Appendix A12.2: Baseline Data and Detailed Survey Methods

1 Purpose of Appendix

1.1.1 This appendix provides detailed information on the survey baseline for the ecological features outlined in Chapter 12. Detailed methods for bats, breeding birds and aquatic surveys are also presented in this appendix. Baseline information for badger, otter, freshwater pearl mussel (FWPM) and Schedule 1 bird species can be found in Appendix A12.3 (Confidential Ecology Features).

2 Online Data

2.1.1 National Biodiversity Network (NBN) data has been used, where appropriate, to assess the occurrence of ecological features within the study area as indicated within Section 12.2 (Chapter 12). The data search of NBN omitted records pre-1986, as thirty years was considered a sufficient time period for records to inform the baseline.

2.1.2 The use of NBN data is governed by the terms and conditions of the network. The data providers, original recorders (where specified), and the NBN Trust bear no responsibility for the further analysis or interpretation of that material, data and/or information. NBN data providers are presented in Table 1.

Table 1: NBN data providers, recorders and dataset licence

Ecological Feature	Data Provider	Recorder(s)	Licence
Beaver	Scottish Natural Heritage	Dr Ruaraidh Campbell	OGL[1]
Pine marten	NBN: Biological Records Centre (BRC)	Youngman, R E	CC-BY[2]
	NBN: Scottish Natural Heritage (SNH)	Henry Schofield	OGL
Adder	NBN: Highland Biological Recording Group (HBRG)	Not specified	CC-BY
Slow worm	NBN: HBRG	Not specified	CC-BY

3 Bats

3.1.1 Survey methods are summarised in Table 12.1 of Chapter 12. Further details of the survey and analysis methods are provided in the following sections.

Roost Surveys – Ground-Based Roost Assessments

3.1.2 Ground-based roost assessment data collected at DMRB Stage 2 was carried forward to inform the DMRB Stage 3 survey requirements and assessment. This data was updated following design changes at DMRB Stage 3 and is presented in Tables 2 to 4.

3.1.3 Detailed ground-based roost assessments were undertaken on those buildings, structures and trees under the footprint of the proposed scheme. These were carried out using binoculars with a close focus, a high powered torch, and an endoscope (Maplin Video Borescope) for directly inspecting cavities for signs of bats. Bat dropping samples collected during surveys were sent to The University of Warwick, Ecowarwicker Ecological Forensics service, where DNA analysis determined the bat species present.

3.1.4 Features with bat potential that were not within the footprint of the proposed scheme up to 50m, were also surveyed. However, access constraints meant that survey of these features was predominantly carried out at a preliminary ecological appraisal level (Collins, 2016) whereby their roosting potential

[1] Open Government License Version 3

[2] Creative Commons Attribution 4.0 International

was assessed from a distance, in combination with its proximity to high, moderate and low quality habitat.

3.1.5 Results of the ground-based roost assessments are presented in Tables 2 to 4. Where activity surveys subsequently identified roosts, this is reflected in the data provided. Of the 27 structures surveyed, 19 had negligible summer roost potential, and 20 had negligible winter roost potential. The locations of these features are shown on Figure 12.5.

Buildings and Structures

Table 2: Results of the bat buildings and structures for summer roost potential

Distance from Scheme	Building Summer Roost Potential					Structure Summer Roost Potential				
	Roost	High	Moderate	Low	Total	Roost	High	Moderate	Low	Total
0m	3	0	0	1	4	1	0	3	3	7
0m+ to 10m	0	3	0	1	4	0	0	0	1	1
11m+ to 30m	0	3	2	0	5	0	0	0	0	0
31m+ to 50m	1	4	8	1	14	0	0	0	0	0
51m+ *	0	2	1	1	4	0	0	0	0	0
Total	**4**	**12**	**11**	**4**	**31**	**1**	**0**	**3**	**4**	**8**

*Based on final design

Table 3: Results of the bat buildings and structures for winter roost potential

Distance from Scheme	Building Winter Roost Potential				Structure Winter Roost Potential			
	High	Moderate	Low	Total	High	Moderate	Low	Total
0m	0	3	1	4	0	0	6	6
0m+ to 10m	0	3	1	4	0	0	1	1
11m+ to 30m	0	5	0	5	0	0	0	0
31m+ to 50m	2	7	5	14	0	0	0	0
51m+ *	0	3	1	4	0	0	0	0
Total	**2**	**21**	**8**	**31**	**0**	**0**	**7**	**7**

*Based on final design

Trees

Table 4: Results of the bat tree ground assessments for significant bat roosts (high potential/1* category trees)

Distance from Scheme	Number of Roost Trees	Number of High Potential (1*) Trees	Grand Total
0m	0	2	2
0m+ to 10m	1[3]	4	5
11m+ to 30m	0	2	2
31m+ to 50m	0	0	0
51m+ *	0	4	4
Total	**1**	**12**	**13**

*Based on final design

Roost Surveys – Summer Emergence and Re-entry Surveys

3.1.6 Surveys at DMRB Stage 3 were carried out using hand-held frequency division bat detectors (Batbox Duet) with Creative Zen, Transcend Mp330 or Tascam DR-05 linear PCM recorders, and complemented by Anabat Express zero-crossing detectors and Anabat Walkabout full spectrum

[3] BT 4.7 was subsequently identified as a roost by Heritage Environmental Ltd, (HEL) as part of surveys prior to ground investigation works

detectors. Acoustic files were analysed using BatSound 4.2 or AnaLook Insight version 21926. Results of summer emergence and re-entry surveys are presented in Table 5 and the locations of these features are shown on Figure 12.5.

Roost Surveys – Winter Hibernation Surveys

3.1.7 Where structures were assessed as having potential to be used by hibernating bats, static bat detectors (Anabat Express and Anabat SD1 bat detectors) were deployed for a minimum of nine days over winter (January-February) (adapted from Hundt, 2012) to give an indication of bat presence over winter. The data have been analysed using AnaLook W v4.1 software.

3.1.8 Hibernation surveys were undertaken at the north and south sides of two structures (BS 4.4 and BS 4.7). No evidence of bats was found during ground-based inspections, and these surveys did not identify the presence of bats within the structures. Passive monitoring recorded bats in the vicinity of structures BS 4.4 and BS 4.7 during the hibernation period.

Confirmed Roost Summary

Table 5: DMRB Stage 3 survey results of bat roosts found during all surveys

Reference	Distance From Scheme	Roosting Species	Roost Type	Details	Figure Reference
Building 4.31	0m	Suspected pipistrelle species and brown long-eared.	Likely summer roost for a common species (pipistrelle sp.) in house and a suspected feeding perch of a common species (brown long-eared).	No emergence or re-entry observed at survey, but suspected pipistrelle droppings observed high up on the outside of a house and evidence of a potential feeding perch were found in a garden shed on the property during the daytime assessment.	12.5c
Building 4.12	0m	Soprano pipistrelle	Summer roost and transitional roost for small numbers of a common species.	One soprano pipistrelle was observed re-entering and two bats displaying touching at a further point on the building during the first of two surveys.	12.5c/d
Building 4.13	0m	Brown long-eared and soprano pipistrelle	Possible maternity roost and transitional roost for two common species (soprano pipistrelle and brown long-eared).	One brown long-eared and two soprano pipistrelles emerged from two points on the building on the only survey.	12.5c
Structure 4.4	0m	Pipistrelle species and common pipistrelle	Summer roosts for small numbers of a common species (common pipistrelle) and a likely common species (pipistrelle species). Not maternity roosts.	On the first of three surveys droppings were found on the south abutment, which were DNA analysed and confirmed as common pipistrelle. Two pipistrelle species bats possibly emerged from above these. One common pipistrelle possibly re-entered the north side of the bridge on the third survey.	12.5c
Building 4.11	51m+	Brown long-eared, soprano pipistrelle, Myotis and pipistrelle species	Maternity and transitional roosts for three common species (soprano pipistrelle, common pipistrelle and brown long-eared). Myotis species bat likely night and transitional roost.	On the first of three surveys ten unknown bats, four brown long-eared and twelve pipistrelle species bats were observed re-entering and a single Myotis species emerged. On the second survey twelve soprano pipistrelles, one pipistrelle species and four unknown bats emerged. On the third survey two brown long-eared and five soprano pipistrelles re-entered and a single Myotis species bat emerged from the same location as the first. Droppings collected which were DNA analysed and confirmed as brown long-eared and soprano pipistrelle.	12.5c

Activity Surveys

3.1.9 Bat flight lines (particularly road crossing points) and aspects of the landscape such as culverts and bridges were assessed at DMRB Stage 2 for their foraging/commuting potential, which was based on professional judgement of the physical characteristics, quality of habitat and the presence of existing linear features leading to the structure. Those areas with moderate or high value for foraging/commuting were identified as potential bat flight lines and were surveyed using static detectors at DMRB Stage 3.

Passive Monitoring at Bridges and Culverts

3.1.10 Surveys at DMRB Stage 3 were carried out using static detectors (Anabat Express and Anabat SD1 bat detectors). Detectors were deployed for a minimum of three nights over spring, summer and autumn (adapted from Hundt, 2012). Where possible, surveys were spread across the season, to cover the periods when bats would be expected to be most active during the pre-maternity, maternity and post-maternity seasons respectively.

3.1.11 The acoustic sound files were analysed using AnaLook W v4.1 software.

3.1.12 In the absence of guidance on criteria for transforming the number of echolocation calls detected into relative activity levels, a method was developed to enable a comparison between the sites surveyed and enabled mitigation to be designed to target the most important areas.

3.1.13 This valuation was based on:

- overall activity levels (recorded as bat passes per night for all species);
- species richness; and
- presence of rare species (as defined in Wray et al., 2010).

3.1.14 To create the activity index for structures, the interquartile range (IQR) was calculated. The IQR is a measure of variability, which is based on a rank-ordered dataset being divided into four equal parts, called quartiles (Q). The thresholds are Q1, Q2 and Q3, and the IQR is the range Q3 - Q1, which accounts for 50% of data points.

3.1.15 The activity data, measured as bat passes per night (BPpN) was combined for all species across the four proposed schemes which make up the Southern Section Projects of the A9 Dualling Programme. Using this combined dataset made the interquartile thresholds more robust.

3.1.16 Across the four Southern Section Projects, passive monitoring was undertaken at 36 locations. Results from two sites were identified as being outliers, and were removed from the calculation of the IQR to avoid distorting the calculation and potentially undervaluing other locations. Quartiles 1 and 3 were then calculated using the remaining 34 sites, which in this instance was 6.95 to 162.8 BPpN.

3.1.17 This provided three categories, which were used to assign High, Moderate or Low activity to each structure as follows:

- High activity: BPpN above the third quartile (>162.8 BPpN);
- Moderate activity: BPpN between the first and third quartiles (6.95 to 162.8 BPpN); and
- Low activity: BPpN below the first quartile (<6.95 BPpN).

3.1.18 Species richness was determined by the number of each species recorded at each location. Where species were unknown, or pipistrelle species could not be discerned, these records were excluded from the species richness. Categories of species richness were assigned according to the following:

- High species richness: four species or more;
- Moderate species richness: between two and three species; and
- Low species richness: fewer than two species.

3.1.19 An index value for rarity was calculated using the same approach as above, calculating the IQR of BPpN across the Southern Section Projects but only including Myotis species and brown long-eared bats, which were taken as being rarer species (Wray et al., 2010). As above (see 3.1.17), values of High, Moderate and Low were assigned to the quartile ranges, with the following data thresholds:

- High rarity: rare species BPpN above the third quartile (>1.09 BPpN);
- Moderate rarity: rare species BPpN between the first and third quartiles (0.25 to 1.09 BPpN); and
- Low rarity: rare species BPpN below the first quartile (<0.25 BPpN).

3.1.20 An overall value of each passive monitoring location was calculated by assigning three points to each result of High, two points for Moderate and one point for Low. The total points for each feature then equated to an overall value as follows:

- High value for total scores of eight and nine;
- Moderate value for total scores of five, six and seven; and
- Low value for total scores of three and four.

3.1.21 The overall values of the passive monitoring locations are presented in Table 6 and the locations of these features are shown on Figure 12.6. Table 7 provides the percentage split by species of the total bat activity.

Table 6: Index values for activity, species richness, and rarity for passive monitoring locations, and overall scores

Structure	Activity	Species richness	Rarity	Overall Score	Overall Value
BS 4.1	High	High	High	9	High
BS 4.2	Low	Moderate	Low	4	Low
BS 4.4	Moderate	High	Moderate	7	Moderate
BS 4.6	Moderate	Moderate	High	7	Moderate
BS 4.7	High	High	High	9	High
BS 4.9	Low	Moderate	Low	4	Low
BS 4.11	Moderate	High	High	8	High
BS 4.20	High	Moderate	High	8	High

Table 7: Percentage call abundance and bat activity per night at passive monitoring locations

Structure	Percentage Species Call Abundance						Total BPpN
	Myotis species	Brown long-eared	Pipistrelle species	Common pipistrelle	Soprano pipistrelle	Unknown	
BS 4.1	0.77	0.10	1.08	11.6	86.0	0.40	168.5
BS 4.2	0.00	5.88	0.00	41.2	47.1	5.88	3.8
BS 4.4	0.58	0.46	0.58	11.0	86.2	1.16	65.8
BS 4.6	5.98	0.00	0.00	1.71	92.3	0.00	39.0
BS 4.7	8.62	0.01	0.64	41.6	48.9	0.24	1562.7
BS 4.9	20.0	0.00	0.00	40.0	20.0	20.0	1.3
BS 4.11	17.0	0.71	0.00	46.8	34.0	1.42	10.3
BS 4.20	0.54	0.00	1.38	79.4	18.5	0.15	286.4

Manual Bat Activity Transects

3.1.22 Three walked transect routes were undertaken to obtain a measure of bat activity and species richness in habitats along the proposed scheme and to help identify those areas of higher value to bats to allow mitigation to be designed if needed. The transect routes were designed to encompass a range of habitats at varying proximity to the A9, following BCT guidance (Hundt, 2012).

3.1.23 Surveys at DMRB Stage 3 were carried out using hand-held frequency division bat detectors (Batbox Duet) with Creative Zen, Transcend Mp330 or Tascam DR-05 linear PCM recorders. Trimble Juno T41/5 and Apple iPad mini 4 (Apple A8, iOS, Wi-Fi and cellular) mobile mapping devices with GPS were used to record the exact position of each registration and observation.

3.1.24 The acoustic sound files were analysed using AnaLook W v4.1 software.

3.1.25 See Figure 12.6 for the results from these transects.

3.1.26 Activity was measured in bat passes per hour (BPpH). IQR were created in line with the method used for passive monitoring analysis (overall activity, species richness and rare species activity) and an overall index value was then created for each transect using the following data ranges:

Activity index:

- High activity: BPpH above the third quartile (>19.10 BPpH);
- Moderate activity: BPpH between the first and third quartiles (7.22 to 19.10 BPpH); and
- Low activity: BPpH below the first quartile (<7.22 BPpH).

Species richness:

- High: four species or more;
- Moderate: between two and three species; and
- Low: fewer than two species.

Rarity:

- High rarity: rare species BPpH above the third quartile (>0.19 BPpH);
- Moderate rarity: rare species BPpH between the first and third quartiles (0.01 to 0.19 BPpH); and
- Low rarity: rare species BPpH below the first quartile (<0.01 BPpH).

3.1.27 An overall value of each transect was calculated by assigning three points to each result of High, two points for Moderate and one point for Low. The total points for each feature then equated to an overall value as follows:

- High value for total scores of seven and eight;
- Moderate value for total scores of five and six; and
- Low value for total scores of three and four.

3.1.28 Where species were unknown, or pipistrelle species could not be discerned, these records were excluded from the species richness.

3.1.29 The overall values of the transects are presented in Table 8 and the locations of these features are shown on Figure 12.6. Table 9 provides the percentage split by species of the total bat activity.

Table 8: Index values for activity, species richness, and rarity for transects, and overall scores

Structure	Activity	Species richness	Rarity	Overall Score	Overall Value
T4.1	Moderate	Moderate	High	7	Moderate
T4.2	Low	Low	Low	3	Low
T4.3	Moderate	Moderate	Moderate	6	Moderate

Table 9: Percentage call abundance and bat activity per night of the walked transect routes

Transect	Percentage Species Abundance					Total BPpH
	Myotis species	Pipistrelle species	Common pipistrelle	Soprano pipistrelle	Unknown	
T4.1	49.4	6.5	13.0	27.3	3.9	9.42
T4.2	0.0	13.5	8.1	64.9	13.5	6.19
T4.3*	1.6	3.1	9.4	81.3	4.7	9.51

*Seven bats (soprano pipistrelles) were observed crossing the existing A9 during T4.3

Rare and Cryptic Species Monitoring

3.1.30 Where data search, survey or habitat assessment had shown the presence or potential presence of rare or rarer, and/or cryptic species within 350m of the mainline of the proposed scheme (Wray et al., 2010), additional passive monitoring was conducted. The results were used to help identify those areas of higher value to rare or rarer, and/or cryptic species of bats to allow mitigation to be designed if needed. Cryptic species are defined here as those with similarities in echolocation to other bat species, or those species with echolocation calls which are more difficult to detect.

3.1.31 Surveys at DMRB Stage 3 were carried out using static detectors (Anabat Express and Anabat SD1 bat detectors) deployed for a minimum of four nights over mid-summer. See Figure 12.6 for the monitoring locations.

3.1.32 The acoustic sound files were analysed using AnaLook W v4.1 software. The data was used to determine the likely presence of a roost for species that had not been picked up during previous surveys and to determine the importance of this area for these species.

3.1.33 Cryptic species data was measured in bat passes per night (BPpN) of rare species. The IQR was calculated for rare species (Myotis species and brown long-eared bats) across the Southern Section Projects. This range was used to assign High, Moderate or Low value to the monitoring location according to the following (Table 10). Where no rare species were recorded, an overall activity value of none was assigned:

- High activity: BPpN above the third quartile (>3.06 BPpN);
- Moderate activity: BPpN between the first and third quartiles (1.11 to 3.06 BPpN);
- Low activity: BPpN below the first quartile (<1.11 BPpN); and
- None: No rare species recorded.

Table 10: Number of rare bat passes and the overall activity value

Woodland	Myotis species calls	Brown long-eared calls	Nights of recording	BPpN	Overall Activity Value
Loch Faskally	0	0	4	0	None
Loch Dunmore	1319	1	6	220	High

4 Breeding Birds

4.1.1 An adapted Breeding Bird Survey (BBS), designed by the BTO, JNCC and RSPB (Bibby et al., 2000) was utilised. The standard BBS methodology (Bibby et al., 2000) recommends multiple survey visits spread across the breeding bird season (March-August inclusive). Due to the large survey area the methodology was adapted to survey the total area once in July. It is considered that by surveying the total area, the data provide a suitable indication of the species assemblage present across all habitat types within 150m from the mainline of the proposed scheme.

4.1.2 The survey area was divided into survey sectors that were 1km to 1.5km in length. Each survey team comprised two ecologists (including at least one specialist ornithologist). Survey work was undertaken

each morning between dawn and 12:00 British Summer Time (BST) in optimum weather conditions for survey (light winds, good visibility and lack of persistent or heavy rain).

4.1.3 A complete list of bird species recorded as breeding within the study area is shown below in Table 11. Species are highlighted (red, amber or green) according to their classification as birds of conservation concern (Eaton et al., 2015). The locations of records are shown on Figure 12.7. Where consultation data provided by RSPB (2015, 2016) indicated records of species with red or amber birds of conservation concern status (Eaton et al., 2015) within 2km of the study area from the last ten years, and which were not recorded during field surveys, these are also included in Table 11.

Table 11: Breeding bird records within the study area, their protection and conservation status.

Species	Breeding Records	Species listed on SBL	Species listed on Tayside Local BAP
Black grouse [x]	Yes	Yes	Yes
House sparrow	2	Yes	Yes
Linnet	1	Yes	Yes
Song thrush	1	Yes	Yes
Spotted flycatcher	2	Yes	Yes
Yellowhammer	7	Yes	Yes
Bullfinch	1	Yes	Yes
Dunnock	1	No	No
Oystercatcher	1	No	Yes
Swift [x]	Yes	Yes	Yes
Blackbird	9	No	No
Blue tit	6	No	No
Buzzard	4	No	Yes
Carrion crow	2	No	No
Chaffinch	30	No	No
Chiffchaff	2	No	No
Coal tit	15	No	No
Common crossbill*	2	No	No
Goldcrest	29	No	No
Goldfinch	7	No	Yes
Great spotted woodpecker	2	No	Yes
Great tit	21	No	No
Greenfinch	1	No	No
Jay	1	No	No
Little grebe	1	No	No
Pied wagtail	1	No	No
Robin	26	No	No
Swallow	3	No	Yes
Whitethroat	1	No	No
Woodpigeon	8	No	No
Wren	57	No	No

* Presence on the Schedule 1 list of the Wildlife and Countryside Act 1981 (as amended)

[x] Identified through desk study records

5 Water Vole

5.1.1 No field signs of water vole were recorded during field surveys. Some of the watercourses surveyed had limited suitable habitat for water vole and are detailed below in Table 12.

Table 12: Watercourses recorded with suitable habitat for water vole

Watercourse	Description
WF61	Drainage ditch which runs between houses, under railway and existing A9 and through a grazed field, southwest of the existing A9. Some potential habitat for water vole in fenced-off vegetated banks of watercourse near houses, although no field signs were recorded.
WF69	Concrete lined banks for approximately 10m where the two streams meet. Evidence of bank vole recorded on the north drain; the presence of these burrowing rodents which utilise similar habitats indicates that the fenced-off vegetated section of the ditch provides suitable habitat for water vole.

6 Pine Marten, Red Squirrel and Wildcat

6.1.1 Incidental recordings of evidence of red squirrel are detailed below in Table 13 and are shown on Figure 12.9. No incidental recordings of pine marten or wildcat were made.

Table 13: Incidental records of red squirrel

Species	Evidence	Grid Reference	Description of Incidental	Figure Reference
Red squirrel	Sighting	NN 93207 57646	Beech woodland by Fonab Castle.	12.9a
Red squirrel	Camera recording	NN 93129 57783	Red squirrel recorded on camera trap by Loch Faskally.	12.9a
Red squirrel	Sighting	NN 92711 58216	Woodland west of the A9, south of the Coronation Bridge, south of Cluniemore House. One individual visited a crevice in a shattered and fallen Scots pine trunk.	12.9a
Red squirrel	Sighting	NN 92712 58217	Red squirrel sighting.	12.9a
Red squirrel	Sighting	NN 92737 58257	Observed during Ecological Clerk of Work duties	12.9a
Red squirrel	Sighting	NN 92999 58655	In the woods between Faskally Loch and Clunie Bridge Road. Red squirrel observed climbing tree.	12.9a
Red squirrel	Sighting	NN 92948 58780	Observed running across the A924.	12.9a
Red squirrel	Sighting	NN 92945 58781	Atholl Road just north of Pitlochry. Squirrel ran across road in front of car from house into woods.	12.9a
Red squirrel	Sighting	NN 92940 58784	On A924 just north of Pitlochry. Red squirrel ran across the road.	12.9a
Red squirrel	Sighting	NN 92983 58809	Red squirrel feeding on Greengates Cottage windowsill.	12.9a
Red squirrel	Sighting	NN 92764 58877	Anecdotal record of red squirrel sightings from a landowner, in forest opposite by Faskally Cottages and in his property.	12.9a
Red squirrel	Possible drey	NN 92764 58877	In woodland by Faskally Cottages. Mature larch, south-east facing, 8m high, 6m from wall and beside track.	12.9a
Red squirrel	Sighting	NN 92479 58992	Conifer woodland near Forestry Commission car park.	12.9a
Red squirrel	Drey	NN 92302 59567	Intact	12.9b
Red squirrel	Possible drey	NN 91459 60524	Wooded area next to watercourse. Between River Garry and B8019. Immediately north of Faskally Caravan Park. Possible drey high up in trees.	12.9b

7 Reptiles

7.1.1 Results of the reptile surveys conducted are presented in Table 14 and are shown on Figure 12.10.

Table 14: Results of reptile habitat assessment and surveys

Site	Habitat Description	Central Grid Reference	Area (ha)	ACOs Deployed	Species Recorded and Peak Adult Count			Current Reptile Habitat Status	Figure Reference
					Adder	Common lizard	Slow worm		
1	Small area of rough grassland with low shrub coverage.	NN 94458 56932	0.34	10	0	1	0	Presence	12.10a/b
2	Rough grassland with sparse shrub coverage.	NN 91883 60262	0.5	10	0	0 *	0	Presence	12.10d

* Note that presence is indicated for Site 2 as eleven juvenile common lizards were recorded, but no adults were found. Juveniles are excluded from peak counts as per Froglife (1999) guidance.

7.1.2 Incidental sightings along the proposed scheme are detailed below in Table 15 and are shown on Figure 12.10.

Table 15: Incidental sightings outwith ACO and walkover survey areas

Species	No. Individuals	Location	Grid Reference	Figure Reference
Common lizard	1	Maintained A9 south-bound verge, west of Fonab Castle, Pitlochry.	NN 93231 57612	12.10b
Common lizard	1	Maintained A9 south-bound verge, west of Fonab Castle, Pitlochry.	NN 93221 57623	12.10b
Common lizard	1	Forestry ride in pine plantation north of A9 slip road onto A924.	NN 92927 58869	12.10c

8 Phase 1 Habitat Survey

8.1.1 Target notes, detailing habitats and protected species, from the A9 Dualling Programme route-wide Phase 1 habitat surveys (Transport Scotland, 2015) are provided in Table 16 and shown on Figure 12.2.

Table 16: Phase 1 habitat survey target notes

Target Note Reference	Grid reference	Description	Figure Reference
TN39	NN 95370 56876	House with bat potential approximately 250m from A9. Improved grassland behind houses near railway, dominated by Timothy and Yorkshire-fog. Tall ruderal on railway bank consists of rosebay willowherb, common nettle with elm and oak scrub. Reptile and nesting bird potential in grassland and on railway embankment.	12.2a
TN40	NN 94621 56830	Dead young otter found in the road and spraint found nearby on verge.	12.2a/b
TN41	NN 94516 56895	Dead hedgehog and semi-improved neutral grassland with rush.	12.2a/b
TN42	NN 94539 56716	Red squirrel record given by land owner.	12.2a/b
TN43	NN 93993 57424	Potential reptile habitat next to the track and red squirrel habitat in and around old plantation woodland.	12.2b
TN44	NN 93496 57535	Semi-improved neutral grassland on road verge with acidic influence, harebell, ribwort plantain, common bird's-foot-trefoil, devil's-bit scabious and Leyland cypress hedge behind.	12.2b
TN45	NN 93846 57553	Japanese knotweed on walkway to explorer's garden at Pitlochry Theatre. Gardens consist of exotics and some mature trees with possible bat potential and red squirrels present in surrounding woodland.	12.2b
TN46	NN 93436 57468	Semi-natural broadleaved woodland with ancient woodland indicators; wood sorrel, dog's mercury, ferns and mosses. Red squirrel seen in woodland.	12.2b
TN47	NN 92965 57996	Bat potential in roof tiles of houses and out buildings at the end of Foss	12.2b/c

Target Note Reference	Grid reference	Description	Figure Reference
		Road.	
TN48	NN 92787 58556	Loch Faskally: Wildfowl nesting on loch which is surrounded by semi-natural woodland. Mature trees within the woodland have bat potential. Bridge structure has low potential for bats but roosting woodpigeons present.	12.2c
TN49	NN 92822 58501	Dead hedgehog on road.	12.2c
TN50	NN 92758 58803	Bridge structure with limited bat potential.	12.2c
TN51	NN 92637 58988	Railway verge and area between rail and footpath is dense with rosebay willowherb. Common lizard observed on the verge. The woodland behind provides potential habitat for red squirrels.	12.2c
TN52	NN 92178 59861	Area of loose rock covering the bank is indicative of re-grading. Habitat then moves into coniferous woodland with some patches of broadleaved.	12.2c/d
TN53	NN 92010 60204	Dead bat (soprano pipistrelle) with damage to the side of head was found on the ground next to a speed camera on the A9 verge. Some flooding on road verge.	12.2d
TN54	NN 92012 60059	Mature oak and lime on roadside provide potential bat roost.	12.2d

9 Further Habitat Survey

Phase 2 Habitat Survey

9.1.1 Habitat descriptions from Phase 2 habitat survey are provided in Table 17 and shown on Figure 12.11. DAFOR scores indicate abundance as follows: Dominant, Abundant, Frequent, Occasional and Rare.

Table 17: Jacobs Phase 2 survey

Target Note Reference	Grid reference	Description	Figure Reference
J-TN02	NN 94168 57113	A dense area of woodland of approximately 1ha with a canopy of mature oak (mainly pedunculate oak) and sycamore. A very dense area of rhododendron was present towards the road and the north/western edge making this part of the woodland difficult to access. Rhododendron was also scattered throughout the remainder of the wood together with large patches of bramble and common nettle. There was no distinct shrub layer but elder (O), silver birch (O), ash (O) and yew (R) were present. A small accessible area of woodland had a ground flora dominated by grass, mainly Yorkshire-fog. The herb component was species-poor and comprised common dog-violet, wood sorrel and heath bedstraw (all O). The woodland was classified as a species-poor W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, possibly the W10d *Holcus lanatus* sub-community.	12.11b
J-TN04	NN 93976 57290	Broadleaved semi-natural woodland of approximately 1ha. Sycamore is dominant with alder frequent, oak and ash are occasional. There was little or no shrub layer. Approximately 0.7ha of the woodland was listed on the Ancient Woodland Inventory (AWI). The woodland has been heavily disturbed and the landowner uses the area to dispose of garden cuttings and other waste material. There is also a lot of rubble present. Rhododendron is present. The ground flora was dominated by dog's mercury and large patches of common nettle were also present (F). Due to the presence of dog's mercury and due to the large amount of sycamore, this area was classified as a species-poor W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland. The northern part of the AWI area lies within the existing A9 highway boundary and was not surveyed in detail but comprises planted broadleaved trees and managed grassland (as part of highway maintenance). The grassland was damp in parts and quite species rich, with northern marsh orchid (NMO) present (Chapter 12, Photograph 12.3).	12.11b

Target Note Reference	Grid reference	Description	Figure Reference
J-TN08	NN 92288 59271	The woodland within the anticipated Land Made Available (LMA) to the Contractor area comprised mainly coniferous plantation woodland with patches of semi-natural broadleaved woodland around the edge, especially adjacent to the existing A9. The coniferous plantation woodland comprised two principal types: Scots pine dominated and dense Sitka spruce. Small pockets of European larch dominated woodland were also present. The broadleaved-woodland comprised a variety of species but the main canopy species were silver birch, sycamore and pedunculate oak. A powerline wayleave runs from north to south through the area which and was dominated by bracken (W25 *Pteridium aquilinum-Rubus fruticosus* scrub, W25b *Teucrium scorodonia* sub-community). The W25 community also occurred in small scattered patches across the site in open areas where trees had been felled and/or where there had been some changes in management. Small patches of acid grassland and dry heath were present under the wayleave where the W25 community had not become dominant in, for instance, rocky areas. The Sitka spruce plantation had little or no ground flora. In European larch areas, the ground flora was species-poor comprising mainly grass with few herb species. Those herb present were common grassland types such as white clover and creeping buttercup. Under Scots pine plantations the ground flora was more variable, depending on tree density. Some areas had a dry (well-drained) heath ground flora indicating W18 *Pinus sylvestris-Hylocomium splendens* woodland. In dense locations, the ground flora was limited to carpets of wood-sorrel and mosses. In the heathy areas, bilberry, bitter-vetch, bugle, hard-fern, heather, heath bedstraw, melancholy thistle, St John's-wort, thyme-leaved speedwell, tormentil, wood anemone and wood-sorrel were recorded. The most herb-rich areas were in the verges of the forest tracks, but the species were very variable in frequency and distribution. Species included kidney vetch, common bird's-foot-trefoil, red clover, fairy flax, selfheal, creeping cinquefoil and white clover. Broom and creeping thistle were also occasionally present. NMO was mainly Rare, but occasionally very locally frequent. Other species very occasionally recorded were bell heather, cotoneaster, rhododendron, wild strawberry and wood sage. Outside the anticipated LMA to the Contractor area, along some of the drains within the forestry, and forming in gullies, rush-dominated. and wet/flush habitats had formed. Ragged-robin, butterwort, yellow saxifrage, cross-leaved heath, milkwort, lesser spearwort were all common (Occasional-Frequent). There were also small patches of wet heath and dry heath scattered with marsh thistle. Brooklime and globeflower (Rare) were also recorded. Clear-felled areas higher up had a very species-poor ground flora, comprising dense Yorkshire-fog, with Frequent-Abundant foxgloves. Under the powerline wayleave, the W25 community transitioned to acid grassland with scattered scrub (mainly regenerating silver birch) and a small amount of heather. Species noted in the grassland included tufted hair-grass, common sorrel, germander speedwell, melancholy thistle, wavy hair-grass, heath bedstraw, heather, false oat-grass (Occasional), nettle (Occasional-Rare), St John's-wort, bracken (Locally Frequent), fescue spp., creeping thistle (Locally Dominant), raspberry, wood-rushes, common dog-violet, tormentil, sheep's sorrel and thyme-leaved speedwell. Common grasses such as Yorkshire-fog and cock's-foot were also present.	12.11c

Northern Marsh Orchid

9.1.2 Incidental target notes relating to the locations of northern marsh-orchid (NMO), including the proposed source site for translocation, are provided in Table 18 and shown on Figure 12.11.

Table 18: Incidental target notes relating to northern marsh orchid

Target Note Reference	Grid reference	Description	Figure Reference
J-TN01	NN 94788 56529	NMO on the slope above the Tummel floodplain	12.11a
J-TN03	NN 94067 57212	This grassland is poor semi-improved with areas of rank/rough grassland	12.11b

Target Note Reference	Grid reference	Description	Figure Reference
		with weeds such as creeping thistle. Some trees have been planted towards the southwest of the site, but are still very young. NMO and hybrid orchid plants were abundant in parts, but not near the existing A9. 	
J-TN04	NN 93976 57290	As noted in Table 17, NMO was present in this area.	12.11b
J-TN05	NN 93924 57396	Scattered NMO on the verge near a non-motorised user route.	12.11b
J-TN06	NN 93863 57547	Several NMO plants in grass verge behind Festive Theatre carpark in Pitlochry.	12.11b
J-TN07	NN 92587 58906	NMO in the area of grassland at the A9/A924 junction; record received through the consultation process and identified during site surveys. The site is proposed as a source and donor site for NMO translocation. The species was present within the southern two-thirds of the grassland, with increasing density towards the southern extent. This distribution is associated with reduced disturbance and wetter ground conditions, evidenced by an increasing proportion of wet/marsh grassland species towards the south. Species identified included marsh thistle, common bird's-foot-trefoil, ribwort plantain, ground-elder and willow saplings. Considerable moss growth was also evident within the southern extent. NMO were absent from the northern portion, where there was most evidence of disturbance. Anecdotal evidence indicates that individuals have flowered at this location in previous years, although it is noted that orchids tend to exhibit flowering patterns which are highly variable year to year.	12.11c

10 Aquatic Analysis Methods

Watercourse Condition

10.1.1 The Water Framework Directive (WFD) classification does not place a value (or importance) on the watercourses as such; rather it qualifies a deviation from reference or pristine condition due to environmental stress. That means a minor watercourse that is exceeding its predicted quality (based upon a suite of physically and biologically similar reference sites) can be classified at High status, without supporting habitat or species of importance. Whilst the minor watercourse may be an excellent example of that watercourse type, the classification/status does not infer any environmental value other than the absence of environmental stress.

10.1.2 It should be noted that watercourses classified as Highly Modified are given an Ecological Potential rather than an Ecological Status.

Macroinvertebrates

10.1.3 The following macroinvertebrate metrics were calculated for each site: WFD classification; Whalley, Hawkes, Paisley and Trigg (WHPT) metric; Biological Monitoring Working Party (BMWP); Number of Scoring Taxa (NTAXA); Average Score Per Taxon (ASPT); Lotic Invertebrate Index for Flow

Evaluation (LIFE); Proportion of Sediment-Sensitive Invertebrates (PSI); and Community Conservation Index (CCI). Descriptions of these metrics are given below.

WFD Classification

10.1.4 An ecological status class of High, Good, Moderate, Poor or Bad is calculated for the macroinvertebrate biological quality element in surface waters using the WFD-compliant River Invertebrate Classification Tool (RICT) (WFD-UKTAG, 2014). Environmental characteristics recorded during the field survey, macroinvertebrate metric data and other site data including water chemistry, distance to source and altitude are used to assign each site to a class (WFD-UKTAG, 2014). The observed macroinvertebrate community is compared to that expected from a watercourse in reference condition and the variance between the observed and expected determines the ecological status. Macroinvertebrate metrics were calculated using the WHPT method which replaces the formerly used BMWP method (WFD-UKTAG, 2014). Two metrics, the ASPT and number of taxa contributing to the assessment (NTAXA), were calculated using the WHPT method in RICT and were used to classify the site. The metrics calculated by RICT are not appropriate for artificial water bodies, non-flowing or ephemeral water bodies (such as ditches) or sites located within 2.5km of their source.

BMWP and Derived Metrics

10.1.5 BMWP score and its derived metrics are no longer used for WFD classification, but are still valid measures of the impact of organic pollution and general degradation on macroinvertebrate communities (Hawkes, 1997). To calculate the score, each macroinvertebrate family present in a sample is assigned a score from one to ten, depending on their tolerance to pollution (low scores are given to pollution-tolerant taxa). The BMWP score is the sum of all the scoring families present in a given sample. The BMWP score is divided by the number of macroinvertebrate families present in the sample (NTAXA) to give the ASPT. Higher BMWP and ASPT scores indicate increased sensitivity to pollution. ASPT is considered a more stable and reliable measure of pollution than BMWP because it describes the tolerance of the families collected in each individual sample whereas BMWP scores can be low at sites with low NTAXA, even if the taxa collected all belonged to pollution-intolerant families. No formal interpretations exist for these metrics, but BMWP scores greater than 100 and ASPT scores greater than 6.0 are considered to represent good quality macroinvertebrate communities.

LIFE

10.1.6 Freshwater macroinvertebrates have specific requirements for flow conditions and can be used to determine not only predominant flow types (Extence et al., 1999) but also changes in flow character. The LIFE metric uses abundance data to assign a flow preference score to macroinvertebrate families present in a sample and an overall score for the site can be interpreted as an abundance-weighted average-score-per-taxon metric. The family-level LIFE score is also calculated in RICT as is an O/E ratio (observed/expected at reference sites) for the sample. The metrics calculated by RICT are not appropriate for artificial water bodies, non-flowing or ephemeral water bodies (such as ditches), so O/E scores were not calculated for these sites (WFD-UKTAG, 2014). A LIFE O/E score of 0.93 or greater suggests that a site is not subject to flow-related stress (Clarke et al., 2003).

PSI

10.1.7 The PSI metric aims to act as a proxy for the quantity of fine sediment at a site (Extence et al., 2011). Macroinvertebrate species are assigned a fine sediment sensitivity rating that ranges from highly insensitive to highly sensitive to fine sediment. The PSI score is calculated as the percentage of sensitive taxa in the sample (Table 19).

Table 19: Interpretation of PSI scores.

PSI Score	Description
81-100	Minimally sedimented/Unsedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

CCI

10.1.8 The CCI metric represents the national rarity and diversity of species identified within a site and designates a conservation value to the sampled community (Chadd & Extence, 2004). A conservation score (CS) based upon each species' national rarity is applied to each species. The CCI is calculated from the sum of conservation scores divided by the number of contributing species to obtain the mean value. This is then multiplied by the community score (CoS), derived either from the rarest taxon present or the BMWP score. CCI scores are assigned into conservation classes, the class boundaries and descriptions are given in Table 20. CCI scores and classes can be adjusted to take into account local conditions. For example, a species may be nationally scarce but relatively common in a particular location, and vice versa.

Table 20: CCI score classifications (Chadd & Extence, 2004).

Conservation Class	Score	Description
Low	< 5.0	Sites supporting only common species and/or low taxon richness.
Moderate	5.0 – 10.0	Sites supporting at least one species with limited distribution and/or moderate taxon richness.
Fairly High	>10.0 – 15.0	Site supporting at least one uncommon species or several of limited distribution and/or high taxon richness.
High	>15.0 – 20.0	Site supporting several uncommon species, one of which may be nationally rare and/or high taxon richness.
Very High	>20.0	Site supporting several rare species and/or very high taxon richness.

11 Aquatic Survey Results

Aquatic Habitats

11.1.1 Relevant notes from the aquatic walkover surveys undertaken in 2015 by Jacobs are provided in Table 21 below.

Table 21: Watercourse characterisations based on aquatic walkover surveys.

Water Feature	Grid Reference	Description	Similar Water Features
River Tummel (WF70A)	NN 95115 56669	The river is approximately 70m wide at this point and the substrate is mixed. At the right bank the water is shallow (20-30cm) however the main channel is around 1m deep, fast flowing riffle and run. The habitat around the Tummel crossing is suitable for salmonid fry and parr and forms part of the migratory route for adults.	n/a
WF61	NN 95424 56488	Small watercourse 0.25m wide and 20cm deep flowing through pasture. Flows into culvert in field, outfall not observed. Substrate predominantly sand with a small amount of gravel.	n/a

Water Feature	Grid Reference	Description	Similar Water Features
WF64	NN 94406 57084	Small watercourses 1m wide and 5-10cm deep. Flowing down wooded hillside upstream of A9 and behind farmyard and alongside small road downstream of A9. Substrate is mixture of cobble, gravel and pebble. Provides habitat for invertebrates but limited fish habitat. Directly connected to River Tummel. Characteristic of several watercourses in the area.	WF63 - NN 94521 56751 WF65 - NN 93893 57334 WF66 - NN 93477 57447 WF67 - NN 93269 57631 WF68 - NN 93196 57625
Loch Faskally (WF70B)	NN 92786 58547	Large area of mostly still water created by the Pitlochry Dam. Depth and substrate currently unknown.	River Tummel (WF70C) – NN 91948 59754
Allt an Aghastair (WF76)	NN 92009 59556	Small channels, with mixed substrates, predominantly sand, gravel and cobble, and a mixture of mostly riffle and run flowing down wooded hillside into Loch Faskally/River Tummel.	WF69 - NN 92835 57995 WF69A - NN 92849 57923 WF71 - NN 92680 58764 WF73 - NN 92108 59220 WF74/185 - NN 92079 59419 WF77 – NN 91442 60536
WF72	NN 92529 58871	Pond approximately 15m x 20m of unknown depth, surrounded by coniferous woodland. Predominantly silt and organic matter substrate. Fed by small channel flowing down steep wooded hillside. 	n/a
Loch Dunmore (WF73A)	NN 92012 59209	Large pond, looking north, managed for still water fishery. Dense vegetation at southern end of pond. 	n/a

Aquatic Habitat Evaluation

11.1.2 Each water feature was given an ecological value through professional judgement and determined by the presence and accessibility of habitat and resources for the qualifying species of the River Tay SAC (see Table 12.5 for criteria). These classifications are displayed on Figure 12.12.

11.1.3 Four sites on the River Tummel were given an ecological value of excellent due to the presence of suitable habitat for all life stages of the qualifying fish species. Loch Faskally was given an ecological value of good due to the presence of suitable habitat for the qualifying species, although juvenile and spawning habitat was limited. Allt an Aghastair and seven unnamed watercourses were classified as having moderate ecological value due to provision of resources supporting the SAC but had no suitable habitat for qualifying species and limited accessibility. Loch Dunmore and seven unnamed

watercourses were given poor ecological value due to being inaccessible and providing no habitat for qualifying species.

Aquatic Macroinvertebrates

11.1.4 WFD classifications were calculated for all three sites surveyed, the River Tummel (WF70A), Loch Faskally (WF70B) and a small unnamed tributary (WF64). All three sites were surveyed in April 2015, but due to high flows, only WF64 could be surveyed again in November 2015. The unnamed watercourse was classified as High in April and Good in November whilst the River Tummel and Loch Faskally sites were classified as Moderate and Bad respectively. SEPA do not give macroinvertebrate WFD classifications for any of the three sites.

11.1.5 The BMWP score indicated that site WF70A supported low diversity and was impacted by organic pollution and general degradation, however the ASPT score indicated that pollution-intolerant families were present in the sample (Table 22). BMWP and ASPT scores for WF64 indicated a diverse macroinvertebrate community that contained many families intolerant to organic pollution.

11.1.6 LIFE scores suggest that sites WF70A and WF64 contained macroinvertebrate communities indicative of slow to moderate flowing water, but that WF70B contained a community indicative of standing or barely flowing water (Table 22). Sites WF70A and WF64 are lowland streams with slow gradient and site WF70B is on Loch Faskally, so the LIFE scores accurately described the macroinvertebrate community expected at each site.

11.1.7 PSI scores indicated that sites WF70A and WF64 were slightly or minimally sedimented (Table 22).

11.1.8 CCI scored indicated that site WF64 supported a macroinvertebrate community of fairly high conservation value and that sites WF70A and WF70B supported macroinvertebrate communities of moderate conservation value. No species of conservation importance were found in any of the three sites, but the Regionally Notable stonefly, *Protonemura meyeri*, was collected from WF64 in November. It should be noted, however, that *Protonemura meyeri* is widespread in Scotland.

11.1.9 Loch Faskally (WF70B) had the lowest scores for all metrics, except ASPT. These results were as expected due to the impoundment caused by Pitlochry Dam resulting in a slow flowing, heavily sedimented environment.

Table 22: Summary of macroinvertebrate metrics calculated based on the April and November surveys.

Site Name	Month	Temperature (°C)	Dissolved Oxygen (%)	Conductivity (µs)	WFD Class	BMWP	NTAXA	ASPT	LIFE (O/E)	PSI Score	CCI Score	CCI Class	CCI Species of Conservation Interest (CS ≥ 6)
River Tummel (WF70A)	Apr	6.7	108	35	Moderate	50	8	6.3	0.97	77	10.0	Moderate	n/a
Unnamed (WF64)	Apr	7.2	107	96	High	162	24	6.8	1.05	90	12.4	Fairly High	n/a
	Nov	5.7	104	78	Good	155	23	6.7	1.02	92	15.6	High	*Protonemura meyeri*
Loch Faskally (WF70B)	Apr	6.4	104	34	Bad	40	11	3.6	0.74	4	6.7	Moderate	n/a

12 References

Bibby, C., Burgess, N.D., Hill, D., and Mustoe, S. (2000). Bird Census Techniques. Second Edition, Academic Press, London, England.

Chadd, R. and Extence, C. (2004). The conservation of freshwater macro-invertebrate populations: a community based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems. 14: 597-624.

Clarke, R.T., Armitage, P.D., Hornby, D., Scarlett, P. and Davy-Bowker, J. (2003). Investigation of the relationship between the LIFE index and RIVPACS. R&D Technical Report W6-044/TR1.

Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London.

Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D.G., Stroud, D, and Gregory, R. (2015). Birds of Conservation Concern 4: The population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds. 108, p.708–746.

Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999). River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management, 15, 543-574.

Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J. and Taylor, E.D. (2011). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications, 29, 17-55.

Froglife (1999). Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth.

Hawkes, H.A. (1997). Origin and development of the Biological Monitoring Working Party score system. Water Research. 32 (3): 964-968.

HEL (2016). Findings of ecological surveys associated with ground investigation works, provided by email to Jacobs.

Hundt, L. (2012). Bat Surveys: Good Practice Guidelines – 2nd Edition, Bat Conservation Trust, London.

Transport Scotland (2015). A9 Dualling Programme Strategic Study Report. Preliminary Ecological Appraisal, South Scheme, Tay Crossing to Glen Garry. Report to Transport Scotland, January 2015.

WFD-UKTAG, (2014). Invertebrates (general degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT).

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010). Valuing bats in Ecological Impact Assessment. *In Practice*, 70: 23-25