short-term (Daytime)

Project/Option:		Option ST2D		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-0.9**	322	18	Negligible Adverse
	1.0-2.9	151	8	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	40	7	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-0.9**	179	8	Negligible Beneficial
	1.0-2.9	82	3	Minor Beneficial
	3.0-4.9	8	0	Moderate Beneficial
	5.0 +	0	1	Major Beneficial

Table 14: Route Option Assessment Summary Table – Option ST2D – Long-term (Daytime)

Project/Option:		Option ST2D		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Daytime**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{A10,18h}$	**0.1-2.9**	565	38	Negligible Adverse
	3.0-4.9	1	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	18	1	No Change
Decrease in noise level, $L_{A10,18h}$	**0.1-2.9**	193	5	Negligible Beneficial
	3.0-4.9	5	0	Minor Beneficial
	5.0-9.9	0	1	Moderate Beneficial
	10.0 +	0	0	Major Beneficial

Table 15: Route Option Assessment Summary Table – Option ST2D – Short-term (Night-time)

Project/Option:		Option ST2D		
Scenario/Comparison:		Opening Year (2026)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-0.9**	334	19	Negligible Adverse
	1.0-2.9	136	7	Minor Adverse
	3.0-4.9	0	0	Moderate Adverse
	5.0 +	0	0	Major Adverse
No Change	**0**	46	8	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-0.9**	192	8	Negligible Beneficial
	1.0-2.9	70	2	Minor Beneficial
	3.0-4.9	4	1	Moderate Beneficial
	5.0 +	0	0	Major Beneficial

Table 16: Route Option Assessment Summary Table – Option ST2D – Long-term (Night-time)

Project/Option:		Option ST2D		
Scenario/Comparison:		Future Assessment Year (2041)		
Change in noise level		**Night-time**		
		Number of dwellings	**Number of other sensitive receptors**	**Magnitude of impact**
Increase in noise level, $L_{night,outside}$	**0.1-2.9**	566	38	Negligible Adverse
	3.0-4.9	0	0	Minor Adverse
	5.0-9.9	0	0	Moderate Adverse
	10.0 +	0	0	Major Adverse
No Change	**0**	18	1	No Change
Decrease in noise level, $L_{night,outside}$	**0.1-2.9**	197	5	Negligible Beneficial
	3.0-4.9	1	1	Minor Beneficial
	5.0-9.9	0	0	Moderate Beneficial
	10.0 +	0	0	Major Beneficial

Appendix A21.1: Assessment of Policy Compliance

1.1 Introduction

1.1.1 This appendix provides a review of national to local planning policy documents, and an assessment of the extent to which the proposed route options comply with policy and guidance.

1.1.2 DMRB LA 104 'Environmental Assessment and Monitoring' (Highways England et al., 2020) states that environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation. In addition, DMRB LA 101 'Introduction to Environmental Assessment' (Highways England et al., 2019) requires that project objectives and environmental objectives should deliver improved environmental performance by being linked and informed by wider legislative, regulatory or strategic requirements).

1.1.3 Volume 1, Part 3 – Environmental Assessment (Chapter 21: Policies and Plans) summarises the Plans, Policies and Strategies (PPS) which are relevant to the environmental assessments of the proposed route options and provide an assessment of the extent to which the principle of the project is compliant with policy objectives.

1.1.4 Tables 1 – 12 of this appendix provide the findings of the National Planning Policy Assessment for each topic chapter. Each table references the national PPS framework relevant to the topic, along with relevant local PPS and guidance. Summaries of the objectives of the PPS relative to each topic, and the key findings of the topic chapter are used to undertake the policy assessment.

1.1.5 An assessment of the proposed route options' compliance with these policies is described and marked with either a ' ' or an 'X' to demonstrate the overall outcome of the assessment. It is acknowledged that an infrastructure scheme of this scale and complexity will result in short term impacts and effects during the construction phase, however, the assessment of policy compliance focuses on the long-term operational phase taking into account potential mitigation where this has been possible. Proposed route options marked '?' indicate potential non-compliance issues that would be further assessed at DMRB Stage 3 and for which mitigation proposals may be developed where appropriate. For each environmental factor there can be several different policy objectives relevant to elements (for example the water environment factor includes various elements such as water quality and flooding). A broad assessment of compliance in relation to the overall factor is made, but where a particular area of non-compliance is identified for an element, this is marked in brackets with a ' (X)' or '? (X)' as appropriate and explained in the text.

1.1.6 A summary of the relevant PPS, and the assessment of policy compliance is provided in each of the environmental factors of this DMRB Stage 2 environmental assessment.

1.2 National Planning Policy Assessment

Table 1: Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 8: Population - Land Use)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural resilient place A successful sustainable place A connected place **SPP** Sustainability Placemaking Promoting Town Centres Promoting Rural Development Supporting Business & Employment Valuing the Natural Environment Maximising the Benefits of Green Infrastructure Managing Flood Risk & Drainage Scotland's Third Land Use Strategy 2021-2026 - Getting the best from our land (Scottish Government, 2021) PAN 59 - Improving Town Centres (Scottish Government, 1999)	**PKC LDP2** Policy 7 - Employment and Mixed-Use Areas Policy 8 - Rural Business and Diversification Policy 9 - Caravan Sites, Chalets and Timeshare Developments Policy 14 – Open Space Retention and Provision Policy 16 – Social, Cultural and Community Facilities Policy 17 - Residential Areas	**Promoting Town Centres** SPP seeks to encourage a mix of uses in town centres to support their vibrancy, vitality and viability throughout the day and into the evening. PKC LDP2 Policy 16 (Social, Cultural and Community Facilities) considers developments that have the potential to result in the loss or change of land or buildings presently (or more recently) used for community purposes and seeks to ensure that this land is safeguarded. Promotion of residential uses within town centres is outlined within SPP. PKC LDP2 Policy 17 (Residential Areas) looks to protect residential amenity and ensure that development within allocated 'Residential Areas' is compatible with the amenity and character of the area. **Promoting Rural Development** SPP promotes developments which are appropriate to the character of rural areas	**Construction** <u>Private Property & Housing and Businesses</u> In relation to impacts upon employment and mixed-use areas and residential areas, Option ST2A and Option ST2B will result in disruption to 9 groups of housing and business properties and Option ST2C and Option ST2D will result in disruption to 8 as a result of construction activities. Option ST2A, Option ST2C and Option ST2D would require the acquisition of the Birnam Industrial Estate including three business tenants (Aran Bakery, Lonely Mountain Skis and Merriman Joinery), with Option ST2B only resulting in the relocation of one business (Aran Bakery). <u>Community Assets</u> In relation to community assets, all proposed route options would require the construction of Dunkeld Junction. Works as part of the grade separated junction for Option ST2C at Dunkeld are located in close proximity to community assets at Craigvinean Surgery and Dunkeld and Birnam Recreation Club which would result in temporary change in accessibility and reduction in use of the recreation club facilities. Dunkeld & Birnam Station would remain open during construction of all proposed route options. Temporary access for pedestrians would be provided for all proposed route options during construction.	?	?	?	?

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
PAN 65- Planning & Open Space (Scottish Government, 2008)	Policy 42 – Green Infrastructure Policy 43 – Green Belt Policy 50 – Prime Agricultural Land Policy 51 – Soils Policy 54 – Health and Safety Consultation Zones **TAYplan** Policy 2 – Shaping Better Quality Places Policy 9 – Managing TAYplan's Assets	which additionally encourages prosperous and sustainable communities and businesses. As such, SPP requires Development Plans to set out policies and proposals for leisure accommodation including holiday units, caravans and huts. Policy 9 of PKC LDP2 (Caravan Sites, Chalets and Timeshare Developments) seeks to safeguard land for Caravan Sites, Chalets and Timeshare Developments. **Business & Employment** SPP seeks to promote business and industrial development that increases economic activity while safeguarding and enhancing the natural and built environments as national assets. Development is therefore seen as a balancing act between weighing up the economic benefit and the potential impact on the environment. PKC LDP2 Policy 7 (Employment and Mixed-Use Areas) seeks to retain employment provisions in designated areas. In addition, Policy 8 (Rural Business and Diversification) seeks to retain employment provisions in designated areas. The policy stipulates the criteria for new businesses in the area and protecting existing proposals. Policy 8 also	<u>Community Land</u> All proposed route options would result in a temporary change in WCH accessibility and potential reduction in the level of use of Torwood Park and The Hermitage. Specific to Option ST2C, the construction of the grade separated Dunkeld Junction is anticipated to result in a temporary change in WCH accessibility and as such potential reduction in use of Open Space at Riverside Land and Land by Little Dunkeld Manse. <u>Agricultural Land Holdings</u> All proposed route options would require tree felling works at Murthly Estate due to the location of the construction compound for the construction of Murthly/Birnam Junction. However, such impacts may be able to be mitigated during DMRB Stage 3 design. **Operation** <u>Private Property & Housing and Businesses</u> In relation to business and employment, all proposed route options would require the demolition of two business buildings located at land safeguarded for employment (General) (Foster Contracting (North) Ltd). In addition, all proposed route options would require the demolition of one business property (currently leased by Aran Bakery) and the partial loss of land from one business land interest (Network Rail Infrastructure). Option ST2A, Option ST2C and Option ST2D would require the acquisition of land safeguarded for employment (General) at Birnam Industrial Estate and as such would				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		promotes tourist-related developments which would help extend the tourist season. **Maximising the Benefits of Green Infrastructure** SPP aims to protect, enhance and promote green infrastructure which includes open space and green networks, which are deemed important to build stronger and healthier communities. PKC LDP2 Policy 42 (Green Infrastructure) seeks to ensure that all new development contributes to the creation, protection and management of green infrastructure. PKC LDP2 Policy 14 (Open Space Retention and Provision) seeks the retention and provision of open space and recreation. **Valuing the Natural Environment** SPP places an importance on planning to protect, enhance and promote access to key environmental resources, including soils and semi-natural woodland. PKC LDP2 Policies 50 (Prime Agricultural Land) and 51 (Soils) seek to protect prime agricultural land and soils from damage such as erosion or compaction.	require the demolition of two business units (Lonely Mountain Skis and Merriman Joinery). All proposed route options would require demolition of one house (Auchlou Cottage) and the partial loss of land from two houses (1 Station Cottages and Rownalea). Option ST2A and Option ST2B are expected to result in land-take from a residential planning application for the erection of a garage (PA03), with Option ST2A also recording land-take on an additional application for the extension of a dwellinghouse (PA04). However, due to the low land-take from the application boundaries the potential for effects of Slight significance are assessed. <u>Green Infrastructure</u> All proposed route options would result in land-take from Little Dunkeld Recreation Park, The Hermitage and Riverside Land. In relation to impacts upon open space, all proposed route options would result in potential land-take from areas allocated as open space (Little Dunkeld Recreation Park and Riverside Land) within PKC LDP2, however land-take and loss of amenity is not expected to affect their use as recreation land. In addition, Option ST2C would require additional land-take from open amenity ground at Inchewan Burn due to the creation of a SuDS basin. In circumstances of loss of community land and open space, the need for provision for exchange land and the requirement to mitigate effects would be considered at DMRB Stage 3. However, Option ST2A has the most potential to offset loss of community land and open space through the creation of recreational land (assumed for the purposes of this				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			assessment to be informal Open Space) with net gain assessed to be approximately 3.8 ha. <u>Valuing the Natural Environment</u> All proposed route options are expected to result in land-take from non-prime and prime agricultural land and woodland. Effects of Moderate significance are assessed for Murthly Estate for all proposed route options and the remaining effects on agricultural holdings are assessed as Slight. **Summary** There is potential for non-compliance and also compliance with policy objectives and local designations. Further assessment would be undertaken at DMRB Stage 3 which would consider design development and environmental mitigation, which can reduce impacts and improve the likelihood of policy compliance.				

Table 2 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural, resilient place **SPP** Valuing the Natural Environment A Natural, Resilient Place Managing Flood Risk and Drainage PAN 33 – Development of Contaminated Land (Scottish Government, 2016)	**PKC LDP2** Policy 51 – Soils Policy 58 – Contaminated Land and Unstable Land **TAYplan** Policy 9 – Managing TAYplan's Assets	**Land Quality** SPP's theme of '*Valuing the Natural Environment*' seeks to protect soils from damage such as erosion or compaction. Development proposals should demonstrate how they have avoided unnecessary disturbance, degradation, or erosion of peat and soils. PKC LDP2 Policy 51 (Soils) seeks to protect soils from damage such as erosion or compaction specifically to good quality agricultural soils and carbon rich soils including peatland. **Contaminated Land** PKC LDP2 Policy 58 (Contaminated Land and Unstable Land) seeks to ensure that development on contaminated land is appropriate in terms of remediation measures and use of the land. **Groundwater** SPP's theme of '*Valuing the Natural Environment*' seeks to protect and improve the water environment in a sustainable and co-ordinated way, including groundwater. In addition, TAYplan Policy 9 (Managing TAYplan's Assets) seeks to manage assets	Volume 1, Part 3 – Environmental Assessment (Chapter 9: Geology, Soils and Groundwater) considers construction and operation related effects together as the majority of construction effects would extend throughout the operational phase. **Land Quality** In relation to the protection of carbon rich soils, Chapter 9 (Geology, Soils and Groundwater) identifies no peat deposits within 250m of the proposed route options and the existing A9. Although GI data identified peat in three boreholes and two trial pits, soil and peat deposits are considered to be of negligible sensitivity. In addition, to ensure there are no localised detrimental effects if peat is encountered during construction, measures such as excavation, storage and re-use would be considered taking cognisance of best practice guidance and adherence to Scottish Government waste management practices. In relation to impacts on agricultural soils, all proposed route options would result in potential significant effects on LCA Class 3.2 (non-prime) agricultural soils during both construction and operation phases. Mitigation proposals will be developed at DMRB Stage 3 to reduce impacts and effects of permanent loss or sealing of agricultural soils. **Contaminated Land** In relation to contaminated land, it is anticipated that potential risks associated with development of brownfield sites can be managed during construction and operation and	?	?	?	?

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		and protect finite resources, including nationally important minerals, geodiversity, the water environment, wetlands and floodplains.	therefore mitigated for all identified potential contaminated land sources. Option ST2A and Option ST2B would involve the direct disturbance of Ladywell Landfill which is governed by a Waste Management Licence (WML). Although this would require full or partial surrender of the WML, dialogue with the licence holder, site operator, PKC and SEPA is proposed as well as undertaking further Ground Investigations (GI), and the implementation of a remediation strategy and monitoring. **Summary** Overall, although impacts are found in relation to agricultural soil and land contamination, mitigation has been proposed and will be further developed at DMRB Stage 3. At this stage it is anticipated that all proposed route options could comply with relevant national, regional and local policies in relation to Geology, Soils and Groundwater following mitigation.				

Table 3 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural resilient place **SPP** Sustainability Placemaking Valuing the Natural Environment Managing Flood Risk & Drainage PAN 61 - Planning & SUDS (Scottish Executive, 2001) PAN 79 - Water & Drainage (Scottish Executive, 2006a) Scottish Environmental Protection Agency (SEPA) - Planning Authority Protocol (Policy 41) Development at Risk of Flooding: Advice and Consultations (SEPA, 2016) WFD policy guidance 'The Future for Scotland's Waters: Guiding Principles on the Technical Requirements of the Water Framework Directive' (SEPA, 2002) National Transport Strategy 2 (Transport Scotland, 2020)	**PKC LDP2** Policy 52 – New Development and Flooding Policy 53 – Water Environment and Drainage **TAYplan** Policy 2 – Shaping Better Quality Places	**Managing Flood Risk and Drainage** SPP aims to build the resilience of Scotland's cities and towns and places emphasis on planning in reducing the vulnerability of existing and future development to flooding. Specifically, SPP requires the planning system to promote: § a precautionary approach to flood risk § flood avoidance; § flood reduction; § avoidance of increased surface water flooding through requirements for Sustainable Drainage Systems (SuDS) In addition, NTS2 seeks to enhance the resilience of the transport network in Scotland during planned, unplanned events or extreme weather incidents to reduce disruption. PKC LDP2 also makes provisions to manage flood risk. Specifically, PKC LDP2 Policy 52 (New Development and Flooding) sets out a general presumption against proposals for built development in areas where there is a significant probability of flooding. Similarly, TAYplan Policy 2 (Shaping Better Quality Places) part C seeks to ensure that places are resilient and future-ready and presumes	**Construction** <u>Flood Risk</u> Volume 1, Part 3 – Environmental Assessment (Chapter 10: Road Drainage and the Water Environment) provides an assessment of the potential for flood risk from the different proposed route options as well as proposes mitigation and management measures to reduce flood risk. During construction, significant effects on flood risk are predicted for all proposed route options before mitigation. However, with the implementation of appropriate mitigation, which will be developed at DMRB Stage 3, these effects are assessed as not significant during construction. <u>Hydromorphology (Construction and Operation)</u> Potentially significant effects are anticipated for hydromorphology during construction and/or operation on the River Tay as a result of all proposed route options before mitigation. However, following the implementation of mitigation, these potential effects are anticipated to reduce to not significant. Option ST2A and Option ST2B would require extensive works on Inchewan Burn, which would lead to the total loss of the restored reach of Inchewan Burn, resulting in potential significant effects. Chapter 10 (Road Drainage and the Water Environment) states that due to the potential for significant effects from Option ST2A and Option ST2B on the Water Environment (Inchewan Burn), adherence with the Scotland River Basin Management Plan (RBMP) or the Water Environment and Water Services (WEWS) (Scotland) Act 2003	**(x)**	**(x)**		

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		against developments which are in areas vulnerable to flood risk. In addition, PKC LDP2 Policy 53 (Water Environment and Drainage) requires developments to accord with River Basin Management Plans or any other relevant associated Area Management Plans and to prevent development over an existing culvert or the culverting of watercourses unless there is no practical alternative. **Protecting the Water Environment** Under '*Valuing the Natural Environment*', SPP requires the planning system to promote protection and improvement of the water environment, including rivers. Aligning with this TAYplan Policy 9 (Managing TAYplan's assets) seeks to safeguard the integrity of natural and historical assets including the water environment, wetlands and floodplains (in-line with the Water Framework Directive).	may not be met. No significant effects are anticipated as a result of Option ST2C and Option ST2D. Discussions with SEPA have been undertaken for this DMRB Stage 2 assessment, however should either Option ST2A or Option ST2B be taken forward to DMRB Stage 3, further consultation would be required. In addition, the bridge structure over the River Braan and the operation of one road drainage outfall could potentially alter local sediment and flow dynamics of the river as a result of all proposed route options. As such, potential significant effects are assessed on the River Braan, however, subject to the development of appropriate mitigation (at DMRB Stage 3) to reduce or offset these effects in accordance with Good Practice guidance, these potential effects are anticipated to reduce to not significant. At this stage of assessment, Option ST2A and Option ST2B are considered to not comply with the provisions of SPP '*Valuing the Natural Environment*', in addition to PKC LDP2 Policy 53A (Water Environment) and TAYplan Policy 9 (Managing TAYplan's Assets) given the likelihood that it would not be possible to mitigate the significant effects on the Inchewan Burn. <u>Surface Water Quality</u> During construction, in-channel activities on Inchewan Burn associated with all proposed route options are likely to lead to increased siltation, polluted runoff and spillages affecting water quality and aquatic ecology. After the implementation of mitigation, the potential effects on overall water quality, particularly the loss of fish passage, would remain significant during operation for Option ST2A and Option ST2B and not				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			significant for Option ST2C and Option ST2D at Inchewan Burn. As such, due to the effects upon surface water quality related to Option ST2A and Option ST2B, these options are assessed to be non-compliant with SPP *'A Successful, Sustainable Place'*, due to the irreversibility of effects upon Inchewan Burn. <u>Surface Water Supply</u> Effects upon surface water supply during construction are predicted to be significant prior to mitigation, however with the implementation of mitigation, effects can be reduced to not significant. **Operation** <u>Flood Risk</u> During operation, the vertical alignment of Option ST2A and Option ST2B would require a pumped solution as a back-up during exceedance events. Additional mitigation has been proposed to reduce the risk of flooding in the event of a blockage or pump failure and as such the residual risk could be reduced to not significant during operation. In addition, potential beneficial effects on the River Braan and Mill Stream floodplain are found for all proposed route options. As such, in compliance with the requirements of SPP, Chapter 10 (RDWE) assesses construction and operation flood risk and proposes appropriate measures to avoid flooding during operation of the proposed route options.				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			Surface Water Quality During operation, significant effects are anticipated on surface water quality of Mill stream and WF12A. However, further development of SuDS proposals at these locations would be undertaken at DMRB Stage 3. **Summary** Overall, the assessment of the proposed route options has had regard to national and local flood risk policy objectives, in addition to proposing mitigation and management measures to reduce flood risk as a result of the proposed route options. However, hydromorphology and surface water quality impacts and effects upon Inchewan Burn as a result of Option ST2A and Option ST2B would result in non-compliance with national, regional and local policy due to the likely irreversible nature of the effects after mitigation. Further assessment would be undertaken at DMRB Stage 3 should either of these be selected as the Preferred Route Option. However, at this stage, Option ST2A and Option ST2B are not considered to fully comply with relevant policies.				

Table 4 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 11: Biodiversity)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A low carbon place A natural resilient place SPP Sustainability Placemaking Valuing the Natural Environment Maximising the Benefits of Green Infrastructure The 2020 Challenge for Scotland's Biodiversity (Scottish Government, 2013a) Scottish Government's Woodland Removal Policy (Forestry Commission Scotland, 2009) The Environment Strategy for Scotland: Vision and Outcomes (Scottish Government, 2020a) PAN 51- Planning, Environmental Protection and Regulation (Scottish Executive, 2006b) PAN 60 - Natural Heritage	PKC LDP2 Policy 38 – Environment and Conservation Policy 40 - Forestry, Woodland and Trees Policy 41 – Biodiversity Policy 42 – Green Infrastructure TAYplan Policy 2 – Shaping Better Quality Places Policy 9 – Managing TAYplan's Assets	**Designated Sites** SPP states that protected sites and species should be conserved and enhanced, taking account of the need to maintain healthy ecosystems. Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment. Direct or indirect effects on statutorily protected sites will be an important consideration, but designation does not impose an automatic prohibition on development. In addition, PKC LDP2 Policy 38 (Environment and Conservation) seeks to protect International, National and Local environmental designations and subsequently provides criteria at each scale. TAYplan Policy 9 (Managing TAYplan's Assets) seeks to protect Natura 2000 sites and in the case that developments result in significant effects, they are required to be subject to an appropriate assessment and mitigation in accordance with SPP. **Trees and Woodlands/Green Networks** SPP and the Scottish Government's Woodland Removal Policy seeks to protect	**Construction** Designated Sites In relation to impacts upon designated sites, Volume 1, Part 3 – Environmental Assessment (Chapter 11: Biodiversity) states that there would be significant effects during construction to the River Tay SAC resulting in habitat fragmentation, de-watering, de-watering of watercourse, run-off from construction, noise and vibrations from piling and hydrological changes resulting from in-stream works. Potential mitigation to reduce these impacts include careful routing of site access routes, creating exclusion zones, use of directional lighting and use of noise and vibration management plans during construction. Consideration of the implications of the Preferred Route Option would be assessed further at DMRB Stage 3, together with a further assessment of compliance with policy including SPP, PKC LDP2 Policy 38 (Environment and Conservation) and TAYplan Policy 9 (Managing TAYplan's Assets). Protected and other important species During construction Option ST2A and Option ST2B have potential construction related residual significant effects on fish species of conservation interest due to fragmentation of habitat from the lowering on Inchewan Burn. Option ST2C and Option ST2D do not involve the lowering of Inchewan Burn and therefore do not have the associated potential significant effects. In addition, Option ST2A and Option ST2B involve the realignment and lowering of the Inchewan Burn into a	**? (x)**	**? (x)**	**?**	**?**

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
(Scottish Executive, 2008)		woodlands of high nature conservation value. Ancient semi-natural woodland should be viewed as an important and irreplaceable resource, together with other native or long-established woodlands hedgerows and individual trees with high nature conservation or landscape value. The requirements of PKC LDP2 Policy 40 (Forestry, Woodland and Trees) are similar in that the Policy seeks to protect woodland and trees, ensuring that new development does not lead to a loss of these features. Both PKC LDP2 Policy 42 (Green Infrastructure) and TAYplan Policy 2 (Shaping Better Quality Places) reflect the ambitions of SPP to protect and enhance green infrastructure/networks. **Protected and other Important Species** SPP's '*Valuing the Natural Environment*' requires the planning system to conserve and enhance protected species, taking account of the need to maintain healthy ecosystems. Where there is good reason to believe that a protected species may be present on site or may be affected by a proposed development, a survey must be carried out to establish any such presence and if necessary, a mitigation plan to avoid or minimise any effects on the species.	culverted drop structure which would be impassable to otter, leading to habitat fragmentation along the burn. However, it is assessed that the upper reaches of Inchewan Burn are likely accessible from the River Braan and as such fragmentation of Inchewan Burn would not inhibit otters from accessing the upper reaches. Due to the potential for significant residual effects upon fish species of conservation interest, Option ST2A and Option ST2B are assessed to be non-compliant with SPP's '*Valuing the Natural Environment*' requirements, PKC LDP Policy 41 (Biodiversity) and TAYplan Policy 9 (Managing TAYplan's Assets). **Operation** <u>Designated Sites</u> Significant effects upon the River Tay SAC are anticipated to continue during operation of all proposed route options due to the removal of terrestrial habitats and shading of stream or riverbed. Potential mitigation during operation would include enhancement of existing habitat with the aim of increasing the amount of supporting habitat available for qualifying species, and adherence to the design principles set out in the programme-level HRA, which includes maximising distance between any dualling works and the SAC boundary, minimising additional crossings of the River Tay SAC and minimising permanent new structures in watercourses. <u>Trees and Woodlands/Green Networks</u> In regard to areas within the Ancient Woodland Inventory (AWI) and native woodland loss, Chapter 11 (Biodiversity) states that all proposed route options are considered to have				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		SPP seeks benefit for biodiversity from new development, where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats. This requirement to safeguard and enhance habitats and species of importance and promote biodiversity and geodiversity is also reflected in PKC LDP2 Policy 41 (Biodiversity) and TAYplan Policy 9 (Managing TAYplan's Assets). **2020 Challenge for Scotland's Biodiversity** In line with the Scottish Government's purpose of increasing sustainable economic growth, the 2020 Challenge for Scotland's Biodiversity sets out aims relevant to this assessment: § Maximise the benefits of a diverse natural environment; § Engage people with the natural world; and § Support biodiversity and ecosystems.	a significant adverse effect due to the loss of woodland categorised on the AWI (20.58ha for Option ST2A, 17.08ha for Option ST2B, 18.12ha for Option ST2C and 16.56ha for Option ST2D). A high-level assessment of potential locations for compensatory planting for lost AWI sites was undertaken and identified suitable areas to fully compensate losses for all proposed route options and will be considered in more detail as part of DMRB Stage 3, at which point policy compliance will be determined. <u>Protected and other important species</u> During operation, residual significant effects on fish species of conservation interest are expected to remain as a result of habitat fragmentation at Inchewan Burn for Option ST2A and Option ST2B. During operation, no additional related effects are predicted for otter with regards to Option ST2A and Option ST2B. **Summary** Further assessment is required at DMRB Stage 3 to assess policy compliance in relation to impacts upon designated sites and trees and woodland. However, at this stage, Option ST2A and Option ST2B are considered to be non-compliant with national, regional and local policy in relation to anticipated significant residual effects upon fish species of conservation interest for those proposed route options.				

Table 5 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapters 12: Landscape and 13: Visual)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A low carbon place A natural resilient place **SPP** Sustainability Placemaking Valuing the Natural Environment Maximising the Benefits of Green Infrastructure Fitting Landscapes (Transport Scotland, 2014) Scottish Government's Woodland Removal Policy (Forestry Commission Scotland, 2009) Scotland's Third Land use Strategy – Getting the best from our land (Scottish Government, 2021) PAN 60 - Planning for Natural Heritage (Scottish Executive, 2008) PAN 65 - Planning and Open Space (Scottish Government, 2008)	**PKC LDP2** Policy 1 – Placemaking Policy 28 – Conservation Areas Policy 39 – Landscape Policy 40 - Forestry, Woodland and Trees Policy 42 – Green Infrastructure **TAYplan** Policy 2 – Shaping Better Quality Places Policy 9 – Managing TAYplan's Assets	**Landscape Quality** SPP's provision on '*Valuing the Natural Environment*' requires the planning system to facilitate positive change while maintaining and enhancing distinctive landscape character. Over-development should be avoided. Landscaping should contribute to the development of successful places contributing to distinctive, safe, pleasant, welcoming and accessible developments. Siting and design of new development should take account of local landscape character. TAYplan Policy 2 (Shaping Better Quality Places) aligns with this SPP requirement and seeks to promote developments which are Place-led which take cognisance of development arrangement, layout, design, density and mix of development. PKC LDP2 Policy 39 also aims to manage development and land use change to ensure that they accord with the aim to maintain and enhance the landscape quality of the local area the future landscape quality of the area or in certain cases permit development where the impacts are clearly outweighed by social and economic benefits.	For the purposes of this policy assessment, Volume 1, Part 3 – Environmental Assessment (Chapter 12: Landscape and Chapter 13: Visual) have been assessed together due to similarity in policy of relevance to both assessments. **Construction** During construction, all of the proposed route options are likely to result in potential impacts on the landscape due to construction of design elements such as the proposed junction, slip roads, underpasses/overpasses, associated retaining walls, cut and cover tunnel, offline widening and realignment of the A9 and associated earthworks. **Operation** <u>Landscape Quality</u> Chapter 12 (Landscape) identifies the potential for significant effects on the landscape, as a result of all proposed route options, for the section of route within the Strath Tay: Lower Glen LLCA, Strath Tay: Dunkeld and Birnam LLCA and the River Tay (Dunkeld) NSA between Dalpowie Plantation, north of the River Tay crossing. Potential effects to Strath Tay: Lower Glen LLCA are anticipated to be significant for all proposed route options. Potential effects to Birnam/Dunkeld LLCA would only be significant for Option ST2C. The proposed route options are not anticipated to result in significant risk to the integrity of the River Tay (Dunkeld) NSA. Potential impacts on landscape receptors would likely be reduced in most instances with the implementation of landscape mitigation (e.g. planting along the length of the	**? (x)**	**? (x)**	**? (x)**	**? (x)**

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		PKC LDP2 Policy 1 (Placemaking) requires the provision of services in appropriate locations, and to ensure that new development safeguards and enhances environmental quality. Policy 1A specifically requires developments to contribute positively to the quality of the surrounding built and natural environment. Policy 1B provides criteria of relevance to Chapter 12 (Landscape): § Criterion B requires proposals to consider and respect site topography and any surrounding landmarks, views or skylines, in addition to the wider landscape character of the area; § Criterion C requires proposals to consider the design and density which should complement the surrounding area; § Criterion E seeks to promote, safe, accessible and inclusive places for all people including non-motorised users (NMUs). **Designated Sites** Development should conserve and enhance protected sites, taking account of the need to maintain healthy ecosystems. These may be locally, nationally or internationally designated sites. The level of protection given to local designations should not be as high as that given to international or national	proposed route). Specific mitigation measures would be assessed at DMRB Stage 3. However, it is anticipated that the landscape mitigation proposals would help integrate the widened A9 and the junction proposals into the landscape. <u>Designated Sites</u> In relation to designated sites, Chapter 12 (Landscape) records no significant effects upon Birnam Conservation Area and Dunkeld Conservation Area. However, it is assessed that Option ST2A would result in a Slight Beneficial effect to Birnam Conservation Area due to the replacement station car park (accessed via Station Road) and linkage on top of the covered A9 potentially improving the integrity of the two sections of Birnam Conservation Area either side of the A9. The creation of a new link between the two parts of the settlement and station would be beneficial for the Conservation Area. Option ST2B, Option ST2C and Option ST2D would all result in non-significant effects. <u>Trees and Woodland/Green Networks</u> All of the proposed route options would result in the loss of woodland, including AWI broadleaved woodland, roadside screening trees which contribute to the character of the landscape. However, with the implementation of appropriate mitigation (e.g. planting along the length of the proposed route) it is predicted that the impacts on landscape receptors would be likely to be reduced in most instances. Specific mitigation measures would be assessed at DMRB Stage 3, however, it is anticipated that the landscape mitigation proposals would help integrate the widened A9 and the junction proposals into				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		designations. Similarly, PKC LDP2 Policy 28 (Conservation Areas) seeks to ensure that development within a conservation area must preserve or enhance its character or appearance. **Trees and Woodland/Green Networks** Woodlands of high nature conservation value should be protected. Specifically, ancient semi-natural woodland should be viewed as an important and irreplaceable resource, together with other native or long-established woodlands hedgerows and individual trees with high nature conservation or landscape value. PKC LDP2 Policy 40 (Forestry, Woodland and Trees) seeks to ensure woodland maximises benefits for communities and the environment. SPP's '*Valuing the Natural Environment*' and '*Maximising the Benefits of Green Infrastructure*' require the planning system to protect, enhance and promote green infrastructure, including green networks. PKC LDP2 Policy 42 (Green Infrastructure) aligns with this SPP requirement.	the landscape. A formal approach to planting proposals may be adopted at the Dunkeld Junction (Option ST2A, Option ST2B and Option ST2D), the Dalguise Junction (all proposed route options) or at the tunnel portals associated with Option ST2A. <u>Visual Impacts</u> Chapter 13 (Visual) also considers the impact of the proposed route options upon viewpoint locations with all proposed route options resulting in potentially significant effects between Dalpowie Plantation and Inver (approx. ch400-ch4800), with potential significant effects ranging between **Moderate** to **Large** at eleven receptor locations (Viewpoints 1,2,4,5,6,7,8,10,11,13 and 14) for all proposed route options. From ch4800 to the end of the scheme a further five viewpoints (Viewpoints 15,16,17,20 and 21) would have the potential for significant effects resulting from changes which would be common to all proposed route options. Where potential effects do arise, it is anticipated that the majority of predicted potential effects associated with each of the proposed route options could be reduced. These reductions would principally be derived from the implementation and establishment of areas of woodland planting as part of the conceptual landscape mitigation proposed. It is anticipated that with the further development of mitigation at DMRB Stage 3, the majority of effects to visual receptors would be reduced although views from a range of viewpoints as identified in table 13.8 of Chapter 13 (Visual) identifies significant adverse effects would likely remain after mitigation.				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		Visual Impact Developments should be designed to reflect the landscape characteristics and should enhance the visual quality of the area.	**Summary** Although significant effects are anticipated with respect to landscape quality and viewpoint locations, with the implementation of mitigation measures it is anticipated that impacts on receptors would be reduced in most cases. However, some residual significant effects to visual receptors would remain post mitigation. A full policy compliance assessment will be undertaken upon consideration of specific mitigation proposals at DMRB Stage 3; however, for all proposed route options there remains elements of non-compliance at this stage.				

Table 6 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 14: Cultural Heritage)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural, resilient place **SPP** Sustainability Placemaking Valuing the Historic Environment Historic Environment Policy for Scotland (HEPS) (Historic Environment Scotland, 2019a) Managing Change in the Historic Environment (Historic Environment Scotland, 2019b): § Setting (2016); § Gardens and Designed Landscapes (2016); § Interim guidance on the Designation of Conservation Areas and Conservation Area Consent (2019); § Interim Guidance on the Principles of Listed Building Consent (2019); and	**PKC LDP2** Policy 26 – Scheduled Monuments and Archaeology Policy 27 – Listed Buildings Policy 28 – Conservation Areas Policy 29 – Gardens and Designed Landscapes Policy 30 – Protection, Promotion and Interpretation of Historic Battlefields Policy 31 (Other Historic Environment Assets)	**Valuing the Historic Environment** SPP places an importance on planning in maintaining and enhancing irreplaceable historic places within Scotland. Specifically, it promotes the protection of designated and non-designated individual assets, related settings and the wider cultural landscape. In addition, it requires developments to make a positive change in the historic environment which is informed by a clear understanding of the importance of the heritage assets affected and to ensure their future use. In the case that change is required, it should be managed sensitively to avoid or minimise adverse impacts on the fabric and setting of the asset and ensure that its special characteristics are protected, conserved or enhanced. TAYplan Policy 2 (Shaping Better Quality Places) requires developments to be *Place-led* to deliver distinctive places which enhance historic assets, including ancient monuments, archaeological sites and landscape, historic battlefields and historic buildings. TAYplan Policy 9 (Managing TAYplan's Assets) seeks to safeguard the integrity of historic assets, including	**Construction** <u>Historic Buildings</u> Construction of the proposed route options would result in the complete removal of Auchlou (a historic building) (Asset 793). This is not a designated building, a listed building or scheduled monument where policy would seek to protect its removal. Given that Asset 793 is a common vernacular building type, the significance of residual effect is not predicted to be significant. In addition, potential significant effects are anticipated to Farnyhaugh Military Bridge, but this again is not a designated structure. Construction of all proposed route options has the potential to result in accidental damage to the Category A Listed Building, Dunkeld and Birnam Station including Footbridge (Asset 26). However, after the application of construction best practice, such as safe working distances from construction plant, the significance of potential effect would reduce to Slight significance. In addition, construction of all proposed route options would partially remove the forecourt (now the car park), which forms an important element of the setting of Dunkeld and Birnam Station including Footbridge (Asset 26). This would sever the pedestrian link between the Dunkeld & Birnam Station and Birnam from Station Road under the existing A9 via Birnam Glen and reinforce the existing severance of the station from Birnam. However, temporary measures would be in place to maintain access to the station during construction.	**? (x)**	**? (x)**	**? (x)**	**? (x)**

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
§ Demolition of Listed Buildings (2019). PAN 2/2011 – Planning and Archaeology (Scottish Government, 2011a) PAN 78 – Inclusive Design (Scottish Executive, 2006c)	**TAYplan** Policy 2 – Shaping Better Quality Places Policy 9 – Managing TAYplan's Assets	archaeology, historic battlefields, historic buildings and monuments. PKC LDP 2 outlines a number of policies of relevance to protecting historic assets, and generally presume against development that would adversely affect Scheduled Monuments, Conservation Areas, Gardens and Designed Landscapes, Listed Buildings, Battlefields and other historic environment assets including historical woodlands and routes. **HEPS** HEPS provides Historic Environment Scotland's policy for making decisions which affect the historic environment. It sits alongside SPP. It provides six primary policies, underpinned by a series of core principles. Refer to Chapter 21 (Plans and Policies) for detail of the requirements of the six policies.	Option ST2A and Option ST2B with access option 1 would result in physical changes to the station's northbound and southbound platforms and an additional change to the setting of the station through the presence of the extended platforms and the removal and replacement of the existing Highland Main Line railway bridge over Inchewan Burn. Similar impacts are anticipated for Option ST2A and Option ST2B with access option 3, however with an additional change to the setting of the station resulting from the presence of a temporary pedestrian footbridge. The potential effects on Dunkeld and Birnam Station including Footbridge (Asset 26) resulting from these changes are assessed to be significant. <u>Historic Landscapes</u> Volume 1, Part 3 – Environmental Assessment (Chapter 14: Cultural Heritage) states that construction of all proposed route options would require land-take from Murthly Castle (HLT 14). Impacts include permanent changes to the land-use of an area of the Inventory Garden and Designed Landscape. The potential effects are anticipated to be of **Large** significance due to the inability of mitigation measures to reduce impacts. These potential impacts and effects would continue into operation. In relation to effects upon conservation areas, Chapter 14 (Cultural Heritage) reports that there would be Slight or Neutral effects on Birnam Conservation Area as a result of changes to setting and reinforcement of existing severance to the north-east of the Highland Main Line railway for Option ST2A and Option ST2B with access options 2, 4 and 5 and for Option ST2B and Option ST2C.				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			For Option ST2A and Option ST2B with access options 1 and 3, a **Moderate** effect on Birnam Conservation Area is identified. **Operation** <u>Historic Buildings</u> During operation, the potential effects on Dunkeld and Birnam Station including Footbridge (Asset 26) as a result of Option ST2A and Option ST2B with access option 1 or access option 3 have been assessed as significant. Option ST2A and Option ST2B with access option 2,4 or 5 are assessed to potentially result in significant effects to Dunkeld and Birnam Station including Footbridge due to the permanent changes to setting from the loss of the forecourt. Option ST2C and Option ST2D with access option 2 are assessed to potentially result in significant effects to Dunkeld and Birnam Station including Footbridge (Asset 26) as a result of changes to setting from the loss of the forecourt, the visible presence of the carriageway and associated infrastructure, and reinforcement of the existing separation between the station and Birnam. However, Option ST2A and Option ST2B would result in **Large** beneficial effects due to the A9 being in a tunnel or underpass where it passes Dunkeld and Birnam Station including Footbridge (Asset 26), allowing the connection between Dunkeld & Birnam station and Birnam to be resorted and enabling the reinstatement of the public forecourt to the north-east. In addition, Option ST2C and Option ST2D would result in improvements to the physical connection between Dunkeld & Birnam Station and Birnam, and the replacement car park,				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			pedestrian underpass and vehicular access from the A9 would provide an opportunity for the re-use of the building. As such the potential significance of effect has been assessed to be Slight beneficial. Whilst mitigation is still to be developed, it is expected that all proposed route options would result in some non-compliance with the provisions of the policy due to the effects on the setting of Dunkeld and Birnam Station including Footbridge (Asset 26). However, it is also relevant to note that as Option ST2A and Option ST2B would provide **Large** beneficial effects, these have been noted compliant with policy in the respect that the proposed route options would support beneficial re-use of the building. <u>Historic Landscapes</u> Potential significant effects to Murthly Castle Inventory garden and designed landscape during construction are assessed to carry into operation as a result of all proposed route options. In addition, it is unlikely that these potential effects could be reduced through mitigation. All other effects identified during construction are not significant during operation of the proposed route options. **Summary** Overall, there are areas of compliance and non-compliance with policies related to Cultural Heritage. Particular areas of non-compliance are in relation to the potential effects on the Category A listed Dunkeld and Birnam Station including Footbridge (Asset 26), and the Murthly Castle designed landscape as a result of all proposed route options. The tunnel proposed in Option ST2A may provide less of an				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			impact on the setting of Dunkeld & Birnam Station than other proposed route options but this is balanced with other impacts identified above. It is considered at this stage due to the potential for both beneficial and adverse significant effects, no one proposed route option is notably more compliant in policy terms than another. A more detailed assessment would be undertaken when specific mitigation measures are proposed at DMRB Stage 3.				

Table 7 – Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 15: Air Quality)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A low carbon place A natural resilient place **SPP** Sustainability Placemaking Valuing the Natural Environment PAN 51- Planning, Environmental Protection and Regulation (Scottish Executive, 2006b) The Environment Strategy for Scotland: Vision and Outcomes (Scottish Government, 2020a) Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3) (Scottish Government, 2018) and 2020 Update Securing a green recovery on a path to net zero (Scottish Government, 2020c) Cleaner Air for Scotland: The Road to a Healthier Future	**PKC LDP2** Policy 32 – Embedding Low and Zero Carbon Generating Technology in New Development Policy 33 – Renewable and Low-Carbon Energy Policy 34 – Sustainable Heating and Cooling Policy 57 – Air Quality	**Air Quality** SPP seeks to promote development that balances the cost and benefits of a proposal over the longer term, which includes both supporting the delivery of infrastructure and considering the implications of development for air quality. PKC LDP2 Policy 57 (Air Quality) seeks to improve air quality by preventing the creation of new pollution hotspots and by preventing exposure to existing poor air quality. In addition, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Department for Environment, Food and Rural Affairs (Defra) 2011) sets out air quality objectives to further improve air quality in the UK in order to minimise impacts upon people's health and on the environment. **Cleaner Air for Scotland** The purpose of Cleaner Air for Scotland – The Road to a Healthier Future - is to provide a national framework which sets out how the Scottish Government and its partner organisations propose to achieve further	**Construction** Volume 1, Part 3 – Environmental Assessment (Chapter 15: Air Quality) identifies 381 sensitive receptors within 200m of the proposed route options which are likely to be affected during construction. However, with the implementation of appropriate mitigation and best practice techniques, potential effects from construction activities are anticipated to be not significant for all proposed route options. **Operation** All proposed route options are predicted to result in exceedances of annual mean NOx at a various ecological transect locations through designated sites along the length of the scheme. In addition, there are increases in nutrient nitrogen deposition rates above 1% of the Critical Load at a majority of ecological transect locations where road alignments would be moved closer and traffic movements have changed. As such, there is the potential for significant effects on designated sites for all proposed route options. However, at DMRB Stage 2 detailed survey information was not available to establish the conditions at each of the designated habitat sites to allow a full determination of significance. The assessment has identified areas of potential significance at worst case locations, which would be considered in more detail at DMRB Stage 3 for the Preferred Route Option.	?	?	?	?

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
(Scottish Government, 2015a) Cleaner Air for Scotland 2 – Draft Air Quality Strategy Consultation (Scottish Government, 2020b) The Clean Air Strategy (DEFRA, 2019) The air quality strategy for England, Scotland, Wales and Northern Ireland: Volume 1, DEFRA, 2011		reductions in air pollution and fulfil our legal responsibilities as soon as possible **Climate Change Plan 2018 – 2032** The Scottish Government's Climate Change Plan and update in December 2020 identify the following key outcomes in relation to transport and air quality:- § By 2030 our roads will contain no new petrol and diesel cars and vans § Car kilometres will have reduced by 20% by 2030 § we will have begun to work to decarbonise challenging transport modes, such as HGVs § more walking, wheeling, cycling, public transport and shared transport options § where people do use private cars, these will predominantly be electric (2032) § Sustainable Transport and Investment Hierarchy will have informed infrastructure investment development.	Generally, Chapter 15 (Air Quality) identifies that there is an increase in concentrations of pollutants at most receptors for all proposed route options. However, no Air Quality Objectives are breached and the pollutant concentrations at all assessed human health receptors are below the objective values set to protect human health. **Summary** Overall, although construction related effects are assessed to be not significant, potential significant effects upon designated sites for all proposed route options may result in policy non-compliance. As detailed survey information was not available at DMRB Stage 2, a full policy compliance assessment will be undertaken at DMRB Stage 3 when a full determination of significance can be assigned.				

Table 8 – Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 16: Noise and Vibration)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
SPP Placemaking Valuing the Natural Environment PAN 1/2011: Planning and Noise (Scottish Government, 2011) Assessment of Noise – Technical Advice Note (TAN, 2011)	**PKC LDP2** Policy 56 – Noise Pollution	**Placemaking** SPP places importance on sustainable and well-designed places which meet people's needs and are appealing. SPP requires that planning should support development that is designed to a high-quality, which demonstrates the six qualities of successful place. Of relevance to noise and vibration is that development results in places that are welcoming, safe and pleasant. **Noise Pollution** PKC LDP2 Policy 56 (Noise Pollution) presumes against the sitting of developments that would generate high levels of noise and would negatively impact sensitive receptors.	Volume 1, Part 3 – Environmental Assessment (Chapter 16: Noise and Vibration) identifies a total of 782 residential dwellings and 45 other noise sensitive receptors (NSRs) within the study area. Chapter 16 identifies adverse and beneficial noise impacts associated with the proposed route options. In relation to construction noise, Option ST2A is considered likely to result in the greatest number of significant construction noise effects, as it is expected to have the longest duration of high noise levels at NSR properties. Option ST2B is considered to be intermediate, as it is expected to have the second longest period of high construction noise levels at NSR properties. Option ST2C and Option ST2D are considered likely to result in the least number of significant construction noise effects as they are expected to have the shortest periods of high noise levels at NSR properties. In relation to operation, while all proposed route options would result in at least some minor adverse impacts upon NSRs it is only Option ST2C that potentially generates a moderate adverse impact which may be more difficult to mitigate. **Summary** Overall, there are minimal differences in policy compliance terms between the proposed route options at this stage based on potential noise effects during construction and operation as all proposed route options have some degree of adverse effects as a result of the scheme on NSR. However, given the	?	?	?	?

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			predominantly minor level of adverse effects anticipated during operation it is considered that there remains reasonable prospects that the impacts could be suitably mitigated at DMRB Stage 3. A more detailed assessment of the Preferred Route Option, including a noise mitigation strategy and appropriate measures would be developed at DMRB Stage 3 in order to reduce adverse noise impacts at receptors, and this would inform a further assessment against national to local policy. At this stage, likely policy compliance/conflict cannot be fully established.				

Table 9 – Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 17: Population – Accessibility)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural resilient place A successful sustainable place A connected place **SPP** Sustainability Placemaking Promoting Sustainable Transport and Active Travel Maximising the Benefits of Green Infrastructure National Transport Strategy 2 (Transport Scotland, 2020)	**PKC LDP2** Policy 1 – Placemaking Policy 15 – Public Access Policy 42 – Green Infrastructure Policy 60 – Transport Standards and Accessibility Requirements **TAYplan** Policy 2 – Shaping Better Quality Places	**Promote Sustainable Transport and Active Travel** SPP requires the planning system to support development which promotes the use of existing infrastructure and reduce the need to travel. The planning system should provide safe and convenient opportunities for walking and cycling for both active travel and recreation and facilitate travel by public transport. This is supported at a local level with PKC LDP2 Policy 1 (Placemaking) criteria e) seeking to promote safe, accessible, inclusive places for all people particularly on foot, bicycle and public transport. TAYplan Policy 2 (Shaping Better Quality Places) seeks to promote development proposals which are '*Active and healthy by design*' where new development is integrated with existing community infrastructure and transport and land use are integrated to improve accessibility by foot, cycle and public transport. **Access** PKC LDP2 Policy 15 (Public Access) seeks to ensure that no adverse impacts would occur on the integrity of any public access routes	**Construction** In this DMRB Stage 2 assessment, the likely nature and location of the construction activities has not been developed to include routes for walkers, cyclists and horse-riders (WCH). As such, it was not possible to undertake a detailed assessment of the impact on WCH during construction. However, in the absence of mitigation, the disruption to WCH resulting from construction activities would be significant. Measures to reduce disruption due to construction would be identified during the DMRB Stage 3 assessment. **Operation** During operation, Volume 1, Part 3 – Environmental Assessment (Chapter 17: Population – Accessibility) states that there are impacts on 16 WCH routes common to all proposed route options. In addition, Option ST2A and Option ST2B would have potential impacts on an additional seven and eight WCH routes respectively with Option ST2C and Option ST2D both potentially resulting in impacts to six WCH routes. The additional impacts for Option ST2A and Option ST2B are due to the junction arrangement at Dunkeld in combination with the proposed access road to the properties south of Dunkeld & Birnam Station at Birnam Glen. Neither of the long-distance routes identified in NPF3, are located within the study area of the proposed route options. However, Chapter 17 (Accessibility) identifies that Option ST2B, Option ST2C and Option ST2D would result in	?	?	?	?

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		requiring proposals to not unreasonably affect access to these routes. Developments that may have an adverse impact on either of the Long Distance Routes identified in NPF3 would not be permitted. In addition, Policy 60 (Transport Standards and Accessibility Requirements) sets out the transport and accessibility framework for Perth & Kinross, which has been developed in line with SPP and the Regional Transport Strategy.	a section of the National Cycle Route Path (Path 22/NCR77) being severed, resulting in WCH being rerouted and a potential decrease in amenity. Option ST2A would also sever Path 22/NCR77. However, there is potential for a replacement path to be placed on top of the cut and cover tunnel and therefore there would be an increase in amenity value as WCH would no longer be travelling adjacent to vehicular traffic. A Non-Motorised User[1] (NMU) Access Strategy for the overall A9 Dualling programme has been developed (Transport Scotland, 2016) which includes mitigation measures embedded into the detailed design such as the provision of crossing points and details of any re-routing required for affected paths. Any significant effects identified at this stage would be assessed further at DMRB Stage 3 for the Preferred Route Option and mitigation developed to reduce them. **Summary** Although all proposed route options would result in potential impacts upon WCH routes during operation, the development of the WCH Access Strategy outlines mitigation measures to reduce impacts upon WCH access, which will be further considered for the Preferred Route Option as part of the DMRB Stage 3 assessment. As such, with the further consideration of mitigation at DMRB Stage 3, it is anticipated that all proposed route options could comply with national, regional and local policy.				

[1] The term Non-Motorised User (NMU) has been changed to walkers, cyclists and horse-riders (WCH) due to revisions to the DMRB in 2019.

Table 10 – Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 18: Material Assets and Waste)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural, resilient place **SPP** Sustainability Planning for Zero Waste Planning and Waste Management Advice (Scottish Government, 2015b) Scotland's Zero Waste Plan (Scottish Government, 2010) Climate Change Plan – The Third Report on Proposals and Policies 2018-2032 (Scottish Government, 2018) and 2020 Update Securing a green recovery on a path to net zero (Scottish Government, 2020c)	**PKC LDP2** Policy 1 – Placemaking PKC Supplementary Guidance – Delivering Zero Waste (2020) **TAYplan** Policy 2 – Shaping Better Quality Places	**Planning for Zero Waste** SPP refers to waste as a resource and an opportunity. SPP requires the planning system to promote developments that minimise the unnecessary use of primary materials and to promote the use of secondary materials. In addition, it promotes the delivery of infrastructure at appropriate locations and prioritises development which is in line with the waste hierarchy: waste prevention, reuse, recycling, energy recovery and waste disposal. Where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO_2) emissions. Developments should aim to minimise this release. Scotland's Zero Waste Plan (Scottish Government, 2010) reflects this objective by outlining the vision of a Scotland '*where resource use is minimised*' and specifically to the proposed scheme '*reduce Scotland's impact on the environment, both locally and globally, by minimising the unnecessary use of primary materials, reusing resources where possible, and recycling and recovering value from materials when they reach the end of their life*' (p.3).	The assessment in Volume 1, Part 3 – Environmental Assessment (Chapter 18: Material Assets and Waste) relates to construction impacts only as operational impacts associated with material assets and waste are not considered significant (by quantity) in the context of the proposed route options. Furthermore, DMRB LA 110 specifies that the environmental assessment should only report on the first year of operational activities (i.e. the opening year). It has been assumed that no significant maintenance activities would occur during the opening year, and therefore no significant materials consumption or waste generation is likely to be realised. Whilst it is appreciated that the first year of operational activities is a time period not necessarily confined to operational effects, any construction phase effects overlapping within this period are captured within the construction phase assessment. At this stage of assessment, there is limited information available regarding the quantities of waste to be generated by each proposed route option. As such, a more detailed assessment would be undertaken at DMRB Stage 3 where potentially significant effects and detailed information and the types and quantities of materials and wastes would be analysed. Volume 1, Part 3 – Environmental Assessment (Chapter 18: Material Assets and Waste) outlines a series of anticipated mitigation measures which will be implemented to minimise the potential impacts associated with both the				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		The requirement to consider sustainable design and construction of developments is included in PKC LDP2 Policy 1 (Placemaking).	consumption of material assets and the production and management of wastes during construction of the Preferred Route Option. This would include the development and implementation of a Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP). In addition, the chosen Contractor will take cognisance of all relevant SEPA guidance, and in line with SPP will take all such measures available to apply the waste hierarchy of prevention; preparing for re-use; recycling; other recovery, including energy recovery, and disposal in way which deliver the best overall environmental outcome. **Summary** The design and assessment of the proposed route options has had regard to, and is compliant with, policy objectives to minimise effects on material assets and waste. Further assessment will be undertaken at DMRB Stage 3 to identify effects and detailed information and the types and quantities of materials and wastes. However, the assessment of waste and materials assets accords with the requirements national policy through consideration of mitigation, in line with the waste hierarchy.				

Table 11 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 19: Climate)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural resilient place A successful sustainable place A connected place **SPP** Sustainability Placemaking Promoting Sustainable Transport and Active Travel Planning for Zero Waste Promoting the Responsible Extraction of Resources Scotland's Zero Waste Plan (Scottish Government, 2010) The Environment Strategy for Scotland: Vision and Outcomes (Scottish Government, 2020a) Climate Ready Scotland: Second Scottish Climate Change Adaptation Programme 2019-2023 (Scottish Government, 2019)	**PKC LDP2** Policy 1: Placemaking **TAYplan** Policy 2: Shaping better quality places Policy 7: Energy, Waste and Resources	**Sustainability** Sustainability concerns making efficient use of existing capabilities of land, buildings and infrastructure. SPP supports the principle of sustainability and requires a presumption in favour of sustainable development. As such, in relation to the climate assessment of the proposed route options, policies and decisions should be guided by the following principles: § supporting good design and the six qualities of successful places; § making efficient use of existing capacities of land, buildings and infrastructure; § supporting delivery of infrastructure, for example transport; and § supporting climate change mitigation and adaptation. § avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality. These aspirations are further iterated in other national strategies such as The Environment Strategy for Scotland: Vision	**Construction** Construction of the proposed route options has the potential to result in the consumption of substantial quantities of raw materials which contain 'embodied' carbon content and reflect the emissions generated during the extraction of their constituent raw materials and the manufacturing process. The transportation of materials to site and engineering processes also release emissions from the combustion of fuels in vehicles, site equipment and utilities. In addition, construction of the proposed route options would release GHG emissions from the transport and treatment of waste material from demolition, construction and excavated soils. However, Volume 1, Part 3 – Environmental Assessment (Chapter 19: Climate) identifies potential mitigation to be implemented during the design and construction stages. As such, key early intervention procedures, as identified in the Infrastructure Carbon Review (HM Treasury, 2013) have been considered in the suggestion of mitigation, including avoiding/reducing principles in the use of GHG intensive materials and processes, minimise distances over which materials and wastes are transported and set contractor requirements with standards for substitution/replacement of GHG intensive materials. **Operation** During operation, the changes in operational road user GHG emissions of each of the proposed route options				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
Climate Change Plan - The Third Report on Proposals and Policies 2018-2032 (Scottish Government, 2018) and 2020 Update Securing a green recovery on a path to net zero (Scottish Government, 2020c) National Transport Strategy 2 (Transport Scotland, 2020)		and Outcomes (Scottish Government, 2020a) and The Scottish Government's Climate Change Plan and update in December 2020 identify the following key outcomes in relation to transport and air quality:- § By 2030 our roads will contain no new petrol and diesel cars and vans § Car kilometres will have reduced by 20% by 2030 § we will have begun to work to decarbonise challenging transport modes, such as HGVs § more walking, wheeling, cycling, public transport and shared transport options § where people do use private cars, these will predominantly be electric (2032) § Sustainable Transport and Investment Hierarchy will have informed infrastructure investment development. **Placemaking** PKC LDP Policy 1 (Placemaking) requires developments to be planned and designed with cognisance of climate change, mitigation and adaptation. PKC LDP 2 places importance on the Perth and Kinross area being a Low-Carbon Place and sets the following objectives of relevance to Chapter 19 (Climate) assessment:	considered are likely to have an adverse effect on climate. However, the magnitude of the changes in GHG emissions associated with each of the proposed route options is considered negligible when compared with UK carbon budgets and Scottish Government interim targets. Therefore, it is not expected that any of the proposed route options would materially hinder the Scottish or UK Governments from meeting their legislative carbon reduction targets. As such no significant residual effects are identified. **Summary** Overall, the design and assessment of the proposed route options has had regard to policy objectives to minimise effects on climate. While it is anticipated that the proposed route options would result in an increase in GHG emissions during construction and operation, when compared with relevant UK Carbon budgets and Scottish Carbon reduction targets no significant effect is assessed in relation to climate. As such, the proposed route options are expected to comply with national policy objectives on climate.				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
		§ *'Improve the long-term resilience and robustness of the natural and built environment to climate change; and* § *Ensure that development and land uses make a positive contribution to helping to minimise the causes of climate change and adapting to its impacts.'*					

Table 12 - Assessment of Policy Compliance for Volume 1, Part 3 – Environmental Assessment (Chapter 20: Human Health)

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
NPF3 A natural resilient place A successful sustainable place A connected place **SPP** Sustainability Placemaking Promoting Sustainable Transport and Active Travel Maximising the Benefits of Green Infrastructure PAN 65 - Planning & Open Space (Scottish Government, 2008) PAN 77 - Designing Safer Places (Scottish Government, 2006d) PAN 78 - Inclusive Design (Scottish Government, 2006) Climate Ready Scotland: Second Scottish Climate Change Adaptation Programme 2019-2023 (Scottish Government, 2019)	PKC LDP2 Policy 56: Noise Pollution Policy 57: Air Quality TAYplan Policy 2: Shaping Better Quality Places	**Sustainability** SPP theme '*Sustainability*' places importance of the planning system to support economically, environmentally and socially sustainable places by enabling development that balances costs and benefits of a proposal over the longer term. As such, consideration should be given to supporting good design and the six qualities of successful places, one being promoting 'Safe and Pleasant Developments'. In addition, developments are encouraged to improve health and well-being by offering opportunities for social interaction and physical activity. This is a priority of the NTS2 which seeks to improve the safety of transport infrastructure and promoting active travel. This is further reflected in the Climate Change Plan (Scottish Government, 2018) and the Environment Strategy for Scotland (Scottish Government , 2020a) which seek to achieve the outcomes of a healthier society and an environment which supports a fairer, healthier, more inclusive society, respectively.	**Construction** During construction, several environmental factors have the potential to effect health and wellbeing determinants across all proposed route options, including noise and vibration disturbance, stress and anxiety from reduced access, disruption or change in access for vulnerable groups, reduction in amenity value to WCH and a reduction in community connectivity due to reduced access to historic sites. Potential effects on human health from air quality related to construction traffic, will be considered in more detail at DMRB Stage 3 for the Preferred Route Option. It is anticipated that the changes to health and wellbeing determinants and their resulting effects on the communities would be similar, due to the disruptive activities required during construction. However, Chapter 20 (Human Health) assesses an overall likely negative health and wellbeing outcome during construction across all proposed route options. **Operation** It is anticipated that there is potential for a range of beneficial effects on health and wellbeing determinants to arise during operation of the proposed route options, including reduced driver stress and improved road safety. In				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
The Environment Strategy for Scotland (Scottish Government, 2020a) Climate Change Plan - The Third Report on Proposals and Policies 2018-2032 (Scottish Government, 2018) and 2020 Update Securing a green recovery on a path to net zero (Scottish Government, 2020c) National Transport Strategy 2 (Transport Scotland, 2020)		PKC LDP2 Policy 57 (Air Quality) seeks to improve air quality by preventing the creation of new pollution hotspots and to prevent introduction of new human exposure to existing poor air quality. In relation to noise impacts, PKC LDP2 Policy 56 (Noise Pollution) has a presumption against the siting of developments which will generate high levels of noise in the locality of existing or proposed noise sensitive land uses. <u>Valuing the Natural Environment</u> SPP theme '*Valuing the Natural Environment*' identifies the environment as a valued national asset which offers a wide range of opportunities for enjoyment, recreation and sustainable economic activity. As such SPP places an importance on supporting opportunities which protect and improve the natural environment. <u>Accessibility</u> TAYplan Policy 2 (Shaping Better Quality Places) seeks to promote development proposals which are '*Active and healthy by design*' where developments are integrated with existing community infrastructure and land uses.	addition, there is potential for changes to WCH routes to affect journeys by active travel, access to green and blue spaces and visits to the outdoors across all proposed route options, although the likely effects on health and wellbeing is not known at this stage of design development. The diversion of Path22/NCR77, which would be severed by Option ST2A, would be re-routed on top of the cut and cover tunnel, and it is anticipated that there would be an increase in amenity value along this section as WCH would no longer be travelling adjacent to vehicular traffic. However, there is potential for adverse effects on Murthly Castle GDL and the Birnam Conservation Area during operation for all proposed route options which could negate some of the beneficial effects on health and wellbeing arising from reduced driver stress and improved road safety. Although there are differences between the proposed route options in terms of number and types of air quality effects during construction, these effects are not considered significant as the pollutant concentrations at all assessed human health receptors are below the objective values set to protect human health. Volume 1, Part 3 – Environmental Assessment (Chapter 20: Human Health) assesses a likely positive health and wellbeing outcome for Option ST2A and Neutral health and wellbeing outcomes for Option ST2B, Option ST2C and Option ST2D. Positive effects specific to Option ST2A				

National Policy/ Guidance	LDP Policy/ Supplementary Guidance (SG)	Summary of Policy Objectives	Policy Assessment Summary	Compliance			
				Option ST2A	Option ST2B	Option ST2C	Option ST2D
			include the creation of additional Open Space and community land, in addition to landscaping the cut and cover tunnel creating amenity space which could potentially contribute to an increase in physical activity and visits to the outdoors, both having the potential to contribute to a likely beneficial effect on health and wellbeing. In addition, although change in noise levels would not pass the threshold at which there could be an influence on life expectancy or premature mortality for any of the proposed route options, it is considered that Option ST2A would have the potential to contribute to a likely beneficial health and wellbeing outcome as a result of a reduction in noise and vibration levels. **Summary** Overall, although the proposed route options are anticipated to result in likely negative health and wellbeing outcomes during construction, potential likely beneficial and neutral health and wellbeing outcomes are assessed during operation of the proposed route options. In addition, one of the key objectives of the project is to improve the safety of the existing A9 for all users. As such, policy compliance with national, regional and local policies related to Human Health is expected for all the proposed route options.				

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