25 Ecology and Nature Conservation

This chapter provides a description of existing ecological conditions in the vicinity of the Southern Leg section of the proposed scheme, assesses the likely impacts on ecological receptors, and proposes mitigation to ameliorate these potential impacts. The Southern Leg section passes through a diverse range of habitats of varying sensitivity, including the River Dee Special Area for Conservation (SAC) and Cleanhill Wood and Kingcausie.

The proposed Dee River crossing is located in the vicinity of a population of Freshwater Pearl Mussels, which are one of the qualifying species for which the river has been designated an SAC. Besides potential impacts on this species, the scheme may also give rise to impacts on the other qualifying species: otters and Atlantic salmon.

Key potential impacts are likely to occur at Cleanhill Wood and Kingcausie. It is an important area that supports diverse woodland and parkland habitats and includes protected species: otters, red squirrels and bats. In this location, the proposed scheme is likely to result in potential impacts that include habitat loss and fragmentation.

Other sensitive areas where impacts on nature conservation are potentially significant include Hare Moss. At this site, road drainage may potentially affect the hydrology of the moss, and the proposed scheme will result in potential fragmentation impacts on existing woodland areas north of the Dee.

Mitigation of red squirrel habitat fragmentation will require planting and management of existing woodlands to favour red squirrels over grey squirrels in the following areas: Kingcausie/CleanhillWood/Durris Forest, Milltimber Wood/Guttrie Hill Wood and Silverburn Wood/Gairnhill Wood. In addition, strategic mitigation directed at mitigating impacts on the wider, regional red squirrel population may be required.

At several locations, licenses will be required for a number of actions affecting protected species, including the closure of badger setts, the exclusion of otter holts/couches and the exclusion of bat roosts.

25.1 Introduction

25.1.1 As reported in this ES, ecology is defined as the scientific study of the processes that influence the distribution and abundance of organisms, and the interactions between those organisms and their environment. Nature conservation is the maintenance of viable populations of fauna and flora and the habitats and communities to which they belong.

25.1.2 The objectives of nature conservation are the:

- maintenance of diversity and landscape character, including wildlife communities and important geological and physical features; and
- maintenance of viable populations of native species throughout their traditional distribution range, and the improvement of the status of rare or endangered species.

25.1.3 This chapter is concerned with the impacts of the proposed scheme on habitats and species present within the Southern Leg study area. Survey and assessment reports are provided as appendices in Volume 2, Part C.

25.1.4 Cumulative impacts, combining the predicted impacts for all habitats and species over the entire AWPR proposed scheme are described in Part E (Cumulative Assessment) of the Environmental Statement (ES).

25.1.5 To aid the interpretation of the assessment, the Southern Leg has been sub-divided, based upon habitat boundaries either man-made such as existing roads or due to habitat changes such as wooded areas changing into intensive agriculture. The route sections for the Southern Leg are as follows:

- Section SL1 ch37000 – 33150 (Charleston to Bishopston);
- Section SL2 ch33150 – 12000 (Bishopston to Cleanhill Junction);
- Section SL3 ch12000 – 15100 (Cleanhill Junction to the A93);
- Section SL4 ch15100 – 18000 (A93 to end of Beanshill);
- Section SL5 ch18000 – 20500 (end of Beanshill to the A944); and
- Section SL6 ch20500 – 28200 (the A944 to Derbeth Overhills).

Legislative and Policy Framework

25.1.6 Relevant nature conservation legislation and policy are described in detail in Chapter 10 (Ecology and Nature Conservation) of the Northern Leg.

25.2 Approach and Methods

Overview of Approach

25.2.1 The DMRB Stage 3 ecology surveys and assessment of impacts for the AWPR involve a process of Ecological Impact Assessment (EcIA) that is based on a matrix approach to Impact Assessment. This system of EcIA has been previously adapted for road construction projects and is recommended in Transport Appraisal Guidance documents such as Scottish Transport Appraisal Guidance (STAG) and the Highways Agency's guidance WEBTAG.

25.2.2 The matrix approach to EcIA involves a three stage approach to impact assessment:

- firstly, all ecological features are evaluated in terms of their ecological importance and/or conservation value;
- the magnitude of the impacts on these features is assessed according to a simple scale; and
- finally, the significance of the impacts is determined by combining the information on the ecological importance of the feature with the magnitude of the impacts upon it.

25.2.3 The three stages of the EcIA process have been modified to be directly applicable to the proposed scheme and are based an early draft version of IEEM guidance on EcIA (IEEM, 2002) and Transport Advisory Guidance, (STAG and WEBTAG). The bulk of the assessment for the AWPR Northern Leg was produced before the 2006 issue of the IEEM guidelines. Therefore, to maintain consistency and relevancy to other road construction guidelines, the assessment for the subsequent Southern Leg and Fastlink sections of the AWPR also follow the general approach described in the IEEM 2002 guidelines, although impact assessment is only addressed in generic terms.

Scope of Assessment

25.2.4 The scope of this ecology assessment was determined through scoping and consultation with statutory and non-statutory bodies, and in accordance with client instruction and programme. The relevant information is summarised in this chapter, however further details of the EcIA consultation process and responses are provided in Chapter 6 (Scoping and Consultation).

25.2.5 Detailed ecological assessments were undertaken for habitats and a range of rare or protected species, as agreed with SNH. Assessment results are summarised within this chapter and provided in full in the following technical appendices:

- A25.1 – Terrestrial Habitats;
- A25.2 – Badger (Confidential Document);
- A25.3 – Bats;

- A25.4 – Breeding Birds;
- A25.5 – Otter;
- A25.6 – Red Squirrel;
- A25.7 – Water Vole;
- A25.8 – Deer;
- A25.9 – Freshwater Ecology (includes macroinvertebrates, river habitat and fish); and
- A25.10 – Freshwater Pearl Mussels (Confidential Document).

25.2.6 In addition to the species covered in the technical appendices, habitat evaluation was also undertaken for the following species and assemblages:

- Amphibians;
- Brown Hare;
- Reptiles;
- Terrestrial Invertebrates; and
- Water Shrew.

25.2.7 To minimise the need for cross referencing, these evaluations are not reported in separate technical appendices, instead the information is presented in this chapter. As no further information is provided on these species/assemblages, the amount of detail provided in this chapter is slightly greater than that warranted by their relative importance compared to the various protected species that are reported in the detailed technical appendices and summarised in this chapter.

25.2.8 Roe deer do not have any specific legal protection for nature conservation and no ecological impact assessment has been undertaken on them. Appendix A25.8 reports the results of consultation and survey to establish baseline conditions for deer in the vicinity of the proposed scheme. It also provides a risk assessment that identifies key areas where there is a risk of deer/vehicle collisions. As these data on deer have been included in the context of a potential traffic hazard associated with the proposed scheme rather than because of their nature conservation value, they will not be further reported in this chapter.

Baseline Conditions

25.2.9 Ecological baseline conditions were identified using two methods, described in more detail below:

- consultation, of statutory and non-statutory organisations and of recognised publications; and
- specialist field survey and habitat assessment.

25.2.10 All ecological assessments were undertaken by Jacobs, with the exception of bird and bat surveys, which were undertaken by Mackenzie Bradshaw Environmental Consulting (MBEC) and electric-fishing surveys, which were undertaken by the Dee District Salmon Fishery Board (DDFSB). The names and qualifications of the ecology team are presented in Table 25.1.

Table 25.1 – Team Member Qualifications

Responsibility	Name and relevant qualifications
Ecology Team Leader	Rebecca Hewlett BSc (Hons) MSc MIEEM
Ecology Team Leader	Jon Huckle BSc (Hons) MSc PhD MIEEM
Ecology Assessment	Martina Girvan BSc (Hons) MSc PhD MIEEM
MBEC Leader	Paul Bradshaw BSc (Hons) MSc MRes
Survey Scoping and Coordination	Graham Rankin BSc (Hons) MSc MIEEM
Phase 1 Habitat and NVC	Chris Smillie BSc (Hons) MSc MCSM PhD MIEEM

Responsibility	Name and relevant qualifications
Badger	Jon Guarnaccio BSc (Hons) MSc MIEEM
Bats (MBEC)	Nicola Tallach BSc (Hons) BTEC HNC MIEEM Claire Hopkins BSc (Hons) MSc AIEEM Licenced Bat Worker (Jacobs)
Breeding Birds (MBEC)	David Coote MPhys MSc Graham Rankin BSc (Hons) MSc MIEEM (Jacobs)
Wintering Birds	Jon Durward BSc (Hons) MSc MIEEM
Otter	Claire Hopkins BSc (Hons) MSc AIEEM
Red squirrel	Kate Finlinson BSc (Hons) MSc AIEEM
Water Shrew and Vole	Richard Roe BSc (Hons) MSc MIEEM
Amphibians and Reptiles	Chris Kerfoot BSc (Hons) International MSc AIEEM
Deer	Jon Durward BSc (Hons) MSc MIEEM
Brown Hare	Jon Durward BSc (Hons) MSc MIEEM
Freshwater Habitat	Rachel Wilson BSc (Hons) MSc AMIBIOL LMIFM
River Habitat Survey	Simon Holden BSc (Hons) MSc Accredited River Habitat Surveyor
Freshwater Pearl Mussel	Rachel Wilson BSc (Hons) MSc AMIBIOL LMIFM Licensed Pearl Mussel Worker
Terrestrial Invertebrates	Claire Beverley BSc (Hons) MSc PhD MIEEM
Fish	Gillian McCoy BSc (Hons) MSc PhD MIEEM
Electric Fishing (DDSFB)	Adrian Hudson BSc (Hons) SFCC Stage 2

Consultation and Literature Review

25.2.11 A full list of the organisations consulted is presented in Chapter 6 (Scoping and Consultation). The following organisations responded with regard to ecology and nature conservation and either provided data or assisted in the identification of key issues, a list of acronyms is provided in the Northern Chapter 10 (Ecology and Nature Conservation):

- Aberdeen Bat Group;
- Aberdeen City Council: City Development Services;
- Aberdeenshire Council: Planning and Environmental Services;
- Aberdeen Countryside Project;
- Aberdeen University;
- Centre for Ecology and Hydrology;
- Forestry Commission;
- Grampian Badger Surveys;
- Grampian Fungus Group;
- National Farmers Union of Scotland;
- North East Scotland Biological Records Centre;
- North East Scotland Biodiversity Partnership Coordinator;
- NES Local Biodiversity Action Plan;
- Royal Society for the Protection of Birds;
- Scottish Executive Development Department Planning Division: Wildlife and Habitats Division;
- Scottish Ornithologists' Club; and
- Scottish Natural Heritage Area Office: Aberdeen.

25.2.12 Responses are summarised in Chapter 6 (Scoping and Consultation), with further details provided in Appendix A6.1. Those responses of specific relevance to ecology are identified within the relevant section of this chapter and appendices as appropriate.

25.2.13 Three key publications were used extensively as a guide to the character and distribution of nationally and locally important habitats and species within Aberdeenshire, and particularly within the study area:

- UK Biodiversity Action Plan (UK BAP) as set out in the Biodiversity Steering Group Report (Vol. 2; 1995) - information included on the 45 habitats and 391 species included in the UK BAP due to rarity, decline or other importance;
- North East Scotland Local Biodiversity Action Plan (NES LBAP) - information on the habitats and species identified as local priorities within North East Scotland; and
- North East Scotland Biodiversity Audit (Alexander et al. 1998) - information on status and range of species and habitats in Aberdeen city, Moray and Aberdeenshire.

25.2.14 In addition to these documents, a review was also undertaken of relevant literature on species and habitat abundance, distribution and susceptibility to impacts. Aerial photographs from spring 2006 were also used to inform interpretation of results. Best practice guidance was also taken into account during the formulation of appropriate survey methods, as referenced for each field survey described below and in Appendices A25.1 to A25.10.

25.2.15 A search of the internet sources of information was also undertaken as part of the literature review including: SNH Lowland Raised Bog Inventory Data, the UK BAP, the North East of Scotland Biodiversity Audit, NES LBAP priority and locally important habitats and species, as well as citations for sites designated at the local, national and international levels.

25.2.16 Phase 1 Habitat Survey data collected during surveys undertaken in 2004 for previous route options were also reviewed and utilised where appropriate. These data were collected using the methods supplied in the Northern Chapter 10 (Ecology and Nature Conservation) and Appendix A10.1 (Terrestrial Habitats).

Field Survey

25.2.17 The study area for each survey generally extended to a minimum of 500m each side of the centreline of the proposed scheme (i.e. a 1km wide study corridor). Study corridors referred to below were centred on the proposed alignment unless otherwise stated. Variation in study corridor width was dependent on the habitat or target species as identified in the methods summary below. This was consistent with best practice as determined by the appropriate government or professional body (including the Scottish Environment Protection Agency [SEPA], the Institute of Ecology and Environmental Management [IEEM]) and/or as described in the Design Manual for Roads and Bridges (DMRB) Volume 11 (Highways Agency, 2001).

25.2.18 For this report, ecological survey methods followed the IEEM 2006 guidelines whereas the evaluation followed the IEEM 2002 guidelines for reasons of consistency as stated in paragraph 25.2.2. In addition to the IEEM 2006 guidelines, the ecological survey methods followed current best practice, based on the DMRB Volume 11 (Highways Agency, 2001). Prior to undertaking fieldwork, the approach and methods were agreed with SNH following consultation and submission of an ecological scoping report (Jacobs, 2006).

25.2.19 Brief summaries of the methods used are presented below, with full details provided in the respective technical reports (Appendices A25.1 to A25.10).

Differences Between Survey Methods in the Northern and Southern Leg Sections

25.2.20 In general, survey methods used for the Southern Leg section of the AWPR were the same as those used for the Northern Leg section with some exceptions, all of which were agreed with SNH in advance. These exceptions were due to survey methods being refined during the northern

surveys in order to improve survey efficiency and changes in accepted survey standards between 2004 and 2006. Southern Leg section surveys that were substantially different from the Northern Leg surveys were:

- Bat surveys were modified by a shift in the emphasis of the habitat and commuting route survey from a transect approach to an assessment targeted on key Habitat Areas;
- Water shrew surveys were substantially scaled down as the baited plastic tube surveys that were carried out for the Northern Leg yielded no results. Habitats were still assessed in terms of suitability for water shrew and evaluated accordingly;
- Amphibian surveys were not undertaken in the Southern Leg as no protected species were found in the Northern Leg section although non-protected amphibians were recorded. Habitats were still assessed in terms of suitability for amphibians and evaluated accordingly;
- Reptiles were extensively surveyed for in the Northern Leg section and no species were recorded although previous biological records show a numer of reptiles to be presnt in within the study area. Therefore, although no surveys were conducted in the Southern Leg section, habitat assessments were undertaken and evaluated for suitability for reptiles and reptile were treated in a precautionary fashion ;
- Freshwater macroinvertebrates were sampled once for the Northern Leg section, whereas two sampling occasions were planned for the Southern Leg in order to bring the sampling protocol in line with SEPA's monitoring;
- Fish surveys were expanded in the Southern Leg following feedback from SNH. In contrast to the Northern Leg section where existing data from the Don Salmon Fisheries was reported, electric fishing surveys were conducted by the Dee District Salmon Fishery Board to inform the ecological evaluation of the southern section; and
- Detailed freshwater pearl mussel surveys were undertaken in the River Dee, the Crynoch Burn and the Burn of Muchalls (reported in the Fastlink Ecology and Nature Conservation chapter: Chapter 40).

25.2.21 In areas where Northern Leg and Southern Leg survey areas overlap, survey methods have been shown to yield largely the same results demonstrating that, despite small differences between survey protocols, results are comparable between the northern and southern sections of the proposed scheme.

Terrestrial Habitats

25.2.22 Habitats were assessed, coded and mapped using the survey methods outlined in the 'Handbook for Phase 1 Habitat Survey – a technique for environmental audit' (JNCC, 1993). A Phase 1 Habitat Survey of a 1km wide study corridor centred on the proposed route alignment was undertaken between May and July 2006 following guidance contained within the DMRB (2001). Areas of particular botanical interest were further surveyed using the National Vegetation Classification (NVC) following standard methods (Rodwell, 1991a, b; 1992; 1995; 2000).

25.2.23 The survey was undertaken from May to July 2006, which is an optimal time of year to carry out botanical, habitat surveys as flowering plants are in leaf and flower and thus the risk of misidentification is minimised. However, no survey of wildlife can guarantee that all biological cues are recorded, and early or late flowering species may be under represented.

25.2.24 To aid the interpretation of the habitat assessment for the Southern Leg, its component route sections were sub-divided into Habitat Areas. These divisions were defined *a posteriori*, following analysis of the Phase 1 Habitat Survey data and the aerial photographs, forming the basis for the ecological evaluation of the habitats based on the features present and their location within the study corridor (Figures 25.3a-h). Several Habitat Areas may occur in each section of the route (e.g. a network of agricultural fields and areas of woodland). It is intended that these Habitat Areas provide a framework for discussion of all key species occurring in each area.

Badger

25.2.25 The status of badger populations was assessed within a 1km route corridor centred on the proposed route alignment. The route corridor was surveyed for signs of badgers between the 13 February and 6 July 2006 following methods by Harris et al. (1989) and the DMRB (Highways Agency, 2001) guidance. Where survey results indicated that further information was required from outside the route corridor, this boundary was increased. For example, where survey results suggested that a main sett was located just outside the route corridor and locating this sett would provide useful information regarding the local distribution of social groups, ensuring that territories of all potentially impacted badger social groups were correctly identified.

25.2.26 Signs of badger activity was mapped with reference to data from the Phase 1 Habitat Survey Maps to provide information about badger social group territories. Field signs included badger setts, badger paths, latrine sites, evidence of foraging and dung pits and can be summarised as follows:

- all hedgerows, dry stone walls, paths and other linear features, within the survey corridor, were walked to locate badger field signs. In addition, all areas of woodland and scrub were actively searched (where practicable);
- badger paths were identified through the observation of field signs including prints, badger hairs on barbed wire or vegetation, and dung pits;and
- the interiors of fields were surveyed in addition to their boundaries, where they exhibited evidence of badger foraging or where badger paths passed through them.

25.2.27 Land access issues did not compromise the badger activity surveys for 2006.

Bats

25.2.28 The aims of the bat surveys were to identify roosts, commuting routes and foraging areas using a combination of habitat assessment and bats activity surveys. The habitat assessment was undertaken to identify potentially important areas for bats, followed by surveys of key areas to assess the level of bat activity.

25.2.29 The study area within which field surveys were carried out was defined with regard to specified standards (DMRB, 2001) and consideration was given to the six species likely to be present (Ms Isobel Davidson, Aberdeen Bat Group, pers. comm.; Richardson, 2000). The survey area extended 500m either side of the alignment giving a 1km wide survey corridor. Although this is narrower than the ideal width for such surveys (DMRB, 2001), the survey area and methods were agreed with SNH (Jacobs UK Ecological Scoping Report 2006) and preliminary surveys and desk study including information requests extended beyond 500m.

25.2.30 The habitat assessment was undertaken in spring/summer 2006, to identify potential roosts within natural and/or man-made structures (excluding mines) and to inform the scope of the bat activity surveys. The habitat assessment followed methods outlined by Walsh and Harris (1996a, b), Entwistle et al. (1997), Jenkins et al. (1998), DMRB (2001) and Mitchell-Jones (2004).

25.2.31 Emergence surveys of roosts/potential roosts and activity surveys of habitats identified during the habitat assessment were undertaken at the optimal time between June and early August 2006 at select periods of dusk, dark and dawn following methods outlined by DMRB (2001) and Mitchell-Jones (2004). Surveys were carried out by suitably trained, experienced and licensed bat specialists as detailed in Table 25.1.

25.2.32 Methods were refined based on feedback from SNH and experiences encountered during the 2004 survey for the Northern Leg section. To take into account SNH's recommendation that greater effort be channelled into identifying fragmentation and severance issues involving bats, commuting route surveys are planned as part of the bat activity surveys. Some of these were completed in 2006 and are scheduled to be completed in 2007. These data will be included in a series of Environmental Assessment Reports (EARs) to be published in 2007.

25.2.33 Due to difficulties in obtaining access permission from landowners and homeowners (and the resulting impact on available time to complete the surveys), activity surveys and buildings (i.e. potential roost sites) within 200m of the road alignment were prioritised. Consequently, buildings and activity surveys outside 200m will be completed during the 2007 survey season.

Breeding Birds

25.2.34 A two-stage survey strategy (agreed by SNH, Jacobs UK Ecological Scoping Report 2006) was developed to select bird survey areas within a 1km wide study area. The first stage in the selection process involved the identification and selection of high value habitats referred to as Sites of Ornithological Value (SOV) which were identified by experienced ornithologists based on an initial walkover survey together with an assessment of data supplied by the NESBReC and analysis of aerial photographs and Ordnance Survey maps.

25.2.35 The second stage in the selection process involved the use of a Line Transect and Quadrat sampling system to obtain a representative sample of remaining habitats outside of the SOVs, which was used to infer the importance of all remaining non-surveyed areas throughout the route corridor for breeding birds. A single, 500m wide transect was established along the centre of the study area along which 500m square Quadrats were systematically arranged and sampled at a ratio of 1:3.

25.2.36 Selected SOVs and Quadrats were subject to an adapted breeding bird survey (BBS) based on the Common Bird Census (CBC) standard mapping technique, as developed by the British Trust for Ornithology (Bibby et al., 2000). Observations of key species present within or adjacent to each of the SOV and Quadrat, in addition to the wider study area, were noted during the other ecological surveys for the proposed scheme.

25.2.37 Information obtained from the Phase 1 Habitat Survey (Terrestrial Habitats Appendix A 25.1) was used to inform a description of the habitats represented within each SOV and Quadrat and to assess the value of their habitats for breeding birds. A habitat value (expressed as high, medium or low) was assigned to each SOV, Quadrat and Ecological Habitat Area (as described in the Terrestrial Habitats Report, Appendix A25.1). In addition to providing a description and value of habitat for each SOV and Quadrat, data from the Quadrats were considered in the context of the Phase 1 Habitat Survey of the route corridor to determine how representative each Quadrat was of surrounding Habitat Area. The values assigned to Habitat Areas were based upon a combination of their habitat evaluation and the results of the species surveys.

Otter

25.2.38 The otter (*Lutra lutra*) survey aimed to identify holts, couches, other lying up areas, commuting routes and foraging areas within the study area. A survey of otter activity in a 1km wide study corridor was extended where signs were not initially identified within the 1km study corridor, undertaken between March and July 2006, following methods outlined by Kruuk (1986) and DMRB (2001). As otters have no fixed breeding season this period is considered to be optimal for identifying the features of importance to otters. This survey concentrated on, but was not exclusive to, watercourses and wetlands.

25.2.39 As otters avoid disturbance and are largely nocturnal, surveys usually have to be carried out by searching for otter field signs. In the present study, all watercourses and waterbodies including lochs, burns, rivers, field drains and ditches within the 1km route corridor (Figures 25.7a-h) were surveyed for signs indicative of the presence of otters, including:

- otter spraint;
- footprints;
- actual or potential resting sites. These include underground ‘holts’ (e.g. beneath the roots of bankside trees) or above ground ‘couches’ (e.g. in reedbeds);

- slides or other well-used access points to watercourses (though additional evidence would be required to positively confirm their use by otters);
- feeding remains, e.g. fish carcasses (though additional evidence would be required to positively confirm these as evidence of otter presence); and/or
- sightings, including otter Road Traffic Accidents (RTAs) and evidence supplied by landowners.

25.2.40 In general, otter surveys only attempted to identify the terrestrial habitats of otters lying within 10m of a watercourse. In some areas where otter signs were abundant, the survey was extended to include adjacent habitats and to identify tracks leading from the watercourse. Incidental observations of tracks and signs were also made throughout the survey period.

Red Squirrel

25.2.41 Red squirrel (*Sciurus vulgaris*) surveys were conducted to determine the presence or absence of red squirrels and to identify areas of woodland supporting red squirrels. Due to the extent of the study area, and methodological difficulties in accurately assessing red squirrel population size, no attempt was made to quantify levels of use of various habitats by this species. However, to determine the presence/absence of red squirrels, visual surveys and hair-tube surveys were undertaken in woodlands, previously determined by walkover surveys, as suitable red squirrel habitat within a 1km wide study corridor. The surveys were performed between May and July 2006 following methods outlined by Gurnell et al. (2001).

25.2.42 Hair tube surveys collect squirrel hair on a sticky medium as they pass through baited tubes. Squirrel hairs collected were stained and viewed under a high-powered microscope to distinguish red or grey squirrel hairs, following methods outlined by Teerink (1991), Gurnell and Pepper (1994), and Dagnall et al. (1995).

Water Vole

25.2.43 Water Vole survey methods followed those described in the Water Vole Conservation Handbook (Strachan, 1998). At the time of Survey the 2006 edition of this Handbook had not been issued, however the methods proposed are still in agreement with the earlier edition. All riparian zones, watercourses and standing water bodies within 250m either side of the proposed alignment were surveyed for evidence of water vole occupation. All waterbodies were identified from Ordnance Survey maps, aerial photographs and through a preliminary walkover survey.

25.2.44 All watercourses and ponds were surveyed from within the channel/pond where possible to give the best view of bank habitat. This was possible for all waterbodies apart from some deeper sections of the River Dee. The survey comprised searching for field signs as described in Strachan (1998), which included burrows, latrines, footprints and feeding stations.

25.2.45 The habitat suitability of water bodies for water voles was assessed using landscape factors known to be conducive to supporting water vole colonies (Strachan, 1998; Woodroffe, 2000).

Water Shrew

25.2.46 Water shrews are semi-aquatic and live along the banks of watercourses that are clean, clear and have a high number of invertebrates on which they feed. Water shrew are sometimes found far from water in woodlands or rough grassland (Churchfield, 1984). However, it has been suggested that such populations are only transitory, either in search of alternative food sources or using these terrestrial habitats to disperse from their natal ranges (Harris *et al.,* 1995). Therefore, the habitat assessment focussed on the aquatic habitat and the immediate bankside vegetation.

25.2.47 Incidental sightings of water shrews were noted as part of the other ecological surveys undertaken between March and August 2006. Ordnance Survey maps (1:25000), aerial photographs, Phase 1 Habitat Survey target notes (Appendix A25.1) and the Freshwater Ecology Survey Report

(Appendix A25.9) were used to identify waterbodies and areas showing the potential to support water shrew populations within the route corridor (500m either side of the alignment).

25.2.48 A desk-based survey was used to identify areas of terrestrial and aquatic habitat suitable for water shrews and their presence was assumed in all such areas. This habitat assessment was mainly based on the vegetation suitability and macroinvertebrate data taken from the Freshwater Ecology Report and Water Vole Report (Appendix A25.7). The desk survey coupled with incidental sightings was deemed sufficient to accurately reflect the ecological value of the water shrew and their habitat in this section. A precautionary approach to mitigation will be adopted that reflects the ecological value of these habitats. Any loss of suitable habitat will be mitigated for on the assumption that they support a water shrew population and mitigation will be required during construction.

25.2.49 Vegetation was assessed for suitability by examining the potential cover it offered to foraging water shrew. Water shrew habitat designations are awarded as follows in Table 25.2.

Table 25.2 – Water Shrew Habitat Designations

Habitat Value	Criteria
High	Suitable vegetation offering dense cover (i.e. abundant emergent vegetation, tall herbs etc.), with either water of Good or Excellent Quality or high Average Score per Taxon (ASPT scores).
Medium	Some suitable vegetation, with either Average water quality or medium ASPT scores.
Low	Poor quality or inappropriate vegetation with Low water quality and low ASPT scores.

25.2.50 In addition to assessing individual water bodies, the network of watercourses were evaluated using professional judgement taking into account the quality of each watercourse for water shrew, and the connectivity, size and distribution of the network throughout the wider landscape.

Amphibians

25.2.51 Incidental sightings of amphibian species were noted as part of the other ecological surveys undertaken that were between March and August 2006.

25.2.52 Amphibian surveys of all suitable ponds were undertaken for the Northern Leg (Appendix A.10.9) and for the previous route alignment, these recorded common frog, common toad and palmate newt, no fully protected statutory species such as the great crested newt were recorded nor have they ever been recorded in Aberdeen City or Aberdeenshire according to NBN Gateway records. Following these results, a desk-based survey was considered sufficient (agreed with SNH) to identify areas of terrestrial and aquatic habitat within the Southern Leg study area which were suitable for amphibians.

25.2.53 Ordnance Survey maps (1:25000), aerial photographs and the following specialist reports: Appendix A25.1 Terrestrial Habitats Report, Appendix A25.5 Otter Report, Appendix A25.7, Water Vole Report and Chapter 24 (Water Environment), were used to identify waterbodies and areas showing the potential to support amphibian populations within the route corridor (500 m either side of the alignment). This desk survey coupled with incidental sightings was considered sufficient to accurately reflect the ecological value of the amphibians and their habitat in this section.

25.2.54 As no specific field surveys took place for amphibians the quality of aquatic habitat in all waterbodies identified was assumed to be high enough to support breeding populations. The terrestrial habitat was assessed as being suitable or not by using key parameters identified by Oldham et al. (2000) that indicate habitat of particular value, as well as considering the dispersion of habitats throughout the local landscape and the presence of any barriers to amphibian migration throughout the landscape. Favourable terrestrial habitat for amphibians would provide places for refuge, hibernacula and foraging opportunities and evaluation of the habiat is provided below in Table 25.3. Rating of suitability of sites according to the criteria identified in Table 25.4 was undertaken.

Table 25.3 – Evaluation of Terrestrial Habitat Quality

Rating	Criteria
Suitable Habitat Features	Presence of substantial woodland and/or large areas of scrub or rank grassland or large rock piles or many dry stone walls. Presence of a large area scrub and/or small spinney/copse or areas of rank grassland or rock piles or dry stone walls.
Unsuitable Habitat	Lack of woodland, scrub, rank grassland and rock piles.

Brown Hare

25.2.55 Brown hare presence within a 500m study corridor was assessed through the collation of incidental records made during all other floral/faunal surveys over a 15 week period. Data relating to the size and types of habitat within the study area were determined through review of the Phase 1 Habitat maps to enable a general assessment of the suitability of the study area for brown hares.

Reptiles

25.2.56 The common lizard, slow-worm and adder are the only reptile species that have been recorded as being present in the Aberdeen area (Arnold, 1995). Incidental sightings of reptile species were noted as part of the other ecological surveys undertaken between March and August 2006.

25.2.57 A desk-based survey was used to identify areas of habitat suitable for reptiles and their presence assumed in all such areas. Ordnance Survey maps (1:25000), high-resolution aerial photographs and data collected for the Phase 1 Habitat Survey (Terrestrial Habitat Report, Appendix A25.1) were used to identify potential reptile habitat within the route corridor (500m either side of the alignment). Potential habitats include such areas as heathland, gorse scrub (*Ulex europaeus*), rough grassland, rank grassland, woodland edges, glades and rides. Other features include hedgerows and drystone walls.

25.2.58 This desk survey coupled with incidental sightings was considered sufficient to accurately reflect the ecological value of the reptiles and their habitat in this section. A precautionary approach to evaluation was adopted where any habitat capable of supporting a reptile population was assumed to do so.

Terrestrial Invertebrates

25.2.59 Due to the large numbers of individuals and species of this taxon present in the study corridor, systematic surveying for terrestrial invertebrates was not considered practical. Instead, the assessment of potential impacts on terrestrial invertebrates was based on the habitat potential of sites to support terrestrial invertebrates throughout the proposed route corridor. The assessment focussed on habitats suitable for important species, including those identified in the NES LBAP (North East Biodiversity Audit, 1998).

25.2.60 Phase 1 Habitat Survey maps and target notes (Appendix A25.1) were used to assess nature conservation potential for invertebrates. A walkover survey was undertaken at the following sites with a high potential for terrestrial invertebrate habitats:

- Hare Moss;
- River Dee (SAC);
- Deeside Old Railway (DWS); and
- West Hatton (DWS);

Freshwater Macroinvertebrates and Habitats

25.2.61 A freshwater survey was undertaken to assess the general aquatic ecological health of watercourses potentially affected by the proposed scheme. Physical parameters such as discharge and the size of catchment area were used to enable efficient targeting of sampling effort and assist in the interpretation of survey data.

25.2.62 Watercourses were sampled for simple in-situ physico-chemical parameters and aquatic macro-invertebrates following standard methods outlined by Wright et al. (1984). These samples were preserved and identified to species level where possible using published keys. Diversity indices including Biological Monitoring Working Party (BMWP) (ISO-BMWP, 1979) Average Score Per Taxon (ASPT) values were calculated to provide a measure of the ecological status of each watercourse.

25.2.63 An accredited surveyor undertook River Habitat Surveys (RHS) in accordance with Environment Agency (EA) (2003) guidelines in June 2006. RHS data were used to calculate a Habitat Modification Score (HMS). The assessment of the nature conservation value of each watercourse was based on water quality, macro-invertebrate community and habitat modification. An RHS was not undertaken for watercourses that were modified to the extent that they were considered by default to be severely modified.

Fish

25.2.64 An initial walkover survey and habitat assessment of watercourses crossed by the proposed scheme was undertaken in May 2006. These initial watercourse surveys were to determine their potential to support fish, particularly salmonids and during which *in-situ* water quality measurements were also taken. Notes were made at each site describing the nature of the in-channel and riparian habitat, and in particular, any factors likely to influence resident fish populations. These data were used to undertake a HABSCORE assessment, which is a predictive tool to provide an indication of fish likely to be present based on habitats present (Appendix A25.9 Freshwater Ecology).

25.2.65 Based on this assessment, watercourses suitable for electric fishing were identified and were surveyed in September 2006. Electric fishing was aimed at providing data on what species were present in each watercourse. A further survey is planned for January 2007 during which salmon spawning habitat was identified and evaluated through the identification of salmon redds.

25.2.66 Data from the macroinvertebrate and RHS were used to augment data from these walkover surveys. Using these data and using professional judgment, the fish species most likely to be present in the watercourse were identified.

Freshwater Pearl Mussels

25.2.67 Freshwater pearl mussel surveys were carried out with an appropriate Animal Conservation Licence (No. 7255) issued by SNH under the terms and conditions of the Wildlife and Countryside Act (1981) (as amended). Surveys followed an adapted version of the standardised sampling protocol for a mussel population (Cosgrove and Young, 1998; Young et al., 2003), incorporating 100m upstream and 500m downstream of proposed crossing points. The potentially affected area was subdivided into 50m sections (ten downstream and two upstream), marked out by pacing and checked using a hand-held global positioning system (GPS) set.

25.2.68 Each 50m section was searched using glass-bottomed viewing buckets in water sufficiently shallow for safe wading. Searches were made in an upstream direction, checking all possible and favourable areas (e.g. in the shelter of cobbles or other obstructions) and were conducted from both banks in wide rivers. Loose debris and trailing weed were moved gently aside, but no disturbance of fixed substrate was undertaken. Any live mussels were counted using a standard methodology (Cosgrove and Young, 1998).

25.2.69 During the initial searches, if live mussels and/or empty shells were detected, a maximum of one standard 50m x 1m transect per section (situated at least 1m out from the riverbank) was carried out resulting in a detailed survey at most sites where mussels were detected subject to safety considerations (see survey limitations). Transects were numbered according to section (e.g. transect T1 in Section SL1). All visible mussels seen along the transect were counted with an additional five $1m^2$ quadrat counts of 'visible' and 'total' numbers of mussels also being recorded (these are the numbers of mussels observed before and after checking for concealed mussels within the complex of stones, fine sediments and weed on the river bed). The quadrat counts were positioned at 10m, 20m, 30m, 40m and 50m along each transect.

25.2.70 The presence or absence of (immature) juvenile mussels (<65mm shell length) was noted as an index of recent reproductive success and recruitment. The criteria of juveniles present are used to determine whether populations are viable or reproductively functional (Cosgrove et al., 2000).

Evaluation of Nature Conservation Value (Baseline Assessment)

25.2.71 The method for assessing the value of an ecological receptor uses all of the information collated in determining the baseline status of the resource. The ecological evaluation of a receptor is determined by reference to any designations, the results of consultations, a literature review and field surveys. The evaluation method incorporates a geographical framework where ecological receptors are assessed according to a series of criteria that are presented in Table 25.4. These criteria are based on the Ratcliffe Criteria (Ratcliffe, 1977) used in the selection of biological Sites of Special Scientific Interest (SSSI) and include size (extent), naturalness, rarity, typicality, vulnerability and position in an ecological/ geographical unit.

25.2.72 The criteria used in the ecological evaluation process include reference to the legal protection conferred on species or habitats as well as the conservation status of the receptor, such as presence on UK BAP or LBAP. These factors give rise to a level of conservation importance being assigned to species/habitats that reflects the geographical framework used in the evaluation process. Thus, for example, species such as otters and bats that are protected by international legislation, are referred to as internationally important in terms of their conservation status. Other species such as wych elm, which are identified as priority species in the NES LBAP are referred to as regionally important species.

25.2.73 The ecological evaluation of a feature or area of habitat takes into account the level of conservation importance of the species, as well as other factors such as the level of use of the habitat or feature by a species, whether the species or habitat is locally or regionally common or rare, as well as other criteria that contribute to a feature's importance. In this way, the method of evaluation provides a system that combines legislative protection on species and/or habitats and conservation parameters that all contribute to the ecological importance of the receptor.

25.2.74 Terrestrial Habitat Areas (as defined by the Phase 1 Habitat Survey –Terrestrial Habitats Report, Appendix A25.1) and Freshwater Habitat Areas (as defined by the Freshwater Report, Appendix A25.9) were used to provide a spatial framework for the assessments. In each Habitat Area, records of the species and the habitats or features used by individual species were considered to provide an overall assessment of ecological value. For all habitats and for species with home ranges that correspond with the Habitat Areas, an ecological evaluation was made per Habitat Area. For species where the home ranges cover larger areas than the Habitat Areas (e.g. badgers and otters), the ecological evaluation was made for sub-sections of the Southern Leg that represent a spatial resolution appropriate to these species.

25.2.75 The status of bird species was also used to assist in their evaluation. The Joint Nature Conservation Committee (JNCC) categorises 247 species in the UK as either Red listed (population in severe decline), Amber listed (populations in moderate decline or previously in severe decline but are recovering), or Green listed (no identified threat to their populations).

25.2.76 Evaluation criteria used to evaluate sensitivity/importance are identified in Table 25.4.

Table 25.4 – Evaluation of Ecological Receptor

Value/ Importance	Criteria
International (European)	Habitats An internationally designated site or candidate site (Special Protection Area (SPA), provisional SPA, Special Areas of Conservation (SAC), candidate SAC, Ramsar Site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area that would meet the published selection criteria for designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any river classified as Excellent A1 and likely to support a substantial salmonid population. Any river with a Habitat Modification Score indicating that it is Pristine or Semi-Natural or Obviously Modified. Species Any regularly occurring population of internationally important species, threatened or rare in the UK. (i.e. a UK Red Data Book species categories 1& 2 of UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring, nationally significant population/number of an internationally important species.
National (Scottish)	Habitats A nationally designated site (Site of Special Scientific Interest (SSSI), Areas of Special Scientific Interest (ASSI), National Nature Reserve (NNR), Marine Nature Reserve (MNR)) or a discrete area which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines). A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat essential to maintain wider viability. Any river classified as Excellent A1 and likely to support a substantial salmonid population. Any river with a Habitat Modification Score indicating that it is Pristine or Semi-Natural or Obviously Modified. Species A regularly occurring, regionally or county significant population/number of an internationally/nationally important species. Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see local BAP). A feature identified as of critical importance in the UK BAP.
Regional (North East Scotland)	Habitats Sites which exceed the County-level designations but fall short of SSSI selection criteria. Viable areas of key habitat identified in the Regional BAP or smaller areas of habitat essential to maintain wider viability. Viable areas of key habitat identified as of Regional value in the appropriate SNH Natural Heritage Future area profile. Any river classified as Excellent A1 or Good A2 and capable of supporting salmonid population. Any river with a Habitat Modification Score indicating that it is significantly modified or above. Species Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16 of 100 10 km^2 squares in the UK or in a Regional BAP or relevant SNH Natural Heritage Future area on account of its regional rarity or localisation. A regularly occurring, locally significant population/number of a regionally important species. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county.
Authority Area (e.g. County or District) Aberdeenshire/City of Aberdeen	Habitats Sites recognised by local authorities e.g. District Wildlife Sites (DWS) and Sites of Interest for Nature Conservation (SINS). County/District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR). A viable area of habitat identified in County/District BAP or in the relevant SNH Natural Heritage Future area profile. A diverse and/or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25 ha. Any river classified as good A2 or fair B and likely to support coarse fishery. Any river with a Habitat Modification Score indicating that it is significantly modified or above. Species Any regularly occurring, locally significant population of a species listed in a County/District BAP due to regional rarity or localisation. A regularly occurring, locally significant population of a County/District important species. Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. Sites/features scarce in the County/District or which appreciably enrich the County/District habitat resource.

Value/ Importance	Criteria
Local (immediate local area or village importance)	Habitats Areas of habitat that appreciably enrich the local habitat resource (e.g. species rich hedgerows, ponds). Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25 ha. Any river classified as Fair B or Poor C and unlikely to support coarse fishery. River with a Habitat Modification Score indicating that it is severely modified or above. Species Populations/assemblages of species that appreciable enrich the biodiversity resource within the local context. Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations.
Less than Local (limited ecological importance)	Sites that retain habitats and/or species of limited ecological importance due to their size, species composition or other factors. Any river classified as Impoverished D and/or with a Habitat Modification Score indicating that it is severely modified.

Qualitative Impact Assessment

25.2.77 As the assessment of impacts and mitigation development for the Southern Leg of the proposed scheme was restricted by the need to meet client programme, the assessment of potential impacts has been undertaken in a qualitative manner only. No quantification of impact magnitude or significance has been undertaken as part of this exercise. However, the general impacts on ecology and nature conservation of new trunk roads are well understood, and the impacts of the Southern Leg of the proposed scheme are discussed in generic and qualitative terms. This is intended to provide an indication of what kinds of impacts are likely to result from the scheme prior to mitigation. The impact assessment also identifies main impacts considered to have the potential for significant adverse effects.

25.2.78 Similarly mitigation is proposed in general terms only. Unlike that developed for the Northern Leg, site specific mitigation has not been formulated for the Southern Leg assessment. Standard mitigation known to be effective for road schemes is outlined. This mitigation is to be implemented across the whole scheme where appropriate and describes a general approach and guiding principles to follow that are established methods used on UK road schemes.

25.2.79 Although a detailed consideration of residual impacts cannot be undertaken in the absence of site specific mitigation, the risk associated with residual impacts remaining following successful implementation of mitigation is discussed. This identifies key areas of the scheme where species or habitat impacts are at risk of remaining at a significant adverse level following generic mitigation. Areas where species licences (i.e. otter, badger, bat) are likely to be required are also identified.

25.2.80 In the context of this risk appraisal, key areas were identified where the level of impacts on habitats and species would be likely to result in significant adverse residual impacts or anything above Negligible in terms of impacts on the site integrity of the River Dee SAC. These significant adverse residual impacts are defined in the Northern Leg as likely to be Moderate or Major in terms of definitions of the appraisal. The more stringent definition of significance for the Dee River SAC is due to the need for potential impacts to have no adverse impact on site integrity in order to satisfy the requirements for an Appropriate Assessment under the Habitats Directive, which will follow the ES.

25.2.81 Included in this discussion of main residual impacts is an exploration of potential specific mitigation that could be undertaken to further reduce residual impacts to acceptable levels. This is provided to give an indication of the risk of residual impacts that may remain significant following both generic and targeted mitigation.

Limitations to Assessment

25.2.82 In addition to the limitations described above, this section discusses other limitations to the surveys and assessment.

25.2.83 Provisional land-take figures are presented in Table 25.14 , however these figures are provisional as this habitat loss includes only the footprint of the scheme, including attenuation ponds. It does not include the area surrounding ponds that may be removed from agricultural/community use and the subsequent land-take required for mitigation.

25.2.84 The land-take calculations undertaken for ecology assessment differ from those undertaken as part of the land use assessment, owing to the different focuses of the assessments. The ecology assessment considers the value of woodland in terms of community use, whereas the land use assessment considers the value of woodland in terms of habitat value and presence of protected species.

Limitations to Survey

25.2.85 The need to comply with client programme, seasonal constraints and delays in agreeing access led to the following surveys being incomplete or not undertaken:

- Bats (remaining: hibernacula, monitoring, emergence and activity surveys scheduled to be completed in late 2006/2007);
- Breeding Birds (remaining: completion of site survey in spring 2007);
- Wintering Birds (to be carried out in winter 2006/2007); and
- Freshwater Macroinvertebrates (remaining: reporting of second sampling in September 2006).

25.2.86 These data will be reported in a series of Environmental Assessment Reports to be published in 2007.

25.3 Baseline Conditions

25.3.1 Due to the complexity of assessing the wide range of species and habitats present, the description of baseline conditions in this section is reported separately to their evaluation. The results of consultation, literature review and field survey are provided below. More detailed information, obtained through the literature review process including species characteristics and habitat requirements, is provided in the relevant technical appendices (A10.1 to A10.16). Further details of habitats and individual species distributions are provided in Table 25.4 and in Section 25.4.

Terrestrial Habitats

Consultation and Literature Review

25.3.2 SNH provided records of ancient and long-established woodlands from their Semi-natural and Ancient Woodland Inventories, and peatlands listed in the Lowland Raised Bog Inventory (LRBI).

25.3.3 Aberdeen City Council provided details of statutory and non-statutory designated sites of ecological importance including SSSI, District Wildlife Sites (DWS) and a list of NES LBAP priority habitats. The NES LBAP Coordinator confirmed locally important species and priority habitats.

25.3.4 The NESBReC provided Phase 1 Habitat Survey results undertaken by the Scottish Wildlife Trust in 1992 to 1997 and 2002 and a plan showing DWS and the results of the Grampian Natural Habitat Survey undertaken in 1988.

25.3.5 The Forestry Commission provided data about forest/woodland areas and their management.

Designated Areas

25.3.6 The River Dee (including some of one of its tributaries, Crynoch Burn) is designated as a SAC under the European Union Habitats Directive 1992. It is a high quality watercourse, comprising of 2446.82ha supporting rare species including Atlantic salmon, otter and freshwater pearl mussel (which form the qualifying species for the SAC). It also supports brown and sea trout, brook and

sea lamprey and various wetland bird species. The River Dee Valley is also designated as a SSSI and a DWS.

25.3.7 Cleanhill Wood and Kingcausie is a Study of Environmentally Sensitive Area (SESA),

25.3.8 Deeside Old Railway DWS includes crubland, grassland and woodland that have become established along the disused railway track. It has become a very valuable linear habitat linking the built up area with the surrounding countryside.

25.3.9 Guttrie Hill Wood and Culter House Woods DWSs are long-established coniferous woodlands of plantation origin on the AWI.

25.3.10 Rotten O'Gairn DWS is a small area (approximately 1.7 ha) of wet grassland with willow scrub and mire. This is a relatively small, but good wetland site supporting a variety of marsh plants. There is a further 0.6 ha of dry unimproved grassland to the northwest of the site, although this has not yet been incorporated within the DWS boundary.

25.3.11 Moss of Auchlea DWS, is a small area of rush pasture of approximately 6 ha that is crossed by the Silver Burn. It is suffering inundation by birch and willow scrub but the site supports a range of wetland plants.

25.3.12 West Hatton Woods DWS is a small area of open woodland with rowan, oak and beech. The ground flora comprises acid grassland with woodland and heathland plants. Wet areas and an overgrown pond are present within the woodland supporting a limited diversity of wetland plants.

25.3.13 A number of woodlands throughout the study area are listed on the Ancient Woodland Inventory (AWI). None are of semi-natural origin but are long-established of plantation orgin. They are found at the following locations: Geenhowe, Sunnyside, Clochandighter, Greenloaning, Whitestone, Hill of Blairs, Cleanhill, Kingcausie, Durris, Camphill, Milltimber, Culterhouse, Guttrie Hill, Gairnhill, Kingshill, Silverburn and West Hatton.

25.3.14 Maps showing sites designated for their conservation value. These areas are presented in Figures 25.1a-c and are discussed in further detail in the Terrestrial Habitats section and Appendix A25.1.

25.3.15 Habitat types include boundary and linear features, arable and horticultural land, improved grassland, fen, marsh and swamp, coniferous woodland and broad-leaved, mixed (and yew) woodlands.

25.3.16 Several priority UK BAP habitats are present in the study area, including lowland heath, lowland raised bog, cereal field margins, lowland meadows, wood-pasture and parkland, and wet woodland. The NES Biodiversity Audit identified that Aberdeenshire holds 44 listed habitats. The habitats are well represented in NE Scotland in a UK or Scottish context. Those of relevance to the study area are planted coniferous woodlands, acid grassland, lowland raised bogs and fens. In addition, six locally important habitats were identified. Of these, four are relevant to the study area: scrub, riparian woodland, birch woodlands and serpentine grassland/heath mosaic. Birch woodlands and serpentine grassland/heath mosaic are considered to be of national significance.

25.3.17 The NES Biodiversity Audit identified that Aberdeenshire holds approximately 309 listed species. UK BAP and NES LBAP Priority species include the red squirrel, otter, freshwater pearl mussel (*Margaritifera margaritifera*), river and brook lamprey (*Lampetra fluviatillis* and *L. planeri*) and water vole (*Avicola terrestris*). Several bird species also are national and local priority species, including the bullfinch (*Pyrrhula pyrrhula*), linnet (*Perdix perdix*), song thrush (*Turdus philomelos*), and skylark (*Alauda arvensis*). An NES LBAP stonefly (*Brachyptera putata*) was also recorded by SEPA during routine monitoring of the River Don between 1980 and 2003.

25.3.18 Additional NES LBAP Priority and locally important species include Daubenton's bat (*Myotis daubentonii*), wych elm (*Ulmus glabra*), kingfisher (*Alcedo atthis*), goldeneye (*Bucephala clangula*) and yellowhammer (*Emberiza citronella*).

Field Survey

25.3.19 The following paragraphs briefly describe the main habitats found along the route corridor, with Habitat Area numbers given in parentheses, with a summary in Table 25.5 and presented on Figures 25.3a-g. The description is from south to north following the route corridor and reported in the route sections (referenced by chainage in paragraph 25.1.5) for clarity. More details are provided in the Terrestrial Habitat report in Appendix A25.1.

Section SL1

25.3.20 Although generally dominated by agricultural fields bounded by dry stone walls, this section contains a number of different habitats. Woodland is extensive, primarily consisting of conifer plantation at Blue Hill (S3) Greenhowe (S6) which is on the Ancient Woodland Inventory as long-established of plantation origin) and Duff's Hill (S7). These plantations contain semi-improved mesotrophic grassland within rides and surrounds.

25.3.21 Modified raised bog communities are present at Hare Moss (S10) and to the south of Greenhowe Wood (S4) (on the AWI as above). Wet modified bog is the dominant community in both areas. However, both also contain elements of dry modified bog in raised areas, grading to swamp in wetter areas. Willow (*Salix* sp.) and birch (*Betula* sp.) are present, as dense carr and scattered trees/shrubs. Marsh is generally associated with the margins of the bogs.

Section SL2

25.3.22 Fields containing improved grassland with stone wall boundaries comprise the majority of this section. To the west, many of these fields become dominated by dense gorse scrub. Woodlands are a feature of this section. Clochandighter Wood (S14) is a large conifer plantation, the northern half of which has been felled. Pine and spruce dominate the canopy, with dry heath present in the fire breaks and below less dense areas of woodland.

25.3.23 Greenloaning Wood (S12) (AWI as above) spans a wet birch plantation in the west and a more semi-natural birch plantation to the east. Sunnyside Wood (S11) (AWI as above) in the south is another example of birch plantation woodland, although this is tending to semi-natural in the west.

25.3.24 Hill of Blairs (S15) (AWI as above) is a complex mosaic of communities dominated by plantation woodland. The wood is dominated by broad-leaves to the north, whilst conifers predominate to the south. Bracken and gorse communities are extensive and connect to the agricultural fields below the area. Heathland dominates much of the eastern area and is also present as ground flora under the conifer plantation. A wetter area of basin mire is present in a clearing of the plantation. The plantation connects to the conifer plantation of Whitestone Wood (S15) (AWI as above), which is adjacent to the mature Cleanhill Wood (AWI as above) lodge pole pine, Scots pine plantation.

Section SL3

25.3.25 The south of this section is dominated by woodland, while, in the north, agricultural fields are the prime features. Major plantations of Cleanhill Wood (S20) and Durris Forest (S18) (both on the AWI as long-established woodland of plantation origin) although Durris Forest is largely outside of the study area of the proposal) are the dominant features. Cleanhill Wood is dominated by Scots pine (*Pinus sylvestris*), with a border of Sitka spruce (*Picea sitchensis*). Under the Scots pine, dry heath and acid grassland is the dominant ground flora; however, the invasive species, rhododendron (*Rhododendron ponticum*), becomes more dominant in the shrub layer to the north, lining the burns and crossing over to dominate the shrub layer in Kingcausie (S24). Semi-natural woodland around Kingcausie (S24) and Cleanhill (S20) are both on the AWI (as above) in addition to their SESA status. They are derived from plantation, but have developed a ground flora with ancient woodland indicators and a structure including shrub layer.

25.3.26 Herb Paris (*Paris quadrifolia*) has been previously recorded in this area (1987, NBN Gateway, and since the 18th Century, (Mr David Welch BSBI Recorder pers. comm.)). Although not a protected or

Biodiversity Action Plan species, it is rare in the region. At the time of survey, the marshy area in the woodland where the species was previously recorded appeared to be drying out and no stems of herb paris were recorded. A later survey in 2006 by Mr Welch also reported a dramatic reduction in the population. For the purposes of this assessment, however it is assumed to be present at the previously cited area.

25.3.27 Semi-natural woodland (AWI as above) is found within the Camphill Estate (S30) and the District Wildlife Site of the Deeside Old Railway (S31).

25.3.28 The banks along the Crynoch Burn (S22), which is part of the River Dee SAC, are divided into marsh and wet grassland in the south through to semi-natural riparian woodland in the north. To the west of the burn, parts of the banks have been developed into a children's theme park. The Blaikiewell Burn (S22) grades from wet birch wood and marsh in the upper levels to flood-plain mire in the lower areas. The banks of the River Dee SAC (S28) split into wet willow/alder carr in the west, mesotrophic grassland on a wide floodplain in the northeast and a steeply sloping woodland in the southeast.

25.3.29 The invasive species, Japanese knotweed (*Fallopia japonica*), was found close to the agricultural fields of Kingcausie (S23) and within the northern bank of the Crynoch Burn (S22).

Section SL4

25.3.30 In the south, amenity grassland with plantation dominates in the west, whilst the east is the built-up area of Milltimber (S33). This gives way to wall-lined improved grassland fields with frequent scrub. Scots pine plantations (AWI as above)are connected to these fields, notably at Guttrie Hill (S34) and Milltimber Wood (S35) (AWI as above). A linear series of wooded habitats are present, emanating from Upper Beanshill (S37).

25.3.31 In the northern area of this section, lowland dry heath and acid grassland are present (S39), dominated by heather (*Calluna vulgaris*) and wavy-hair grass (*Deschampsia flexuosa*), respectively. The increased presence of heather suggests the western portion of the northern area is more of a heathland complex than the eastern, which appears to have a higher grazing intensity. Scattered gorse and broom scrub (*Cytisus scoparius*) occurs across these habitats.

Section SL5

25.3.32 Conifer plantation woodland dominates the south and east of this section. Gairnhill Wood (S43) (AWI as above) is dominated by Scots pine with an acid grassland flora underneath. However, certain areas contain thick plantations of Sitka spruce or Scots pine, under which no ground flora has developed.

25.3.33 Kingshill Wood (S43) (also AWI) is a complex plantation. Scots pine is dominant overall, but the wood is divided into a number of different compartments. Under the Scots pine and larch (*Larix europaea*) compartments, an acid grassland/dry heath flora has developed, whilst the ground flora is largely absent from spruce and western hemlock (*Tsuga heterophylla*) areas. Beech (*Fagus sylvatica*) is particularly abundant around the edge and to the south where, in some cases, a semi-natural character has begun to develop. In a clearance, a marshy grassland community has developed with a willow wood beginning to develop in close proximity.

25.3.34 Silverburn wood (S41) (also AWI) is a small coniferous plantation woodland contiguous with the scrub and riparian habitat of Rotten O' Gairn DWS (S42). Silver Burn runs through this DWS which is largely marshy grassland with scattered scrub which currently links Silverburn Wood and Kingshill Wood.

25.3.35 The main area of semi-natural woodland occurs within Moss of Auchlea (S45). This is a wet woodland, dominated in the centre by a willow community and surrounded by birch woodland. Wet grassland tends to dominate underneath. However, where the water table is at the surface, swamp has developed. *Sphagnum* occurs in some areas of the wood.

25.3.36 Across the west and north, this section is dominated by agricultural fields. Dry stone walls provide a boundary to many of these fields. This can increase conservation value by providing refuges to shade-loving plants and shelter for fauna, whilst connecting to more valuable habitats, such as woodland and wetland. Wetland is present in the form of marshy grassland across the wetter fields in the south of this section.

Section SL6

25.3.37 The majority of this section is dominated by improved grassland, though the majority of these are bounded by dry stone walls thereby increasing its value.

25.3.38 Cloghill (S48) is largely composed improved grassland with numerous rocky outcrops and farm tracks. A large block of semi-improved grassland within the centre comprises of primarily mesotrophic grassland flora. Around areas on thinner soils and in the vicinity of rocky outcrops, an acid grassland flora has developed.

25.3.39 The linear woodland of West Hatton Wood (S47) (AWI-listed) is comprised of a semi-natural mix derived from plantation. The value of this wood is further enhanced by connections with mixed plantation on Cloghill (S48) via scrub communities and dry stone walls.

Table 25.5 – Terrestrial Habitat Descriptions

Section	Feature	Ecological Habitat Area	Features of value
SL1	Hatton Wood	S1	Small broad-leaved woodland plantation or recent origin, of local ecological interest
	Agricultural fields west of the A90	S2	A series of largely improved fields, many of which have boundaries of dry stone walls.
	Blue Hill Wood	S3	Extensive dense gorse scrub merging into a bracken/conifer plantation (LHAP) assemblage. A pond is present within a disused quarry where UK BAP wet woodland willow carr and LHAP marshy grassland has begun to develop.
	Bog south of Greenhowe	S4	Degraded bog habitat of not greater than local value due to small size and damaged condition with little potential for improvement.
	Agricultural fields south of Greenhowe	S5	Dominated by large arable and improved fields, this area also contains a drain-associated marshy grassland with influence of bog species. A woody element is provided by conifers to the south of un-named farm buildings. Japanese knotweed is present.
	Greenhowe	S6	AWI-listed young coniferous plantation with broad-leaved edges and occasional blocks. A patch of marsh and a pond with surrounding wet grassland is present. Listed on the AWI.
	Duff's Hill	S7	Dense pine plantation.
	Agricultural fields west of Duff's Hill	S8	Series of improved, poor semi-improved and arable fields.
	Wood west of Greenhowe	S9	Young spruce plantation with little ground flora, plus other habitats of low value. Semi-improved acid grassland with scrub and a small semi-natural broad-leaved woodland are also present.
	Hare Moss	S10	Extensive area of lowland raised bog, a priority habitat in the UK BAP. Hare Moss is an important component of a network of sites in the region and integral to the viability of the region's habitat resource.
SL2	Sunnyside Wood	S11	Plantation birch/ rowan woodlands listed on the AWI
	Greenloaning Wood	S12	Wet birch woodlands plantation listed on the AWI.
	Agricultural fields around Sunnyside to Causeyport	S13	A series of improved and horse-grazed semi-improved fields.
	Clochandighter Wood	S14	Mature conifer plantation woodland dominated by lodgepole pine and spruce. Dry heath dominates the rides and under much of the plantation. Listed on the AWI
	Whitestone Wood and Hill of Blairs	S15	Series of biodiverse habitats including AWI-listed mature conifer plantation with species rich ground flora, areas of dry heath, wet heath (both of which are UK BAP Lowland Heathland) and mire (UK BAP Fen).
	Agricultural fields to the east of Burnhead to Greenloaning	S16	Improved grassland with marshy grassland, trees and hedgerows, plus dry stone walls.
	Agricultural fields to the east of Cleanhill Wood	S17	Improved grassland fields with broad-leaved avenue.
SL3	Durris Forest	S18	Large expanse of AWI-listed plantation woodland. Dry heath is often associated with the paths through the wood.
	Blaikiewell Farm	S19	Horse-grazed semi-improved fields lined with shrubs approaching hedgerows. An arable field is also present.

Section	Feature	Ecological Habitat Area	Features of value
	Cleanhill Wood	S20	AWI-listed mature conifer plantation (LHAP) with significant amounts of semi-natural broad-leaved woodland. The ground flora can be species rich. However, rhododendron can also be extensive. The area is a SESA
	Agricultural fields below Parkhead	S21	Series of arable and improved fields with shrubs and trees.
	Floodplain and immediate surrounds of Crynoch Burn (north) & Blaikiewell Burn	S22	Semi-natural broad-leaved woodland lines much of the River Crynoch. Japanese knotweed is present. Blaikiewell Burn supports the UK BAP Fen community.
	Agricultural fields within Kingcausie	S23	Predominantly improved grassland with occasional trees and shrubs. The area also contains ancient hedgerows (UK BAP habitat) and a small broad-leaved plantation located close to LHAP swamp and UK BAP wet woodland. The area is a SESA. Contains the LBAP species wych elm.
	Kingcausie	S24	A number of different habitats dominated by AWI listed woodland. The area is a SESA., contains the LBAP species wych elm and LBAP habitat of Lowland Wood Pasture and Parkland.
	Caravan Park	S25	Caravan Park with amenity grassland and scattered trees and shrubs.
	Old Mill Inn and agricultural field surrounds	S26	Agricultural fields with well-vegetated field drain.
	Agricultural fields south of the River Dee	S27	Improved fields with UK HAP veteran boundary trees and wooded pockets. Contains the LBAP species wych elm.
	Floodplain and immediate surrounds of the River Dee	S28	The River Dee is a SAC, SSSI and DWS. The Area also contains UK BAP wet woodland. Contains the LBAP species wych elm.
	Agricultural fields south of Milltimber	S29	Agricultural fields with little ecological value
	Camphill School	S30	Mostly amenity grassland and new buildings the conservation value is increased by the presence of semi-natural woodland.
	Deeside Old Railway	S31	DWS comprising of a tree-lined former railway track with various semi-natural habitats.
SL4	Peterculter and western Milltimber	S32	Amenity grassland with wooded habitats. The conservation value is raised by the presence of a short UK BAP ancient hedgerow.
	Milltimber	S33	Built up area with occasional trees.
	Guttrie Hill	S34	Conifer plantation woodland with abundant broadleaves and a well-developed ground flora. This wood is a DWS and listed as an AWI
	Milltimber Wood	S35	AWI-listed Scots pine plantation with birch surround. Much of the woodland has now been felled.
	Agricultural fields around Nether Beanshill	S36	Agricultural fields with shrubs, walls, small pockets of woodland and shelter belt.
	Woodland from Hill Farm to Westfield Lodge	S37	Linear wooded structure comprising of conifer plantation, scrub and small amounts of semi-natural woodland.
	Beans Hill south	S38	Improved fields with gorse scrub and walls.

Section	Feature	Ecological Habitat Area	Features of value
	Beans Hill north	S39	Heath (UK BAP Priority Habitat) and acid grassland mosaic dominates this area. Acid grassland is particularly dominant, though dry heath increases in abundance in the south west. Gorse is scattered occasionally around the area. Wall enclosed sheep grazed improved grassland is dominant to the east with occasional trees.
SL5	Agricultural fields around Silverburn	S40	Improved fields with marshy grassland stemming from the Silver Burn LHAP.
	Silverburn Wood	S41	Adjacent to Rotten O' Gairn DWS, plantation woodland with other plantation close by but not connected.
	Agricultural fields to the east of Silverburn Wood	S42	Rotten O' Gairn DWS species rich marshy grassland
	Gairnhill and Kingshill Wood	S43	AWI-listed plantation conifer woods with dry heath below.
	Agricultural fields to the west of Kingshill Wood	S44	Agricultural fields with walls.
	Moss of Auchlea	S45	District Wildlife Site. UK BAP wet willow/birch woodland with species rich ground flora in places, including swamp.
SL6	Agricultural fields to the north of the A944	S46	Improved and poor semi-improved fields with wall surround and frequent shrubs.
	West Hatton Wood	S47	District Wildlife Site of relatively open AWI-listed woodland, with semi-natural characteristics.
	Cloghill	S48	Mosaic of communities dominated by low value improved grassland bordered by stone walls linking coniferous woodland and dense scrub. Rich mesotrophic grassland with acid characteristics (Species rich Grassland LHAP) with UK BAP lowland dry acid grassland present.

Badger

25.3.40 Badgers (*Meles meles*) and their setts are legally protected by the Protection of Badgers Act (1992), the Nature Conservation (Scotland) Act (2004) and through inclusion in Schedule 6 of the Wildlife Countryside Act (1981). Through these Acts they are legally protected from intentional or reckless cruelty, such as badger-baiting and from the results of lawful human activities, such as housing, road or other developments. Badgers are afforded protection from wilful or attempted killing, injuring and interference with a badger's sett.

Consultation and Literature Review

25.3.41 Badger sett and RTA locations within the study corridor were supplied by Grampian Badger Survey (Mike Harris, Grampian Badger Survey, personal communication) and NESBReC. An independent report to Aberdeen City Council was also made available (Harris, 1997).

25.3.42 Where the study corridor crosses existing roads, and for the period from 1992 to 2004, four badger RTAs were recorded on the A90, 11 on the B9077, two on the A944, three on the B977 and two on unclassified roads. Full details on the locations of these records are provided in Appendix A25.2.

25.3.43 Badger setts were located through a combination of consultation and survey. These locations have informed the subsequent impact assessment and have been provided as a confidential report to SNH. Due to the risk of badger baiting and snaring, this information is not published within the ES.

Field Survey

25.3.44 Badgers were found throughout the study area. Setts were found in each of the six route sections for the Southern Leg (Table 5, Appendix A25.2, Badger Report). The greatest density of badgers was in the vicinity of Kingcausie, Cleanhill, Gairnhill and Kingshill Woods. This is likely to be due to the suitability of the area for sett making (i.e. the availability of vegetative cover, sloping ground and little human disturbance). The area offers shelter and foraging opportunities as well as ready access to foraging in adjacent pasture and arable land. The area provides a secure commuting environment for social groups through its links to other woodlands in the area.

25.3.45 A total of 11 social groups were identified during the survey and were present throughout the survey corridor. All areas of rural land are likely to be used either for shelter (location of setts), foraging or for commuting between setts and foraging areas, with the A90, River Dee and the A944 forming barriers to badger movements.

25.3.46 Land adjacent to the River Dee offers the most suitable foraging habitat where pasture soils are rich in alluvium and likely to have high densities of earthworms. Land around Kingshill/Gairnhill Woods and the Kingcausie Estate offers the most suitable sett forming habitat although the pasture fields around these woodlands are likely to be less productive than in the river floodplain. Land north of the River Dee contains a mixture of woodland and pasture offering a combination of foraging and sett-making habitat. Land south and east of Kingcausie generally has fewer areas of woodland, but offers some extensive areas of pasture foraging habitat.

Bats

25.3.47 All British bat species and their roosts are protected under Annex IV of the Habitats Directive (transposed as Schedule 2 of the Conservation (Natural Habitats & c.) Regulations 1994) and Schedule 5 of the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act 2004, the UK ratification of the Bern Convention (1979. This affords bats protection against intentional or reckless killing, injuring or taking or damage, destruction or obstruction of roost sites. By law, a roost is any structure or place used for shelter or protection.

25.3.48 Prosecutions for unlawful killing or injuring of bats may result in a fine of up to £5000 per bat and a possible jail sentence. As bats tend to reuse the same roosts, the roost is protected whether the

bats are present or not. Bats (with the exception of the common pipistrelle) are protected through the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention 1992). The Agreement on the Conservation of Bats in Europe (EUROBATS) came into force in 1994.

Consultation and Literature Review

25.3.49 Five bat species have been reported breeding in Aberdeenshire (Ms Isobel Davidson, Aberdeen Bat Group, personal communication):

- Common pipistrelle bat (*Pipistrellus pipistrellus*);
- Soprano pipistrelle bat (*Pipistrellus pygmaeus*);
- Brown long-eared bat (*Plecotus auritus*);
- Daubenton's bat (*Myotis daubentonii*); and
- Natterer's bat (*Myotis nattereri*).

25.3.50 The NESBReC and the University of Aberdeen provided no recent data for the survey area, although Aberdeen University have published a number of scientific papers from the area (Rydell et al., 1994). Four roosts were identified in Milltimber, two of which are within the study area. Numerous roost sites were identified in Peterculter.

25.3.51 The Aberdeen Bat Group carried out a dusk and dawn survey on Kingcausie Estate at the end of June 2006. They recorded common pipistrelle along the track between Dalfogart Lodge (NO 863990) and the farm buildings (NO 866 999) and near a small fire pond (possibly NO 875 996). Daubenton's and soprano pipistrelle bats were also recorded.

25.3.52 Ten of the 60 known Daubenton's bat maternity roosts in Britain are known to be located in the Deeside and Donside Valleys (Racey, undated). While the proportion of the Dee Valley to be affected by the proposed scheme is relatively small and many of the known roosts are likely to be outside the study area, the Dee is considered to be an important resource for this species.

25.3.53 There have been isolated sightings of Nathusius' pipistrelle near Aberdeen and Leisler's bats have been recorded foraging near Peterculter although the status of these species is currently unclear (Mr Rob Raynor, SNH, personal communication).

Field Survey

25.3.54 The following provides a summary of baseline conditions with respect to bats in the vicinity of the proposed scheme, more details can be found in Appendix A25.3.

25.3.55 Bat numbers were variable along the route, reflecting the suitability of the habitat. The total numbers of bats recorded and bat activity was observed to be highest in the centre of the study area around the River Dee, Kingcausie Estate and Milltimber. The lowest numbers of bats were recorded in the easternmost parts of the study area. The bat survey results for Sections SL1 – SL6 of the Southern Leg are shown in Figures 25.4a-h.

Section SL1

25.3.56 Section SL1 contains ten Habitat Areas and is characterised by several areas of largely plantation woodland, with smaller areas of broad-leaved and semi-natural woodland, areas of swamp/marsh and marshy grassland and small water bodies which provide the best foraging potential. Areas of improved and semi-improved grassland are interspersed between the above habitats. Linear features include woodland edges/rides, roads, tracks and stone walls. A total of 27 bat passes were recorded within this section, all of which were from common and soprano pipistrelles. This represents the lowest level of bat activity over the Southern Leg. Bats were observed foraging at Hare Moss, the woods west of Greenhowe, agricultural fields west of Duff's Hill, Duff's Hill,

Greenhowe, agricultural fields south of Greenhowe, the bog south of Greenhowe, wood/scrub mosaic east of Greenhowe, and Hatton Wood. Commuting bats were recorded near Duff's Hill and Hatton Wood. A small pipistrelle roost was identified in a barn at Lochview and another roost was identified in a building at Mains of Charleston during day surveys. One potential tree roost and 18 potential building roosts were also identified.

Section SL2

25.3.57 Section SL2 contains seven Habitat Areas and is characterised by extensive areas of semi-improved and improved grassland, with some marshy grassland, scrub and woodland areas of woodland including broad-leaved and native species. Several waterbodies, burns, pools and ditches are also present. The highest value foraging habitat is in the west of the section. A total of at least 221bat passes (may be more as large numbers are uncertain due to the speed at which they pass) from three species (common and soprano pipistrelles and brown long-eared bats) were recorded in Section SL2. Over 200 passes were from bats foraging, mostly in the westernmost parts of the section around Hill of Blairs, Clochandighter, Whitestone Wood and Greenloaning Wood where the highest value foraging and commuting habitat including tree and scrub-lined roads and woodland edges exists. Section SL2 forms a part of wider high value habitat for bats, which lies to the northwest, north and northeast of the study area. No confirmed roosts were identified, although 20 buildings and six areas where individual trees or groups of trees have been identified as having potential for use as roosts.

Section SL3

25.3.58 Section SL3 contains 15 Habitat Areas and is characterised by extensive areas of broad-leaved and conifer plantation and semi-natural woodland interspersed with improved and semi-improved grassland, arable fields and grazed parkland. This includes important water features such as the River Dee, Crynoch Burn, Blaikiewell Burn and several minor burns/ditches and ponds at Glenburnie and Kingcausie. A total of at least 1059 bat passes from common and soprano pipistrelles, Natterer's, and Daubenton's bats were identified in this section. Brown long-eared bats were also observed during emergence surveys at Rumlins Fauld. MBEC reported sightings of two Leisler's bats on a single occasion in July in this section but have not been recorded since despite subsequent survey effort. Bat foraging activity was recorded throughout Kingcausie, along the River Dee, Crynoch Burn and Storybook Glen, the Camphill Estate and Deeside Old Railway. Commuting routes were also identified along linear features within the Kingcausie Estate, along Crynoch Burn and the River Dee and along the B979. The Deeside Old Railway is also likely to be a commuting route. MBEC surveyors reported sightings of two Leisler's bats on a single occasion in July in this section. These bats have not been recorded since despite subsequent survey effort.

25.3.59 This section includes ten building roosts in Red Tile Lodge, Storybook Glen, the house adjacent to Eastland Bridge, Eastland House and Cottage, Rumlin's Fauld, the Coach House, the Old Mill Inn, Witiko and Camphill House); two of which are anecdotal; and one tree roost. A further 16 properties/buildings and four culverts/bridges within this section have been identified as having potential for roosting. Many trees in the section, particularly within Kingcausie, have also been identified as having high roost potential. The presence of large numbers of several species of bats, possibly including the rare Leisler's bat, indicates the high value of the habitats for roosting, commuting and foraging, and is likely to maintain populations of a number of bat species.

Section SL4

25.3.60 Section SL4 contains eight Habitat Areas and is characterised by a large residential area with surrounding gardens and woodland at Milltimber. The north of this section is characterised by grazed and arable fields with some rougher scrub. Linear features such as dry stone walls, hedgerows, shelter belts, tracks and gorse lined field boundaries are abundant in this part of the section. A number of small burns and field drains exist. At least 430 bat passes were recorded in this section of which all were from common and soprano pipistrelles aside from one brown long-eared bat, recorded emerging from a roost. Foraging, commuting and social behaviour were recorded throughout Milltimber and along tree lined roads and tracks nearby. Potential commuting

routes were also identified along the field edge running east to west from Bloomfield and along the road adjacent to Hill Farm.

25.3.61 Seven roosts were identified during daytime and evening surveys at West Lodge, Culter Lodge, Bloomfield, Beanshill House, Airy Park Lodge, Upper Beanshill and a mixed pipistrelle and brown long-eared roost at the International School. A further two roosts were identified by the Aberdeen Bat Group (Ms Isobel Davidson, Aberdeen University, personal communication). In addition, 13 buildings and many trees within and near to Milltimber were also identified as having roost potential.

Section SL5

25.3.62 Section SL5 contains six Habitat Areas and is dominated by a mixture of arable/grazing fields, as well as conifer and broad-leaved woodland. Silver Burn is situated in the south of this section and has associated woodland/wet woodland and marshy habitat suitable for foraging bats. A total of at least 114 bat passes were recorded within Section SL5, the majority of which were common and soprano pipistrelles, although brown long-eared bats were also recorded. Of these, 104 were foraging and social calling bat passes centred around high value foraging habitats at Silverburn, Kingshill and Gairnhill Woods and Moss of Auchlea. Commuting routes were identified along the Silverburn Road, the track alongside Kingswells Wood, minor tracks within Gairnhill and Kingshill Woods, the track to Moss of Auchlea and the track past Ben View. Potential commuting routes include the access track to Moss-side of Auchlea and the access road/track from Tigh na Bruaich to the A944.

25.3.63 Four roosts at Silverburn House, Ard Na Moine, Moss Side of Auchlea and Back Hill of Brodiach, and a further 14 potential roosts, have been identified in this section. Three areas within the section contain trees with high roost potential. These are within Gairnhill Wood, along the road edge north of Silverburn House and in the woodland to the south of Gairnhill Wood.

Section SL6

25.3.64 Section SL6 contains 12 Habitat Areas and is characterised by extensive areas of arable and pasture farmland with low inherent value to bats. This section is bordered by shelterbelts of mature mixed trees and fragments of mature broad-leaved and mixed woodland of higher value, including West Hatton Wood and Fairley Home Farm Wood. An extensive area of conifer plantation woodland and gorse scrub exists at Brimmond Hill. A total of at least 143 bat passes were recorded within Section SL6, the majority of which were from common and soprano pipistrelles, although Daubenton's, Natterer's and a brown long-eared bat were also observed foraging. Of these passes, 138 were foraging bat passes and five were commuting bat passes. Foraging activity was centred along West Hatton Wood, Fairley Home Farm wood and shelterbelts. Commuting routes were identified along the edges of West Hatton Wood, along the shelterbelts at Cloghill and Dykeside and at farm access tracks near Fairley Home Farm.

25.3.65 Daytime surveys revealed the presence of ten roosts in this section of which three are in buildings (The Coach House, Fairley Home Farm and Derbeth Farm). Seven were identified in trees during previous surveys undertaken in 2004 and are considered to be small roosts belonging to pipistrelle bats, brown long-eared bats and Myotis species, all of which are located in the shelterbelts and mature trees north of Fairley Home Farm and south of Hillhead of Derbeth. A further six potential building roosts and many potential tree roosts were identified, with the large residential area at Kingswells is likely to be an important roosting area for pipistrelles.

25.3.66 The total number of bat passes recorded within Section 6 is at least 143. The majority of these were made by common and soprano pipistrelles. Of these passes at least 116 were recorded during the 2006 survey period and 27 were recorded during the 2004 survey period. The majority of passes observed were foraging passes; 5 commuting bat passes were recorded along the tracks and field boundaries at Hillhead of Derbeth and West Hatton Wood. Natterer's bats were also recorded foraging constantly at the same time as soprano pipistrelle but the number of passes recorded is a combination of the two species. Brown long-eared bats were recorded foraging in 2004 and 2006 at Fairley House and near West Hatton Wood.

Breeding Birds

25.3.67 The Birds Directive (1979) provides full protection for all Annex I species and their habitats, listing species that may be conditionally hunted in Annex II and III. Under the Wildlife and Countryside Act (1981) (as amended) all wild birds, their nests and eggs are protected. However, game birds are not included in this definition (except for limited parts of the Act, Schedule 2) and are covered by the Game Acts, which confer protection during the closed season. Schedule 1 birds that may be present along the route include the fieldfare (*Turdus pilaris*), kingfisher (*Alcedo atthis*), barn owl (*Tyto alba*) and osprey (*Pandion haliaetus*).

Consultation and Literature Review

25.3.68 SNH did not provide any records of breeding birds in their consultation correspondence. Consultation with the Royal Society for the Protection of Birds (RSPB) confirmed that there are no RSPB nature reserves within or adjacent to the proposed scheme study area.

25.3.69 Scottish Ornithologists' Club (SOC) and the RSPB are jointly involved in a five-year project to produce a Breeding Bird Atlas for Aberdeenshire in 2006. Records of confirmed, possible and probable breeding bird species were available for some areas within the route corridor. However, survey data were not obtained from SOC and the RSPB for the following reasons:

- the data were not of sufficient detail in terms of the location of bird species for an EIA (the survey resolution was too large); and
- data derived from SOC/RSPB and Jacobs surveys were incompatible due to data collation differences. SOC/RSPB used the Brown and Shepherd (1993) method for surveying upland breeding wader populations, but Jacobs surveyors used the CBC methodology.

Field Survey

25.3.70 The following results are derived from an incomplete survey due to land access issues and seasonal constraints (see paragraph 25.2.85). However, enough data were obtained from survey and incidential observations to give a provisional characterisation of bird interest in the vicinity of the Southern Leg. More details are provided in Appendix A25.4.

25.3.71 Sixteen SOVs were identified in the study area, within or adjacent to the proposed route corridor:

- Blue Hill (S2 and S3);
- Hare Moss (S10);
- Heatherknowe (F11);
- South Greenloaming (S15);
- Hill of Blairs (S15);
- Burnhead (S19 and S20);
- Blaikiewell Burn (S22);
- Cleanhill Wood (S20);
- Crynnoch Burn (S22, S24 and S27);
- River Dee (S27 and S28);
- Deeside Old Railway (S31);
- Beanshill (S39);
- East Silverburn (S42);
- Gairnhill/Kingshill Wood (S43);
- Moss of Auchlea (S45); and

- West Hatton Wood (S42).

25.3.72 These data are presented in (Figures 25.6 a-f) and account for approximately 22% of the total study area. Three of SOVs (Blue Hill, Hare Moss and West Hatton Wood) were previously surveyed in 2004.

25.3.73 Twelve Quadrats were also surveyed:

- Quadrat SL-Bb01 Marywell (S2 and S5);
- Quadrat SL-Bb02 Charleston (S2);
- Quadrat SL-Bb03 Duffs Hill (S6, S7 and S9);
- Quadrat SL-Bb04 Jameston (S10 and S13);
- Quadrat SL-Bb05 Merchants Croft (S15);
- Quadrat SL-Bb06 Kirkton of Maryculter (S19 and S20);
- Quadrat SL-Bb07 Storybrook Glen (S21, S22, S23);
- Quadrat SL-Bb08 Milltimber (S29, S30,S31,S32 and S33);
- Quadrat SL-Bb09 Contlaw (S36 and S37);
- Quadrat SL-Bb10 Moss of Auchlea (S39 and S40);
- Quadrat SL-Bb11 Westfileld Lodge (S44); and
- Quadrat SL-Bb12 Kingswells (S46, S47 and S48).

25.3.74 A total of 12 Quadrats were surveyed in the Southern Leg study area, within or adjacent to the proposed route corridor (Figures 25.6 a-f) and account for an equivalent of approximately 22% of the survey corridor area. Five of the Quadrats (SL-Bb01 to SL-Bb04 and SL-Bb12) were previously surveyed in 2004.

25.3.75 In total, 24 key bird species were recorded throughout the study area. Three of the species were CWA1i status (barn owl, kingfisher and osprey) which were recorded within or adjacent to the route corridor at Greenloaning and Moss of Auchlea, River Dee and Loirston Loch, respectively. Seven were of JNCC Red List/UK BAP status and 14 were JNCC Amber List status including curlew (*Numenius arquata*) and lapwing (*Vanellus vanellus*), which are additionally LBAP status.

Table 25.6 – Records of Key Bird Species (ordered by status)

Species	Scientific Name	Status	Location/Description
barn owl	*Tyto alba*	WCA1i, JNCC Amber list, LBAP	Recorded in flight at Greenloaning, approximately 500 m north of Clochandighter Wood and flying from Kingshill Forest to Moss of Auchlea across the proposed route corridor.
kingfisher	*Alcedo atthis*	WCA1i, JNCC Amber list	Recorded feeding on the River Dee south of Camphill, west of the current road bridge (note that surveys confirmed breeding east of the bridge).
osprey	*Pandion haliaetus*	WCA1i, JNCC Amber list	Recorded over Loirston Loch.
linnet	*Carduelis cannabina*	JNCC Red list, UK BAP	Recorded singing on Beanshill.
reed bunting	*Emberiza schoeniclus*	JNCC Red list, UK BAP	Recorded singing on Beanshill.
skylark	*Alauda arvensis*	JNCC Red list, UK BAP	Recorded in most sections of the survey corridor on a number of occasions.
song thrush	*Turdus philomelos*	JNCC Red list, UK BAP	Recorded singing on Blue Hill and singing at the Old Mill Inn at the Dee bridge.

Species	Scientific Name	Status	Location/Description
bullfinch	*Pyrrhula pyrrhula*	JNCC Red list, UK BAP	Recorded near the Old Mill Inn at the Dee bridge.
yellowhammer	*Emberiza citrinella*	JNCC Red list, LBAP	Recorded north of Beanshill, at Nether Beanshill and east of Heatherknowe.
starling	*Sturnus vulgaris*	JNCC Red list	Flocks recorded foraging north of Camphill and at Burnhead.
curlew	*Numenius arquata*	JNCC Amber list, LBAP	Recorded east of Heatherknowe and east of Kingshill/Gairnhill Wood.
lapwing	*Vanellus vanellus*	JNCC Amber list, LBAP	Recorded near Burnhead and south of Craiglug.
stock dove	*Columba oenas*	JNCC Amber list	Recorded at Blaikiewell.
goldcrest	*Regulus regulus*	JNCC Amber list	Recorded in Cleanhill Wood and Millbank.
greylag goose (x120)	*Anser anser*	JNCC Amber list	Recorded at Burnhead.
dunnock	*Prunella modularis*	JNCC Amber list	Recorded in Cleanhill Wood and near the Old Mill Inn at the Dee bridge.
meadow pipit	*Anthus pratensis*	JNCC Amber list	Recorded at Greenloaning and on Beanshill.
herring gull	*Larus argentatus*	JNCC Amber list	Recorded foraging across much of the survey corridor, recorded north of the Dee.
oystercatcher	*Haematopus ostralegus*	JNCC Amber list	Recorded north of the Dee, near the Old Mill Inn at the Dee bridge and on Blue Hill.
woodcock	*Scolopax rusticola*	JNCC Amber list	Recorded near Greenloaning.
swallow	*Hirundo rustica*	JNCC Amber list	Recorded at Merchant's Croft and observed frequently throughout the survey corridor.
grey wagtail (pair)	*Motacilla cinerea*	JNCC Amber list	Recorded near the Old Mill Inn at the Dee bridge.
willow warbler	*Phylloscopus trochilus*	JNCC Amber list	Recorded near the Old Mill Inn at the Dee bridge and on Blue Hill.
mistle thrush	*Turdus viscivorus*	JNCC Amber list	Recorded on Hill of Blairs.

25.3.76 The River Dee and Moss of Auchlea were the most important SOVs for breeding birds within the Southern Leg route corridor. Each SOV supported a total of 34 breeding birds species including, kingfisher (recorded on the River Dee) and barn owl (recorded as an incidental flying between Kingshill Wood and Moss of Auchlea), both of which are CWA1i species together with 10 JNCC Red List and 12 JNCC Amber List species.

25.3.77 Kingfisher was confirmed breeding to the west of the proposed Dee crossing. No evidence of breeding barn owl was recorded anywhere within the route corridor although dedicated surveys for barn owl were not undertaken. Other SOVs with notable breeding bird assemblages included; Cleanhill Wood, Blue Hill, Deeside Old Railway, Hill of Blairs, Crynoch Burn and Gairnhill/Kingshill Wood supporting between 21 and 31 breeding species with 3-4 JNCC Red List and 4-5 JNCC Amber List species. In comparison, Burnhead, East Silverburn, West Hatton Wood, South Greenloaming and Beanshill were the least valuable SOVs supporting between 8 and 20 breeding species with 1–5 JNCC Red List and 2–4 JNCC Amber List species (Figures 25.6a-h).

25.3.78 Quadrat 11 - Auchlea was the most important Quadrat for breeding birds supporting 34 species including one non-breeding CWA1i species (greenshank), together with five JNCC Red List and seven JNCC Amber List species. Quadrat 4 – Jameston and Quadrat 7 – Storybook Glen were the second most important Quadrats within the route corridor for their breeding bird assemblages each supporting 30 breeding bird species including, three JNCC Red List and between six and seven Amber List species respectively. Good numbers of JNCC Red and Amber List species were recorded in Quadrat 2 - Charleston, Quadrat 5 – Merchant's Croft and Quadrat 6 – Kirkton of

Maryculter where breeding birds recorded ranged from 23 - 27 species with between 4 - 6 JNCC Red List and 4 - 8 JNCC Amber List species recorded. Quadrat 8 – Milltimber was the least important Quadrat supporting 8 breeding bird species of which only 1 species was JNCC Red and Amber List listed.

25.3.79 Ospreys were observed fishing on Loirston Loch. Subsequent investigation identified a breeding pair of osprey on the Loch of Skene approximately 15 km from the Loirston Loch. It is possible that this pair of nesting osprey is the same as that recorded feeding on Loirston Loch. Breeding osprey territories often cover an area of >14 km^2 (Poole et al., 2002).

Otter

25.3.80 The European otter (*Lutra lutra*) is fully protected by UK law through ratification of the Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive and inclusion in Schedule 5 of the Wildlife and Countryside Act (1981) (as amended) and Schedule 2 of the Conservation (Natural Habitats & c.) Regulations 1994. Under this legislation, it is an offence to *inter alia* intentionally or recklessly kill, injure or disturb otters, and/or intentionally or recklessly obstruct, damage or destroy otter holts or couches. The otter is also listed on Appendix 1 of the Convention on International Trade of Endangered Species (CITES),. The otter is a priority species in the UK BAP. However, the otter is not threatened or rare in the region or county and is not an NES LBAP priority species.

Consultation and Literature Review

25.3.81 National population surveys of otters were carried out from 1977 to 1979, 1984 to 1986 and 1991 to 1994 in response to a perceived decline in numbers. In the 1991 to 1994 survey, otters were recorded at 88% of sites surveyed in Scotland, representing a rise of 15% over the results from the first survey (Green and Green, 1997). Otters are now believed to be present in every river catchment in Scotland (Grogan et al., 2001).

25.3.82 The National Otter Survey of Scotland 1991-1994 (Green and Green, 1994) identified a rise of 2% in the number of positive sites in the Grampian region. The majority of negative sites (i.e. no otters recorded) were along isolated coastal fringes.

25.3.83 The Centre for Ecology and Hydrology (CEH) in Banchory provided a record of otter RTA in the survey area, dating from 1995 to 2001 (see Figure 25.7h) on the B9077 road at NJ 858 001. SNH provided the following information of otter sightings:

- 25 June 2006 an otter was observed swimiming upstream on the River Dee at NJ 861004; and
- 26 June 2006 an otter was sighted swimming across the River Dee to the NW bank near Badger Island at NJ 864008.

Field Survey

25.3.84 The following is a summary of baseline conditions with respect to otters in the vicinity of the proposed scheme, more detail is provided in Appendix A25.5 and Figures 25.7a-h. As otter populations may be limited by prey abundance, areas possessing or allowing access to optimal foraging habitat are judged to be of importance and any factors likely to affect the availability of prey items including water quality are likely to affect the suitability of an area for otters. Favourable habitat for otters is indicated by good vegetative cover and low likelihood of disturbance. Areas possessing sub-optimal foraging habitat, but have other habitat qualities (e.g. low levels of disturbance and dense riparian cover) are of lesser importance, as they are less likely to be vital to local otter survival (Kruuk et al*.,* 1993).

25.3.85 Overall high levels of otter activity were recorded during the 2004 (as part of the ecological surveys for a previous routealignment) and 2006 survey periods. Otter signs were recorded along most of the main burns and their tributaries, and along field drains on the River Dee floodplain.

25.3.86 The River Dee and Crynoch Burn were observed to be core areas of otter activity with a number of sightings in summer 2006, evidence of juvenile otters using Crynoch Burn and abundant field signs including fresh spraints, feeding remains, prints and excavated cavities suitable for use as couches and holts, many showing signs of recent use. These watercourses form part of the River Dee SAC, providing a variety of suitable prey items and connecting with a number of tributary burns and drainage channels that provide refuge during times of spate.

25.3.87 Hare Moss, Greenloaning Wood, Kingcausie, Gairnhill Wood, the Moss of Auchlea and smaller areas of woodland and heath are considered to provide ideal habitat for lying up including natal holts, enhancing the resource provided by the burns that flow through them. Many of these habitats also have low levels of disturbance.

25.3.88 In general, there is good connectivity between the watercourses in the study area. Shanna Burn, the Burn of Ardoe and Crynoch Burn provide well-used commuting routes south of the river, while Milltimber Burn and Culter House Burn (outside of the study area) allow access to habitats north of the River Dee. North of the A944, there are relatively few watercourses draining the land and signs of otters were considerably less frequent despite the presence of suitable cover and foraging resources at Borrowstone Pond and Bucks Burn. However, it is likely that many drains, in particular those located close to main watercourses extensively used by otters, will be used especially in periods of spate for exploiting different prey resources at certain times of the year or for navigating between different resources within otter territories. The absence of field signs should not be taken as absence of otters.

25.3.89 It is not possible to draw any conclusions about the numbers or the sex of otters present over the study area in the absence of definitive observational evidence (Chanin, 2003). However, evidence from prints indicate that there are at least two otters, including an adult and juvenile, which were recorded along Crynoch Burn. Separate sightings recorded at Silver Burn and along the River Dee are also considered to belong to different otters.

Red Squirrel

25.3.90 Red squirrels are protected by UK law through ratification of Appendix III of the Bern Convention and inclusion on Schedule 5 and 6 of the Wildlife and Countryside Act (1981) (as amended) and the Nature Conservation (Scotland) Act (2004) which makes it an offence to intentionally or recklessly kill, injure, take or possess a wild red squirrel, or to intentionally or recklessly damage, destroy or obstruct access to any structure or place used by a red squirrel for shelter or breeding. It is also prohibited to intentionally or recklessly disturb a red squirrel while it is occupying a structure or place for protection, or to kill or capture red squirrels by indiscriminate methods such as snaring or poisoning. The red squirrel is further protected by the Wild Mammals (Protection) Act 1996.. The red squirrel is listed as a Priority Species on the UK BAP and is also an NES LBAP species.

Consultation and Literature Review

25.3.91 Records of red squirrel presence (post 2000) held by NESBReC, the FC and the Grampian Squirrel Group include three records at Durris Forest, two at Gairnhill Wood and one record from each of Craigingles, Cleanhill, Milltimber, Dalmunzie, Blacktop and Kingshill woods and are presented on Figures 25.8a-h and Table 4 in Appendix A25.6).

Field Survey

25.3.92 The following is a summary of the baseline conditions with respect to red squirrel populations in the vicinity of the proposed scheme, more details are provided in Appendix A25.6. Aberdeenshire is on the edge of the current northern distribution of the grey squirrel, which may compete with the red squirrel where the two occur together. Grey squirrel is a carrier of the Squirrelpox virus that is potentially fatal for the red squirrel, whilst the grey squirrel appears unaffected. This virus has been considered to be a major factor in the replacement of reds by greys (Rushton et al*.,* 2000; Tompkins et al., 2003). Although, the first incidence of Squirrelpox virus in Scotland was recorded from a grey squirrel in the Borders, in August 2001, as of yet, the disease has not been detected in

red squirrels in Scotland (SNH, 2004). Therefore in Scotland the replacement of red squirrels with grey squirrels is thought to be more likely to be due to direct competition.

25.3.93 In general, small, isolated woodlands are unlikely to be used by red squirrels (e.g. Sunnyside Wood is an isolated area of mature mixed woodland, considered to be of medium quality habitat; however, red squirrel have not been recorded here due to its small size and isolated position). Dense semi-mature Sitka spruce plantations, of which there is much in the study area, also offer limited resources for red squirrels, but are considered to provide refuge habitat for red squirrels due to their unsuitability for greys (Scottish Squirrel Group, 2004).

25.3.94 During 2006 visual summer surveys, six red squirrel sightings were recorded at Kingcausie Estate, Milltimber Wood, Guttrie Hill Wood, Gairnhill Wood, Silverburn Wood and near Hillhead of Derbeth Woodland.

25.3.95 The results of hair-tube surveys, visual surveys, and consultation exersise conducted in summer 2006 showed that red squirrels were present in ten out of the 19 woodlands surveyed within the Southern Leg route corridor, whilst grey squirrels were found to be present in 11 of the woodlands surveyed. Furthermore, red and grey squirrels were recorded co-existing in seven of the surveyed woodland areas. An incidental sighting of a red squirrel was also made near Hillhead of Derbeth Woodland northeast of Fairly Home Farm.

Table 25.7 – Summary of Woodland Areas with Red Squirrel Records within 500m of the proposed scheme (data are from 2006 surveys unless otherwise stated)

Section	Wood Name	NESBReC/Grampian Squirrel Group Records (post 2000)	Jacobs Hair-Tube Survey	Jacobs Visual Sightings	Unrecorded Sightings (Personal Communication)
SL1	Duff's Hill	None recorded	None recorded 2004 Survey	None recorded	Yes (local resident, personal communication)
SL2	Hill of Blairs	None recorded	None recorded	None recorded	Yes (local resident, personal communication)
SL3	Cleanhill Wood	Yes	Yes	None recorded	Yes (local resident, personal communication)
	Durris Forest	Yes	None recorded	None recorded	None recorded
	Kingcausie	None recorded	Yes	Yes	Yes (local resident, personal communication)
SL4	Milltimber Wood	Yes	Yes	Yes	Yes (local resident, personal communication)
	Guttrie Hill Wood	None recorded	Yes	Yes	Yes (local resident, personal communication)
SL5	Gairnhill Wood	Yes	Yes	Yes	Yes (local resident, personal communication)
	Silverburn Wood	None recorded	Yes	Yes	None recorded
	Kingshill Wood	Yes	Yes 2004 survey	None recorded	Yes (local resident, personal communication)
SL6	(Near to) Hillhead of Derbeth	None recorded	None recorded 2004 Survey	Yes (incidental sighting)	None recorded

Water Vole

25.3.96 The water vole is afforded partial protection by the Wildlife and Countryside Act (1981) (as amended) through inclusion in Schedule 5, which makes it an offence to intentionally damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection, or to disturb water voles while they are using such a place. However, a recent JNCC review of the Wildlife and Countryside Act (1981) (as amended) in 2005 recommended full protection in Schedule 5. This would provide a similar level of protection to species such as otter. However, a date for ratification of these amendments has not yet been set.

Consultation and Literature Review

25.3.97 No water vole surveys had been performed prior to this study within the study corridor. However, water vole are known to be present in the wider area of North East Scotland. The 1996 National Water Vole Survey found remnant water vole populations present at a few isolated locations in the Upper Dee catchments (Jefferies, 2003). Water vole colonies were also identified in low numbers in other river catchments in North East Scotland including the lowland farmland of Buchan and tributaries of the River Ythan.

Field Survey

25.3.98 ALthough no previous water vole surveys were carried out within the proposed route corridor, otter surveys by Jacobs commenced in February 2006. The otter surveys covered a wider corridor than the study area for this assessment as the preferred route alignment had not yet been selected. During the otter surveys, water vole signs were identified in the Fastlink route corridor. However, these surveys were undertaken principally for otters, therefore a full water vole survey of the study area was undertaken at the appropriate time of year as stated in the methods section, paragraph 25.2.43.

25.3.99 The following is a summary of baseline conditions with respect to water vole in the vicinity of the proposed scheme. Further details of habitat assessment are given in Appendix A25.7. Of the 33 sites surveyed, no signs of water vole were found. Twenty-two sites were identified as offering either ‘poor’ or ‘poor/moderate’ habitat suitability for water voles, five were identified as being of ‘moderate’ suitability and six were identified as being of ‘high’ suitability for water voles. The six sites identified as being of high suitability for water vole are identified below.

25.3.100 Hare Moss consists of scattered trees and scattered and dense scrub in an area of wet bog with pools and small areas of marsh/marshy grassland, which offer foraging potential and potential nesting habitat. Blaikiewell Burn offers foraging and nesting vole habitat. Glenburnie Ponds consist of permanent water with lush emergent vegetation and soft banks and the River Dee, which has extensive bankside vegetation and good burrowing habitat in earth banks. Moss of Auchlea, which supports areas of willow and birch scrub on wet grassland and marsh, offers potential foraging and nesting habitat in grass and rush vegetation. Burrowing habitat is offered in drainage ditches and Borrowstone Pond has a historical record of water voles being present. Evidence of mink, a water vole predator, was found along the length of the Crynoch Burn and the River Dee. The Glenburnie Ponds are in close proximity to and linked to the River Dee and are therefore also likely to be used by mink.

25.3.101 As outlined above, two extensive areas of wetland with habitat of ‘high’ suitability for water voles were identified at Hare Moss and the Moss of Auchlea (sites four and seven). These two locations are likely to be too small to support a sustainable water vole population in isolation and both wetlands are separated from other water vole populations by areas of intensive farmland. This isolation would preclude recruitment of water voles from elsewhere, which would be necessary for the maintenance of a viable population. Nevertheless, as these areas offer habitat of a ‘high’ suitability for water voles and given the difficulties of carrying out field sign surveys for water voles in this type of habitat, the presence of water voles within these two wetlands cannot be completely ruled out. Water voles using wetland habitats may be nesting in tall grass and rush vegetation and

may not be latrine marking. This would greatly reduce the probability of encountering field signs during survey.

Amphibians

25.3.102 All six species of amphibian native to the UK are subject to legal protection, although the level and type of protection varies between species. Great crested newt (*Triturus cristatus*) and natterjack toad (*Bufo calamita*) are protected from killing and injury and disturbance to their habitats through their inclusion in Appendix 5 of the Wildlife and Countryside Act (1981) (as amended) and the Conservation (Natural Habitats & c.) Regulations 1994. Smooth newt (*Triturus vulgaris*), palmate newt (*Triturus helveticus*), common frog (*Rana rana*) and common toad (*Bufo bufo*) are protected from being sold through inclusion in Appendix 5 of the Wildlife and Countryside Act (1981) (as amended).

Consultation and Literature Review

25.3.103 Consultation with SNH, Aberdeen City Council, the NES LBAP Co-ordinator, NESBReC and the local herpetofauna recorder (Mr Bob. Laing) did not identify any historic records of amphibians within the study area. There are no historical records of great crested newt (statutorily protected by the Nature Conservation (Scotland) Act 2004, Countryside and Wildlife Act 1981 (as amended) and Conservation (Natural Habitats & c.) Regulations 1994)) within 50 km of Aberdeen (Arnold, 1995).

Field Survey

25.3.104 Incidental sightings of five amphibians were recorded while field surveys were being performed. Two common toads and a common frog were seen in terrestrial habitat around the Hill of Blairs (NO 879 986, NO 880 987 and NO 884 989). Two ponds are present at this location, within the same continuous habitat area that provides breeding habitat. Another common toad was seen in terrestrial habitat around Greenhowe pond (NJ 922 003) and a common frog was seen amongst extensive terrestrial habitat at Beans Hill (NJ 847 034).

25.3.105 Data from a complete amphibian survey conducted for a previous route option found that in Greenhowe pond palmate newt, common toad and common frog were all found. In Turnamiddle pond evidence of breeding palmate newts was found, at Cairnfield pond palmate newt and common toad were seen, at Borrowstone pond common toad, common frog and ppalmate newt were observed and at Hillhead of Derbeth Pond both frog and toad were found..

25.3.106 A total of 19 ponds are located within 500m of the route corridor and these ponds and surrounding terrestrial habitat were assessed in terms of their suitability for amphibians (Table 25.8 and Figures 25.10a-h).

Table 25.8 – Aquatic and Terrestrial Habitat Assessment for Amphibians

Habitat Area	Pond Name	Aquatic and Terrestrial Habitat Description
S3	Greenhowe	A disused quarry pond approximately 30m in diameter. On three sides the banks are bare rock with overhanging gorse. There is some marginal vegetation and the surrounding terrestrial habitat is a mixture of mature coniferous wood with developed understory and improved fields
S9	Turnamiddle	A long and narrow small natural pond (61 m^2). The water is clear and frequent aquatic vegetation. There is a lack of shading from bank vegetation. The depth at the water's edge is about 15 cm dropping steeply to approximately 1.5 m. A high proportion of terrestrial habitat comprised a mosaic of conifer plantation, semi improved grassland, swamp, wet modified bog, marshy grassland and stone walls.
S9	Cairnfield	A long and narrow medium artificial pond (551 m^2). The water is clear with abundant aquatic vegetation. There is a lack of shading from bank vegetation. The depth at the water's edge is about 40 cm dropping steeply to approximately 1.5 m and deeper towards the centre. A high proportion of terrestrial habitat comprised a mosaic of conifer plantation, semi improved grassland and marshy grassland

Habitat Area	Pond Name	Aquatic and Terrestrial Habitat Description
S13	Cowford	An irregular shaped natural pond surrounded by improved grassland that offers little cover for amphibians. The Phase 1 report identifies the pond as being seasonal, drying out and turning to mud periodically.
S15	Hill of Blairs (N)	Small natural pond amongst confieferous plantation
S15	Hill of Blairs (S)	Small natural pond surrounded by wet heath
S23	Eastlands Pond	Small natural pond surrounded by some scattered scrub and some swap/wet woodland. Waterbody quite choked with vegetation but still open water and section s 70cm deep.
S22	Glenburnie Ponds	Series of natural ponds that are part of the Crynoch burn flood plain. Surrounding terrestrial habitat ranges from amenity grassland to scrub and broad-leaved woodland, all of which provide foraging habitat to amphibians.
S24	Kingcausie House Pond (S)	This pond may be seasonally dry as there was no water when it was recorded in the Phase 1 Habitat survey. Seasonal ponds can suit breeding amphibians as it ensures there are no fish present that could predate the amphibian eggs and larvae
S24	Kingcausie House Pond (N)	Small natural pond with no vegetation. Sourounding terrestrial habitat is broad-leaved woodland with shrub layer that would provide cover and shelter to over-winter.
S29	Waterside Pond	Seasonally dry pond amongst improved and semi-improved fields that form part of the River Dee flood plain.
S40	East Brotherfield Pond (E)	Natrural flush that periodically fills with water. Surrounded by improved fields which provide little cover for amphibians but close to a network of wet field drains
S40	East Brotherfield Pond (W)	Smaller flush immediately adjacent. Periodically fills with water and is surrounded by improved fields that provide foraging habitat but little cover.
S43	Kingshill Wood Pond	A small natural pond that recives partial shading. Terrestrial habitat is made up of wet and dry heath and coniferous plantation.
N2	Borrowstone Pond	A large square artificial pond (2378 m^2). The water is clear with occasional aquatic vegetation. The pond is shaded on the western edge by tall trees. Depth ranges from 50 cm to approximately 1.5 m towards the centre. A moderate proportion of terrestrial habitat comprising marshy grassland, stonewalls and conifer plantation.
N4	Fairley Home Farm Pond	A large square artificial pond (533 m^2). The water is clear with occasional aquatic vegetation. There is approximately 50% shading from surrounding trees. The depth slopes gently from very shallow water to 1.5 m. A moderate proportion of terrestrial habitat comprising stonewalls, semi-mature deciduous woodland and conifer plantation
N3	Derbeth Farm (S)	A small man made garden pond with plenty of emergent vegetation. It is surrounded by garden lawns and a small stand of coniferous plantation.
N3	Derbeth Farm (N)	Man made pond built to shoot ducks. Presently dry due to tear in the liner but potential to be repaired and to fill with rain water.
N6	Hillhead of Derbeth Pond	A large irregular artificial pond (919 m^2) with a small island at the western end. Fish were present. The water is clear with occasional aquatic vegetation. Depth ranges from 20 cm to 1m The pond is shaded on the western and southern sides by tall trees. A high proportion of terrestrial habitat comprised dense continuous scrub, semi-natural broad-leaved woodland, conifer plantation and dense continuous bracken.

Brown Hare

25.3.107 Brown hare (*Lepus europaeus*) are offered limited protection by the Ground Game Act 1880, Hare Preservation Act 1892 and the Wild Mammals (Protection) Act 1996 against 'unnecessary suffering', but there is no legal protection from being killed in a 'swift and humane way'. However, they are a priority UK BAP species and an NES LBAP species due to their general decline caused by changes in farming practices and hunting.

Consultation and Literature Review

25.3.108 The National Biodiversity Network revealed the presence of brown hare records in the vicinity of Hare Moss (NO 9199), Section SL2.

Field Survey

25.3.109 A single brown hare sighting was recorded within the study area in the vicinity Sliverburn at East Brotherfield, Section SL5.

25.3.110 In general, the habitat available in the study area was assessed as being of low suitability for brown hare based on Phase 1 Habitat survey (Terrestrial Habitats Report, Appendix A25.1) and aerial photographs. There were some small areas that were considered to be of medium value for hare and these are described below.

25.3.111 In Section SL1, two areas were identified as being of medium value for brown hare. Habitat Area S10, Hare Moss (Figure 25.11a-b) comprises a number of bog communities, with heather dominant. Extensive areas of marsh grading to swamp are present, mainly associated with vegetated drains. Scrub can be extensive and dense, particularly towards the south, whilst willow and birch occur across the bog. Highly suitable cover and good potential foraging are provided within Hare Moss. S13 (Figure 25.11b) comprises a series of improved and horse-grazed semi-improved fields. Small copses of broad-leaves surrounded by walls are present though the ground flora is species poor. Habitat surrounding S10 should be evaluated in tandem with S13 as both provide connecting foraging and cover potential.

25.3.112 In Section SL2, habitat area S16 is dominated by improved grassland. Soft-rush dominated marshy grassland is also present within the field providing a good foraging resource. Trees and hedgerows are present within some of the fields surrounding the area, as are dry stone walls, providing good potential cover.

25.3.113 In Section SL4, habitat area S38 is made up of a series of improved fields providing suitable foraging with frequent pockets and field borders of gorse scrub and dry stone walls providing good cover.

25.3.114 In Section SL5, S40 includes fields alongside Silver Burn, to the south of East Brotherfield that are used as set aside, providing suitable foraging, but with scrubby areas and wooded borders providing good cover. S44 is dominated by improved and arable fields providing suitable foraging. Walls are a dominant feature of the borders between fields with occasional gorse providing good cover, as well as Moss of Auchlea to the north.

Reptiles

25.3.115 There are six species of reptile native to the UK: the common lizard (*Lacerta vivipara*), sand lizard (*Lacerta agilis*), slow-worm (*Anguis fragilis*), smooth snake (*Coronella austriaca*), grass snake (*Natrix natrix*), and adder (*Vipera berus*). In addition, there are several introduced species arising from escapes or illegal releases, which may be encountered occasionally (English Nature, 2004). Common lizard, slow-worm and adder are common and widespread throughout the UK and receive limited protection under the Wildlife and Countryside Act (1981) (as amended), which makes it an offence to intentionally or recklessly kill or injure these animals.

Consultation and Literature Review

25.3.116 The only reptile species recorded within 50km of Aberdeen are the common lizard, slow-worm and adder (Arnold, 1995; Reading et al., 1995; Reading et al., 1996). A questionnaire survey carried out in 1992 recorded adders in all 10km^2 grid squares around Aberdeen, (Reading et al., 1995; Reading et al., 1996).

25.3.117 A review of information from the National Biodiversity Network (NBN) revealed no records of reptiles within any of the10km^2 grid squares that the road alignment passes through.

Field Survey

25.3.118 Analysis of the Phase 1 Target Notes (Terrestrial Habaitats Report, Appendix A 25.1), Ordnance Survey maps and aerial photos allowed potential reptile habitat to be identified (see Figures 25.10a-h).

25.3.119 Section SL1 contains habitat in areas S3 and S10. Both are large and provide excellent habitat with extensive areas of gorse scrub and some areas of heather. This provides plenty of potential foraging, basking and sheltering sites, which are critical for reptiles. Although they are not connected, their size and suitability make them of local value in this section. All other Habitat Areas are on no ecological value in this section.

25.3.120 Section SL2 has a large area of suitable habitat in area S15. It is made up of wet and dry heath, bracken and continuous scrub. Some smaller fragments of marshy grassland habitat are found in area S16. These are less than optimal but still considered suitable. There are hedgerows and drystone walls that do provide suitable habitat and also function as a corridor linking areas of habitat and providing a dispersal route for the reptiles to move along. These Habitat Areas are of local value for reptiles.

25.3.121 Extensive reptile habitat is present in Section SL3, in areas S18, S22, S23 and S24. This area of scrub, woodland, heath and acid grassland is all continuous with nothing blocking movement between the areas. This is of importance because a larger area of habitat is more robust and resilient to change. Therefore the populations of reptiles presumed to be present should persist. A further strip of habitat exists at the north of this section in area S31. It provides suitable habitat and serves as a corridor along which reptiles can disperse. Information obtained from SNH during the previous consultation, revealed that common lizards have been observed on the disused railway line at Peterculter and Cults (Mr Rob Raynor and Ms Fiona Mutch, SNH, pers. comm.). These Habitat Areas are of local value for reptiles.

25.3.122 Most of the habitat in the south of Section SL4 exists as small, isolated areas within areas S32 and S35. There is an extensive area of continuous habitat at the very north of this section in area S30. It is dominated by lowland heath and acid grassland which is excellent reptile habitat.because it will support a high number of prey species, and provide suitable foraging, basking and refuge habitat.

25.3.123 There is very little reptile suitable habitat in Section SL5 with just two small fragmented patches in the south of the section in area S42. The area is mainly improved/semi-improved grassland with some marshy areas. This is not optimal habitat because there is little cover and the lack of vegetation diversity means there will be less prey. These Habitat Areas are sub-optimal but may still be suitable and are of less than local importance .

25.3.124 Section SL6 contains some habitat that is fragmented within area S48. It is mainly improved fields which have limited use to reptiles but does include some drystone walls that are lined by shrubs. There is also some acid grassland and dense scrub that is more suitable, this is of less than loal importance. Further north, at the end of this section habitat areas N3, N7, N8, N11 and N13 form a large area of connected habitat that is suitable for reptiles and as such these areas are of local importance to reptiles.

Terrestrial Invertebrates

25.3.125 A number of terrestrial invertebrates are included in Schedule 5 of the Wildlife and Countryside Act (1981) (as amended) and the Nature Conservation (Scotland) Act (2004) that are given full or part protection. These include species of beetles, butterflies, moths, true bugs, crickets, dragonflies, spiders, annelid worms and molluscs. Invertebrates are important in both ecosystem functioning and in agricultural systems. As herbivores, predators, parasites and as a food source for other species, they are a vital element in terrestrial food chains.

Consultation and Literature Review

25.3.126 A combination of North East Scotland Biodiversity Audit Data (2003), NESBAP and UK BAP data, and local entomologist recorder information was used to produce a table of potential invertebrates of local significance. NESBReC currently only holds non-confidential records of two of these species near Aberdeen: the pyralid moth (*Catoptria permutatella*) and sword-grass moth (*Xylena exsoleta*). Records for other species are held, but most of these are from upper Deeside or the Morayshire coast.

Field Survey

25.3.127 Despite the study area being predominantly under intensive agricultural land use, suitable habitats for a range of terrestrial invertebrates were present throughout the study corridor. Habitat Areas within the study area include semi-natural and plantation woodland (wet, broad-leaved, mixed and coniferous), willow, alder (*Alnus glutinosa*), aspen (*Populaus tremula*) and gorse scrub, marshy and acid grassland, tall ruderal vegetation, wet heath, wet and dry modified bog. There is also running water and/or open water present within the study corridor.

25.3.128 Although Section SL1 is generally dominated by agricultural fields lined with dry stone walls, this section contains a number of different habitats. Woodland is extensive, primarily consisting of conifer plantation at Greensgate and Duff's Hill. These plantations are marked by semi-improved mesotrophic grassland within rides and surrounds. These varied habitats may support Coleoptera, Aranae, Lepidoptera and Hymenoptera. The dry stone walls may support the mountain whorl snail (*Vertigo alpestris*) and the wall whorl snail (*Vertigo pusilla*).

25.3.129 Section SL2 section is dominated by small fields of improved grassland, used for grazing cattle and sheep. A number of richer grasslands are associated with the grazing of horses. The majority of these fields are lined with dry stone walls. Scrub, including dense pockets, occurs throughout this section. Woodland is extensive, consisting mainly of conifer plantations. Hill of Blairs is a particularly rich area, consisting of a variety of habitats, including conifer and broad-leaved woodland, as well as heath and bog communities. This area may support Aranae, Coleoptera, Hymenoptera and Lepidoptera.

25.3.130 Conifer plantation dominates the majority of Section SL3. However, areas such as Cleanhill Wood contain conifer and mixed plantation combined with more semi-natural birch wood. The division between these communities can be unclear. The northern half of the section contains semi-natural broad-leaved wood, though the majority of this is derived from plantation. Invertebrates supported in this area may include Hymenoptera, Coleoptera and Aranae.

25.3.131 In Section SL4 improved grassland is overall the most dominant habitat. However, large areas of amenity grassland and built-up areas are present to the south of this section. Dry stone walls line the majority of these fields, with woodland, both plantation and semi-natural, occasional. This area may support Aranae, Coleoptera, Gastropoda, Hymenoptera, and Lepidoptera. The dry stone walls may support the Mountain whorl snail and the Wall whorl snail.

25.3.132 Improved and arable farmland is the dominant habitat within Section SL5. Many walls line these fields, with gorse scrub lining occasional. This area is also notable for the large plantations of Kingshill Wood and Gairnhill Wood, plus the smaller plantation of Silverburn Wood. Wet semi-natural wood is present within Moss of Auchlea. Invertebrates supported in this area may include Aranae, Lepidoptera, Diptera and Coleoptera. Although not of local importance, the broom-tip moth (*Chesias rufata*) has declined dramatically in national terms, it feeds on gorse species and may occur here. Locally significant species that may be supported in this area include the small pearl-bordered fritillary (*Boloria selene*) and the large heath butterfly (*Coenonympha tullia*).

25.3.133 The majority of Section SL6 is characterised by improved grassland with dry stone wall lining. Semi-natural broad-leaved woodland is present in the largely linear woodland of West Hatton Wood, whilst small pockets of plantation woodland are present upon Cloghill. Although still largely

comprised of improved grassland, Cloghill also contains a large area of mixed mesotrophic/acid grassland, combined with small fragments of dense scrub. This section may support Aranae, Lepidoptera, Coleoptera, and Hymenoptera.

Section SL1

25.3.134 As a lowland raised bog, Hare Moss has its own characteristic invertebrate fauna. Although isolated by surrounding farmland, the long history of this type of site normally results in specially adapted species, including invertebrates, being present. Hare Moss is a modified bog, due to agricultural improvement, and has developed a mosaic of habitats dominated by mature heather with tussocks of purple moor grass (*Molinia caerulea*) and hare's-tail cotton-grass (*Eriophorum vaginatum*). Hare's-tail cotton-grass is the food plant of the large heath butterfly and this is known to occur here.

25.3.135 Both of the *Boloria* fritillaries, (pearl-bordered and small pearl-bordered), have been found in this type of habitat in the past. A number of locally important Lepidoptera feed on willows and alders in wet grassland. This area could support the priority Lepidopteran species: pearl-bordered and small pearl-bordered fritillaries, Large heath butterfly, cousin German moth (*Paradiarsia sobrina*) and sword-grass moth (*Xylena exsoleta*).

Section SL3

25.3.136 Along the River Dee scattered trees and scrub occur on the south bank, scrub is an important terrestrial invertebrate habitat. The few broad-leaved trees, which remain mainly on the south bank are probably of little importance to terrestrial invertebrates. These are large, mature trees, (lime *Tilia* sp. and sycamore *Acer pseudoplatanus*) without any young growth and of a mix of native and foreign species. The woodland habitat on the bank side may support the cranefly (*Rhabdomastix hilaris)*.

25.3.137 There are extensive stands of tall ruderal vegetation. There is a mixture of long, un-grazed vegetation, flooded areas, and shorter grazed grassland. The steepness of the slope has prevented nutrient enrichment from cattle or sheep and the sward is species rich. Where drainage is poor, marshy grassland has developed. Butterflies such as orange tip (*Anthocharis cardamines*), Small copper (*Lycaena phlaeas*) and Common blue (*Polyommatus icarus*) are known to occur along the riverbank in the vicinity and probably an interesting range of nocturnal species of moths. The area may also support giant yellow bumble bee (*Bombus distinguendus*) and sword-grass moth.

25.3.138 There are also small areas of shingle/pebble banks, which are of importance due to their usage by several of the priority species (refer to Chapter 10: Ecology and Nature Conservation, Northern Leg). Shingle specialist spiders like the wolf spider, *Arctosa cinerea*, the stiletto fly, *Threreva lunulata* and some species of beetles and flies are rare or uncommon and locally important.

25.3.139 The Deeside Old Railway is a DWS that is used as a cycleway and footpath. The area has now become established with species-rich semi-improved neutral grassland, scrub and woodland. The sheltered nature and species rich herb flora of the old railway line make this site particularly interesting, particularly for Lepidoptera such as the small blue butterfly (*Cupido minimus*) and sword-grass moth. The small blue butterfly requires sheltered sites and used to be found along this railway line. It is now extinct in this area, but there is potential for re-colonisation. The giant yellow bumble bee is also a potential coloniser for this habitat.

25.3.140 Dry, bare, stony areas are attractive to various spiders and beetles and the possibility of limestone or other basic (or at least neutral) rocks used in the construction of the railway or associated building makes the occurrence of locally important lime-loving invertebrates (particularly snails) a possibility. Species such as the Wall whorl snail, the mountain whorl snail and the subterranean spider (*Lepthyphantes insignis*) are all potentially present in this habitat.

Section SL6

25.3.141 The southern section of West Hatton is a mature, broad-leaved woodland, of long-established plantation origin. The canopy consists of mature birch and rowan (*Sorbus aucuparia*) with occasional mature beech with naturally regenerating tree species. The ground flora includes abundant broad buckler-fern, Yorkshire-fog (*Holcus lanatus*), creeping soft-grass (*Holcus mollis*), wood sorrel (*Oxalis acetosella*), climbing corydalis (*Ceratocapnos claviculata*), wavy hair-grass, heath bedstraw (*Galium saxatile*), chickweed-wintergreen (*Trientalis europaea*), male fern (*Dryopteris felix mas*). The woodland extends to the north as a relatively narrow strip and connects the northern section of the wood to the southern section.

25.3.142 The broad-leaved woodland east of West Hatton farm shows evidence of coppicing with a canopy of mature rowan. The shrub layer is largely absent and ground flora is sparse in places, with good leaf litter. Ground flora in this area comprises Yorkshire-fog, creeping soft-grass and Cock's-foot (*Dactylis glomerata*). There is some standing and fallen deadwood of a variety of native species and hence some potential for saproxylic invertebrates such as beetles and flies. There are several remains of old buildings in the wood, together with rock piles and there may be some potential for associated spiders, beetles and molluscs. Field margins in this general area comprise dry stonewalls, often 2 to 3m wide, again representing excellent habitat for invertebrates.

25.3.143 The west end of the wood is relatively open woodland, probably of plantation origin but long-established and with semi-natural characteristics. At the west end of wood, the canopy is dominated by beech and silver birch over a grazed grass-dominated ground flora with wood meadow-grass, smooth meadow-grass (*Poa pratensis*), Yorkshire-fog, creeping soft-grass and common sorrel (*Rumex acetosa*) with patches of scattered and dense gorse scrub in more open areas. Further east, the woodland canopy becomes dense, dominated by Birch and Rowan with occasional beech and sycamore over a ground flora with Yorkshire-fog, creeping soft-grass, germander speedwell (*Veronica chameadrys*), creeping buttercup (*Ranunculus repens*), common nettle, foxglove (*Digitalis purpurea*) and common sorrel.

25.3.144 In addition to attracting invertebrates in general, there are several locally important species that this area may support. In the areas with grass and scrub, this habitat may support the Pearl-bordered fritillary butterfly, the Small pearl-bordered fritillary and the Sword-grass moth. The dry stone walls may support the Mountain whorl snail and the Wall whorl snail, while the bare earth areas may support the subterranean spider.

Water Shrew

25.3.145 The water shrew (*Neomys fodiens*) is protected by the Wildlife and Countryside Act (1981) (as amended) through inclusion in Schedule 6, which prohibits killing and certain methods of capture. Water shrews are found throughout Britain, but appear to have a patchy, localised distribution, particularly in northern Scotland (Harris et al*.,* 1995; Greenwood et al., 2002).

Consultation and Literature Review

25.3.146 SNH, Aberdeen City Council, the NES LBAP Co-ordinator and NESBReC held no records of water shrew within 10km of the study area. However, one dead water shrew was recorded during the 2004 surveys carried out for the Northern Leg (refer to Chapter 10: Ecology and Nature Conservation, Northern Leg).

Field Survey

25.3.147 No evidence of water shrew was recorded in the study area. Thirteen watercourses were identified from the Freshwater Ecology Report that were considered to provide suitable conditions for water shrew populations (Appendix 25.9 and Figures 25.9a-h). Of these, two were identified as providing high quality water shrew habitat: Silver Burn and the River Dee, both of which provide complex riparian habitat, and abundant and diverse macroinvertebrate fauna.

Freshwater Macroinvertebrates and Habitats

Consultation and Literature Review

25.3.148 SEPA monitors a number of watercourses in Aberdeenshire for water quality and biological measures and has recent river classifications for two relevant watercourses along the route. These data have been used in the impact assessment both in terms of aquatic ecosystem health and water quality. A summary of SEPA's biological data is given below (Table 25.9). Please refer to Chapter 24 (Water Environment) for more details and to Figure 24.1a-h for locations of SEPA sampling points.

Table 25.9 – Summary of SEPA Biological Data

Route Section	Watercourse	Year	Classification
SL3	Crynoch Burn	2005	A1
SL3	River Dee	2005	A2

25.3.149 It should also be noted that the LBAP species *Brachyptera putata* was recorded by SEPA as part of their routine monitoring of the River Dee between 1981 and 2004.

25.3.150 In addition to baseline information obtained from SEPA, physical parameters were also calculated for each watercourse. These showed that the River Dee and the Crynoch are the largest watercourses in the study area in terms of catchment area and discharge. Also, a number of small streams have very low mean flows suggesting that they may dry out during certain periods of the year, particularly Cowford Burn, Milltimber Burn, Bellenden Burn and Jameston Ditch. Finally, a simple measure of the variation in mean monthly velocities for each watercourse shows that the most 'flashy' watercourses (i.e. those with a highly variable flow) are the River Dee, Crynoch Burn (downstream) and Kingcausie Burn.

Field Survey

25.3.151 This baseline information is a combination of macroinvertebrate and RHS data. Macroinvertebrate surveys were undertaken in June 2006 with sampling points, shown in Figures 25.13a-h. Repeat sampling was undertaken in September 2006, which will be reported in the Environmental Assessment Reports to be published in 2007. RHS was undertaken to describe the physical parameters along 500m sections of each of the watercourses that would be crossed by the AWPR. Locations of RHS are shown in Figures 25.11a-h.

Section SL1

25.3.152 Loirston Burn (Figures 25.11a) was found to be significantly modified throughout its stretch. The upstream section formed a straightened channel flowing along the perimeter of a conifer plantation, whilst the downstream section is culverted under two major roads (A90 and A956) before flowing into Loirston Loch. A macroinvertebrate sample was taken downstream of the culvert beneath the A90, as the upstream sections were too small and polluted. The assemblages present were limited with only pollution tolerant individuals such as the freshwater shrimp and true fly (Diptera) larvae. This limited assemblage led to a classification of impoverished biological status (ASPT 2.7), which is typical of heavily modified channels.

25.3.153 The RHS was undertaken at Loirston Burn (downstream), the reach closest to Loirston Loch. The channel is extensively realigned and over-deepened as it passes through a long culvert. Both banks are extensively re-sectioned and whole bank reinforcement is present along both banks. Poaching by cattle and embanking are present on the left bank and it was classed as severely modified. Loirston Burn (upstream) is the section farthest from Loirston Loch and was classed as obviously modified. It is extensively realigned and over-deepened and both banks were found to be extensively re-sectioned.

25.3.154 No macroinvertebrate sample was taken at Bishopston Ditch which is extensively realigned and over-deepened and passes through one culvert. It flows into Hare Moss where the channel disappears.

25.3.155 No macroinvertebrate sample was taken at Heathfield Burn, which is a drainage ditch that was classed as significantly modified by RHS data. The channel has been realigned and over-deepened, passing through two culverts. Both banks are extensively re-sectioned. The right bank is reinforced and embanked in places.

25.3.156 Jameston Ditch (Figures 25.11b) is a field drain flowing into the Burn of Ardoe (see below). Despite being a field drain, the channel was of substantial width with good cover of aquatic macrophytes. The ditch supported a varied macroinvertebrate assemblage with fauna showing a range of pollution tolerances. A number of water beetles were identified as were dipteran larvae, freshwater snails, caddis flies and freshwater hog louse. These species identified all have no specific flow requirement and are generally representative of slow flowing or standing waters (Extence et al*.,* 1999).

25.3.157 The Burn of Ardoe (Figures 25.11b) was not accessible for sampling during the survey therefore macroinvertebrate data from previous surveys has been used to inform the assessment. The sampling point was upstream of the proposed crossing point, which was classified as good with a macroinvertebrate fauna comprising mainly common, but often pollution-sensitive species. The Burn of Ardoe was assessed by RHS as severely modified as it has been extensively re-sectioned and reinforced with the upstream section straightened.

Section SL2

25.3.158 Cowford Burn (Figures 25.11b) forms part of a complex of field drains to the north of the proposed route. Cowford Burn is a straightened channel flowing along field boundaries and culverted under access roads. The macroinvertebrate assemblage was varied with species intolerant of pollution being identified, leading to a classification of good biological status. A number of caddis fly larvae were identified, as were stoneflies, pearl mussels, dipterans and beetles. The species identified are generally found in slow flowing or standing waters, with the exception of the caddis fly *Plectrocnemia conspersa* and *Chaetopteryx villosa* that require a moderate flow (Extence et al*.,* 1999).

25.3.159 Burnhead Burn (Figures 25.11c) flows through semi-improved grasslands and Is a straightened channel adjacent to an access road before flowing into Blaikiewell Burn. Burnhead Burn was sampled along the straightened section upstream of its confluence with Blaikiewell. The macroinvertebrate assemblage was varied supporting a number of intolerant species such as the stonefly *Chloroperla torrentium*. A total of 12 families were identified from the burn leading to a classification of good biological status. A number of species identified within Burnhead Burn have more specific flow requirements typically greater than 20cms^{-1} (Extence et al*.,* 1999). Burnhead Burn was classed as significantly modified using RHS data. As it is extensively realigned and over-deepened in sections, both banks are re-profiled and bank toe reinforcement is extensive.

Section SL3

25.3.160 No macroinvertebrate sample was taken at Whitestone Burn which is a ditch identified to be a significantly modified straightened field drain,

25.3.161 Crynoch Burn was sampled for macroinvertebrates in two separate locations (Figures 25.11c-d), one in the upstream reaches and a second downstream towards the confluence with the River Dee. Both of these sampling locations fall within the boundary of the River Dee SAC. Crynoch Burn is a natural meandering watercourse flowing down a shallow valley, with fast flow and varied substrate. The upstream and downstream sections supported the largest number of species with ASPT scores indicating excellent biological status. SEPA's 2005 classification put Crynoch Burn at excellent biological status, matching that of the current survey. Although slightly different, both the

upstream and downstream sites supported flow-dependent species of stonefly, mayfly, caddis fly and beetles.

25.3.162 Crynoch Burn, upstream of the proposed crossing point, was classed as significantly modified by RHS data. It is sinuous, but partly impounded by a weir. The banks are extensively reinforced at the toe. Several un-vegetated point bars were recorded showing the burn to be actively transporting materials. Crynoch Burn, downstream of the proposed crossing point, was classed as obviously modified. The burn flows through a gorge into the River Dee. Toe only bank reinforcement is present along half of the reach. Some of the reach is impounded by two weirs. Two non-vegetated point bars were recorded indicating that the burn is actively transporting materials.

25.3.163 Blaikiewell Burn (Figure 25.11c) is a fast flowing watercourse between semi-improved grassland on the left bank and broad-leaf mixed woodland to the right. The macroinvertebrate assemblage was varied with a total of 12 species identified, showing a range of pollution tolerances. Many of the major groups were identified with species of mayflies, caddis flies, stoneflies and beetles, all of which require moderate to fast flows. The burn was classified as excellent biological status based on the diverse assemblage present. Blaikiewell Burn has been realigned, but appears to be becoming more naturalised again with several riffles, pools and point bars recorded. Both banks are extensively re-sectioned, but no artificial features were recorded. It was classed as obviously modified using RHS data.

25.3.164 Kingcausie Burn (Figure 25.11d) is modified in its upstream reaches forming straightened field drains, though the channel takes a much more natural form as it flows through broad-leaf woodland in its downstream reaches before flowing into Crynoch Burn via a steep waterfall. The macroinvertebrate assemblage identified was slightly limited with only six species being identified. One species in particular, the weevil *Litodactylus leucogaster*, was abundant within the woodland stretch, and is a Notable b Species (does not fall within red data book categories, but is uncommon in the UK). Kingcausie Burn was classified as being of fair biological status based on the macroinvertebrate assemblage (though it was approaching good status).

25.3.165 RHS survey showed that upstream reaches of Kingcausie Burn are heavily modified with a fully reinforced left bank and bed. The surveyed reach is sinuous and flows through plantation woodland and improved grassland. It was classed as obviously modified using RHS data.

25.3.166 The River Dee (SAC) was the largest watercourse assessed within the study area (Figure 25.11d), and supported a diverse macroinvertebrate assemblage with a total of 11 species being identified. The ASPT score indicated that the Dee is of a good biological status, which matches the 2005 classification made by SEPA. The River Dee supports a number of flow-dependent species including stoneflies, mayflies and beetles.

25.3.167 RHS survey showed that the River Dee, downstream of the proposed crossing point, was classed as semi-natural. A set-back embankment along the left bank was the only modification recorded. Side bars were recorded along this reach of active river. The River Dee upstream of the proposed crossing point was classed as obviously modified. The B979 currently crosses the River Dee via a bridge. Embankment is present along both banks. One riffle, one vegetated point bar and side bars were recorded along this reach of active river.

25.3.168 Milltimber Burn is a straightened channel flowing to the north of the River Dee (Figure 25.11d), supporting a species-poor macroinvertebrate fauna with only seven individuals being identified. The burn was small and had a high level of suspended sediment, only supporting freshwater snails, dipterans, worms and the freshwater shrimp. The ASPT score for this burn indicates that it is of fair biological status. RHS data showed Milltimber Burn to be extensively realigned and over-deepened. It was classed as significantly modified due to the presence of a culvert, extensively re-sectioned banks, poaching, reinforcements and embanking.

Section SL4

25.3.169 Alburn Burn is a straightened drainage ditch flowing through an urban area east of Peterculter (Figures 25.11d). The burn at the sample point flowed around the perimeter of a school sports ground and was heavily choked with vegetation, namely nettles and bramble. A total of 11 species were identified from within the burn with only seven of those being scoring families. The ASPT score for the burn indicates that it is in a good biological status. The burn supported species of caddis fly, blackfly and beetles all requiring moderate to fast flow. No RHS was undertaken for Alburn Burn.

25.3.170 Bellenden Burn (Figure 25.11e) flows down through a small patch of conifer plantation before flowing along a straightened channel through residential areas. The upstream end of the burn follows natural meanders with moderately fast flow over cobbles and boulders, with organic debris from the woodland. The burn supported ten species with caddis flies and mayflies being the dominant groups. This burn also supported the notable weevil species, *Litodactylus leucogaster*. The ASPT score for this burn indicates that it is in good biological status. No RHS was undertaken for Bellenden Burn.

25.3.171 Culter House Ditch (not shown on map) was not sampled for macroinvertebrates and was classed as severely modified using RHS data. The left bank is fully reinforced by a dry stone wall. The ditch is extensively realigned and over-deepened with one culvert being recorded. Both banks are extensively re-sectioned and embanked.

Section SL5

25.3.172 Silver Burn (Figure 25.11f) is a naturally meandering burn, though is modified in sections where it is culverted beneath roads. The burn supported a total of 11 species and the ASPT score indicated a classification of excellent biological status. The dominant groups were the caddis flies and stone flies, which made up six of the 11 species identified.

25.3.173 Access to Gairn Burn was restricted and the burn was assessed from a road bridge for macroinvertebrate sampling. A total of 11 species were identified, with the majority being relatively pollution tolerant species, leading to an ASPT score indicating fair biological status (though approaching good). The dominant groups identified were the dipterans and mayflies.

25.3.174 Gairn Burn was classed as significantly modified using RHS data. A survey was carried out downstream of the proposed crossing point as dense vegetation prevented access to the burn upstream of this. The channel has been extensively realigned and over-deepened with one culvert, and six road bridges were recorded. The surveyed reach flowed from a conifer plantation under a road and through a garden.

25.3.175 Upper Beanshill Burn was not surveyed for macroinvertebrates and RHS was undertaken outside of the study area due to land access issues. This allowed the character of the watercourse to be assessed. This reach was classed as significantly modified. The channel has been extensively realigned and over-deepened with two culverts being recorded. The watercourse appears to have been excavated to drain conifer plantations along the upstream section of the reach. Further downstream, the burn flows into online ponds within ornamental gardens.

Section SL6

25.3.176 No macroinvertebrate sampling was undertaken for Westholme Burn, which is a field drain. The Burn was classed as significantly modified using RHS data due to being extensively realigned and over-deepened. Both banks are extensively re-sectioned and reinforced with the left bank being embanked in places.

25.3.177 No macroinvertebrate sampling was undertaken for Borrowstone Burn, which is also extensively realigned and over-deepened and passes through one culvert. It was classed as significantly modified using RHS data.

Fish

Consultation and Literature Review

25.3.178 Atlantic salmon (*Salmo salar)* are protected under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 which makes it an offence to knowingly take, injure or destroy any smolt, parr, salmon fry or alevin; injure or disturb any salmon spawn during the annual close time; obstruct or impede salmon passage for spawning. Atlantic salmon are listed on Appendix III of the Bern Convention as ratified by the Wildlife and Countryside Act (1981) (as amended). Freshwater populations are listed on Annex II of the EC Habitats Directive and Schedule 3 of the Conservation Regulations (1994).

25.3.179 Brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*) are listed in Annexes II and V of the EU Habitats Directive and Appendix III of the Bern Convention, ratified by the Wildlife and Countryside Act (1981) (as amended). All remaining fish species are not considered nationally scarce and are afforded no specific legal protection. They are on the UK BAP list and a draft Action Plan is in preparation. In Scotland, these species are not currently threatened, but are in decline (SNH 2004).

Field Survey

25.3.180 Not all of the burns within the vicinity of the proposed route were suitable for HABSCORE (habitat scoring) and electric fishing assessments as they were either considered too small to support salmonids or were ephemeral. Those watercourses that were suitable for HABSCORE are shown in Table 15 of Appendix A25.9, with the likely possibility of salmon and trout age classes being present. In addition, the results of the electric fishing surveys to confirm the presence or absence of salmon and trout are provided.

25.3.181 In Section SL2, Burnhead Burn (Figure 25.11c), near the proposed scheme crossing point, forms part of a straightened channel. Flow is moderate with a stoney substrate and in-stream vegetation providing refuge for small fish, a few of which were observed during the survey (brown trout juveniles). Assessments of the site showed that it is suitable for small brown trout, though not suitable for salmon or sea trout. The HABSCORE output for the burn indicated that trout fry (age class, 0+) and juveniles (<20cm) are likely to be present, with a possibility of adults (>20cm) also being present. The electric fishing surveys within Burnhead Burn yielded no fish, though suitable habitat was observed for lampreys and sticklebacks. It cannot be assumed that lamprey and stickleback are absent from the burn based on the electric fishing results as these species may have evaded capture.

25.3.182 In Section SL3, Blaikiewell Burn (Figure 25.11c) flows directly into Crynoch Burn through a shallow cascade and as such is open to migratory species. The burn offers excellent bank cover for fish and offers suitable habitat for stickleback and minnows. The presence of a waterfall at the confluence with the Crynoch indicates that the burn is inaccessible for lamprey. During the habitat assessment, juvenile brown trout were identified. The HABSCORE output for the burn indicated that it was unlikely for salmon to be present, although it is possible for all life stages of trout to utilise the burn. Electric fishing results confirmed the presence of trout within the burn with fry (0+) and parr (1+ and 2+) being caught. No other fish species were identified within the burn, though stickleback and minnow may also be present.

25.3.183 In Section SL3, Crynoch Burn was assessed at two locations, one upstream of the Blaikiewell Burn confluence and another upstream of the Kingcausie Burn confluence (Figures 25.11c-d). The upstream site was found to be likely to support salmon parr (>0+) and trout juveniles (<20 cm), although it is unlikely to support fry of either species. However, the downstream site is likely to support salmon parr and fry, trout fry and possibly trout juveniles and adults. No electric fishing surveys were completed within Crynoch Burn as it is within the River Dee SAC, which is designated *inter alia* for Atlantic salmon. Therefore, the presence of Atlantic salmon is pre-supposed in areas connected to the River Dee without physical barriers to their movement.

25.3.184 In Section SL3, Kingcausie Burn (Figure 25.11d) flows through woodland and forms a natural meandering channel at the sampling point (upstream the burn is extensively straightened). The burn provides refuges for fish through overhanging branches, and instream debris. Kingcausie Burn flows into Crynoch Burn through a steep waterfall indicating that it is not accessible for migratory fish. This is reflected in the HABSCORE output where salmon are unlikely to be found, though juvenile and adult trout are considered likely to be present. No electric fishing surveys were completed within Kingcausie Burn.

25.3.185 The River Dee is a large slow-flowing river providing a variety of habitats for a large number of fish species. HABSCORE assessments indicated that the River Dee is likely to support salmon fry and parr, trout fry, and possibly juvenile and adult trout. No electric fishing surveys were carried out within the River Dee SAC, which is designated *inter alia* for Atlantic salmon, and therefore their presence and that of other qualifying species is pre-supposed.

25.3.186 In Section SL4, Bellenden Burn flows along a natural meandering channel with fish refuges present in the form of fallen vegetation. The HABSCORE assessment indicated that the burn was unlikely to support salmon, though it possibly supports adult and juvenile trout. No electric fishing surveys were carried out within Bellenden Burn.

25.3.187 In Section SL5, Silver Burn was assessed along a small reach alongside the proposed route as it flows along the edge of woodland. The burn had a moderate flow with cobble and gravel substrate making it suitable for fish species, although a dam approximately 8.5km downstream of the crossing point deems the burn inaccessible to migratory salmonids. The HABSCORE output indicated that the burn was unlikely to support salmon, but it possibly supports trout fry, juveniles and adults. Electric fishing surveys of the burn confirmed the presence of trout with fry (0+) being identified. No other species were found, although suitable habitat was present for lamprey, minnows and stickleback.

25.3.188 Gairn Burn was also assessed along a small reach where it flows beneath the line of the proposed road. The flow is moderate with a cobble and pebble substrate providing fish refuges. The HABSCORE output indicated that the burn was unlikely to support salmon or trout fry, though was likely to support trout juveniles and adults. Electric fishing surveys of the burn confirmed the presence of trout with fry (0+) being identified. No other species were found, though suitable habitat was present for lamprey, minnows and stickleback.

25.3.189 No electric fishing was performed in Section SL6 due to lack of suitable habitat as detailed in paragraphs 25.3.155 and 25.3.156.

Freshwater Pearl Mussels

Consultation and Literature Review

25.3.190 Freshwater Pearl Mussel (*Margaritifera margaritifera*) is listed as one of the qualifying interests for the River Dee SAC. A recent extensive survey of the main stem of the River Dee, commissioned by SNH (Cosgrove et al*.,* 2003) indicated that pearl mussels are patchily distributed along the river between Aberdeen and Braemar.

Field survey

25.3.191 The field survey of the Dee River (Section SL3) and its tributaries recorded a population of approximately 70 pearl mussels including juveniles, indicating that the population is viable. The location of this pearl mussel bed is confidential due to the threatened nature of these species and is reported in more detail in Appendix A25.10 (Pearl Mussel Confidential Report).

Overall Summary of Baseline Conditions

25.3.192 In the predominantly agricultural habitat present within the study corridor, there is a relatively small amount of semi-natural habitat. Coniferous plantation woodland is the dominant land use after agriculture, with areas of mixed plantation and scrub recorded frequently. There are small patches of semi-natural and wet woodland usually dominated by birch and rowan. Semi natural woodland in the Kingcausie Estate supports a variety of ground flora, which indicate ancient origin. Hare Moss supports dry and wet modified bog and semi-natural woodland in the form of birch and willow carrs, while Moss of Auchlea has small remnants of wet modified bog, marshy grassland and swamp.

25.3.193 This largely agricultural landscape supports a wide range of species. Badgers are present in lower numbers than in the Northern Leg, although they are still common and widespread throughout the Southern Leg with Kingcausie and the River Dee supporting the largest populations. Bats are present throughout the study area with roosts and commuting routes located in close proximity to the route. Woodlands in Kingcausie have been identified as being a core area for a variety of bat species, possibly including the rare Leisler's bat. Otter activity is generally concentrated along the River Dee and its tributaries, with the Crynoch Burn and the Burn of Ardoe providing well-used commuting routes. Other core areas providing suitable lying up habitat for otters include Hare Moss, Greenloaning Wood, Kingcausie, Gairnhill Wood and the Moss of Auchlea. Red squirrels are present throughout the study corridor with Cleanhill Wood, Durris Forrest, Kingcausie, Milltimber Wood, Guttrie Hill Wood and Gairnhill Wood being core areas.

25.3.194 Frogs, toads and palmate newts were assumed to be present throughout the study area (paragraph 25.2.20) in close proximity to areas of standing water such as Greenhowe Pond. No reptiles were observed during field survey although their presence is likely due to habitat suitability. Incidental sightings of the generally nocturnal brown hare were not abundant, but suitable habitat was found particularly around Silver Burn. Water vole were absent from the area despite suitable habitat especially at Moss of Auchlea and Silver Burn, probably due to the presence of mink throughout the area. Water shrew presence is assumed throughout the area. Mosaic habitats are of greatest potential for terrestrial invertebrate populations. Hare Moss, Deeside Old Railway, River Dee and West Hatton Wood were all suitable for a number of locally and nationally important species.

25.3.195 Freshwater macroinvertebrate sampling combined with River Habitat Survey highlighted the following burns as being of particular ecological value: Crynoch Burn, River Dee, Blaikiewell Burn, Kingcausie Burn and Silver Burn. The fish habitat surveys recorded the best potential habitat for the greatest number of species at the River Dee and Crynoch Burn with trout likely to be present in Burnhead Burn, Blaikiewell Burn, Kingcausie Burn, Bellenden Burn, Silver Burn and Gairn Burn. Freshwater Pearl Mussels are present in the main stem of the River Dee.

25.3.196 Overall, the baseline data for habitats and species has highlighted that the Kingcausie Estate and the nearby River Dee are key areas for biodiversity in the region.

25.4 Evaluation of Baseline Conditions

25.4.1 The ecological value of the baseline conditions described above have been evaluated in accordance with the methods described above and the geographical framework detailed in Table 25.4. For each of the ecological receptors, the baseline conditions evaluated below are considered for each of the six study area sections.

25.4.2 The paragraphs below summarise the ecological value of terrestrial and freshwater habitats and local species populations found in the study area. The most significant Habitat Areas for each habitat and species are discussed and reported in the summary Table 25.12. For those receptors with full details provided in Appendices A25.1 to A25.10 the summary table presents only those areas of county importance or above. For those receptors without Appendices, evaluations are presented in full.

Terrestrial Habitats

Section SL1

25.4.3 In this section there are two sites assessed as being above local value. Blue Hill Wood (S3, county) and Hare Moss (S10, regional) due to their UK BAP status and the frequency of habitat in the study area.

Section SL2

25.4.4 Clochandighter Wood (S14) and Whitestone Wood (S15, part of the Hill of Blairs complex mosaic of habitats) are plantation woodlands of high conservation value. The complex ground flora at Clochandighter Wood is of county level. Whereas Whitestone Wood's wet habitats including wet heath and and mire, are of regional value.

Section SL3

25.4.5 The linked Habitat Areas of Cleanhill Wood, Kingcausie and agricultural estates of Kingcausie (S20, S23 and S24 respectively) represent a sizeable area of long-established LHAP plantation woodland, with small areas of UK BAP wet woodland and UK BAP ancient hedgerow. The agricultural field to the north of Kingcausie contains frequent mature trees that have been present since the 19th century (map data 1810-1829) and represents the UK BAP Lowland Wood-Pasture and Parkland. These areas are therefore of county value,

25.4.6 The riparian habitats of Crynoch Burn, Blaikiewell Burn and the River Dee, (S22 and S28) contain UK BAP wet woodlands as well as UK BAP Fen in the Blaikiewell Burn. Although the SAC designation primarily relates to fauna, the SAC submission (JNCC, 2006) does also record a number of Annex I habitats within the corridor. These areas.are therefore of regional value.

25.4.7 Although the LBAP species, wych elm, is found within Habitat Areas S23, S24, S27 and S28. None of these are key areas of LBAP species (e.g. none are wych elm rich woodlands), therefore these Habitat Areas are of local value.

Section SL4

25.4.8 Both Guttrie Hill DWS (S34) and the site of the Deeside Old Railway DWS (S31). S32 is listed as of county value due to the presence of UK BAP Ancient Hedgerow. However, the lack of connectivity with other valuable habitats limits the value of the hedge.

25.4.9 Beans Hill contains the UK BAP Lowland Heathland habitat. However, only a portion of the area is composed of this habitat with acid grassland being dominant overall. This grassland is not of the same community as that described in the UK BAP Lowland Dry Acid Grassland. However, the potential to increase the value of this habitat remains, thus the area is valued at county level.

25.4.10 Although the LBAP species, wych elm, is found within Habitat Areas S32 and S37. None of these are key areas of LBAP species (e.g. none are wych elm rich woodlands), therefore these Habitat Areas are of local value.

Section SL5

25.4.11 There are three Habitat Areas of greater than local importance in this section. Silver Burn Wood on the AWI (S40) Rotten O' Gairn DWS (HA S42) with UK BAP wet woodland and Gairnhill and Kingshill Wood (S43) DWS, long-established woodland of plantation origin (AWI) are of county value. Moss of Auchlea DWS (S45) contains UK BAP wet woodland with a groundlayer supporting areas of swamp, marsh and fen underneath. There is also the potential for extension and restoration, therefore this area is of regional value.

Section SL6

25.4.12 In this section there is one area of county value, West Hatton Wood DWS (S47 long-established woodland of plantation origin (AWI)) and one of regional value, Cloghill (S48). Cloghill has a mosaic of habitats including species rich grassland (LHAP), dry acid grassland UK BAP) plantation woodland linked with walls and scrub.

Badger

25.4.13 Badgers are common and widespread throughout the British Isles and to a lesser extent in Europe. However they are a nationally protected species in terms of legislation and recently have been included on the 'Scottish Biodiversity List' under the Nature Conservation (Scotland) Act 2004 as a species considered to be of principal importance for the purpose of biodiversity conservation in Scotland. The potential impact of road schemes on badgers in terms of mortality, displacement, severance, habitat fragmentation and foraging habitat loss, could be considered a breach of current legislation, which makes it an offence to kill or injure badgers or interfere with their setts.

25.4.14 Therefore, for animal welfare and conservation reasons and to minimise such offences, badgers are considered to be a nationally important species. Habitats that are necessary to maintain badger populations (i.e. main setts) are evaluated as being of County ecological value. Habitats of good or moderate quality that support badger populations as identified by social groups and described in Appendix A25.2, but are not essential to maintain the populations, are evaluated as being of County ecological value. Those necessary for maintenance of the local population are evaluated as being of regional value.

25.4.15 The following paragraphs contain a summary of the information reported for badgers, for full details refer to Appendix A25.2.

Section SL1

25.4.16 Section SL1 offers extensive areas of generally flat, exposed and relatively unproductive pasture and wet grassland with scrub including Hare Moss in the west of the section. These areas are considered unsuitable for sett construction and offer limited and patchily distributed foraging habitat. In the east of the section. Duff's Hill, Greenhowe and associated scrub habitats provide more cover, although Blue Hill Wood is considered unsuitable for sett construction due to the high density of trees. Woodland rides and scrub, particularly around Blue Hill, provide suitable commuting routes and alternative foraging and setting habitat.

25.4.17 The soils within the large pasture fields are generally thin, meaning that earthworms are likely to be patchily distributed especially due to the prevalence of wet grassland and bog habitat, in particular around Hare Moss. Conifer plantation woodlands also provide fewer and lower quality foraging habitat than broad-leaved habitats in the west. Alternative foraging habitat is provided by gorse scrub and occasional arable fields.

25.4.18 This section contains one social group (Greenhowe Group) as identified from the presence of a five-hole main sett, three-hole annexe sett, three outlier holes and a potential sett in a clump of gorse scrub. The group is bounded to the east by the A90 where three RTAs have been recorded, restricting badger movements into and out of the area. Activity and territorial marking around Hare Moss possibly delineate the extent of another group from outside the study area. It is unlikely that more than one social group could be supported in this area due to the low value habitat. Poorer habitat requires badgers to roam widely in search of food and badgers may occasionally have to enter adjacent home ranges.

25.4.19 Within this section, habitats are of moderate quality for setting and foraging. It appears that it supports one badger group and is evaluated as being of county ecological value.

Section SL2

25.4.20 Section SL2 offers abundant pasture fields that are less exposed and likely to be more productive foraging habitat in terms of earthworms than that in Section SL1. Alternative foraging habitat is represented in the form of gorse scrub and arable land. Several woodland areas provide shelter and good connectivity including Whitestone, Hill of Blairs, Craigingles and Clochandighter Woods, although large sections of Clochandighter Wood have been felled. Extensive gorse scrub near Merchant's Croft provide sett and commuting habitat.

25.4.21 The western end of this section offers high quality sett-making habitat within Whitestone Wood and Hill of Blairs. Alternative areas for setts exist in nearby Whitestone Wood and surrounding gorse scrub. These areas provide cover and well-drained sloping ground ideal for setts. The flatter eastern end of the section offers fewer sett-making opportunities.

25.4.22 One group of badgers, the Merchant's Croft Group, has been identified in this section. The main sett is in an area of dense gorse scrub, the subsidiary sett is within Whitestone Wood and outliers exist in Hill of Blairs. An unidentified sett in Clochandighter Woods indicates that another group may exist in the felled area as the wood is relatively isolated from other woodlands in the area. Badgers from neighbouring territories may occasionally use the area at certain times of year and during infrequent visits for dispersal, or to exploit foraging resources.

25.4.23 The habitats in this section are of low to moderate quality, supporting one group of badgers. The section is evaluated as being of county ecological value.

Section SL3

25.4.24 Section SL3 offers large areas of high quality sett-making habitat within Cleanhill and Kingcausie Woods within the Kingcausie Estate. These woodlands provide excellent cover and well-drained sloping ground ideal for setts. Limited human disturbance within the estate and the presence of pasture fields that surround and separate woodland areas represent high quality foraging habitat, providing ideal habitat. The woodlands also represent the largest woodland area in the study area.

25.4.25 The highest quality foraging habitat is likely to be adjacent to the River Dee where the soils are richest. Alternative foraging habitat in the area is present in broad-leaved woodlands and arable fields, providing year-round resources for badgers.

25.4.26 There is a high density of badger social groups in this section due to the abundance of high value, optimal badger sett-making and foraging habitat. The Kingcausie Group's main sett is located near the edge of the study area, but their main territory is represented within the study area. Two other social groups also make use of the habitat in this area, including the Cleanhill Group and another based in the Murtle Estate. A further social group could be supported in the vicinity of the River Dee, owing to the presence of optimal badger habitat here. It is likely that badger groups in this section are larger in terms of badger numbers per group and may have higher survival rates than in the previous two sections, despite two RTA records along the B9077.

25.4.27 In this section, habitats of moderate to high quality maintain badger populations from at least two social groups and have the potential to support more. This section is therefore evaluated as being of regional ecological value.

Section SL4

25.4.28 Section SL4 is delineated to the south and west by the residential areas of Peterculter and Milltimber, which provide a barrier to badger movements. Several small to moderate-sized blocks of suitable sett-making habitat are located in close proximity to each other and additional setting habitat is provided within areas of dense gorse on Beanshill.

25.4.29 Pasture is abundant throughout this section although fields on Beanshill are exposed and are only likely to be of moderate productivity in terms of earthworms. Alternative foraging opportunities are provided by adjacent arable fields and woodland, although there are moderate levels of disturbance from humans near built up areas.

25.4.30 Badgers from the Milltimber group, which is located within the study area, and the Nether Contlaw Group, which is centred outside the study area, both use this section. Badgers from the Gairnhill Group to the north also use this section to some extent. It is likely that other social groups could be supported within this section owing to the quality of the habitat. This section is evaluated as being of county ecological importance to badgers.

Section SL5

25.4.31 In Section SL5, Gairnhill and Kingshill Woods offer the second largest area of woodland in the study area, providing suitable sett-making habitat although some degree of human disturbance is likely due to the presence of footpaths. The contiguous nature of these woodland habitats provides excellent connectivity for badgers, enabling them to travel safely through the area. In addition, Silverburn Wood and areas of gorse and bracken, particularly on Backhill provide suitable setting locations. Extensive areas of pasture fields provide areas of suitable foraging habitat likely to be productive in terms of earthworms. Alternative seasonal foraging habitats are offered by woodland areas and arable land.

25.4.32 Only one social group is resident within this section (Gairnhill Group) although the Nether Contlaw, Kingshill and Bishops Court Groups, which have their main setts outside the study area, are likely to use the habitat within. These social groups are in close proximity to each other and all areas of rural habitat area likely to be used, thus it is unlikely that further social groups could be supported in this area. The northern extent of badgers in this section is likely to be the A944, which forms an effective barrier to badger movements north/south.

25.4.33 The high density of badger groups within this section reflects the area's moderate to high quality badger habitat in terms of foraging and sett-making opportunities. The section maintains one social group and supports up to three others. This section is evaluated as being of regional ecological importance.

Section SL6

25.4.34 Section SL6 offers a limited amount of sett-making habitat owing to the fragmented nature of habitats. Gorse scrub on Cloghill, occasional shelterbelts and woodland blocks such as Hillhead of Derbeth are generally small, although good connectivity between them provides probable commuting routes and an effective wildlife corridor.

25.4.35 Pasture comprises the predominant land use in this section, which can be foraged for earthworms. Few alternative foraging habitats are available in areas of scrub and woodland and there is little arable land to offer seasonal foraging resources through crops.

25.4.36 One social group (Cloghill Group) is resident in this section, bounded to the east by the large residential area of Kingswells, although the section is utilised by another social group centred on Brimmond Hill. These badger groups are likely to occupy large territories widely distributed from one another. It is unlikely that further social groups could be supported in this area. This is due to the section's limited sett habitat and limited alternatives for earthworm foraging habitat.

25.4.37 In this section of the route, low to moderate value habitats support badger populations with one social group resident. The section is evaluated as being of county ecological importance.

Bats

25.4.38 All species of bat are European protected species, protected by legislation set out in the EU Habitats Directive and transposed into UK law by the Conservation Regulations (1994). Pipistrelle bats are priority species in the UK BAP and Daubenton's bats are included in the NES LBAP.

25.4.39 As an internationally important group of species, the sites necessary to maintain the viability of populations in the Aberdeen area, such as roost sites, are evaluated as being of Regional importance to nature conservation. Sites deemed to be supporting bat populations, such as important foraging habitat or commuting corridors, are evaluated as being of county importance. Sites with potential to support bat populations considered to appreciably enrich the habitat resource within the local context are evaluated as being of local importance.

25.4.40 The following summarises the evaluation reported for bats, for full details refer to Appendix A25.3. It must be noted that the following is based on incomplete survey data and as such, evaluations are provisional.

Section SL1

25.4.41 Of the ten habitat areas identified within Section SL1, one has been assessed as being of regional importance due to the presence of two roosts. Nine habitat areas have been assessed as being of county value to bats on account of the presence of valuable commuting and foraging habitat (including Hare Moss) and / or potential roosts. The habitats in this section are not considered the most valuable in the whole study area due to the predominance of exposed arable and pasture farmland of low inherent value to roosting and foraging bats, and because suitable shelter and foraging habitat including woodland, wet habitats and scrub are generally small, patchy and fragmented. However, the importance of these features as a whole, in particular their role in providing connecting habitat between more valuable areas outwith the study area confirm the importance of the area in supporting populations of bats.

Section SL2

25.4.42 All six of the Habitat Areas identified within Section SL2 have been identified as being of county importance to bats due to the presence of potential building and tree roosts and / or on account of the valuable commuting and foraging features identified. Section SL2 and SL1 provide a similar resource in terms of the quantity and quality of suitable foraging and roosting habitat, as areas of shelter and high value foraging habitat are scarce and fragmented. However the presence of bats foraging and commuting around the patches confirm the value of this section in supporting populations of bats, and in providing stepping stones between alternative areas of resource outwith the study area, including Clochandighter Wood, Shanna Burn Wood and the Kingcausie Estate.

Section SL3

25.4.43 Two of the 15 Habitat Areas in Section SL3 have been identified as being of national importance primarily due to the numbers of bats supported or the range of species present, which may possibly include the Leisler's bat at the northernmost limit of its range on the Kingcausie Estate and a historic Leisler's bat record over the River Dee (Rydell et al. 1993). Five habitat areas have been evaluated as being of regional importance to bats due to the presence of roosts and seven have been evaluated as being of county value to bats. The results of habitat assessment and activity surveys on the Kingcausie Estate and surrounds show this area to be very important in terms of provision of high quality roosting, foraging and commuting habitat which is subject to very low levels of disturbance. The estate includes some of the best examples of ideal bat habitat in the study area including a number of building roosts and mature broad-leaved trees with suitable crevices and cracks, and a well house with potential as a hibernaculum. The mosaic of pasture and arable land with mature broad-leaved shelterbelts and woodland areas, and sheltered woodlands adjacent to Crynoch Burn and the River Dee support a variety of species including common and soprano pipistrelles, Daubenton's, Natterer's, brown long-eared and possibly Leisler's bats; the

largest range of species in the proposed Southern Leg. The River Dee represents a high value commuting and foraging resource connecting habitats up- and downstream for species including the LBAP species Daubenton's bats and supporting maternity roosts for Daubenton's bats of National significance (Racey, undated.)

Section SL4

25.4.44 Five of the eight Habitat Areas identified in Section SL4 have been evaluated as being of regional importance to bats largely due to the presence of roosts. The number of roosts represented in this section reflects the importance of built up areas such as Milltimber for bats as they provide suitable roosting opportunities, especially for pipistrelle species. Milltimber and residential areas surrounding it are likely to be of strategic importance to bats which forage over the River Dee and roosts, commuting routes and woodland habitats in the centre and north of this section are likely to be of strategic importance to bats which commute to forage at Silverburn in section SL5. The remaining Habitat Areas have been evaluated as being of county importance in recognition of the high quality commuting and foraging habitat they provide. The southern part of this Section in particular is likely to provide vital resources for bats roosting both within and outwith the study area, especially given its proximity to the River Dee and the excellent foraging habitat south of the river. The section maintains and supports populations of soprano and common pipistrelles, Daubenton's and brown long-eared bats.

Section SL5

25.4.45 Three of the six habitat areas within Section SL5 have been identified as being of regional importance to bats on account of the presence of four roosts. The remaining three areas have been evaluated as being of county importance as they include potential roosts and / or support commuting and foraging bats. This section includes an important green corridor which covers a wide area from Murtle Den north to Kingshill and Gairnhill Woods and provides connectivity between valuable bat habitats across this section including Silver Burn, Rotten O'Gairn and the Moss of Auchlea. The section maintains and supports populations of soprano and common pipistrelles and brown long-eared bats.

Section SL6

25.4.46 Of the twelve habitat areas assessed within Section SL6 four are considered to be of regional importance to bats as they maintain populations of roosting bats. In particular the presence of seven roosts including Fairley Home Farm and a number of trees, which is considered a significant number of roosts for the region, support pipistrelle, brown long-eared and Myotis species. Five habitat areas are evaluated as being of county importance, due to their importance to foraging and commuting bats, as observed during bat activity surveys. One habitat area is assessed as being of local importance as the habitats it provides, including sheltered field boundaries with potential for commuting and foraging bats, is considered to appreciably enrich the habitat resource on the local level. Two habitat areas north of Kingswells are assessed as being of less than local importance to bats due to the absence of resources suitable for supporting bats and the exposed nature of the Habitat Areas. The woodlands and shelterbelts that characterise this Section are largely fragmented but they are of value to roosting, foraging and commuting bats and are strategically located between a large area of potential roosting habitat in Kingswells and foraging resources in the west including Brimmond Country Park. They maintain populations of at least five species of bats that are of international importance but are not threatened or rare in the region.

Breeding Birds

25.4.47 The ecological value of each SOV and Quadrat for breeding birds was determined by considering the evaluation of its habitat potential for breeding birds (derived from information in Appendix A40.1 Terrestrial Habitats) combined with the value of the breeding bird assemblage present as recorded (refer to Appendix A40.4).

25.4.48 An assessment was then made of the representativeness of the habitats found in each Quadrat or SOV in relation to the non-surveyed areas adjacent. The ecological value of the remaining Habitat Areas in each route section was then determined by an initial evaluation of their habitat potential for breeding birds combined with the knowledge of the breeding bird assemblages found in adjacent representative Quadrats or SOVs.

25.4.49 All Quadrats were determined to be sufficient for the comprehensive evaluation of breeding bird assemblages with the exception of: Quadrat SL-Bb05 – Merchant's Croft; Quadrat SL-Bb07 – Storybook Glen; Quadrat SL-Bb09 - Contlaw; Quadrat SL-Bb10 – Westfield Lodge; and Quadrat SL-Bb12 - Kingswells. The full complement of three surveys were not completed in these areas, and will be adressed and reported in the 2007 EARs.

25.4.50 The following summary presents an evaluation of habitats and breeding bird populations for SOVs, Quadrats. The following summary presents an evaluation of habitats and breeding bird populations according to SOVs and Quadrats for each route section in the study area (full details are presented in Table 17 Appendix A40.4.

Section SL1

25.4.51 Two SOVs (Blue Hill and Hare Moss) and four Quadrats (Marywell, Charleston, Duff's Hill and Jameston) are located within Section SL1..

25.4.52 Habitats within Blue Hill comprise a mosaic of coniferous and deciduous plantation woodland, with areas of mixed parkland/scattered trees, scrub and grassland. In comparison, Hare Moss comprises a mosaic of woodland and remnant heathland/bog habitats. Blue Hill is assessed as being of medium value in terms of habitats and local value in terms of breeding bird populations. Hare Moss is assessed as being of high value in terms of habitats and county value in terms of breeding bird populations.

25.4.53 Habitats within the Quadrats comprised improved agricultural fields with areas of scattered and dense scrub and marsh/marshy grassland with occasional parkland/scattered trees (along boundary features) together with areas of mixed, broad-leaved and coniferous plantation woodland. These are assessed as being of low value. An exception to this is Quadrat SL-Bb03 – Duff's Hill, which is considered to be of medium value. All Quadrats are assessed as being of local ecological value in terms of their breeding bird populations with the exception of Quadrat SL-Bb01 – Marywell, which is assessed as being of less than local value.

Section SL2

25.4.54 Four SOVs (Heatherknowe, South Greenloaming, Hill of Blairs and Burnhead) and two Quadrats (Merchant's Croft and Kirkton of Maryculter) are located within Section SL2. .

25.4.55 Habitats within the SOVs are dominated by coniferous and deciduous plantation woodland, dense/scattered scrub, grassland, heathland and swamp, which ranged from low (Burnhead) to high (Hill of Blairs) value. Heatherknowe was assessed as being of local value in terms of its breeding bird populations. Hill of Blairs in comparison due to its high value habitat is of county value. South Greenloaming and Burnhead were assessed as being of less than local value.

25.4.56 Habitats within Quadrats comprised arable and improved agricultural grassland fields with pockets of scrub, bracken, and coniferous and mixed plantation woodland, which are assessed as being of local (with respect to Quadrat SLBb05 - Merchant's Croft) and medium (with respect to Quadrat 6 - Kirkton of Maryculter) value. Both Quadrats have poor breeding bird assemblages, with Quadrat 5 - Merchant's Croft considered to be of less than local value and Quadrat 6 - Kirkton of Maryculter, considered to be of local value.

Section SL3

25.4.57 Five SOVs (Blaikiewell Burn, Cleanhill Wood, Crynoch Burn, River Dee and Deeside Old Railway) and one Quadrat (Storybook Glen) are located within Section SL3.

25.4.58 Habitats within the SOVs are dominated by a mixture of riverine, coniferous and deciduous plantation/semi-natural woodland, scrub and grassland habitats with significant areas of scattered and parkland trees (especially in Kingcausie Estate), which ranged from medium value (Blaikiewell Burn and Deeside Old Railway) to high value (remaining SOVs). Cleanhill Wood and Old Deeside Railway were assessed as being of local value in terms of their breeding bird populations with the exception of Blaikiewell Burn, which was less than local value. In comparison, Crynoch Burn and the River Dee were both assessed as being of county value in terms of their breeding bird assemblages.

25.4.59 Quadrat SL-Bb07 – Storybook Glen, which comprises a mosaic of grassland, woodland and fresh water habitats, was assessed as being of medium value in terms of habitats and local ecological value in terms of breeding bird populations. However, the Habitat Area to the east of the Quadrat has a higher habitat quality due to a valuable mosaic of riparian woodland, and marsh with ancient hedgerows, this area was assessed as being of county value.

Section SL4

25.4.60 One SOV (Beanshill) and two Quadrats (Milltimber and Contlaw) are located within Section SL4.

25.4.61 Beanshill SOV comprises a mosaic of woodland, scrub, heathland and grassland habitats which are assessed as being of medium value in terms of habitats and local ecological value in terms of breeding bird assemblages.

25.4.62 Quadrat 8 - Milltimber comprises a mosaic of grassland and residential (dominated by areas of amenity grassland with mature parkland/scattered trees) habitats, while in comparison, Quadrat 9 – Contlaw comprises mostly agricultural fields with scrub edges and occasional small blocks of coniferous woodland. Habitats in both Quadrats are assessed as being of medium value. Quadrat 8 - Milltimber is assessed as being of less than local importance in terms of breeding bird populations while Quadrat 9 – Contlaw is considered to be of local importance.

Section SL5

25.4.63 Three SOVs (East Silverburn, Gairnhill/Kingshill Wood and Moss of Auchlea) and two Quadrats (Westfield Lodge and Auchlea) are located within Section SL5..

25.4.64 The SOVs comprised a mixture of woodland, scrub and grassland habitats that ranged from medium value (East Silverburn and Gairnhill/Kingshill Wood) to high value (Moss of Auchlea) in terms of habitats and less than local value (East Silverburn) to county value (Gairnhill/Kingshill and Moss of Auchlea) in terms of their breeding bird populations.

25.4.65 Quadrat SLBb10 – Westfield Lodge comprised a mosaic of wet heath/grassland habitats with areas of standing and running water assessed as being of medium value. Quadrat SLBb11 – Auchlea comprised mostly improved agricultural fields with patches of scrub and an area of mixed woodland assessed as being of low value for breeding birds. Quadrat SLBb10 – Westfield Lodge was assessed as being of less than local value while Quadrat SLBb 11 – Auchlea was assessed as being of county value in terms of breeding bird populations.

Section SL6

25.4.66 One SOV (West Hatton Wood) and one Quadrat (Kingswells) are located within Section SL6...

25.4.67 West Hatton Wood comprises a mosaic of woodland and scrub habitats that are assessed as being of medium value in terms of habitats and local ecological value in terms of breeding bird population.

25.4.68 Quadrat SL-Bb12 – Kingswells comprises a mosaic of agricultural fields, mixed plantation woodland and semi-improved grassland with areas of scattered/parkland trees assessed as being of low value in terms of habitats and local ecological value in terms of breeding bird populations.

Otter

25.4.69 The otter is a species of International conservation importance due to its inclusion in Annex IV and Annex II of the Habitats Directive. It is also a priority species in the UK BAP. However, the otter is not threatened or rare in the region or county, and is not an NES LBAP priority species. Aberdeen is known to be an important area supporting internationally important populations of otters in the Dee and Don catchments, therefore local otter populations are assessed as being of National conservation importance. The identification of otter signs, their resting places and otters themselves along many of the watercourses within the study area reflects this assessment.

25.4.70 Habitats that support a viable local population of otter are evaluated as being of county ecological value, and habitats vital to maintain a local population are assessed as being of regional ecological value. The following paragraphs contain a summary of the information reported for otter, full details of which are provided in Appendix A25.5.

Section SL1

25.4.71 The Burn of Ardoe provides high value foraging and lying up habitat and a commuting route south of the River Dee to Hare Moss that is considered vital to maintaining the local otter population. Loirston Burn and its tributaries are of County importance, providing a commuting route from Loirston Loch. Greenhowe Pond provides some seasonal foraging opportunities although it does not appear to be used regularly by otters. Taken together, the watercourses in this section are assessed as being of regional importance to otters

Section SL2

25.4.72 This section is assessed as being of regional importance to otters. Shanna Burn maintains the local otter population through the provison of fish stocks and high value habitat, as well as a commuting route south from the River Dee. Cowford Burn extends the foraging and lying up habitat in this section, providing access to shelter in Greenloaning Wood. Burnhead Burn supports a population of otters, which are also likely to use the SAC.

Section SL3

25.4.73 Otters are one of the named species for which the River Dee SAC, which includes the River Dee and Crynoch Burn, are notified. The River Dee and Crynoch Burn, where evidence of breeding otters has been recorded, have been identified as core areas of otter activity. The fish and other prey populations these support are vital to maintaining the internationally important population of otters in the area. Blaikiewell Burn, Kingcausie Burn, Glenburnie and ponds, Mill Bank Burn and Milltimber Burn also extend the habitat resource in this area and taken together this section are assessed as being of international ecological value.

Section SL4

25.4.74 Beanshill Ponds are the only major water body within this section. The ponds are considered to be of county ecological value to otters due to their fish stocks and strategic value on a commuting route along Upper Beanshill Burn between Murtle Den to the east and Silver and Ord Burns to the west. Beans Burn appreciably enhances the habitat resource in the area by extending the foraging resource from the ponds to the south.

Section SL5

25.4.75 Ord Burn and Silver Burn form a core area of otter activity with abundant signs, lying-up sites and other habitats in the area supporting the local population including Gairn Burn and Upper Beanshill Burn. An important commuting route between Beanshill Ponds/Murtle Den and Silver/Ord Burns exists along Upper Beanshill Burn and areas of undisturbed scrub and woodland exist at the Moss of Auchlea DWS and in Gairnhill Wood. Taken together, the watercourses in this section are considered to be of regional importance to otters.

Section SL6

25.4.76 Borrowstone Burn and Ponds, and Westholme Burn provide limited foraging and cover, but are considered to enhance the local habitat resource. Collectively, the ecological value of the watercourses in this section is assessed as being local.

Red Squirrel

25.4.77 Aberdeen is on the edge of the current northern distribution of the grey squirrel, which competes with the red squirrel where the two occur together. Red squirrel is considered to be a species of national conservation concern and is threatened throughout Scotland. Habitats supporting populations of red squirrels in the Aberdeen area are therefore assessed as being of regional ecological value as these are regularly occurring locally significant populations of a species that occurs in a regional and UK BAP.

25.4.78 Habitats maintaining locally significant populations are evaluated as being of national importance. Habitats not currently supporting locally significant populations of red squirrel, but are considered to appreciably enrich the habitat resource within the local context, are evaluated as being of county importance. The following paragraphs contain a summary of the information reported for red squirrel; for full details refer to Appendix A25.6.

25.4.79 There are two areas of contiguous woodland within the survey corridor of the proposed route, which are likely to be the most important areas for red squirrels in terms of habitat, range and population. These are the areas comprising Gairnhill Wood, Kingshill Wood and Silverburn Wood north of the River Dee, and the area of woodland comprising Cleanhill Wood, the Kingcausie Estate and Durris Forest south of the River Dee.

Section SL1

25.4.80 Blue Hill Plantation and Drumth Whacket showed no evidence of red squirrel presence and are considered to be of local and less than local importance, respectively. The habitat in this area mainly consists of semi-mature Sitka spruce, which is not a favoured woodland type for red squirrels. Only mature Sitka spruce produces mast (> 30 years old) (Philippa Murphy, Forestry Commission, personal communication) and so it is highly unlikely that any of the trees in these woodland areas will have reached mast producing age. There are some stands of mature Scots Pine (approximately 5%) within Blue Hill Plantation (see Terrestrial Habitats Report, Appendix A25.1, Phase 1 Habitat Survey), but this would have to increase to at least 20% of the forest cover to promote heavy coning and thus provide year-round foraging opportunities for red squirrels (Pepper and Paterson, 1998). Records of red squirrels exist for nearby woodland Duff's Hill. However, recent tree felling means that these woodland areas are now isolated from each other.

25.4.81 Duff's Hill Plantation comprises lodgepole pine (approximately 50%) and Sitka spruce (approximately 50%). Lodgepole pine confers direct value for red squirrels as a food resource and so this woodland area is considered to have potential for supporting red squirrel populations. Anecdotal records of red squirrel exist here (local resident, personal communication) (Figure 25.6a). However, it must be noted that these records were made prior to the felling of the northern section of Duff's Hill and so the plantation is no longer connected to Blue Hill Plantation to the north. The hair-tube surveys also revealed the presence of grey squirrels, thus leading to probable ongoing inter-specific competition between the two species. This area is assessed as being of

county importance to red squirrels, as even though red squirrel records exist, it is unlikely that this woodland can support a locally significant red squirrel population due to its isolated nature and sub-optimal tree species composition.

Section SL2

25.4.82 Clochandighter and Sunnyside Wood are both isolated areas of woodland, in the case of Sunnyside Wood, relatively small (less than 2 ha). Only grey squirrels were recorded in these woodland areas. However, abundant foraging opportunities for red squirrels are provided by the diverse mix of small-masted coniferous species present and thus they are both considered to have some potential for supporting red squirrel populations. Clochandighter and Sunnyside Wood are therefore deemed to be of local importance to red squirrels.

25.4.83 Greenloaning Plantation is considered to be of less than local importance for red squirrel populations. No red squirrels were recorded in this isolated woodland and a dearth of foraging opportunities and lack of suitable cover means this woodland habitat is of low value to red squirrels.

25.4.84 Hill of Blairs and Whitestone Wood are both considered to be of high habitat value to red squirrels, as they are dominated by Scots Pine, providing optimal breeding and foraging opportunities. Red squirrels are present in Hill of Blairs (local resident, personal communication) and so this woodland area is considered to be of regional importance. Whitestone Wood is considered to be of county importance for red squirrels. Even though the hair-tube and visual surveys yielded negative results for Whitestone Wood, it is highly likely that red squirrels are also utilising this area given its high connectivity to Hill of Blairs. Furthermore, the road that separates Hill of Blairs and Whitestone Wood from Cleanhill Wood and Craigingles Wood, where red squirrels are also present, is narrow. The existing road is unlikely to pose a real barrier to the movement of red squirrels thus these woodland areas may be seen in the context of contiguous cover (Reynolds and Bentley, 2004) (see Figures 25.6b-c).

Section SL3

25.4.85 The red squirrels recorded within Kingcausie and Cleanhill Wood are likely to be utilising this entire woodland area as the age structure and mixture of tree species present provide high quality foraging and breeding habitat . Furthermore, red squirrel records exist in Craigingles Wood (NO 875993), which although outside the survey corridor, is contiguous to both Cleanhill Wood and the Kingcausie Estate. Grey squirrels have also been observed in these woodland areas, but in spite of the probable resultant ongoing inter-specific competition, these woodland areas are considered to be of regional importance for red squirrels.

25.4.86 Red squirrel records also exist for Durris Forest. This woodland is considered to provide high quality red squirrel habitat given the favourable assemblage of coniferous species present and its high connectivity to Kingcausie (where red squirrels are also present). Therefore, Durris Forest is considered to be of regional importance, despite the likelihood of ongoing inter-specific competition with grey squirrels also present here.

Section SL4

25.4.87 Red squirrels are present in both Milltimber Wood and Guttrie Hill Wood. Dreys were also recorded by Jacobs ecologists in both woodlands. This, in conjunction with the apparent absence of grey squirrels, means it is highly likely that red squirrels are breeding here. However, this cannot be confirmed without observational evidence. Coniferous trees are the most suitable trees for building dreys and they provide high energy food nearly all year round (Corbett and Southern, 1977; Waulters and Dhondt 1987). These woodlands are therefore considered to be of regional importance to red squirrels.

25.4.88 Verbeylen et al. (2003) have shown that a minimum of 3.5ha of woodland is required to support a viable population of red squirrels, providing that the squirrels are able to disperse to other nearby

woodland areas. As connectivity is high between Milltimber Wood and Guttrie Hill Wood (see Figures 25.6d-e) and given the small size of these woodlands (approximately 6.5ha and approximately 4.5ha, respectively), it is likely that the squirrels are commuting between the two woodlands.

25.4.89 Despite containing Scots pine, Beans Hill Wood provides low value habitat for red squirrels due to its high degree of isolation, and small size (approximately 2ha). No red squirrels were recorded, therefore this woodland is considered to be of less than local importance. Culter House Wood is also considered to be of less than local importance, as its tree species mix renders it to be of unfavourable habitat for red squirrels (due to the high potential for inter-specific competition), and hence this woodland was not subject to survey.

Section SL5

25.4.90 Gairnhill Wood, Silverburn Wood and Kingshill Wood provide optimal red squirrel habitat with an ideal assemblage of tree species and varied age structure, which presents excellent foraging and breeding opportunities. Red squirrels were recorded in all three woodland areas. It is likely that squirrels are inter-dispersing between these woodland areas as there is a high degree of connectivity between them (see Figure 25.6f). Grey squirrels were also recorded in Gairnhill Wood and Kingshill Wood thus there is the potential for inter-specific competition between the two species. Nevertheless, this is considered a key area for red squirrel conservation and so is deemed to be of regional importance.

25.4.91 Moss of Auchlea is an area of wet woodland predominantly comprised of small-masted broad-leaved species, such as goat willow. It is highly isolated from surrounding woodland areas; separated from Gairnhill Wood and Kingshill Wood to the east by open pasture fields (see Figure 25.6f). This high degree of isolation combined with a lack of suitable refuge sites and limited foraging opportunities, means that this woodland is considered to be of less than local importance for red squirrels.

Section SL6

25.4.92 Hillhead of Derbeth Woodland is an isolated area of mature mixed woodland of medium quality habitat. No red squirrels were recorded within the woodland however, an incidental sighting of a red squirrel was made in an adjoining woodland strip, southeast of the woodland. It is therefore possible that red squirrels are utilising Hillhead of Derbeth but went undetected by the hair-tube surveys. Taking a precautionary approach, and assuming that red squirrels are indeed present, this area is therefore considered to be of county importance.

25.4.93 West Hatton Woods (NJ 855070) were not surveyed as the isolated nature and species mixture of this broad-leaved woodland meant that it is considered to be of less than local importance to red squirrels.

Water Vole

25.4.94 All the waterbodies in the study area and consequently all habitat sections (Sections SL1 – SL6) are evaluated as being of less than local ecological value for water voles. This is due to the widespread signs of mink (their predator) in the area and no evidence of water voles being encountered during surveys, even in areas that were assessed as of potentially high value habitat.

25.4.95 In addition, all waterbodies are greater than 7km from the nearest known water vole population (at near Fishermyre (NO 866 904), refer to Appendix A40.7). All sites are severed from the water vole population at Fishermyre by intensively farmed agricultural land. Any water voles attempting to colonise any of the suitable stretches of these main watercourses would be likely to suffer from mink predation, which are widespread throughout the study area. In the unlikely event that water voles are encountered at either Hare Moss or the Moss of Auchlea during follow up surveys, the evaluation of these areas would need to be revised.

Amphibians

25.4.96 No fully protected amphibian species, such as great crested newt, are known to occur within 50km of Aberdeen. It is assumed however that each of the 18 identified waterbodies and the terrestrial Habitat Areas could potentially support populations of common frog, common toad and/or palmate newt and are evaluated as being of local importance to amphibians. Waterbodies are evaluated as county level importance where they are located within 500m of another waterbody. Terrestrial habitat that is considered too small to maintain a viable population and isolated from other areas of habitat is evaluated as less than local importance.

Aquatic Habitat

25.4.97 Of the 19 waterbodies identified from the desk study and the previous survey effort, nearly all were located in close proximity to another waterbody and were thus evaluated as being of county importance. However, Cairnfield Pond (Section SL1), Cowford Pond (Section SL2), Waterside (Section SL3), and Kingshill Wood (Section SL5) were evaluated as of local importance.

Terrestrial Habitat

25.4.98 Section SL1 contains amphibian habitat in Habitat Areas S3 and S10. The habitat within these areas is extensive and despite being poorly connected, they are of local ecological value due to their size and their suitability. They provide a mosaic of gorse scrub, bracken, bog and conifer plantation. This provides plenty of foraging and sheltering habitat that can be utilised at different times of year. Habitat Area S3 is also enhanced by Greenhowe Pond, which provides amphibian breeding habitat. During surveys for a previous route option, it was identified as supporting palmate newt, common frog and common toad.

25.4.99 In Section SL2 amphibian habitat is mainly found within Habitat Area S15 which comprises of dry and wet heath, bracken and scrub. Some smaller areas of marshy grassland are found in area S16. These small areas, if considered alone would be of less than local importance due to their size, but their proximity to each other and the terrestrial and aquatic habitat in S15 increases their importance to the local level as they form a wider area of habitat, which is beneficial to amphibians.

25.4.100 Section SL3 has extensive, well-connected habitat that is present in Habitat Areas S18, S22, S23 and S24. There is a mosaic of woodland, heath, gorse scrub, meadow and marsh that forms a continuous habitat. It is also connected to habitat in section FL3 of the Fastlink section of the AWPR (Chapter 40: Ecology and Nature Conservation, Fastlink) and forms an important feature for amphibians, facilitating their breeding, dispersal and distribution. Habitat Area S31 is a narrow strip of habitat on the old Deeside railway that is a good corridor of habitat linking to other areas outside of the route corridor. Due to the amount and connectivity of the amphibian terrestrial habitat, these Habitat Areas are considered to be of local ecological value.

25.4.101 Amphibian habitat in Section SL4 of the proposed scheme is concentrated in Habitat Area S39, which comprises lowland heath and acid grassland. This provides habitat for foraging, sheltering, hibernating and dispersing. It is an extensive area of suitable terrestrial habitat, which is of local ecological importance, an incidental sighting of a common frog was made here.

25.4.102 Section SL5 has the least amount of suitable habitat for amphibians. A small amount of semi-improved and marshy grassland habitat is found within Habitat Area S42 but it is completely isolated from other suitable areas largely preventing amphibian movement into the area.. Therefore, the habitat area is considered of less than local ecological value. Additional habitat is found within the Moss of Achlea, habitat area S45. This area is dominated by scrub, marsh, swamp and wet grassland. It provides excellent breeding, foraging and refuge potential and although small and isolated, provides highly suitable habitat so is of local ecological importance.

25.4.103 The amphibian habitats identified in Section SL6 are two fragmented areas that are part of Habitat Area S48. They are considered to be of less than local importance due to their size and isolation

from other suitable Habitat Areas. In the Northern Leg, Habitat Areas N3, N7, N8, N11 and N13 form a large continuous area of suitable amphibian habitat that is sufficient to raise the ecological value of the section to local importance.

Brown Hare

25.4.104 Brown hare are a UK BAP and NES LBAP species due to their general decline caused by changes in farming practices and hunting, and are therefore considered to be a species of county ecological value. Any high-value habitat that has the potential to support substantial populations has been evaluated as being of county ecological value. Habitat that is of medium or low value, but that has the potential to support a small population has been assessed as being of local ecological value.

25.4.105 Much of the Southern Leg (SL1 and SL2 in particular) is intensively managed with cattle or sheep and has lower overall density of arable fields. These areas provide less diversity in terms of crop species and set aside ground and therefore a generally low suitability for brown hares. The habitat suitability for brown hares within the Southern Leg has been assessed as generally being of low value, although a small number of specific Habitat Areas have been assessed as of medium value for brown hare (see Baseline for details).

25.4.106 In general, the study area is assessed as being of local value for brown hare. Although certain areas were recognised as being suitable for brown hare, most of the habitat was sub-optimal and the lack of brown hare sightings suggests low populations.

Reptiles

25.4.107 Section SL1 contains reptile habitat in Habitat Areas S3 and S10. The habitat within these areas is excellent, extensive and despite them being poorly connected, they are of local ecological value due to their size. Habitat Area S3 is also enhanced by Greenhowe Pond which directly benefits reptiles by supporting more prey species. These Habitat Areas are evaluated as being of local value.

25.4.108 In Section SL2 is also of local ecological value, the reptile habitat is mainly found within Habitat Area S15 with some smaller areas in area S16. These small areas, if considered alone, would be of less than local importance because small areas are vulnerable to events that cause local extinctions. If the habitat character of a small area is changed then the population has no where to move to and so dies out. With no remnant areas, recolonisation from other areas doesn't occur so the site looses its ecological receptors. Populations within larger areas are more resilient and will persisit longer because there is always a remnant population from which recoloniisatioin can occur. The small areas of area S16 are, however, close to each other and the habitat in S15, which increases their importance to the local level.

25.4.109 Section SL3 has extensive, well-connected habitat that is present in Habitat Areas S18, S22, S23 and S24. This continuous habitat is also connected to habitat in the FL3 section of the Fastlink and forms an important feature for reptiles, facilitating their dispersal and distribution. Habitat Area S31 is a narrow strip of habitat on the old Deeside railway and is a good corridor of habitat that links to other areas outside of the route corridor. Information obtained from SNH during the previous consultation, revealed that common lizards have been observed on the disused railway line at Peterculter and Cults (Mr Rob Raynor and Ms Fiona Mutch, SNH, personal communication). Due to the amount and connectivity of the reptile habitat, These Habitat Areas are evaluated as being of local value.

25.4.110 Reptile habitat in Section SL4 is concentrated on small isolated areas in Habitat Areas S32 and S35. Due to their small size and isolation from other areas, they are considered of less than local ecological value. The majority of the reptile habitat is found in the north of this section in Habitat Area S39. This is an extensive area of suitable habitat that is a potentially important feature for reptiles and so is of local ecological value.

25.4.111 Section SL5 has the least amount of suitable habitat for reptiles. The only habitat identified is in Habitat Area S42. It is a small area that is completely isolated from other habitat so the habitat area and the section are considered of less than local ecological value.

25.4.112 The reptile habitat identified in Section SL6 was identified as two fragmented areas that are part of Habitat Area S48. They are considered to be of less than local importance due to their size and isolation from other suitable Habitat Areas. In the Northern Leg, Habitat Areas N3, N7, N8, N11 and N13 form a large continuous area of suitable reptile habitat that is sufficient to raise the ecological value of the these habitat areas to local importance.

Terrestrial Invertebrates

25.4.113 A combination of a literature review and habitat assessment was used to evaluate the potential habitat for terrestrial invertebrates. High-value habitat is defined as habitat that potentially supports a wide range of species of national and local conservation concern and has been assessed as being of regional ecological value. Habitat of medium value due to size or likely species composition has been assessed as being of county ecological value. Habitat with low value for terrestrial invertebrates, but enriches the overall biodiversity of the area has been assessed as being of local or less than local ecological value. These data are summarised below and fully presented in Table 25.11.

25.4.114 Section SL1 includes agricultural fields, plantation woodland with mesotrophic rides, marshy grassland and bog. Habitats of importance to terrestrial invertebrates are Greenhowe (S6), Duffs Hill, (S7) and Hare Moss (S10). Hare Moss is evaluated as being of county importance while the rest of the specified areas are of local importance. All other Habitat Areas within this section are of less than local importance to terrestrial invertebrates.

25.4.115 In Section SL2 there are wall-lined improved grassland fields many dominated by dense gorse scrub to the west, conifer plantation, wet birch plantation and a complex mosaic of habitats at Hill of Blairs, including woodland and heathland. Clochandigther Wood (S14), Whitestone Wood and Hill of Blairs (S15) are evaluated as being of county importance. The rest of the specified areas are of local importance. All other Habitat Areas within this section are of less than local importance to terrestrial invertebrates.

25.4.116 In Section SL3, the south is largely dominated by woodland and the north by agricultural fields. The riparian habitat around the semi-natural riparian habitats in the Crynoch Burn and Blaikiewell Burn (S22) are evaluated as being of county value while the River Dee riparian habitat (S28) is evaluated as being of regional importance. The Deeside old Railway (DWS) (S31) is also evaluated as being of regional value. The rest of the specified areas are of local importance. All other Habitat Areas within this section are of less than local importance to terrestrial invertebrates.

25.4.117 In Section SL4, all of the specified areas are of local importance. All other Habitat Areas within this section are of less than local importance to terrestrial invertebrates.

25.4.118 In Section SL5, only the Moss of Auchlea (S45) with its marshy grassland and wet woodland habitats is evaluated as being of county importance. The rest of the specified areas are of local importance. All other Habitat Areas within this section are of less than local importance to terrestrial invertebrates.

25.4.119 In Section SL6 there are only two Habtiat Areas of greater than less than local importance. West Hatton Woods DWS (S47) and Cloghill (S48), which are of county value.

Table 25.10 – Evaluation of Habitat Features and Potential Habitat for Terrestrial Invertebrates

Section/Area	Habitats of use to invertebrates	General invertebrate Potential	Locally Important Invertebrate Potential	Potentially Supporting Species	Evaluation
Section 1					
S6 Greenhowe	Young coniferous plantation with broad-leaved edges and occasional blocks. A species poor semi-improved ground flora is limited to these broad-leaved sections. A patch of marsh is present to the west, whilst a pond with surrounding wet grassland is located in the northwest.	Lepidoptera, Diptera, Hymenoptera, Aranae, Isopoda, Coleoptera, Odonata, Gastropoda	Giant yellow bumble bee (*Bombus distinguendus*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Three species of Local significance	Local
S7 Duff's Hill	Dense pine plantation with broad-leaved edge and a strip of scrub	Lepidoptera, Diptera, Hymenoptera, Aranae, Isopoda, Coleoptera	A pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*).	Three species of Local significance	Local
S10 Hare Moss	Modified bog, willow carr and marshy grassland	Diptera, Lepidoptera	Pearl-bordered fritillary (*Boloria euphrosyne*), small pearl-bordered fritillary (*Boloria selene*), large heath butterfly (*Coenonympha tullia*), sword-grass moth (*Xylena exsoleta*), cousin German moth (*Paradiarsia sobrina*)	Two species of National significance and three species of Local significance	County
Section 2					
S11 North of Sunnyside	Two plantation birch/rowan woodlands. The western side is becoming more semi-natural, with a variety of ages and less uniform planting.	Lepidoptera, Hymenoptera, Aranae, Diptera, Isopoda, Coleoptera, Gastropoda	Giant yellow bumble bee (*Bombus distinguendus*), cousin German moth (*Paradiarsia sobrina*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Four species of Local significance	Local
S12 Greenloaning Wood	Two distinct areas of woodland. To the east is a dense birch woodland plantation with other occasional broad-leaved shrubs. The east is dominated by a semi-natural mix of broadleaves though birch is dominant. Pools, burns and channels are present in both woods.	Lepidoptera, Aranae, Diptera, Hymenoptera, Isopoda, Coleoptera, Gastropoda, Odonata	Small pearl-bordered fritillary (*Boloria selene*), large heath butterfly (*Coenonympha tullia*), a wolf spider (*Arctosa cinerea*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Five species of Local significance	Local
S14 Clochandigther Wood	Mature conifer plantation woodland. A sizeable portion of this area has been felled, with the remaining portion being dominated by lodgepole pine and spruce. Dry heath dominates the rides and is also present under much of the plantation.	Lepidoptera, Diptera, Aranae, Isopoda, Hymenoptera, Coleoptera, Gastropoda	A pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Five species of Local significance	County

Section/Area	Habitats of use to invertebrates	General invertebrate Potential	Locally Important Invertebrate Potential	Potentially Supporting Species	Evaluation
S15 Whitestone Wood and Hill of Blairs	Mature conifer plantation is the dominant habitat within this area. This has a rich ground flora, particularly within Hill of Blairs. Areas of dry heath, wet heath and mire also exist within Hill of Blairs, as do areas of dense bracken and continuous scrub.	Lepidoptera, Diptera, Aranae, Isopoda, Hymenoptera, Coleoptera, Gastropoda	Small pear-bordered fritillary butterfly (*Boloria selene*), large heath butterfly (*Coenonympha tullia*), a pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Five species of Local significance	County
Section 3					
S20 Cleanhill Wood	Mature conifer plantation dominates overall; however, this area also contains significant amounts of semi-natural broad-leaved woodland. The ground flora is very variable, ranging from heath and acid grassland to bare soil. Rhododendron can be extensive as a shrub layer.	Lepidoptera, Hymenoptera, Diptera, Isopoda, Aranae, Coleoptera, Gastropoda	A pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*)	Five species of Local significance	Local
S22 Floodplain and immediate surrounds of Crynoch Burn (north) and Blaikiewell Burn	Semi-natural broad-leaved woodland lines much of the area. The river also passes adjacent to the amenity grassland of Storybook Glen. Blaikiewell Burn contains a mosaic of gorse scrub, wet birch woods with grassy undercarpet, marsh in the upper levels grading into flood-plain mire in the level ground by the burn.	Lepidoptera, Aranae, Hymenoptera, Diptera, Isopoda, Coleoptera	Pearl-bordered fritillary butterfly (*Boloria euphrosyne*), small pearl-bordered fritillary butterfly (*Boloria selene*), large heath butterfly (*Coenonympha tullia*), cousin German moth (*Paradiarsia sobrina*)	One species of National significance and three species of Local significance	County
S28 Floodplain and immediate surrounds of the River Dee	Scattered trees and shrubs, tall ruderal vegetation, long grassland, shingle and pebble banks	Aranae, Coleoptera, Diptera, Hymen-optera, Lepidoptera	Giant yellow bumble bee (*Bombus distinguendus*), sword-grass moth, cranefly (*Rhabdomastix hilaris*), wolf spider (*A. cinerea*), stiletto fly (*Thereva lunulata*), stone fly (*Brachyptera putata*)	Two species of National significance and four species of local significance	Regional
S31 Deeside Old Railway Line	Species-rich semi-improved neutral grassland, scrub and woodland	Aranae, Coleoptera, Gastropoda Hymenoptera, Lepidoptera	Giant yellow bumble bee (*Bombus distinguendus*), sword-grass moth (*Xylena exsoleta*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*), subterranean spider (*Lepthyphantes insignis*)	One species of National significance and four species of Local significance	Regional
Section 4					
S32 Peterculter and western Milltimber	Amenity grassland dominates the habitat, though areas of woodland and ancient hedgerows are also present. Wooded areas are primarily plantation with occasional patches of semi-natural broadleaves and frequent scattered trees	Lepidoptera, Aranae, Hymenoptera, Coleoptera, Isopoda, Gastropoda	Giant yellow bumble bee (*Bombus distinguendus*), a pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*).	Six species of Local significance	Local

Section/Area	Habitats of use to invertebrates	General invertebrate Potential	Locally Important Invertebrate Potential	Potentially Supporting Species	Evaluation
S34 Guttrie Hill	This area is dominated by conifer plantation woodland dominated by Scots pine. The western area of the woodland contains abundant broadleaves and a well-developed ground flora.	Lepidoptera, Aranae, Hymenoptera, Coleoptera, Isopoda, Gastropoda	A pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*).	Five species of Local significance	Local
S35 Milltimber Wood	Scots pine plantation with birch surround. Much of the woodland has been felled, with abundant dead wood now littering the site	Lepidoptera, Diptera, Aranae, Coleoptera, Hymenoptera, Isopoda	A pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*), cousin German moth (*Paradiarsia sobrina*).	Four species of Local significance	Local
S39 Beans Hill north	Lowland heath and acid grassland habitats dominate this area. Acid grassland is particularly dominant, though dry heath increases in abundance in the southwest. Gorse is scattered occasionally around the area. Wall enclosed sheep grazed improved grassland is dominant to the east with occasional trees.	Lepidoptera, Hymenoptera, Gastropoda, Coleoptera, Aranae	Giant yellow bumble bee (*Bombus distinguendus*), mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*).	Three species of Local significance	Local
Section 5					
S43 Gairnhill and Kingshill Wood	Plantation conifer woods dominate. Beech can be frequent and sometimes dominant in the canopy. Scots pine probably dominates overall but there is a mix of plantings. Under the Scots pine and larch woodlands, a dry heath community is present.	Lepidoptera, Aranae, Gastropoda, Diptera	Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*), a pyralid moth (*Catoptria permutatella*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*).	Five species of Local significance	Local
S45 Moss of Auchlea	Dominated by a high scrub of willow on wet grassland. Areas of birch are also present. Where trees have been removed, marsh dominates, with areas of swamp also present.	Hymenoptera, Lepidoptera, Aranae, Coleoptera, Diptera	Giant yellow bumble bee (*Bombus distinguendus*), pearl-bordered fritillary butterfly (*Boloria euphrosyne*), a wolf spider (*Arctosa cinerea*).	One species of National significance and two species of Local significance	County
Section 6					
S47 West Hatton Wood	Mature broad-leaved woodland, much leaf litter, scrub, deadwood, dry stone walls	Acoriformes, Aranae, Coleoptera, Diptera, Isopoda, Gastropoda, Hymenoptera, Lepidoptera Oligochaeta, Parastiformes	Pearl-bordered fritillary (*Boloria euphrosyne*), small pearl-bordered fritillary (*Boloria selene*), sword-grass moth (*Xylena exsoleta*), Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*), subterranean spider (*Lepthyphantes insignis*)	Two species of National significance and four species of Local significance	County

Section/Area	Habitats of use to invertebrates	General invertebrate Potential	Locally Important Invertebrate Potential	Potentially Supporting Species	Evaluation
S48 Cloghill	This mosaic of communities is dominated by improved grassland bordered by stone walls, the majority of which are tree and shrub lined. Pockets of coniferous woodland, with some dense scrub are frequent in the northern half. The south of the site is dominated by mesotrophic semi-improved grassland with acid characteristics, plus pockets of more typical acid grassland. Scattered trees and scrub are present throughout.	Lepidoptera, Gastropoda, Diptera, Aranae	Mountain whorl snail (*Vertigo alpestris*), wall whorl snail (*Vertigo pusilla*), a pyralid moth (*Catoptria permutatella*), pearl-bordered fritillary butterfly (*Boloria euphrosyne*), a robber fly (*Laphria flava*), a wolf spider group (*Dipoena torva*)	One species of National significance and five species of Local significance	County

Water shrew

25.4.120 It is assumed that each of the 13 identified waterbodies and adjacent terrestrial Habitat Areas could potentially support populations of water shrew and therefore are evaluated as being of local importance.

25.4.121 The two watercourses identified in Section SL1 are the Burn of Ardoe and Jameston Ditch, which is linked to Hare Moss. Both watercourses have an invertebrate assemblage rated as fair. Vegetation suitability in the Burn of Ardoe varies from poor to good along the extent of the burn. In Jameston Ditch the vegetation suitability is medium. Both watercourses flow through or around Habitat Area S10 that provide marsh and swamp habitat for additional foraging and dispersal. This habitat connectivity, combined with a medium overall habitat quality, suggests that both the Burn of Ardoe and Jameston Ditch should be considered to be of local ecological value for water shrews.

25.4.122 Cowford Burn and Burnhead Burn were the only watercourses identified in Section SL2 with the potential to support water shrews. Both watercourses are rated as good based on the invertebrate species present. Vegetation suitability is medium in Cowford Burn and low-medium in Burnhead Burn. There is no adjacent terrestrial habitat of any value to water shrews. Cowford Burn and Burnhead Burn should be considered to be of less than local ecological value for water shrews.

25.4.123 The five watercourses in Section SL3 are Blaikiewell Burn, Crynoch Burn, Kingcausie Burn, the River Dee and Milltimber Burn. In terms of the biological health, Crynoch Burn and Blaikiewell Burn were ranked as excellent based on the invertebrate assemblage. The River Dee was ranked as good, Kingcausie Burn as fair and Milltimber Burn as poor. The combination of high vegetation suitability in both Blaikiewell Burn and the River Dee and a high quality invertebrate assemblage presents a high overall quality of habitat. In addition, there is extensive suitable terrestrial habitat in Habitat Area S22, around Crynoch and Blaikiewell Burns, which could provide water shrews with alternative foraging and dispersal routes to new areas. Blaikiewell Burn, Crynoch Burn and the River Dee are evaluated as of local ecological value, whilst Kingcausie Burn and Milltimber Burn are considered of less than local ecological value for water shrews.

25.4.124 Alburn Burn and Bellenden Burn in Section SL4 were identified as having a moderate vegetation suitability and good invertebrate assemblage. Water shrews are provided with good potential foraging conditions and habitat along and around their banks and both burns are considered of medium overall habitat quality. In addition, there is some suitable terrestrial habitat adjacent to Bellenden Burn that could provide an alternative foraging resource. Both Alburn Burn and Bellenden Burn are evaluated as of local ecological value to water shrews.

25.4.125 The two waterbodies identified within Section SL5 are Silver Burn and Gairn Burn. Silver Burn has an excellent invertebrate score and a varying vegetation suitability rating of low to high. A high overall quality of habitat was assigned Silver Burn, as the watercourse offers some areas of high vegetation suitability. Gairn Burn produced a lower quality invertebrate assemblage and a varying vegetation suitability of low to high and was assigned a medium overall quality of habitat. In addition, part of Silver Burn flows through the Moss of Auchlea (Habitat Area S45), which provides a variety of habitat types that could be used by shrews while dispersing from their natal ranges. Both Silver Burn and Gairn Burn are considered as being of local importance to water shrews.

Freshwater Macroinvertebrates, Aquatic Habitats, Fish and Freshwater Pearl Mussels

25.4.126 Freshwater macroinvertebrates, aquatic habitats, fish and freshwater pearl mussels are closely linked components of the freshwater environment. Aquatic habitat complexity supports diverse macroinvertebrate fauna, which are an important food source for fish, while freshwater pearl mussels rely on Atlantic salmon for their reproduction. As such, these features provide an overall impression of aquatic ecosystem health. These factors must be considered together to give an evaluation of each watercourse in terms of its ecological importance.

25.4.127 Overall, the watercourses surveyed within the study area ranged in ecological importance from international to local, with biological status ranging from excellent to impoverished. A summary of watercourse evaluation is given in Table 25.11. It should be noted that the following evaluations are based on one macroinvertebrate sampling occasion only and are subject to change following repeat sampling.

Section SL1

25.4.128 Loirston Burn was assessed for habitat modification at two separate locations and was identified as severely and obviously modified. The burn was sampled for macroinvertebrates at one location and was classified as impoverished. The impoverished nature of the watercourse and the degree of modification led to an evaluation of local value.

25.4.129 Heathfield Burn was identified as too small for macroinvertebrate sampling and as such was only assessed for habitat modification. The burn was identified to be significantly modified as it is a straightened field drain. As such, the burn has been evaluated as being of local value.

25.4.130 Jameston Ditch was only assessed for macroinvertebrates as it would not be directly crossed by the proposed scheme. The highly modified ditch was assessed as fair biological status and has been evaluated as being of local value.

25.4.131 The Burn of Ardoe was evaluated as being of county value. Although it is heavily modified, it supports healthy macroinvertebrate communities and provides habitat for otters and fish.

Section SL2

25.4.132 Cowford Burn was only assessed for macroinvertebrates as it would not be directly crossed by the proposed scheme. The ditch was assessed to be in good biological status. However, due to its small size and highly modified status, it was evaluated as being of local value.

25.4.133 Burnhead Burn was assessed for habitat modification at two locations and was identified as both significantly and severely modified. The burn was sampled for macroinvertebrates near its confluence with Blaikiewell Burn and was found to be of good biological status. The burn was also assessed using HABSCORE and was found to possibly support trout fry and parr, but not salmon. No fish were caught in electric fishing surveys. Despite the modified nature of this watercourse, the excellent biological conditions and possible presence of salmonids lead to an evaluation of county value.

Section SL3

25.4.134 Crynoch Burn was sampled for macroinvertebrates at two locations. The site furthest upstream was not assessed for habitat modification and therefore evaluations are based on the biological status of the watercourse and the presence/absence of salmonids.. Further downstream, the burn was assessed using RHS, macroinvertebrates and fish. The burn was identified as both significantly and obviously modified throughout the survey reach, found to be in excellent biological status and likely to support salmon and trout. Despite the degree of modification, the burn has been evaluated as international value due to the excellent biological status, the presence of salmon and trout and the fact that the burn falls within the River Dee SAC.

25.4.135 Blaikiewell Burn was assessed as being obviously modified due to evidence of realignment. The burn was identified as having excellent biological status and supporting trout fry and parr. Ttherefore, the burn was evaluated as being of regional value.

25.4.136 Kingcausie Burn has been obviously modified with the upstream reaches consisting of straightened field drains, though the burn returns to a more natural course downstream. The biological status of the burn was assessed as being fair, though it was found to support the notable weevil species *Litodactylus leucogaster*. The burn is likely to support all age classes of resident trout, though not salmon. Subsequently, the burn has been evaluated as being of regional value.

25.4.137 The River Dee was assessed as being both semi-natural, and obviously modified within the RHS survey reach. Macroinvertebrate sampling indicated that the river was of good biological status supporting a diverse invertebrate assemblage including freshwater pearl mussels. The River Dee is likely to support all age classes of both salmon and trout. The river has been designated as a SAC and as such has been evaluated as being of international value.

25.4.138 Milltimber Burn, a straightened field drain, was found to be significantly modified and was assessed as fair biological status. The modified nature and biological status led to an evaluation of local value.

Section SL4

25.4.139 Alburn Burn was not assessed for habitat modification as it would not be crossed by the proposed scheme. Therefore, the evaluation is based on the macroinvertebrate assemblage. The burn was found to be in good biological status and subsequently has been evaluated as being of county importance.

25.4.140 Bellenden Burn was found to have good biological status and was also found to support the notable weevil *L. leucogaster*. The burn is also likely to support juvenile and adult trout, though no fry or salmon. As such the burn has been evaluated as being of county value.

25.4.141 Culter House Ditch was only assessed for habitat modification as the ditch was dry at the time of sampling. The ditch was identified as severely modified with extensive re-sectioning and realignment. The ditch was evaluated as being of less than local importance.

Section SL5

25.4.142 Silver Burn was assessed for macroinvertebrates and fish and was found to have excellent biological status. The burn supports trout fry, though it is unlikely that it supports salmon due to barriers to migration. RHS was not completed for this burn as it would not be crossed by the proposed route. As such, the evaluation is based on macroinvertebrates and fish and is evaluated as being of regional value.

25.4.143 Gairn Burn is a straightened land drain that was assessed for macroinvertebrates and identified to be of fair biological status. The burn supports trout fry, but it is unlikely to support salmon due to barriers to migration. Gairn Burn has been evaluated as being of county value.

25.4.144 Upper Beanshill Burn was only assessed for habitat modification as flow levels were too low to allow macroinvertebrate sampling. The burn forms a straightened drainage channel and has been significantly modified. As such, the burn has been evaluated as local value.

Section SL6

25.4.145 Westholme Burn and Borrowstone Ditch were not suitable for macroinvertebrate sampling as they were dry at the time of sampling. RHS was conducted on, both watercourses which were identified as significantly modified straightened field drains. Both watercourses were evaluated as being of local ecological value.

Table 25.11 – Summary Evaluation of Watercourses

Watercourse	Ecological Habitat Area	Code	Size (km^2)	ASPT	Biological Classification	HMS	Habitat Classification	HABSCORE Salmon/Trout Presence	Electric Fishing Presence	Evaluation	Comment
Section SL1											
Loirston Burn	S2, S4, S5, S6	LOR DS	0.66			48	Severely modified	n/a	n/a	Local	Straightened and dredged through plantation woodland.
		LOR		2.7	Impoverished			n/a	n/a		
		LOR US				20	Obviously modified	n/a	n/a		
Bishopston Ditch	S13	BISHOP	n/a	n/a	n/a	24	Significantly modified	n/a	n/a	County	Although significantly modified, it flows into Hare Moss
Heathfield Burn	S13	HEATH	n/a	n/a	n/a	32	Significantly modified	n/a	n/a	Local	Straightened field drain.
Jameston Ditch	S10, S13	JAM	0.24	4.4	Fair	n/a	n/a	n/a	n/a	Local	None
Burn of Ardoe	S10, S13	BOA	2.92	5.54	Good	60	Severely modified	n/a	n/a	County	Although severely modified this burn is still of County value as it is only a discrete section that is modified. The burn provides connectivity between the River Dee and Hare Moss, which is particularly valuable for otters.
Section SL2											
Cowford Ditch (Burn)	S12, S13	COW	0.13	5.3	Good	n/a	n/a	n/a	n/a	Local	None
Burnhead Burn	F26, S19	BURN	4.23	5.3	Good	42	Downstream: Significantly modified	Salmon – unlikely Trout - likely	No fish caught	County	None
						45	Upstream: Severely modified	n/a	n/a		None
Section SL3											
Whitestone Burn	S19	STONE	n/a	n/a	n/a	44	Significantly modified	n/a	n/a	Local	None
Crynoch Burn	F27, S18, S22	CRY A	22.16	6.9	Excellent	n/a	n/a	Salmon – parr likely Trout - likely	n/a	International	Part of the River Dee SAC and of excellent water quality.

Watercourse	Ecological Habitat Area	Code	Size (km^2)	ASPT	Biological Classification	HMS	Habitat Classification	HABSCORE Salmon/Trout Presence	Electric Fishing Presence	Evaluation	Comment
		CRY B	28.82	6.3	Excellent	25	Upstream: Significantly modified	Salmon –likely Trout - likely	n/a	International	Part of River Dee SAC. Largely natural burn.
						19	Downstream: Obviously modified				
Blaikiewell Burn	S22	BLA	4.51	6.3	Excellent	20	Obviously modified	Salmon – unlikely Trout - likely	Trout 0+, 1+, 2+	Regional	Realigned burn now returning to a more natural state.
Kingcausie Burn	S20, S22, S24	KIN	1.56	4.8	Fair	20	Obviously modified	Salmon – unlikely Trout - likely	n/a	Regional	Despite the low biological classification the burn retains predominantly semi-natural features, with realignment in places. Also supports the notable b weevil *Litodactylus leucogaster*.
River Dee	S28	DEE	20.45	5.7	Good	1	Upstream: Semi-natural	Salmon –likely Trout - likely	n/a	International	Part of River Dee SAC.
						12	Downstream: Obviously modified				
Milltimber Burn (S3)	S29	MILT	0.59	4.0	Fair	41	Significantly modified	n/a	n/a	Local	None
Section SL4											
Alburn Burn	S32	ALB	0.70	5.3	Good	n/a	n/a	n/a	n/a	County	None
Bellenden Burn	S32, S33, S35, S36	BEL	0.08	5.4	Good	n/a	n/a	Salmon – unlikely Trout - likely	n/a	County	Supports the notable b weevil species *L. leucoagster*.
Culter House Ditch (not shown on plans)	S32, S35, S36	CULT	n/a	n/a	n/a	45	Severely modified	n/a	n/a	Less than local	None
Section SL5											
Silver Burn	S40, S41, S42, S44	SIL	0.20	7.4	Excellent		n/a	Salmon – unlikely Trout - possible	Trout 0+	Regional	On basis of excellent biological status

Watercourse	Ecological Habitat Area	Code	Size (km^2)	ASPT	Biological Classification	HMS	Habitat Classification	HABSCORE Salmon/Trout Presence	Electric Fishing Presence	Evaluation	Comment
Gairn Burn	S40, S42, S44	GAIR	0.82	4.9	Fair-Good		Significantly modified	Salmon – unlikely Trout - possible	Trout 0+	County	On basis of biological status
Upper Beanshill Burn	S40, S42, S43	UBBO	-	-	-	33	Significantly modified	-	-	Local	None
Westholme Burn	S46	WHOLM	n/a	n/a	n/a		Significantly modified	n/a	n/a	Local	None
Borrowstone Burn	N2	BOR	n/a	n/a	n/a		Significantly modified	n/a	n/a	Local	None

Table 25.12 – Summary Evaluation of Habitats and Species

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
SL1				
Terrestrial Habitats	Blue Hill Wood	S3	Extensive dense gorse scrub merging into a bracken/conifer plantation (LHAP) assemblage. A pond is present within a disused quarry, where UK BAP wet woodland willow carr and LHAP marshy grassland has begun to develop.	County
	Hare Moss	S10	Extensive area of lowland raised bog, a priority habitat in the UK BAP. Hare Moss is an important component of a network of sites in the region and integral to the viability of the region's habitat resource.	Regional
Badger	Greenhowe	S3, S6	One main sett (Greenhowe Group H) and alternatives to main sett in Greenhowe Wood and gorse scrub. Secure commuting and foraging habitat in gorse and forest rides in Duff's Hill. Area exposed with patchy distribution of suitable foraging and setting areas.	County
Bat	West Hatton Wood	S1	Woodland provides medium value foraging habitat.	County
	Agricultural fields east of the A90	S2	Two roosts identified by day survey at Lochview and Mains of Charleston.	Regional
	Wood/scrub mosaic east of Greenhowe	S3	Gorse, conifer plantation and pond providing medium value foraging habitat.	County
	Bog south of Greenhowe	S4	Bog habitat providing high value foraging habitat.	County
	Agricultural fields south of Greenhowe	S5	Marshy grassland and linear features providing commuting and foraging habitat for small number of bats; potential roosts.	County
	Greenhowe	S6	A number of medium to high value foraging habitats including conifer plantation woodland.	County
	Duff's Hill Plantation	S7	Dense conifer plantation woodland providing edge habitat of value to commuting bats.	County
	Agricultural fields west of Duff's Hill	S8	Small patches of foraging and commuting habitat and potential building roosts.	County
	Wood west of Greenhowe	S9	Several areas of woodland and grassland used by foraging and commuting bats; potential building and tree roosts.	County
	Hare Moss	S10	Hare Moss provides shelter and valuable foraging habitat.	County
Breeding Birds	Hare Moss	S10	Mosaic of wet modified bog and semi-natural broad-leaved woodland with areas of deciduous parkland/scattered trees, scattered and dense scrub, marsh/marshy grassland and standing water (bog pool) providing high value habitat to breeding birds.	County
Otter	Tributary of Loirston Burn	S2, S4, S5, S6	Otter RTA and spraints indicate burn is used frequently by otters foraging and commuting from Loirston Loch.	County

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Burn of Ardoe	S13	Abundant signs and evidence of lying up; likely to be used as a commuting route between the River Dee and Hare Moss.	Regional
Red Squirrel	Duff's Hill Plantation	S7	Anecdotal records of red squirrels exist for this woodland. Coniferous plantation comprising lodgepole pine and Sitka spruce thus providing some foraging opportunities for red squirrels.	County
Amphibians	Greenhowe Pond	S3	Series of three ponds offering high value aquatic and terrestrial habitat that could potentially support populations of common frog and palmate newt. Common toad was recorded near the ponds.	Local
	Turnamiddle Pond	S9	Turnamiddle Pond offers moderate aquatic and terrestrial habitats potentially supporting populations of common frog, common toad and palmate newt.	Local
	Cairnfield Pond	S9	Cairnfield Pond offers high value aquatic and terrestrial habitat potentially supporting populations of common frog, common toad and palmate newt.	Local
Brown Hare	Hare Moss	S10	Medium value habitats comprising a mosaic of bog, marsh and heathland communities with semi-natural broad-leaved woodland and areas of deciduous parkland/scattered trees and scattered and dense scrub offering highly suitable cover and good potential foraging opportunities.	Local
	Agricultural land surrounding Hare Moss	S13	Medium valued habitat comprising improved and semi-improved fields with small copses of broad-leaves offering potential cover and foraging opportunities.	Local
Reptiles	Blue Hill and Hare Moss	S3 S10	No reptiles recorded. The habitat within these areas is extensive and poorly connected. Habitat Area S3 is enhanced by Greenhowe Pond.	Local
Terrestrial Invertebrates	West Hatton Wood (DWS)	S1	Mature broad-leaved woodland, much leaf litter, scrub, deadwood, dry stone walls	County
	Greenhowe Wood and Surrounds	S16	Young coniferous plantation, broad-leaved woodland , marshy grassland and pond with the potential to support species of local significance	Local
	Duff's Hill Plantation	S7	Dense pine plantation with broad-leaved edge and a strip of scrub with the potential to support species of local significance	Local
	Hare Moss	S10	The site comprises a mosaic of modified bog, willow carr and marshy grassland considered to be of medium value for invertebrates that supports two species of national importance and three species of local importance from the Diptera and Lepidoptera families.	County
Water Shrew	Burn of Ardoe and	S10	The watercourse provides low to good quality riparian habitat for burrowing and fair invertebrate assemblages for foraging.	Local
	Jameston Ditch	S10, S13	The watercourse provides medium quality riparian habitat for burrowing and fair invertebrate assemblages for foraging.	Local
Freshwater Habitats	Burn of Ardoe	S10, S13	Although severely modified this burn is still of County value because it is only a discrete section that is modified. The burn provides connectivity between the River Dee and Hare Moss, which is particularly valuable for otters.	County
SL2				

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
Terrestrial Habitats	Clochandighter Wood	S14	Mature conifer plantation woodland dominated by lodgepole pine and spruce. Dry heath dominates the rides and under much of the plantation. Listed on the AWI	County
	Whitestone Wood and Hill of Blairs	S15	Series of biodiverse habitats including AWI-listed mature conifer plantation with species rich ground flora, areas of dry heath, wet heath (both of which are UK BAP Lowland Heathland) and mire (UK BAP Fen).	Regional
Badger	Merchant's Croft	S15, S16	One main sett (Merchant's Croft Group I) and subsidiary sett; alternative setting locations in Whitestone Wood and surrounding gorse, Hill of Blair's and Clochandighter Wood.	County
Bat	North of Sunnyside	S11	High value foraging and commuting habitat in woodland rides and edges.	County
	Greenloaning Wood	S12	Greenloaning Wood provides valuable foraging and commuting including for brown long-eared bats.	County
	Agricultural fields around Sunnyside to Causeyport	S13	Small copses and drains with high value foraging habitat, potential roosts.	County
	Clochandighter Wood	S14	Medium value foraging habitat and commuting.	County
	Whitestone Wood and Hill of Blairs	S5	Scrub, woodland and pond habitats at Hill of Blairs provide high value foraging habitat including Daubenton's bats; potential roosts.	County
	Agricultural fields to the east of Burnhead to Greenloaning	S16	Ditches and marshy grassland provide high value foraging habitat to species including brown long-eared bats.	County
Breeding Birds	Hill of Blairs	S15	A large mosaic of conifer plantation woodland with pockets of semi-improved grassland, dense and scattered scrub and dry/wet dwarf scrub heath together with a large areas of bracken and a shallow fen that occupies the centre of the wood providing high value habitat to breeding birds.	County
Otter	Shanna Burn	S16	Abundant signs and potential lying up site. Burn represents likely commuting route from the River Dee SAC.	Regional
	Burnhead Burn	S16	Spraints and adult prints present along the burn. Tributary of Blaikiewell Burn and the River Dee SAC.	County
Red Squirrel	Hill of Blairs	S15	Optimal foraging and breeding habitat provided within mature Scots pine plantation. Contiguous to area of coniferous woodland > 150ha. Records of red squirrel presence here (local resident, personal communication).	Regional
	Whitestone Wood	S15	Abundant foraging and breeding opportunities for red squirrels provided by presence of small-masted coniferous species in this well-connected woodland. No red squirrels were recorded in this woodland.	County
Amphibians	Cowford Pond	S13	Pond offers medium value aquatic habitat and low value terrestrial habitat that could potentially support populations of common frog, common toad and palmate newt.	Local
	Hill of Blairs Pond (North) Hill of Blairs Pond (South)	S15	Both ponds offers high value aquatic and high value terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
Brown Hare	Agricultural land surrounding Burnhead	S16	Medium value habitat comprising a series of improved fields with patches of soft rush providing good foraging opportunities. Trees and hedgerows are present within some of the fields surrounding the area, as are dry stone walls, providing good potential cover.	Local
Reptiles	Agricultural land to the north of Stranog/ Berrytop Hill	S15, S16	No reptiles recorded. S15 comprises the majority of suitable habitat with some smaller suitable areas in S16.	Local
Terrestrial Invertebrates	Clochandigther Wood	S14	Mature conifer plantation woodland. A sizeable portion of this area has been felled, with the remaining portion being dominated by lodgepole pine and spruce. Dry heath dominates the rides and is also present under much of the plantation.	County
	Whitestone Wood and Hill of Blairs	S15	Mature conifer plantation is the dominant habitat within this area. This has a rich ground flora, particularly within Hill of Blairs. Areas of dry heath, wet heath and mire also exist within Hill of Blairs, as do areas of dense bracken and continuous scrub.	County
	North of Sunnyside	S11	Broad-leaved plantation woodland with the potential to support locally significant species with the potential to support locally significant species	Local
	Greenloaning Wood	S12	Broad-leaved plantation and broad-leaved semi-natural woodland pools, burns and ditches are present in both woods with the potential to support locally significant species	Local
Water Shrew	Cowford Burn	S12, S13	The watercourse provides medium quality riparian habitat for burrowing and good invertebrate assemblages for foraging.	Less than local
	Burnhead Burn	S16	The watercourse provides low to medium quality riparian habitat for burrowing and good invertebrate assemblages for foraging.	Less than local
Freshwater Haibtats	Burnhead Burn	F26, S19	Good biological status in terms of its macrofaunal community and was found to possibly support trout fry and parr (HABSCORE)	County
SL3				
Terrestrial Habitats	Cleanhill Wood	S20	AWI-listed mature conifer plantation (LHAP) with significant amounts of semi-natural broad-leaved woodland. The ground flora can be species rich. However, rhododendron can also be extensive. The area is a SESA.	County
	Floodplain and immediate surrounds of Crynoch Burn (north) & Blaikiewell Burn	S22	Semi-natural broad-leaved woodland lines much of the River Crynoch. Japanese knotweed is present. The Blaikiewell Burn supports the UK BAP Fen community.	Regional
	Agricultural fields within Kingcausie Estate	S23	Predominantly improved grassland with occasional trees and shrubs. The area also contains ancient hedgerows (UK BAP habitat) and a small broad-leaved plantation located close to LHAP swamp and UK BAP wet woodland. The area is a SESA. Contains the LBAP species; wych elm.	County
	Kingcausie Estate	S24	A number of different habitats dominated by AWI listed woodland. The area is a SESA. Contains the LBAP species; wych elm and LBAP habitat; Lowland Wood Pasture and Parkland.	County

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Floodplain and immediate surrounds of the River Dee	S28	The River Dee is a SAC, SSSI and DWS. The Area also contains UK BAP wet woodland. Contains the LBAP species; wych elm.	Regional
	Deeside Old Railway	S31	DWS comprising of a tree-lined former railway track with various semi-natural habitats.	County
Badger	Kingcausie Estate	S20, S24, S26, S27, S28	One main sett (Kingcausie Group K) and subsidiary and annexe setts; supports majority of territory of Cleanhill Group J (sett outside study area) and likely to support Blairs College and Murtle Estate groups. Alternatives to main setts adjacent to the River Dee and in Kingcausie Estate. Estate provides high quality foraging, setting and commuting habitat; high quality foraging habitat adjacent to the River Dee. River Dee acts as a barrier to movement north/-south.	Regional
Bats	Agricultural fields south of Cleanhill Wood	S17	One roost at Red Tile Lodge.	Regional
	Durris Forest	S18	Woodland forms part of a larger area adjacent to Crynoch Burn supporting foraging and commuting bats.	County
	Blaikiewell Farm	S19	Blaikiewell and Crynoch Burn and hedgerow habitats provide commuting and foraging habitat.	County
	Cleanhill Wood	S20	Tree roost and potential tree roosts; woodland and wet habitats provide foraging and commuting habitat to species including Daubenton's bats and Natterer's bats.	Regional
	Floodplain and immediate surrounds of Crynoch Burn (north) and Blaikiewell Burn	S22	Two building roosts at Storybook Glen and Eastland Bridge, foraging and commuting habitat along Blaikiewell Burn and Crynoch Burn including brown long-eared and Daubenton's bats.	Regional
	Agricultural fields within Kingcausie Estate	S23	Two roosts at Eastland, many potential roosts. Foraging and commuting area for species including Natterer's bats	Regional
	Kingcausie Estate	S24	Two roosts including mixed pipistrelle and brown long-eared roost at Rumlin's Fauld and pipistrelle roost at The Coach House. High value woodland and parkland habitat for species possibly including Leisler's bats	National
	Caravan Park	S25	Roost (anecdotal) at the Old Mill Inn; commuting and foraging habitat strategically located adjacent to the River Dee	Regional
	Old Mill Inn and agricultural field surrounds	S26	Scattered broad-leaved trees adjacent to Crynoch Burn and the River Dee provide shelter and excellent foraging and commuting habitat.	County
	Agricultural fields south of the River Dee	S27	Mature trees with roost potential support populations of foraging and commuting bats.	County
	Floodplain and immediate surrounds of the River Dee	S28	Records of regionally significant numbers of pipistrelle and Daubenton's bats foraging and commuting over the River Dee; previous records of Leisler's bats.	National
	Agricultural fields south of Milltimber	S29	Strategic importance of commuting route between Milltimber and the River Dee/Kingcausie.	County

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Camphill School	S30	Two building roosts within Camphill House and Witiko (anecdotal), high value foraging habitat adjacent to the River Dee.	Regional
	Old Deeside Railway Line	S31	High value linear habitat important for foraging and social calling bats and potentially commuting.	County
Breeding Birds	Crynoch Burn	S22, S24, S27,	Riparian woodland dominated by semi-natural broad-leaved woodland with areas of amenity grassland, conifer plantation woodland with parkland and scattered broad-leaved associated with Kingcausie Estate providing high value habitat to breeding birds.	County
	River Dee	S27, S28	Corridor of riparian broad-leaved semi-natural woodland (to the south of the river) and semi-improved grassland (to the north of the river) with areas of scrub, arable farmland, conifer plantation and open water providing high value habitat to breeding birds. One WCA1i species (kingfisher) recorded on the river, flying across the proposed route.	County
	Agricultural Fields within Kingcausie	S23	A mosaic of high value habitats comprising improved grassland, marsh and woodland with occasional trees and shrubs located on field boundaries. The area also has gardens with ancient hedgerows and amenity grasslands. It is partially sampled by Quadrat SL-Bb07	County
Otter	Blaikiewell Burn	S22	Otter present, Blaikiewell Burn adjacent to Crynoch Burn, supporting the otter population due to riparian habitat for foraging and lying up.	County
	Kingcausie Burn	S20, S22, S24	No signs, but burn flows through dense and undisturbed vegetation suitable for lying up.	County
	Glenburnie and ponds	S22	Otter present, Glenburnie and ponds adjacent to Crynoch Burn, supporting the otter population due to riparian habitat for foraging and lying up.	County
	Crynoch Burn	S18, S22, S27	Abundant signs of otter; holts, couches and breeding otters present. Burn part of the River Dee SAC and vital to maintaining the population of otters.	International
	Mill Bank Burn	S25, S26	Otters present and burn supports population of otters from River Dee and Crynoch Burn due to foraging and lying up resource, especially in times of flood.	County
	River Dee	S28	Abundant signs of otter; holts and couches present. River part of the River Dee SAC and riparian habitat vital to maintaining the population of otters including breeding otters on Crynoch Burn due to fish stocks present.	International
	Milltimber Burn	S29, S30	Otters present and burn supports population of otters from River Dee due to foraging and lying up resource and potential commuting route, especially in times of flood.	County
Red Squirrel	Cleanhill Wood (SESA)	S20	Optimal foraging habitat due to presence of small-masted coniferous species within and contiguous to area of coniferous and broad-leaved woodland > 150 ha. Both red and grey squirrels were recorded in this woodland.	Regional
	Durris Forest	S18	Optimal foraging habitat due to mixture of small-masted coniferous species present. Within and contiguous to area of high value red squirrel habitat > 150 ha. Both red and grey squirrels were recorded in this woodland.	Regional

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Kingcausie	S24	Optimal foraging and breeding habitat (due to tree species present and age structure) within and adjacent to mature contiguous coniferous and broad-leaved woodland >150 ha. Red and grey squirrels present.	Regional
Amphibians	Eastlands Pond	S23	Pond offers high value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Glenburnie Ponds	S22	Ponds offer high value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Kingcausie House Pond (South) Kingcausie House Pond (North)	S24	Both ponds offer high value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Waterside Pond	S29	Pond offers low value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
Reptiles	Durris Forest, Crynoch Burn Woods, Kingcausie Estate and Old Deeside Railway Line	S18, S22, S23, S24, S31	No reptiles recorded. Suitable habitats within S18, S22, S23 and S24 are well connected in addition to habitats in Section FL3 of the Fastlink section, which forms an important feature for reptiles, facilitating their dispersal and distribution. Habitat Area S31 is a narrow strip of habitat on the old Deeside railway and is a good corridor of habitat that links to other areas outside of the route corridor.	Local
Terrestrial Invertebrates	Riparian habitat surrounding the Crynoch and Blaikiewell Burns	S22	Semi-natural broad-leaved woodland lines much of the area. The river also passes adjacent to the amenity grassland of Storybook Glen. Blaikiewell Burn contains a mosaic of gorse scrub, wet birch woods with grassy undercarpet, marsh in the upper levels grading into flood-plain mire in the level ground by the burn.	County
	River Dee (SAC SSSI, DWS)	S28	The area comprises scattered trees and shrubs, tall ruderal vegetation, long grassland, shingle and pebble banks considered to be of high value for invertebrates. Supports two species of national importance and four species of local importance from the Aranae, Coleoptera, Diptera, Hymenoptera and Lepidoptera families.	Regional
	Deeside Old Railway (DWS)	S31	The area comprises a mosaic of species-rich semi-improved neutral grassland, scrub and woodland considered to be of high value for invertebrates. Supports one species of national importance and five species of local importance from the Aranae, Coleoptera, Gastropoda, Hymenoptera and Lepidoptera families.	Regional
	Cleanhill Wood	S20	Mature conifer plantation woodland with areas of of broad-leaved semi-natural woodland with the potential to support locally significant species	Local
Water Shrew	Blaikiewell Burn	S22	The watercourse provides high quality riparian habitat for burrowing and excellent invertebrate assemblages for foraging. There is extensive suitable terrestrial habitat in S22, which could provide water shrews with alternative foraging and dispersal routes to new areas.	Local

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Crynoch Burn	S18, S22, S27	The watercourse provides low quality riparian habitat for burrowing and excellent invertebrate assemblages for foraging. There is extensive suitable terrestrial habitat in S22, which could provide alternative foraging and dispersal routes for water shrew to new areas.	Local
	Kingcausie Burn	S20, S22, S24	The watercourse provides low to high riparian habitat for burrowing and fair invertebrate assemblages for foraging.	Less than local
	River Dee	S28	The watercourse provides high quality riparian habitat for burrowing and good invertebrate assemblages for foraging.	Local
	Milltimber Burn	S29, S30	The watercourse provides medium value riparian habitat for burrowing and poor invertebrate assemblages for foraging.	Less than local
Freshwater Ecology	Crynoch Burn	F27, S18, S22	The burn falls within the River Dee SAC, SSSI, DWS. The burn upstream has an excellent status and is likely to support salmon and trout. Downstream, the burn is significantly and obviously modified. Burn is in excellent biological status and is likely to support both salmon and trout.	International
	Blaikiewell Burn	S22	The burn is obviously modified due to evidence of realignment, but is in excellent biological status, supporting trout fry and parr.	Regional
	Kingcausie Burn	S20, S22, S24	The burn is obviously modified with the upstream reaches being straightened field drains, returning to a natural course downstream. The biological status of the burn is assessed as being fair, though it was found to support the notable weevil species, *Litodactylus leucogaster*. The burn is likely to support all age classes of resident trout, though not salmon.	Regional
	River Dee	S28	The river is designated a SAC, SSSI, DWS and is both semi-natural and obviously modified (within the RHS survey reach). Good biological status supporting a diverse invertebrate assemblage including freshwater pearl mussels and all age classes of both salmon and trout.	International
SL4				
Terrestrial Habitats	Peterculter and West Milltimber	S32	Amenity grassland with wooded habitats. The conservation value is raised by the presence of a short UK BAP ancient hedgerow.	County
	Guttrie Hill	S34	Conifer plantation woodland with abundant broad-leaves and a well-developed ground flora. This wood is a DWS and listed as an AWI.	County
	Beans Hill north	S39	Heath (UK BAP Priority Habitat) and acid grassland mosaic dominates this area. Gorse is scattered occasionally around the area. Wall enclosed sheep grazed improved grassland is dominant to the east with occasional trees.	County
Badger	Milltimber	S32, S35, S36	One main sett (Milltimber Group L) with alternative setting locations in Milltimber Wood and foraging at Kippie Lodge Golf Course. Area supports Nether Contlaw Group M. Alternative sett locations in woodland to the west.	County
Bat	East Peterculter and West Milltimber	S32	Four building roosts in Milltimber including West Lodge, Culter Lodge and a mixed species roost for brown long-eared bats and pipistrelles at the International School; many potential roosts. Mosaic of habitat types provide valuable shelter, foraging and commuting habitat; proximity to aquatic foraging at the River Dee.	Regional

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Milltimber	S33	One recorded roost; mosaic of habitat types provide valuable shelter, foraging and commuting habitat; proximity to aquatic foraging at the River Dee.	Regional
	Guthrie Hill	S34	One roost at Broomfield; Guttrie Hill plantation woodland provides high value foraging and roosting habitat.	Regional
	Milltimber Wood	S35	Milltimber Wood provides foraging habitat of strategic value to bats roosting in Milltimber, especially at edges.	County
	Agricultural fields around Nether Beanshill	S36	Small woodland patches support foraging bats; tracks, field boundaries and Culter House Road support commuting bats.	County
	Woodland from Hill Farm to Westfield Lodge	S37	Two building roosts at Airy Park Cottage and Broomhill House; gardens and patches of woodland support foraging bats; Contlaw Road is a commuting route.	Regional
	Improved fields	S38	One building roost at Upper Beanshill; trees and gardens support foraging bats.	Regional
	Beans Hill	S39	Beans Hill area includes patches of gorse, heath and trees providing scarce sheltered foraging.	County
Breeding Birds	No Areas of greater than local value in this Section SL4	n/a	n/a	n/a
Otter	Beanshill Ponds	Outwith study area	Otters present; ponds support population of otters due to foraging habitat along commuting route.	County
Red Squirrel	Milltimber Wood	S35	Abundance of foraging opportunities and breeding sites provided within this mature coniferous plantation. Red squirrel present here.	Regional
	Guttrie Hill Wood	S34	Optimal foraging and breeding habitat (due to presence of small-masted coniferous species and age structure). Red squirrel present here.	Regional
Brown Hare	Agricultural land to the south of Beanshill	S38	Medium value habitat comprising a series of improved fields providing suitable foraging opportunities with frequent pockets and field borders of gorse scrub and dry stone walls providing good cover.	Local
Reptiles	Agricultural land to the north of Milltimber and Beanshill	S32, S35, S39	No reptiles recorded. Reptile habitats are concentrated into small isolated areas in S32 and S35 with the majority of suitable reptile habitat found in S39.	Less than local – Local
Terrestrail invertebrates	Peterculter and Western Milltimber	S32	Amenity grassland with plantation broad-leaved woodland and ancient hedgerows	Local
	Guttrie Hill Wood and Milltimber Wood	S34,S35	Plantation coniferous woodland both DWS and on the AWI dominated by Scots pine with some birch surrounds with the potential to support species of local significance	Local
	Beans Hill	S39	Lowland dry heath and acid grassland with scattererd gorse with the potential to support species of local significance	Local

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
Water Shrew	Alburn Burn	S32	The watercourse provides medium value riparian habitat for burrowing and good invertebrate assemblages for foraging.	Local
	Bellenden Burn	S32, S33, S35, S36	The watercourse provides medium value riparian habitat for burrowing and good invertebrate assemblages for foraging. There is some suitable terrestrial habitat adjacent to the burn that could provide an alternative foraging resource.	Local
Freshwater Ecology	Alburn Burn	S32	Good ecological status according to macrofaunal assemblage	County
	Bellenden Burn	S32, S33, S35, S36	Good ecological status according to macrofaunal assemblage and likely to support trout (HABSCORE) also supports the notable weevil species *L. leucoagster*.	County
SL5				
Terrestrial Habitats	Agricultural fields around Silverburn	S40	Improved fields with marshy grassland stemming from the Silver Burn LHAP.	County
	Rotten O Gairn DWS	S42	Species rich grasslands and marsh/marshy grassland, plus scrub and wet woodland linkages to Silverburn Wood	County
	Gairnhill and Kingshill Wood	S43	AWI-listed plantation conifer woods with dry heath below.	County
	Moss of Auchlea	S45	DWS. UK BAP wet willow/birch AWI-listed woodland with species rich ground flora in places, including swamp.	Regional
Badger	Kingshill/Gairnhill	S41, S43, S44,	Two main setts (Gairnhill Group N, Kingshill Group P) and subsidiary and annexe setts; alternative sett locations elsewhere in Gairnhill/Kingshill Woods, which represent the second most extensive area of woodland in the study area. Area supports Silverburn Group O and Bishops Court Group Q. Movement restricted by A944 to north.	Regional
Bat	Agricultural fields around Silverburn	S40	One roost at Silverburn House.	Regional
	Silverburn Wood	S41	High roost potential in mature trees; area of strategic value in a corridor of high value habitat west of Kingshill and Gairnhill Woods.	County
	East Silverburn	S42	One roost (anecdotal) at Ard Na Moine.	Regional
	Gairnhill and Kingshill Wood	S43	Extensive area of woodland includes areas of broad-leaved trees with roost potential, supports populations of bats including brown long-eared	County
	Agricultural fields to the west of Kingshill Wood	S44	Two roosts at Moss Side of Auchlea and Backhill of Brodiach strategically located near to Kingshill Wood and the Moss of Auchlea foraging habitat.	Regional
	Moss of Auchlea	S45	Moss, wet woodland and scrub habitat provide valuable foraging habitat in area of agricultural land.	County

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
Breeding Birds	East Silverburn	S42	An area of poor semi-improved grassland, dense scrub and parkland/scattered trees together with an area of broad-leaved plantation woodland along Silverburn providing medium value habitat to breeding birds.	Less than local
	Gairnhill and Kingshill Wood	S43	An expansive area of coniferous plantation woodland, with occasional areas of broad-leaved plantation woodland and scrub providing medium value habitat to breeding birds.	County
	Moss of Auchlea	S45	Broad-leaved woodland/scrub with wet grassland, marsh and areas of swamp offering high value habitat to breeding birds. Two WCA1i species (barn owl and greenshank) recorded within the area. Barn owl was recorded crossing the route of the proposed scheme.	County
Otter	Upper Beanshill Burn	S40, S42, S48	Otters present; burn is a commuting route between two catchment areas and provides potential lying up habitat.	County
	Silver Burn	S40, S42, S44	Otters present; Silver Burn maintains populations due to fish numbers, high value undisturbed habitat and access to potential breeding habitat at the Moss of Auchlea.	Regional
	Ord Burn	S40	Abundant signs and active holt recorded; burn represents commuting route and high value and undisturbed habitat including fish prey.	Regional
	Gairn Burn	S40, S42, S44	Otters present: burn extends resource of Silver/Ord burns and commuting route and high value lying up habitat.	County
	Moss of Auchlea	S45	No signs, but high value, undisturbed otter habitat with potential lying up sites.	County
Red Squirrel	Gairnhill Wood	S43	Plantation predominantly comprising coniferous species providing optimal foraging and breeding opportunities for red squirrels. Contiguous to area of coniferous woodland > 150 ha. Both red and grey squirrels are present here.	Regional
Amphibians	East Brotherfield Pond (Eeast) East Brotherfield Pond (West)	S40	Both ponds offer high value aquatic and low value terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Kingshill Wood Pond	S43	Ponds offers moderate value aquatic and high value terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
Brown Hare	Agricultural land surrounding Silverburn and East Brotherfield	S40	Hare sighting approximately 200 m from the edge of the route corridor at NJ 842042. Medium value habitat comprising a series of fields alongside Silver Burn, to the south of East Brotherfield. Used as set aside providing suitable foraging, but with scrubby areas and wooded borders offering good cover opportunities.	Local
	Agricultural land to the north of Auchlea moss	S44	Medium value habitat comprising a series of improved and arable fields providing suitable foraging conditions. Walls are a dominant feature of the borders between fields with occasional gorse providing good cover.	Local
Reptiles	Silverburn Wood	S42	No reptiles recorded. A very small area of suitable habitat completely isolated from other habitats which prohibits dispersal.	Less than local

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
Terrestrial invertebrates	Moss of Auchlea (DWS)	S45	Dominated by a high scrub of willow on wet grassland. Areas of birch are also present. Where trees have been removed, marsh dominates, with areas of swamp also present	County
	Gairnhill and Kingshill Wood	S43	Plantation coniferous woods dominate. Dominated by Scots pine with occasional larch and patches of locally dominant beech with the potential to support locally significant species	Local
Water Shrew	Silver Burn	S40, S42, S44	The watercourse provides low to high value riparian habitat for burrowing and excellent invertebrate assemblages for foraging.	Local
	Gairn Burn	S40, S42, S44	The watercourse provides low to high value riparian habitat for burrowing and fair invertebrate assemblages for foraging. Part of Silver Burn flows through the Moss of Auchlea (S45), which provides a variety of habitat types that could be used by shrews while dispersing from their natal ranges.	Local
Freshwater Ecology	Silver Burn	S40, S41, S42, S44	The biological status of the burn is excellent, supporting trout fry, though it is unlikely that it supports salmon due to barriers to migration.	Regional
	Gairn Burn	S40, S42, S44	The biological status of the burn is fair to good in terms of its macrofaunal status and it may support trout fry.	County
SL6				
Terrestrial Habitats	West Hatton Wood	S47	DWS of relatively open AWI-listed woodland, with semi-natural characteristics.	County
	Cloghill	S48	Mosaic of communities dominated by low value improved grassland bordered by stone walls linking coniferous woodland and dense scrub. Rich mesotrophic grassland with acid characteristics (Species rich Grassland LHAP) with UK BAP lowland dry acid grassland present.	Regional
Badger	Cloghill	N1, N2, N3, N6, N7	One main sett (Cloghill Group R) and annexe; alternative sett locations in nearby gorse. Supports group S and potentially P and Q. Movement restricted by A944 to south and Kingswells to east. Woodland, scrub and pasture provides foraging habitat.	County
Bat	Agricultural fields to the north of the A944	S46	One roost at Coach House; field boundaries and shelterbelts support brown long-eared and pipistrelles.	Regional
	West Hatton Wood DWS	S47	Broad-leaved semi-natural woodland provides valuable foraging habitat strategically located near Kingswells.	County
	Kingswells	N1	Kingswells likely to be an important roosting area.	County
	Agricultural fields north of Cloghill	N2	Borrowstone Pond and Brodiach Burn provide Daubenton's bat foraging habitat; shelterbelt woodlands provide potential for roosting and support foraging and commuting bats.	County
	Derbeth Farm and agricultural land around Fairley Home Farm	N3	Roost (anecdotal) at Derbeth Farm; shelterbelts are of strategic value to bats likely to roost in Kingswells.	Regional
	Woodland at Fairley Home Farm and Derbeth Farm	N4	One building and six tree roosts in woodlands and shelterbelts near Fairley Home Farm.	Regional

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Woodland west of Hillhead of Derbeth Farm	N6	Mosaic of plantation and broad-leaved woodland and scrub provide foraging habitat and roost potential.	County
	Woodland and shelterbelt east of Hillhead of Derbeth Farm	N7	Tree roost near Dykeside.	Regional
	Brimmond Hill	N8	Scrub and bracken on lower slopes of Brimmond Hill, scrub and trees support a population of foraging common pipistrelle bats -	County
Breeding Birds	There are no habitats of greater than local value for breeding birds in Section SL6	n/a	n/a	n/a
Otter	There are no habitats of greater than local value for otter in Section SL6	n/a	n/a	n/a
Red Squirrel	Hillheah of Derbeth Woodland	N6, N7	Isolated woodland containing mixture of conifers and large and small-masted broad-leaved species. Providing foraging and breeding potential. Incidental sighting of red squirrel approximately 0.5Km away in adjoining woodland strip. It may therefore also be possible that red squirrels are also utilising Hillhead of Derbeth.	County
Amphibians	Borrowstone Pond	N2	Pond offers high value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Fairley Home Farm Pond	N4	Pond offers moderate value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
	Derbeth Farm Pond (South) Derbeth Farm Pond (North)	N3	Both ponds offer moderate value aquatic and terrestrial habitats that could potentially support populations of common frog, common toad and palmate newt.	Local
Reptiles	Clogghill and Brimmond Hill	S48, N3, N7, N8, N11, N13	No reptiles recorded. Two fragmented areas of suitable habitat present within S48, which are isolated from other suitable Habitat Areas. A large continuous area of suitable reptile habitat comprising NL3, NL7, NL8, NL11 and NL13.	Less than local – Local
Terrestrial Invertebrates	West Hatton Woods	S47	The area comprises mature broad-leaved woodland, much leaf litter, scrub, deadwood, dry stone walls considered to be of medium value for invertebrates. Supports two species of national importance and four species of local importance from the Aranae, Coleoptera, Diptera, Hymenoptera and Lepidoptera families.	County

Ecological Receptor	Area	Ecological Habitat Area	Features of Interest to Receptor	Evaluation
	Cloghill	S48	This mosaic of communities is dominated by improved grassland bordered by stone walls, the majority of which are tree and shrub lined. Pockets of coniferous woodland, with some dense scrub are frequent in the northern half. The south of the site is dominated by mesotrophic semi-improved grassland with acid characteristics, plus pockets of more typical acid grassland. Scattered trees and scrub are present throughout.	County
Water Shrew	No habitats of ecological value to water shrew in Section SL6	n/a	n/a	n/a
Freshwater Ecology	No water courses above local importance in Section SL6	n/a	n/a	n/a

25.5 Potential Impacts

Introduction

25.5.1 Roads have several well-documented impacts associated with their construction and operation. This section identifies the potential risks and predicts the associated impacts upon ecological receptors without mitigation. The potential impacts outlined below are: mortality from road construction, mortality from collision with vehicles, modification of animal behaviour, alteration of the physical environment, alteration of the chemical environment, spread of exotics, and increased use of areas by humans.

25.5.2 Road construction can lead to the death of sessile and slow-moving organisms, injure organisms adjacent to a road and alter physical conditions beneath a road. Vehicle collisions affect the demography of many species, both vertebrates and invertebrates. Roads alter animal behaviour by causing changes in home ranges, movement, reproductive success, escape response, and physiological state. Roads can change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of run-off, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone and nutrients to roadside environments.

25.5.3 Roads can promote the dispersal of exotic species by altering habitats, stressing native species and providing movement corridors. Roads can also promote increased hunting, fishing, indirect disturbance of animals due to increased access and landscape modifications. Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in species composition, population sizes, as well as hydrologic and geomorphic processes that shape aquatic and riparian systems.

25.5.4 Potential impacts associated with road developments identified in the DMRB include:

- direct mortality of animals on roads during construction and operation;
- behavioural changes of animals during operation;
- habitat loss through land-take;
- severance or fragmentation of existing Habitat Areas;
- physical obstructions caused by road constructions and bridges;
- disturbance during construction;
- pollution via road drainage, run-off and spray from road traffic;
- air pollution; and
- visual and light pollution caused by road lighting.

25.5.5 Additionally, for species relying on aquatic resources potentially affected by watercourse crossings and surface water run-off, the following potential impacts have also been considered:

- point source and diffuse pollution;
- increased sediment loading;
- decreased habitat complexity;
- habitat fragmentation; and
- changes to discharge regime.

25.5.6 These impacts are discussed in general terms followed by consideration of particular aspects relevant to each habitat and species.

Direct Mortality

25.5.7 Work during the construction phase involving large earthworks and heavy machinery could result in direct mortality of a number of species. Breeding and resting places for particular species such as nests (birds), dreys (red squirrels), setts (badgers), holts (otters), roosts (bats), beds (freshwater pearl mussels) and redds (salmon) could be occupied during preconstruction clearance. For all protected species and breeding birds (i.e. those animals that, while the integrity of the population may not be compromised, legal status prohibits disturbance or injury to), direct mortality caused by the construction of the road would constitute a significant impact.

25.5.8 Direct mortality resulting from road traffic accidents (RTAs) during operation could also constitute a significant impact for protected species and breeding birds. Otters, badgers and squirrels are at particular risk where the road severs their territories or crosses a watercourse.

Habitat Loss

25.5.9 The proposed scheme is predicted to result in direct loss of habitat, and this could result in significant adverse impacts both in terms of the actual habitat loss, if it is particularly diverse, rare and/or difficult to replace as well as in terms of the species that it supports, for example foraging areas, resting/breeding sites or commuting corridors.

Habitat Fragmentation and Isolation

25.5.10 The proposed scheme is also predicted to result in considerable habitat fragmentation both at a local and regional scale. Loss of connectivity between habitats can severely impair the viability of some species' populations. Those species particularly vulnerable in the vicinity of the proposed scheme are red squirrel, where future survival of local populations could be at stake, and bats, where commuting routes can be disrupted preventing foraging (see below).

Disturbance

25.5.11 Disturbance impacts can range from very serious to negligible depending on the sensitivity of the ecological receptor, the ability of the receptor to move away from the source of disturbance and the magnitude and duration of the source of disturbance. Continuous disturbance of breeding, resting sites or foraging sites of sensitive animals may result in an adverse impact on the overall viability of the population. Intermittent disturbance of foraging or breeding sites on mobile species where alternative habitat is available would have little or no impact on the local population.

Pollution and Other Indirect Impacts

25.5.12 Accidental spills of chemicals and other potentially toxic substances during construction of the proposed scheme may occur from machinery. Vegetation removal and earthmoving activities may lead to sediment laden runoff reaching watercourses. During operation, there is risk of pollution from polluted surface water runoff from vehicles or de-icing salts that may contribute to saline pollution. The introduction of a new road can change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of run-off, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone and nutrients to roadside environments. Road construction and operation can also result in the physical modification of watercourses through changes in sediment and discharge regime.

25.5.13 Roads can promote the dispersal of exotic species by altering habitats, stressing native species and providing movement corridors. Native species may also change their home range during operation resulting in displacement and stress affecting reproductive success. Roads can also promote increased hunting, fishing and the passive disturbance of animals by noise and humans causing changes in home ranges, movement, reproductive success, escape response, and physiological state. During construction and operation, light pollution may affect the behaviour of nocturnal animals such as bats or alter the behaviour of fish.

Potential Impacts for Habitats and Species

Terrestrial Habitat

25.5.14 Terrestrial habitats would be affected throughout the study area, primarily through habitat loss and fragmentation. Table 25.13 below outlines, in general terms, the potential impacts on terrestrial habitats arising from the construction and operation of the proposed scheme.

Table 25.13 – Overview of Potential Impacts on Terrestrial Habitats

Generic Impact	Effects in study area	Construction Phase	Operation Phase
Direct Habitat Loss	Direct habitat loss would occur along the whole route corridor. Minimum width of habitat loss being approximately 50m, where the proposed route is at grade with surrounding land. In areas where a cutting or embankment is required, the width of habitat loss is increased depending on the extent of the required works.	Yes	Yes
Severance or fragmentation of existing Habitat Areas	The proposed road would result in the severance of habitats adjacent to the proposed alignment. Fragmentation of Habitat Areas is likely to occur where the proposed route severs existing Habitat Areas, resulting in smaller, more numerous areas of habitat.	Yes	Yes
Physical obstruction caused by road constructions and bridges	The proposed road would act as a physical obstruction to the natural movement of species. These impacts are more obvious on animal populations resident in the study area and these are discussed in other specialist reports. However, movement of plant species can also be obstructed by physical barriers such as roads.	Yes	Yes
Hydrological disruption	Wetland habitats, including mires, blanket bog and wet heaths are susceptible to impacts from developments that affect the hydrological regimes of those habitats. Wetland Habitat Areas close to the proposed route may be subject to such impacts.	Yes	Yes
Pollution via road drainage, run-off and spray	During construction of the proposed road, pollution is likely to be predominantly associated with run-off of construction materials onto semi-natural habitats may result in adverse impacts to these habitats. During the operation of the road, pollution resulting form road drainage, run-off and spray is likely to adversely impact habitats adjacent to the road.	Yes	Yes
Visual and light pollution	Visual and light pollution impacts on existing Habitat Areas are predicted, with the magnitude dependent on the level of road lighting present in specific areas.	Possible	Yes
Air pollution	During the construction phase, particulate deposition of material arising from construction materials may result in limited impacts close to the construction site. During operation of the road, air pollution is likely to arise from traffic emissions.	Yes	Yes
Disturbance during construction	Disturbance to habitats would occur during construction. Disturbance to species activites and movements across the works corridor would occur during construction.	Yes	No

Specific Main Impacts

25.5.15 As identified in Table 25.13, habitat loss is a potential impact. The total amount of land-take required in order to construct the Southern Leg of the proposed scheme is currently estimated at approximately 2km^2. The predicted loss of Phase 1 Habitats resulting from the proposed scheme is presented in Table 25.14 . Note that these figures do not add up to the full 2km^2 and are provisional as this habitat loss includes only the footprint of the scheme, including attenuation ponds and does not include any subsequent land required for mitigation. Therefore, the total land-take for the scheme will increase following finalised design.

Table 25.14 – Breakdown Overview of Land-take

Habitat	Hectares (ha)
Broad-leaved semi-natural woodland	2.15
Broad-leaved plantation woodland	2.27
Coniferous plantation woodland	9.45
Duff's Hill felled coniferous plantation woodland	0.59
Mixed plantation Woodland	3.08
Dense continuous Scrub	3.26
Scattered Scrub	0.22
Parkland scattered trees	0.57
Unimproved acid grassland	0.05
Semi-improved acid grassland	2.92
Unimproved neutral grassland	1.85
Semi-improved neutral grassland	2.48
Improved grassland	82.57
Marshy grassland	5.63
Poor semi-improved grassland	20.85
Dry heath acid grassland mosaic	0.03
Wet modified bog	0.61
Fen	0.24
Open water	0.27
Arable	35.96
Amenity grassland	0.11
Cultivated/disturbed land introduced shrub	0.24
Total	**175.40**

25.5.16 Through consideration of baseline information and scheme design, areas were identified where there is potential for significant impact on terrestrial habitat. These are described in detail in Appendix 25.1 and summarised in Table 25.15 below.

Table 25.15 – Potential impacts on terrestrial habitats

Habitat Area	Feature/ Asset Evaluation	Potential Impact
SL1		
S2	Agricultural fields west of the A90 Local	Direct loss of low value farmland. Severance from farmland on other side of route. Fragmentation of three dry stone walls. No observable secondary impacts are likely to occur.
S3	Blue Hill Wood County	Direct habitat loss of woodland and open habitats with road construction in cutting (approximately 2 ha). (approximately 20-30% of habitat area) Includes loss of quarry pond and associated habitats. Severance and fragmentation of woodland habitats on either side of route. Disturbance and pollution impacts to adjacent habitats.
S4	Bog south of Greenhowe Local	No direct impacts as habitat area approximately 200 – 300 m from route. Potential pollution impacts via drainage ditch along northern edge of habitat area.
S5	Agricultural fields south of Greenhowe Local	Small area of habitat loss east of Duff's Hill Plantation (approximately 0.5 ha). Possible hydrological damage to peaty soils in fields. No direct impact to the area of Japanese knotweed is predicted but potential disturbance during construction and thus spread of this pest species

Habitat Area	Feature/ Asset Evaluation	Potential Impact
S6	Greenhowe Local	Direct habitat loss of young coniferous plantation and associated habitats from ch550 to ch1050 (approximately 2.5-3 ha). (approximately 5-10% of habitat area). Severance and fragmentation of blocks adjacent to route. Disturbance and pollution impacts, including impacts on land drains through forest blocks.
S7	Duff's Hill Local	Direct habitat loss of mature conifer plantation (approximately 1 ha) (<5 % of habitat area). Minor severance impacts as route severs through northernmost section of plantation. Potential pollution and disturbance to forest habitats.
S8	Agricultural fields west of Duff's Hill Less than local	Habitat loss west of Duff's Hill, between (approximately 3-4 ha). (approximately 5-10% of habitat area). Severance and fragmentation of fields west of Duff's Hill adjacent to route. Potential pollution and disturbance impacts, including hydrological damage to peaty soils in fields.
S10	Hare Moss Regional	No direct habitat loss – route passes adjacent to north side of Hare Moss. Potential hydrological damage to bog habitats due to disruption of drainage and site hydrology. Potential damage to sensitive bog habitats from pollution and disturbance during construction and operation.
SL2		
S11	Sunnyside Wood Local	Loss of small edge habitat of woodland. Potential disturbance impacts during construction due to access of construction traffic, but no observable secondary impacts.
S13	Agricultural fields around Sunnyside to Causeyport Local	Direct habitat loss of agricultural fields Direct habitat loss of woodland northwest of Clochandighter (approximately 30% of habitat area) plus surrounding dry stone walls. Severance of agricultural fields on either side of route. Severance of eight dry stone walls. Potential hydrological impacts to areas of marshy grassland. Potential pollution and disturbance to areas adjacent to route.
S16	Agricultural fields to the east of Burnhead to Greenloaning Local	Direct loss of farmland habitat. Severance of species-rich hedgerow with trees. Severance of three dry stone walls. Severance from farmland on other side of route. Potential pollution and disturbance to areas adjacent to route.
SL3		
S19	Blaikiewell Farm Local	Direct loss of semi-improved grassland. Severance from grassland on other side of route. Potential pollution and disturbance to areas adjacent to route.
S20	Cleanhill Wood County	Direct habitat loss of woodland habitat. Severance and fragmentation of blocks adjacent to route. Disturbance and pollution impacts, including impacts on land drains through forest blocks.
S22	Floodplain and immediate surrounds of Crynoch Burn (north) & Blaikiewell Burn Regional	Direct loss of fen and wet woodland of Blaikiewell Burn. Severance of wet habitats from other side of route. Hydrological impacts to the wider habitat. Potential pollution and disturbance to areas adjacent to route, including Blaikiewell Burn.
S23	Agricultural fields within Kingcausie Estate County	Direct loss of species poor semi-improved grassland. Severance of grassland from other side of route. Potential pollution and disturbance to areas adjacent to route.

Habitat Area	Feature/ Asset Evaluation	Potential Impact
S24	Kingcausie County	Direct loss of semi-natural woodland habitat. Direct loss of lowland wood-pasture and parkland. Severance of dry stone wall. Severance and fragmentation of habitats adjacent to route. Disturbance and pollution impacts, including impacts on Kingcausie Burn. Possible hydrological impacts to wetland within Kingcausie Wood and associated herb paris population
S27	Agricultural fields south of the River Dee Local	Direct loss of farmland. Severance from farmland on other side of route. Disturbance and pollution impacts, including impacts to River Dee.
S28	Floodplain and immediate surrounds of the River Dee Regional	Direct loss of rich semi-improved grassland. Severance of grassland from other side of route. Disturbance and pollution impacts, including impacts to River Dee.
S29	Agricultural fields south of Milltimber Less than local	Direct loss of farmland. Severance from farmland on other side of route. Potential pollution and disturbance impacts.
S31	Deeside Old Railway Line County	Direct loss of semi-natural habitats. Severance of linear feature. Loss of ability to act as wildlife corridor. Potential pollution and disturbance impacts.
SL4		
S32	Peterculter and western Milltimber County	Direct loss scattered trees and shrubs. Potential pollution and disturbance impacts.
S34	Guttrie Hill County	Direct loss of small portion of woodland edge habitat. Potential pollution and disturbance impacts.
S35	Milltimber Wood Local	Direct loss of small portion of woodland edge habitat. Potential pollution and disturbance impacts.
S36	Agricultural fields around Nether Beanshill Local	Direct loss of farmland habitat. Direct loss of species poor marsh habitat. Severance of seven dry stone walls. Loss of scrub lining dry stone walls. Potential hydrological impacts to wetland site and hydrological connections. Potential pollution and disturbance impacts.
S37	Woodland from Hill Farm to Westfield Lodge Local	Direct loss of improved grassland. Direct loss of individual trees and shrubs. Loss of connectivity for linear habitat. Loss of ability to act as a wildlife corridor. Potential pollution and disturbance impacts.
S38	Beans Hill south Local	Direct loss of farmland habitat. Severance of five dry stone walls. Potential pollution and disturbance impacts.
S39	Beans Hill north County	Direct loss of acid grassland habitat. Potential hydrological impacts to acid grassland and hydrological connections to adjacent dry heath. Potential pollution and disturbance impacts.
SL5		
S40	Agricultural fields around Silverburn County	Direct loss of farmland habitat. Severance from farmland on other side of route. Potential hydrological to hydrological connections. Potential pollution and disturbance impacts, including along Silver Burn.

Habitat Area	Feature/ Asset Evaluation	Potential Impact
S42	Agricultural fields to the east of Silverburn Wood Local	Direct loss of marsh habitat. Severance marsh on other side of route. Potential hydrological impacts to wetland site and hydrological connections. Potential pollution and disturbance impacts.
S43	Gairnhill and Kingshill Wood County	Loss of woodland edge habitat, including wet woodland. Potential hydrological impacts to wetland site and hydrological connections. Potential pollution and disturbance impacts.
S44	Agricultural fields to the west of Kingshill Wood Local	Direct loss of farmland habitat. Severance from farmland on other side of route. Severance of twelve dry stone walls. Potential pollution and disturbance impacts.
SL6		
S45	Moss of Auchlea Regional	No direct habitat loss. Potential impacts hydrological impacts from pollution and disturbance in adjacent habitat.
S46	Agricultural fields to the north of the A944 Local	Direct loss of farmland habitat. Severance from farmland on other side of route. Severance of four dry stone walls. Potential pollution and disturbance impacts.
S47	West Hatton Wood County	Direct habitat loss in both east and north sections of woodland. Severance and fragmentation of linear habitat. Loss of ability to act as wildlife corridor. Pollution and disturbance impacts likely to be significant during construction and operation phases. Combined impacts likely to result in loss of designated status of site.
S48	Cloghill Regional	Direct loss of edge grassland habitat. Loss of farmland habitat. Severance from farmland on other side of route. Severance of northern edge of plantation woodland. Loss of ability of linear woodland to act as wildlife corridor. Potential hydrological impacts upon acid grassland pockets. Pollution and disturbance impacts. Combined impacts likely to result in loss of designated status of site.

Badgers

25.5.17 It should be noted that the potential generic impacts outlined below frequently interact (i.e. habitat loss during construction can potentially result in disturbance and habitat fragmentation). The resulting combination of impacts may, through synergistic effects, significantly increase the adverse impact of the proposed scheme (Iuell et al., 2003).

25.5.18 One of the main impacts on badgers associated with the scheme is direct mortality caused by road accidents once the scheme is operational. This is the greatest cause of recorded badger mortality in the UK and without mitigation measures being put in place comparatively more badgers may be killed on the new road than at present. Furthermore, the operational AWPR would form a barrier to badger movements, severing badger group territories and limiting immigration and emigration. Habitat loss would also have repercussions on the local badger population where badger setts are lost as part the scheme. Construction of the scheme would also disrupt the routines of badgers and may result in some setts being abandoned.

Direct Mortality

25.5.19 Badgers are naturally inquisitive animals and may investigate construction areas during the night. Here there is an increased probability of mortality through badgers becoming trapped in any pits, piping, fuel containers, wire mesh or similar hazard. Any night works may also lead to an increased risk of badgers being run-over by works vehicles. Earthworks can lead to the destruction of badger setts and the death of any badgers inside, particularly where sett locations are unknown. This would constitute an offence under current legislation.

25.5.20 The principal cause of badger death during the operational stage of the road is likely to be attributable to badgers being struck by traffic as they attempt to cross the new road. Badgers are particularly susceptible where the roads sever existing paths or foraging areas. This is the main cause of badger deaths in the UK. It has been estimated that over 50,000 badgers are killed on roads every year in the UK (Harris et al., 1995).

Habitat Loss

25.5.21 The footprint of the proposed alignment would result in the loss of over 119ha of agricultural land with a further 21ha of poor semi-improved rough grazing grassland and semi-natural habitats, which potentially represent important setting, foraging and commuting habitat for badgers. Where loss of habitat is likely to be greater than 25% (within an individual social group's territory) the impact could potentially affect the viability of the affected social group (National Roads Authority of Ireland (NRA) 2005). The siting of activities such as work compounds, borrow pits, soil heaps, material stores. may also result in temporary loss of habitat. In addition, construction of the road scheme may result in the loss of badger setts, thus displacing social groups from their home range and leading to increased territorial conflict with neighbouring social groups. Without the appropriate licence, the loss or damage of any badger sett would constitute an offence under current legislation.

25.5.22 Edge effects of the road would extend the area of habitat loss beyond the footprint of the scheme with areas of habitat adjacent to the proposed road being avoided, or certain setts being abandoned by badgers due to the disturbance effects of the road. The impacts of habitat loss from the operational phase of the road are likely to vary between social groups depending on the extent to which the territory is affected.

Habitat Fragmentation and Isolation

25.5.23 The construction of the proposed scheme is likely to result in minimal severance as badgers would be able to freely move across the carriageway before it is operational. These impacts are likely to temporarily affect small proportions of individual badger groups' territories, as the road would be constructed in discrete sections. However, temporary localised fragmentation may be caused through disturbance or the construction of temporary barriers or similar structures during construction.

25.5.24 The operational stage of the proposed scheme is predicted to result in the fragmentation of badger territories through the physical barrier effects of the road. The fragmentation of territories may result in badgers being isolated from potential key areas, e.g. valuable foraging locations. The reduction in available resources may in turn lead to an increase in territorial conflict between neighbouring social groups as groups compete for habitat resources and try to make up for the areas of habitat lost to the proposed scheme by encroaching into neighbouring territories. Badgers are capable of inflicting fatal injuries on each other during territorial disputes (Neal and Cheeseman, 1996) and this may indirectly add to the impacts related to direct mortality (see paragraphs 25.5.19 and 25.5.20).

25.5.25 The barrier effects of the proposed scheme may also restrict immigration and emigration of individuals between social groups thus decreasing genetic dispersal potentially leading to increased inbreeding depression (Madsen et al., 1996). This impact is likely to have a far-reaching

effect on badgers outside of the study area as well as within, by creating genetically isolated sub-populations on either side of the road. Those social groups to the east of the alignment in th Milltimber and Kingswells area are likely to be affected the most as they would be bounded by the City of Aberdeen to the east.

25.5.26 Fragmentation effects of the road may render some areas of habitat unviable in terms of their ability to function as a complete resource for badgers, e.g. the fragmentation of a woodland may make it unsuitable as sett habitat or affect its ability to function as an economic foraging resource through a decrease in overall productivity or species diversity.

Disturbance

25.5.27 During construction, machinery and works may cause disturbance to badgers. Night-time working, involving lighting, noise and movement of people is likely to deter badgers from using land around a works area in the short-term. Stores of materials or plant next to an already installed badger-pass may dissuade badgers from using the pass, especially if the plant is used regularly. Similarly, disturbance during the daytime near breeding setts can cause serious disturbance to badgers and mortality of cubs (NRA, 2005). Under current legislation, any works involving heavy machinery within 30 m of a badger sett would result in an offence. Any sett exclusions would result in disturbance while badgers are forced to move to a new sett. This is likely to represent a temporary impact.

25.5.28 During operation, noise and light pollution are likely to create an envelope of disturbance around the proposed scheme, which may perturb badgers from foraging or maintaining setts in close proximity to the alignment, resulting in similar impacts described above. Disturbance could therefore further reduce the overall habitat available to badger social groups that border the road alignment. The impact of disturbance is likely to be reduced over time as badgers become accustomed to the road.

Pollution and Other Indirect Impacts

25.5.29 During construction, substances such as petrochemicals, lubricants and solvents used for plant and general works may represent an increased risk of badger mortality by means of poisoning through the potential contamination of waterbodies used by badgers for drinking. Similarly, there is the potential for the contamination of terrestrial habitats leading to a bio-accumulation of contaminants in food resources such as earthworms and rhizomes. High levels of pollutants may therefore accumulate in badgers resulting in mortality.

Specific Main Impacts

25.5.30 A summary text for the main impacts associated with the construction and operational phases of the scheme is provided below. Impacts such as loss of foraging habitat or runoff from the scheme, are not covered, as although they may still present a significant impact for this species, they are not likely to threaten the survival of badger populations in the Southern Leg.

<u>Section SL1: Charleston to Bishopston</u>

25.5.31 In Section SL1, an outlier badger sett (H4) in the area south of Greenhowe would be destroyed during habitat clearance, resulting in direct mortality or disturbance to badgers using the sett. The proposed scheme would also sever social group H's territory and cross several badger pathways, leading to a potential increase in badger mortality through territorial conflicts and RTAs.

25.5.32 In Section SL2, the proposed scheme would result in the loss of outlier setts I7-I8 (plus potentially more holes hidden in the gorse) at Merchant's Croft, resulting in direct mortality or disturbance to badgers using the setts. The proposed scheme also comes within 50m of the main sett (I1) and may severely disrupt the routines of badgers using the sett. The proposed scheme would sever Group I's territory and cross several badger pathways, resulting in an increase in badger mortality

through territorial conflicts (with an unidentified social group to the north of the study area and a group centred in Craigentath Wood) and RTAs.

25.5.33 In Section SL3, the proposed scheme would result in the loss of outlier sett J8 resulting in direct mortality or disturbance to badgers using the sett. The scheme would also sever the territories of social groups J and K and cross several badger pathways leading to an increase in badger mortality through territorial conflicts and RTAs.

25.5.34 In Section SL4, the proposed scheme would result in the loss of outlier sett L3 resulting in direct mortality or disturbance to badgers using the sett. The scheme would also sever the territory of social group L and cross several badger pathways leading to an increase in badger mortality through territorial conflicts and RTAs.

25.5.35 In Section SL5, the scheme would result in the partial loss of main sett N1, leading to a series of impacts on the social group including: displacement from their home range and main sett, increased territorial conflict with neighbouring social groups (Groups L, M and O) and possible injury or fatality to badgers in the sett. In addition, outlier sett N3 would also be lost to the scheme, resulting in direct mortality or disturbance to badgers using this sett. Furthermore, the scheme would sever the territory of social groups N - P and cross several badger pathways potentially leading to an increase in badger mortality through territorial conflicts and RTAs.

25.5.36 In Section SL6, the proposed scheme would result in the loss of outlier sett R8 resulting in direct mortality or disturbance to badgers using the sett. The scheme would also sever the territory of social group R and cross a badger pathway potentially leading to an increase in badger mortality through territorial conflicts (with a social group centered on Brimmond Hill) and RTAs.

Bats

25.5.37 The following is a summary of impacts on bats that are likely to result from the construction and operation of the proposed scheme. The severity of impacts is generally predicted to increase with the proximity of roosts to the road.

Direct Mortality

25.5.38 Bats are relatively long-lived, they take several years to reach reproductive maturity and then produce only one offspring a year. They therefore invest a lot of energy into producing relatively few young compared with other similar-sized terrestrial mammals. This makes bat populations particularly susceptible to impacts that compromise their numbers or ability to reproduce (Kunz, 1982).

25.5.39 During construction, there is a high risk of mortality if bats are roosting in any structure or tree to be demolished or felled. As discussed above, this may have significant impacts on bat populations and in addition confers a risk of prosecution if bats are killed or roosts destroyed, as bats and their resting places are protected by law.

25.5.40 During operation, there is a risk of RTAs caused by collision with oncoming vehicles. The risk is generally low as bats are unlikely to be attracted to major roads (DMRB, 2001). However, the risk is increased where the road severs flight lines and where young bats are emerging from maternity colonies as they are particularly weak fliers. It has been estimated that between 1 and 5% of bats die as a result of traffic accidents (Limpens et al., 2005). The problem is exacerbated by the fact that most of the bat species present in Aberdeenshire fly relatively low above the ground when commuting (Bach et al., 2004)..

Habitat Loss

25.5.41 Bats are particularly sensitive to habitat loss and even small patches of habitat may have wide-ranging implications for the bats that use them (DMRB, 2001). High roost fidelity and roost selectivity in certain species (e.g. brown long-eared bats; Entwistle et al., 1997) mean that loss of

roost sites may be detrimental to the populations using them. In particular, this may be manifested by the selection of sub-optimal roost sites, which may influence survival rates, especially at sensitive times of year including during hibernation or breeding. Optimal habitats including broad-leaved woodland, habitat corridors and lacustrine/riverine habitats are relatively rare and their distribution scattered (Walsh et al., 1996a, b) and bat populations are likely to be susceptible to changes in resource availability. Although the habitat lost may recover in the medium to long term following the construction period, the quality of the habitat may be reduced especially if the connectivity between remaining patches is also compromised.

25.5.42 Bats use linear features such as rivers, hedgerows and treelines as commuting routes between roosts and foraging grounds (Limpens and Kapetyn, 1991). The integrity of these habitat features is often critical to the continued viability of bat populations as bats need to be able to move freely between them (Mitchell-Jones and McLeish, 1999). Therefore, small scale modifications to such features (for example as a result of development) must be taken into consideration when predicting the impacts of a development (Racey, undated) as well as for impacts from direct mortality and fragmentation.

Habitat Fragmentation

25.5.43 Many of the impacts of habitat fragmentation and isolation are common to the construction and operation phases, as well as the impacts of habitat loss and direct mortality. Impacts include the loss of hedges, fences and tree lines used for navigation by bats. This may be a particularly significant impact for low flying bats including pipistrelle, *Myotis* species and brown long-eared bats (Limpens and Kapetyn, 1991) causing the isolation of resources and increasing the effort needed to commute between them. This may be exacerbated by the patchiness of roosts and foraging areas used by bats. Severance of commuting corridors and removal of sheltered flyways between patches may affect access to resources and may affect long term survival of populations of bats particularly where this occurs within 100 m of a maternity roost as pregnant females may need to feed closer to the roost (Racey and Speakman, 1987). The effects of direct habitat fragmentation and isolation are coupled with the risk of RTA due to vehicle collision as per Direct Mortality above.

25.5.44 Construction impacts of habitat fragmentation and isolation are limited to those short-term impacts caused by the positioning of site compounds, access roads and other construction activities. The locations of such construction activities for the proposed scheme are not yet known but the impact assessment identifies potential habitat fragmentation and isolation impacts that could be expected due to such activities.

25.5.45 Where the road or junctions pass directly through areas used by bats, habitat used for roosting, foraging or commuting may be fragmented and isolated. In addition the severance of flight routes used for commuting between areas of habitat, including indirect isolation of Habitat Areas where flight lines are not directly severed, but the road passes between Habitat Areas, may be caused by the operating road.

25.5.46 Long-term impacts of the proposed scheme are predicted to include the presence of moving traffic, which would act as a barrier to movement between habitats within the landscape. This is exacerbated by the constraints of echolocation calls in some bat species including brown long-eared bats (Entwistle et al., 1996). Bats may be deterred from crossing the road if their echolocation calls are unable to penetrate to the other side. While this has beneficial impacts in terms of reducing the operational impacts of road mortality, it reduces resource accessibility including roost or foraging habitats, forcing bats to use sub-optimal resources. Similarly, the new road may render roosts unviable if it passes between the roost and optimal foraging habitat (Mr Rob Raynor, SNH, personal communication).

Disturbance

25.5.47 The effects of disturbance are likely to be most significant during construction, in particular during felling and demolition works as bats will modify their behaviour to accommodate disturbance over time. Increased human presence and the use of heavy machinery is likely to cause extra dust, noise and vibration. This may cause disturbance to roosting bats and may even cause bats to

abandon a roost, especially if works take place at night and if blasting is used in the construction of cuttings.

25.5.48 Night-time working involving floodlighting may cause disruption of foraging and commuting behaviour (Rydell and Racey 1993). In particular, the use of lighting close to a roost may influence emergence behaviour and activity. Bright light may cause bats to move away from an area or to desert a roost. Changes in site layout due to habitat modification during construction are likely to bring about changes in local environmental conditions including temperature and humidity regimes. As well as affecting roost suitability such modification may affect emergence and behaviour of bats using the area by altering commuting routes.

25.5.49 While fast-flying bat species such as Leisler's bats and pipistrelles, may be attracted to the insects that feed over road lighting. Slower flying species including brown long-eared, Natterer's and Daubenton's bats, are likely to avoid areas road lighting has been installed (Rydell and Racey, 1993).

25.5.50 Maintenance operations can potentially affect bat roosts in bridges or trees and can cause disturbance to bats in roosts (DMRB, 2001). Bats' colonial habits and dependence on buildings and similar structures for roosting also make them vulnerable to repair work, re-roofing and the use of toxic timber treatment chemicals (Schofield and Mitchell-Jones, 2003).

Pollution and Other Indirect Effects

25.5.51 During construction, fluctuation in water regimes of burns, lochs and wetland areas may occur as a result of channel siltation through embankment construction, cutting excavation, culvert installation and provision of temporary access roads and vehicle washing. These are likely to bring about modifications to the channel bed morphology and water turbidity (refer to Chapter 24: Water Environment, and to Freshwater reports in Appendices A24.3 and A25.9). In addition, pollution of watercourses during construction or operation may also change the faunal assemblage. Such fluctuations are likely to result in modification of the insect prey availability with subsequent consequences for foraging bats.

Specific Main Impacts

25.5.52 Most of the land through which the proposed scheme would pass is agricultural land of low overall value to bats or where small numbers of bats are involved or distances are large enough that impacts are considered to be minimal. However, the overall impacts of the proposed scheme resulting from habitat severance, roost loss and disturbance are predicted to be adverse, particularly around Cleanhill Wood.

25.5.53 In Section SL1, direct mortality, as a result of the construction of the proposed scheme, is not assessed as being a main impact as no roosts or potential roosts would be destroyed. Due to the daytime nature of works, generally low levels of disturbance would be unlikely to affect commuting and foraging bats as a result of the construction of the road. However, a roost at Lochview Croft near Charleston Junction (approximately 100m) would be likely to experience increased disturbance due to noise.

25.5.54 During the operation of the road, the risk of direct mortality would be likely to be a potential impact along the edges of Duff's Hill plantation, where commuting bats were observed. Habitat loss, and fragmentation and severance of a commuting/foraging route extending north/south across the corridor along the road adjacent to Hare Moss cottages would also be likely to occur. Some foraging habitat loss would be likely to occur along the southern edge of Hare Moss, both directly and as a result of changes in the water regime during the construction and operation of the scheme. Furthermore, the suitability of Lochview Cottage as a roost and the likelihood of cottages to the east of Hare Moss being used as roosts may reduce. In addition, some disturbance may be anticipated to foraging bats at Hare Moss if lighting is used.

25.5.55 No known roosts are to be demolished in Section SL2 however a potential roost and two unsurveyed buildings may need to be demolished and therefore Direct mortality would be a significant impact.. It is likely that some disturbance to foraging and commuting bats would arise if night works take place near Bishopston or Heatherknowe during the construction phase.

25.5.56 The operation of the scheme would sever commuting routes in Section SL2 including the access track to Heatherknowe, the road between Clochandighter and Auchlunies, the access track south of Whitestone and the road to the south of Cleanhill Wood. Severance of these routes would increase the risk of direct mortality through potential RTAs along these routes. Permanent habitat loss is predicted through the loss of potential roosts at Greenloaning Cottage and the loss of small areas of high value linear foraging and commuting habitat alongside roads and field boundaries including at Bishopston and south of Whitestone. Fragmentation of already small and patchily distributed areas of bat habitat would also be likely to occur.

25.5.57 In Section SL3, the risk of direct mortality as a result of construction of the road is considered to be a potential main impact. Although no known roosts would be demolished or felled, as the proposed surveys in this area are incomplete, it is possible that unrecorded tree roosts exist on the alignment of the proposed scheme, particularly within the mature trees at Kingcausie. Disturbance during construction within this section would also be likely to result from increased human presence, felling of trees, junction and bridge construction, especially where potential roosts are located nearby, as their suitability as roosts may subsequently reduce.

25.5.58 Risk of direct mortality during the operation of the road as a result of RTA would be likely to be a potential impact within Cleanhill Wood, where the proposed scheme would sever at least five commuting routes at woodland edges and along the South Deeside Road. Additional RTA risk is not expected where the road crosses the River as bats will fly under the proposed bridge. Potential pollution of the River Dee during construction and operation may have an adverse impact upon prey species available. The proposed route severs a foraging and probable commuting route along the Deeside Old Railway Line. Should the status of Leisler's bats within the AWPR study area be confirmed as a viable population, this impact could be further exacerbated by the potential to affect the viability of the Leisler's bat population in the area. Permanent habitat loss and fragmentation would be likely to be a impact in this section due to the felling of trees with high potential for roosting bats. High value roosting, foraging and commuting habitat would be severed within Cleanhill Wood and Kingcausie, both by the proposed route and as a result of the realignment and regrading of Kingcausie Burn. High value riparian and aquatic habitat used by large numbers of bats would be lost during construction.. In the long term Kingcausie would be effectively severed. The use of lighting at the proposed Cleanhill Junction may also cause long term disturbance of bat foraging and commuting areas.

25.5.59 In Section SL4, the risk of direct mortality to bats during the construction phase is considered to be a potential impact as the scheme may require the demolition of a mixed common pipistrelle and brown long-eared bat roost at the International School in Milltimber. The severity of the impact is considered higher because at least two species would be affected. One building with roost potential but where no bats were observed to emerge is also to be destroyed, and the proximity of the road to possible roosts in Milltimber may reduce the suitability of this area for bats.

25.5.60 During operation of the scheme, the risk of direct mortality as a result of RTA would be considered to be a potential impact where the road crosses known commuting routes along the North Deeside Road, the access track to Culter House Wood, Culter House Road, Contlaw Road and the access track to Beans Hill. Habitat loss would be an impact from the demolition of a number of other buildings and trees with roost potential in an area used extensively by bats for roosting, commuting and foraging. Loss of foraging habitat at Beans Hill would also have an adverse impact upon the local bat populations. Moreover, habitat fragmentation would occur due to the effective loss of habitat either side of the road at Milltimber if bats were unable to cross the road. The effects of lighting at the junction at North Deeside Road would be likely to be minimal as the existing road is already lit. However, there is potential for disturbance to the bats roosting at Airy Park Cottage.

25.5.61 No roosts would be destroyed in Section SL5 during the construction phase of the proposed scheme. There is potential for disturbance to bats roosting at Ard Na Moine and Moss Side of Auchlea, where the road passes within 200m of the roosts.

25.5.62 The risk of direct mortality as a result of RTA during the operational phase would be predicted to be a potential impact where the scheme crosses known bat commuting routes. The main areas along the road are at East Silverburn and a number of potential commuting routes connecting the roost at Moss Side of Auchlea and Auchlea Moss to foraging opportunities at Kingshill Wood. Minimal habitat of value to bats would be lost to the scheme at Rotten O'Gairn. However, fragmentation and isolation would a potential impact where the proposed scheme would pass between roosts and areas of key foraging habitat, namely between Rotten O'Gairn, East Silverburn Woods and Gairnhill Wood, and between Auchlea Moss and Kingshill Wood. Furthermore, disturbance may occur as a result of traffic noise and road lighting during operation of the scheme, as the section is relatively undisturbed at present.

25.5.63 In Section SL6, the risk of direct mortality and habitat loss would be likely to be potential impacts during the construction phase as tree roosts would be felled in the tree lines north of Fairley Home Farm. Disturbance would also be likely to occur during felling of West Hatton Wood, Fairley Home Farm Wood and the tree lines near Dykeside.

25.5.64 In this section, the risk of direct mortality due to RTA during the operation phase of the scheme would be a potential impact where the road severs West Hatton Wood and commuting routes near Cloghill, Fairley Home Farm and tree lines toward Brimmond Hill if provision were not made for bats to cross the road safely. Habitat loss and severance would result where the proposed scheme would pass through West Hatton Wood, Fairley Home Farm Wood and the shelterbelts between Fairley Home Farm and Brimmond Hill/Dykeside. The severance of important linear connecting habitat would be likely to have a profound effect on the accessibility of foraging resources to the west of the road, fragmenting already small areas of optimal foraging and roosting habitat. The loss of this high value habitat in this section, especially given its strategic location close to Kingswells, which is likely to contain significant populations of roosting bats, would be likely to reduce the viability of the area to support foraging and roosting bats in the long term. The operation of the road would be likely to have an impact on the suitability and viability of existing roosts, particularly tree roosts within 50m of the alignment near Fairley Home Farm and in the shelterbelts towards Dykeside. The loss of important connecting habitat is likely to further reduce their suitability for roosting bats. The suitability of the tree lines at Dykeside as commuting and foraging routes would likely be further reduced due to lighting at the proposed North Kingswells Junction.

Breeding Birds

Direct Mortality

25.5.65 Direct mortality of adult birds, their eggs and un-fledged/fledged young during road construction is directly linked to pre-construction habitat loss and disturbance (refer to paragraphs 25.5.70 and 25.5.78). Habitat loss resulting from clearance of vegetation prior to construction is unlikely to result in direct mortality of adults and/or sufficiently fledged young as they are able to escape by moving into unaffected adjacent habitats. However, birds' eggs and un-fledged young are vulnerable to direct mortality impacts associated with habitat loss with species located in denser habitats, such as dense scrub, grassland or woodland being the most vulnerable.

25.5.66 Direct mortality of bird eggs and young (from habitat loss and disturbance) is most likely to occur during the breeding season, typically between March and August and would constitute a prosecutable offence under the Wildlife and Countryside Act (1981) (as amended) (in particular for those species listed within Schedule 1 of the act).

25.5.67 Many bird species will attempt to cross active roads to move between habitat fragments (Salter, 1994). RTAs typically occur where woodland or scrub habitats are located immediately adjacent to busy roads and it likely that low flying bird species (e.g. members of the thrush family, owls and game birds) would be the greatest affected.

25.5.68 High mortality rates associated with operational roads reduces the exchange of bird populations between habitats and thus increases isolation effects, demonstrating the link between mortality and barrier effects caused by fragmentation (Van Apeldoorn, 1995).

25.5.69 An increase in direct mortality resulting from habitat fragmentation associated with an increase in number of roads and road traffic within the UK, has been highlighted as a major component in the decline of some bird species such as the barn owl (a WCA Schedule 1 species). It has been observed that twice as many barn owls are now killed by road traffic (an estimated 5,000 individuals per annum) on UK roads compared with the 1950s (English Nature, 1996).

Habitat Loss

25.5.70 The direct impact of the proposed scheme would be the physical loss of breeding and foraging habitats along the route corridor. The impacts associated with direct habitat loss are additionally increased by the interaction of disturbance and fragmentation/isolation impacts, which if combined can lead to a change in the distribution of species within a route corridor or wider study area (Iuell et al., 2003).

25.5.71 Pre-construction habitat clearance would result in the destruction of potential breeding habitat for bird species. Cumulative impacts are also likely to arise as a consequence of the destruction of birds' eggs. The direct mortality of un-fledged young and the displacement of adults and fledglings by means of disturbance into adjacent un-affected habitat are possible clearance impacts.

25.5.72 Habitat clearance would additionally result in the direct loss of foraging habitat through the loss of plant food groups such as buds or berries and the indirect loss of invertebrate communities. These form a major dietary constituent for the majority of small to medium sized bird species (e.g. blue tit or song thrush).

25.5.73 The total amount of land-take (which corresponds to direct habitat loss) required in order to construct the Southern Leg of proposed scheme is approximately 2km^2. Species are likely to be adversely impacted by habitat loss of 17ha of woodland, of which 2ha is broad-leaved semi-natural woodland and 3ha of dense scrub. The loss of 119ha of agricultural land is a particular impact upon skylark and lapwing that rely on such areas for breeding.

Habitat Fragmentation and Isolation

25.5.74 Bird species diversity and local species extinctions have been found to be more pronounced in smaller woods than in larger areas of woodland (Hinsley et al., 1992 in English Nature, 2001).

25.5.75 English Nature (1994) reports that the habitats most likely to be affected by fragmentation are woodland, heathland and species rich grassland. Bird species, which move between habitats in order to maintain genetic diversity and avoid inter-breeding, are the most impacted. The ability to utilise fragmented habitats varies according to species with greater impacts on those species less able to cross gaps. Some species will not live within several hundred metres of a road, for example, cuckoo. While the barrier effect imposed by the proposed scheme to birds is difficult to assess due to it being variable between species, as a general rule, the busier and wider the road, the more effective barrier it is to dispersion (English Nature, 2001).

25.5.76 Fragmentation and isolation would have an adverse impact on local bird populations through a reduction in dispersal and subsequent isolation of species, which could potentially result in a reduction in population sizes. The extent of these impacts is likely to be dependent on the size of the isolated area of habitat and the species affected, as the ability to avoid genetic isolation and localised extinctions by moving between fragmented habitats varies between bird species.

25.5.77 Operation of the proposed scheme is likely to have significant fragmentation and isolation impacts on bird populations through a restriction in dispersal and movement of species between habitats (fragmented by construction) resulting from direct mortality, habitat loss associated with minimal operational maintenance, and noise and vibration disturbance caused by road traffic. The

continued fragmentation and isolation of bird species within severed habitats could have a detrimental effect on species population dynamics and ultimately population viability.

Disturbance

25.5.78 Disturbance resulting from noise and vibration associated with construction of the proposed scheme is predicted to occur in two stages. The first stage would comprise disturbance resulting from pre-construction habitat clearance. The second stage would comprise both direct disturbance (e.g. from earthmoving machinery) and indirect disturbance (e.g. human activity). Both direct and indirect disturbance are likely to contribute to an increase in the effects of fragmentation and isolation. If severe or prolonged, disturbance may lead to some species of bird failing to nest during the breeding season (March to August).

25.5.79 A detailed study on the effects of road traffic noise on breeding bird populations in the Netherlands by Reijnen et al*.* (1995a) observed that roads used for high-speed travel reduced the density of breeding birds within adjacent woodland and grassland habitats. Further research undertaken by Reijnen et al. (1995b) has shown that road traffic noise accounted for lower densities of 43 songbird species in habitats adjacent to operational roads and that the distance from a motorway at which breeding bird densities were affected was influenced by the intensity and speed of traffic (Reijnen et al., 1995a).

25.5.80 Road lighting can have adverse impacts on bird species and can affect both breeding and foraging behaviour in a number of species of bird. This impact was first observed by Rawson (1932) who demonstrated the correlation between critical light levels at dawn and singing in thrushes, and suggested that artificial lighting could modify the timing of natural behavioural patterns. Impacts from light pollution have also been observed in nocturnal bird such as barn owl (Hill, 1992).

Pollution and Other Indirect Impacts

25.5.81 Ballard and Hacker (1996) have shown that de-icing salt used in the winter to keep roads ice-free can potentially result in the death of seed eating birds such as finches, which consume seeds contaminated by salt. The application of de-icing salt to the proposed scheme during the winter and the indirect pollution of adjacent habitats via vehicle spray could potentially result in the death of seed eating bird species, foraging in habitats located adjacent to the proposed scheme with wide verges with varied nut or berry bearing planting being most likely to be most impacted.

Specific Main Impacts

25.5.82 A summary of the main potential impacts associated with the construction and operational phases of the proposed scheme on breeding bird assemblages within the route corridor is provided below. It must be noted that this impact assessment is provisional only, as it is based on limited data due to access issues resulting in the bird surveys being approximately 50% complete.

25.5.83 In Section SL1, the proposed scheme would result in the loss and severance of part of Blue Hill Plantation and Greenhowe Wood, which forms part of Blue Hill Site of Ornithological Value (SOV) as well as the loss of a small area of Hare Moss SOV. Remaining habitats outside the SOVs may be adversely affected by habitat loss and fragmentation.

25.5.84 In Section SL2, part of Heatherknowe SOV and most of South Greenloaning SOV would be lost during operation which would be an adverse impact on high value breeding bird sites. No other SOVs would incur habitat loss. The proximity of the scheme to Hill of Blairs and Whitestone Wood may result in disturbance and fragmentation of foraging. The proposed scheme has the potential to impact on the protected barn owl (status: WCA1i, JNCC Amber list, LBAP), which has been observed near Greenloaning. This would be key adverse impact as it identified potential impacts on a Schedule 1 species in this section.

25.5.85 In Section SL3, part of the Blaikiewell Burn SOV, Cleanhill SOV, River Dee SOV, Old Deeside Railway Line SOV would be lost during operation, which would be an adverse potential impact on

high value breeding bird habitats. Other habitats outside SOVs would likely be adversely affected by habitat loss. The proposed scheme may present a potential risk of direct mortality and significant fragmentation/disturbance of kingfisher on the River Dee, which is considered to be a key impact on a WCA1i species in this section.

25.5.86 In Section SL4, part of the Beanshill SOV may be severed as a result of the proposed scheme. This would potentially affect a high value breeding bird habitat. In addition, the proposed route would result in loss of parkland/scattered trees at the International School, loss of part of Milltimber Wood and adjacent habitats, loss of part of Guttrie Wood (DWS) and other habitats throughout Section SL4.

25.5.87 Substantial fragmentation of habitats throughout Section SL5 is predicted to occur together with extensive disturbance, in particular to breeding birds located in Kingshill/Gairnhill Wood SOV, East Silverburn SOV and Moss of Auchlea SOV. The proposed route is also predicted to result in possible direct mortality and significant disturbance of barn owl (which has been observed crossing the proposed alignment between Kingshill/Gairnhill Wood SOV and Moss of Auchlea SOV) and greenshank (recorded as non-breeding), which are considered to be key potential impacts on two WCA1i species in this section.

25.5.88 In Section SL6, part of West Hatton Wood SOV would be severed as a result of the proposed scheme, which would be a key adverse impact on a high value breeding bird habitat. In addition, the proposed scheme would result in the loss of scrub on Cloghill and linear wooded habitats north of Cloghill to Hillhead of Derbeth, together with other habitats throughout Section SL6.

Otters

Direct Mortality

25.5.89 Otters are inquisitive animals and may be attracted onto work sites during the construction phase to investigate new machinery or spoil heaps (Highways Agency, 1999). Therefore, otters risk becoming trapped in any pits, piping, chemical containers or wire mesh. As otters are largely nocturnal, any night works may also lead to otters being run-over by works vehicles. Such events are not common (Grogan et al., 2001), but the otter's status as an internationally protected species means that any direct mortality caused by the construction of the road would constitute an offence.

25.5.90 The principle cause of direct mortality resulting from operation of the scheme is likely to be through otters being struck by vehicles as they attempt to cross the new road. Otters are highly susceptible to being killed on existing roads, with 60% of all recorded violent deaths in the UK being attributed to road accidents (Woodroffe, 2001). Trunk and A-roads account for 57% of these RTAs, although they comprise only 13% of the road network (Philcox et al., 1999). The majority of road casualties (over 50%) occur within 100 m of a watercourse (Highways Agency, 1999).

25.5.91 This frequently occurs during high water levels. In periods of flood, otters are reluctant or unable to swim under a bridge or through a culvert due to strong currents and high flows. This is exacerbated where there is no ledge above the high water level for otters to walk along. Where otters do attempt to swim under the road during strong currents, they are liable to drown, especially in culverts that have become blocked at one end or where there is a lack of air space. RTAs may be increased where drainage ditches and burns run alongside the road, as otters can be attracted onto the carriageway (Grogan et al., 2001).

Habitat Loss

25.5.92 Works associated with the construction of the proposed scheme include loss of habitat due to the siting of works compounds, storage of materials and access roads. The otter is a secretive mammal and as such, holts and couches are very important. Each individual is familiar with its home range knowing each site where shelter is available. The loss of holts and other lying-up sites would therefore place more stress on the animal, requiring it to travel further in order to find suitable cover. This may create conflict between otters particularly where they exist at high otter

population densities (e.g. in Aberdeen) or put them at risk to other hazards such as RTAs (Highways Agency, 1999). Furthermore, this would constitute an offence under UK and European legislation. The impact associated with the construction phase is regarded as being potentially significant where large areas of land adjacent to watercourses would be taken up by the presence of compounds, especially where junctions and bridges are proposed.

Habitat Fragmentation and Isolation

25.5.93 Construction of the road would necessitate the provision of construction compounds, storage facilities and access roads. These may prevent otters from moving freely within and between existing areas of habitat, particularly where they are situated in the vicinity of watercourses. The construction of culverts on some watercourses may act as a barrier to migratory fish movements, and has the potential to reduce fish populations. Reduction in prey numbers would render upper reaches of these burns of limited use to foraging otters, with potentially significant impacts on their suitability for foraging otters.

25.5.94 The operational scheme would result in habitat fragmentation and form a physical barrier to otters, preventing them from moving freely within and between available areas of habitat. The scheme is predicted to divide otters' home ranges possibly causing them to abandon parts of their range or attempt frequent road crossings with the associated risk of RTAs as otters attempt to reach foraging and lying-up areas. Severance of an otter's home range may also place it in direct competition with other otters, thus increasing stress within the metapopulation. Otters are capable of inflicting serious and potentially fatal injuries on each other during disputes over territory (Grogan et al., 2001). The road may also restrict immigration and emigration thus decreasing genetic dispersal and increasing competition amongst currently stable populations. These impacts could be damaging to the population, removing animals that might have successfully colonised new areas in the catchment and affecting breeding.

Disturbance

25.5.95 Otters are likely to suffer increased disturbance during both construction and operation of the new road. Construction of the road is likely to create physical disturbance that could affect the activities of otters. Noise from machinery and vehicles, light for night working, the possible obstruction of holts and otter pathways, and the presence of humans, can all have adverse impacts. Such impacts could be exacerbated by the siting of construction compounds or storage sites during the construction phase, e.g. close to lying-up sites. Under current legislation, it would be an offence if construction works were to obstruct access to a holt, disturb an otter in a holt or damage/destroy a holt or couch. Otters may attempt to avoid any periodic disturbance, which would act as a barrier to their usual activities and deter them from using these lying-up sites. This may cause otters to use different routes that may bring them into conflict with other otters or they may use a route that involves crossing other roads, with associated RTA risk.

25.5.96 During the operational phase, otters are likely to suffer disturbance from traffic noise as well as from road lighting. Otters may become accustomed to these impacts over time (for instance, they commonly use the River Don in Aberdeen city, e.g. at Bridge of Balgownie), but otters could abandon any holts or couches in the immediate vicinity of the scheme.

Pollution and Other Indirect Impacts

25.5.97 Pollution of watercourses and water features in the area could result in serious long-term damage to the productivity and diversity of nearby habitats, having an adverse impact on both otters and their food supply. The construction of bridges and culverts as part of the road scheme may cause restrictions in river and stream channels, which can cause scouring and flooding, cumulating in sediment deposition downstream and a reduction in aquatic invertebrate numbers (Grogan et al., 2001). This would have an adverse impact on fish populations, which in turn could affect otter prey availability. The damage or destruction of salmonid redds is also possible during construction and this could have equally damaging repercussions on the otter population (see Freshwater Ecology Report, A25.9).

25.5.98 Being large carnivores, otters are particularly vulnerable to changes in food availability at all levels of the food chain. A pollution event would be particularly serious if it were to occur on one of the larger rivers such as the River Dee. The rivers have large fish populations (and eel populations in the River Don) and otter use of land and burns in the vicinity of the rivers was high during the surveys. Pollutants such as oil and diesel can also affect thermo-regulation qualities of an otter's coat and cause mortality (Kruuk, 1995; Grogan et al., 2001).

25.5.99 Pollution from roads can be particularly significant during occurrences of storm water run-off or accidental spillage. Run-off from the operational road may contain compounds used in the manufacture of cars including zinc, cadmium and copper. Compounds such as Polychlorinated Biphenols (PCBs) may also be present and these have the potential to seriously affect reproduction of otters (Kruuk, 1995).

Specific Main Impacts

25.5.100 Most impacts are associated with the operation of the road. Pollution incidents potentially resulting from the new road scheme also have the potential to result in changes to the local population, particularly if a serious pollution incident occurred on the River Dee or one of its tributaries as the Dee SAC supports the largest otter and fish populations. Disturbance during construction and operation at the Dee Crossing (C12, Figure 25.7d) would include the destruction of a couch with implications for the availability of lying up opportunities for otters. The road is likely to render a number of couches and holts unsuitable for use due to proximity to the road or by obstructing their access routes. Potential impacts on otters within the River Dee SAC will be the subject of an Appropriate Assessment under the Habitats Directive.

25.5.101 In Section SL1, the scheme crosses the Tributary of Loirston Burn and over Greenhowe Pond, passing immediately to the south of Hare Moss, severing a field ditch (the uppermost reaches of the Burn of Ardoe) to the west of the moss. There are likely to be potential impacts due to increased risk of direct mortality where the road crosses these watercourses. The loss of some potential lying up (breeding) habitat in the south of Hare Moss to the scheme is likely to have some impact on the availability of secluded breeding habitat for otters. Greenhowe Pond would be lost to the scheme and some loss of habitat is also expected where the scheme crosses Loirston Burn and its tributary. Furthermore, disturbance from traffic noise at the culverts along Loirston Burn and its tributary and where the scheme passes alongside Hare Moss is likely to occur, especially if otters are disturbed while breeding or if long-term water quality and habitat deterioration occurs.

25.5.102 In Section SL2, the proposed Cleanhill Junction would involve the realignment and crossing of Burnhead Burn which may result in the potential for pollution incidents during construction, affecting the water quality downstream including the SAC. Risk of direct mortality during the operational phase of the scheme, due to RTAs or drowning in culverts, is a potential impact along Burnhead Burn if otters cannot cross safely. Some loss of medium value habitat alongside Burnhead Burn is also predicted. The proposed Cleanhill Junction would also restrict the movement of otters along Burnhead Burn and reduce the accessibility of upstream resources used by otters that have most of their home range along Blaikiewell and Crynoch Burns and the River Dee. Additional operational impacts are predicted due to disturbance caused by traffic noise.

25.5.103 In Section SL3, road crossings are proposed at Blaikiewell Burn, Kingcausie Burn and the River Dee and increased risk of direct mortality during construction is predicted in these locations. Works accesses and compounds are likely to cause disturbance to otters using their lying up sites on the River Dee. The construction of the proposed bridge over the River Dee is likely to cause disturbance and act as a temporary barrier to otter movement up and down the river. Furthermore, the construction of Cleanhill Junction and the road could potentially result in pollution and siltation due to particulates downstream including in Crynoch Burn as well as where the scheme crosses Blaikiewell and Kingcausie Burn.

25.5.104 Risk of direct mortality due to RTAs or drowning in culverts is likely to be a potential impact during the operational phase of the proposed scheme where it crosses Blaikiewell Burn, Kingcausie Burn and the River Dee. Burn realignment and permanent habitat loss along Kingcausie Burn is likely to involve the destruction or disturbance of a potential holt (H3), which is within 50m of the proposed

works. A couch (C12) would also be destroyed through construction of the Dee crossing. In addition, the proposed Cleanhill Junction would restrict the movement of otters along Blaikiewell Burn and reduce accessibility to resources upstream including Burnhead Burn. Further operational impacts are also predicted due to disturbance caused by traffic noise at Cleanhill Junction, within Cleanhill Wood and on the River Dee. This disturbance is likely to be a key impact, especially where lying up sites are located nearby.

25.5.105 In Section SL4, the proposed scheme crosses the upstream reaches of Milltimber Burn and the risk of direct mortality is likely to be a potential impact during the construction and operation of the proposed scheme.

25.5.106 In Section SL5, the potential for direct mortality during the construction phase is predicted where the proposed scheme severs a probable otter commuting route between Upper Beanshill Burn and Gairn, Ord and Silver Burns close to the watershed. The siting of site compounds and accesses would cause disturbance if located near the holt (H4) on Ord Burn or the potential couch (C26) on Upper Beanshill Burn. Additional disturbance is likely to commuting and foraging otters if night works or lighting are used.

25.5.107 Direct mortality during the operational scheme due to RTAs is likely to be a potential impact at Upper Beanshill Burn where the scheme severs a commuting route. Disturbance due to traffic noise would impact upon Upper Beanshill Burn, Gairn Burn, the easternmost reaches of Silver Burn, and at Auchlea Moss where breeding otters may be disturbed. The impacts of alteration of water quality and availability of fish resources would have downstream effects down both catchments if pollution events are not mitigated for.

25.5.108 No significant watercourse crossings are proposed in Section SL6 and as such, there are no key impacts predicted for otters.

Red Squirrels

25.5.109 According to the Scottish Strategy for Red Squirrel Conservation (2004), the precise reasons for the decline of the red squirrel are unknown, but the changes in woodland habitat and road kills have been identified as likely factors.

25.5.110 Red Squirrels and their dreys are protected under the Wildlife and Countryside Act (1981) (as amended) and the Nature Conservation (Scotland) Act 2004. See section 25.3.78.

Direct Mortality

25.5.111 Direct mortality due to construction of the proposed scheme could represent a significant impact in areas where red squirrels are present. They could suffer direct mortality during construction through tree felling, by works traffic clearing the site or indirect mortality through stress.

25.5.112 Red squirrels may attempt to cross the carriageway during the operational phase of the road and therefore be at increased risk of mortality resulting from traffic. Mortality may increase in areas where the carriageway either fragments or isolates areas of woodland. High mortality rates on roads severing woodland habitat in Britain have been reported (The Highways Agency BAP, undated). These RTAs may threaten the viability of the local population.

Habitat Loss

25.5.113 The loss of woodland habitat due to the proposed scheme may represent a substantial loss of red squirrel breeding and foraging habitat and may affect the long-term viability of woodland areas to support red squirrels. Red squirrels can be prone to starvation and any reduction in habitat may decrease the available food supply and increase the likelihood of starvation (Gurnell, 1987). The presence of a mixture of coniferous tree species (Scot's pine, Douglas fir, European larch and Norway spruce) means that red squirrels can forage throughout the year and the loss of any one of these tree species may lead to a gap in foraging opportunities for red squirrel. In addition, edge

effects of the road resulting from noise, disturbance and pollution may result in the abandonment of a greater area of woodland by red squirrels than that lost directly by the footprint of the road.

Habitat Fragmentation and Isolation

25.5.114 Where the proposed scheme either fragments or isolates woodland, there may be an impact on the long-term genetic diversity of the local red squirrel population. This barrier may cut off populations by restricting movement of red squirrels either during population dispersal, during the breeding season or when red squirrels are foraging throughout their range. Red squirrels are likely to become stressed by any disruption to, or change in their home range. There is also the potential for cumulative impact of further development on those red squirrels isolated on the eastern side of the road.

Disturbance

25.5.115 Disturbance due to construction operations may represent a significant impact in areas where red squirrels are present. Noise from machinery and vehicles, light for night working, dust and the presence of humans can all have adverse effects.

25.5.116 During the operational phase of the proposed scheme, red squirrels are likely to suffer disturbance from traffic noise as well as from road lighting. This disturbance is likely to increase with proximity to the proposed scheme and may prompt squirrels to move away from the carriageway to forage and/or breed. As a result, this may expose both migrant and any resident red squirrels in areas further away from the road to increased levels of stress, intra and inter-specific competition and starvation, due to increased pressure for limited resources.

Specific Main Impacts

25.5.117 A summary of the potential impacts associated with the construction and operational phases of the proposed scheme on local red squirrel populations are described below. Direct mortality and disturbance during clearance for construction would result in significant adverse impacts in woddlands with high squirrel activity or where active dreys are found. The greatest long-term impacts of the proposed scheme are associated with the operation of the road, particularly the resultant fragmentation and isolation of red squirrel habitat. The proposed scheme would sever woodland that currently supports red squirrel populations and would thus act as a barrier restricting movement of red squirrels within their home range. This isolation of populations may lead to loss of genetic diversity and ultimately potential local extinction and therefore may compromise the currently favourable conservation status of red squirrels within the area.

25.5.118 In Section SL1, recent felling activities mean that Duffs Hill and Blue Hill are already isolated from each other, however, the operational scheme would exacerbate these habitat fragmentation issues and introduce direct mortality due to RTAs.

25.5.119 In Section SL2, no key impacts upon red squirrels are predicted due to the distance of the woodland areas with red squirrel presence in this section from the proposed route.

25.5.120 In Section SL3, risk of direct mortality from habitat clearance in Cleanhill Wood and Kingcausie during the construction phase would be a main potential impact. Furthermore, disturbance through increased noise levels and human presence during the construction phase of the scheme is likely to force red squirrels that are in close proximity to construction works, to retreat deeper into the woodland. The permanent loss of high value habitat, comprising mature mixed broad-leaved and coniferous woodland is likely to be red squirrel foraging and/or breeding habitat and is predicted to constitute a substantially adverse impact. Habitat fragmentation of Cleanhill Wood by the operational scheme would prevent dispersal of red squirrels between these woodland areas and other areas of contiguous woodland (such as Durris Forest).

25.5.121 In Section SL4, the risk of direct mortality of red squirrels during construction of the proposed scheme through clearance of woodland in Milltimber Wood and Guttrie Hill Wood would present a

main impact. Furthermore, disturbance through increased noise levels and human presence is also predicted to result in substantial impacts, as woodland areas in close proximity to construction works are likely to become less attractive to red squirrels causing them to retreat into the woodland. Increased risk of red squirrel mortality due to RTAs constitutes a potential impact on the local red squirrel populations. The proposed scheme would prevent commuting of red squirrels between Milltimber Wood and Guttrie Hill Wood resulting in fragmentation and isolation. This is predicted to be a key adverse impact, as isolation of these woodland areas could lead to a loss of genetic diversity and ultimately local extinction.

25.5.122 In Section SL5, the risk of direct mortality due to habitat clearance of Silverburn Wood for construction would result in a potentially adverse impact. Disturbance through increased noise levels and human presence during the construction phase of the scheme is considered an adverse impact. Increased risk of RTAs during the operational scheme is also predicted to constitute a potential adverse impact. Permanent habitat loss and fragmentation of the commuting corridor between Silverburn Wood and Gairnhill Wood is also likely to represent an adverse impact, as isolation of Silverburn Wood could potentially lead to local extinction of the red squirrel population within the woodland. Disturbance through noise and/or traffic pollution during the operational phase of the scheme is exacerbated by the small size of Silverburn Wood and thus the vulnerability of the resident red squirrel population.

25.5.123 In Section SL6, the risk of direct mortality due to habitat clearance of Hillhead of Derbeth Woodland would result in an adverse impact. Temporary adverse impacts may also arise due to disturbance through increased noise levels and human presence during the construction phase of the scheme. Direct mortality as a result of RTAs during the operational scheme would result in an adverse impact upon the local red squirrel population.

Water Vole

25.5.124 No water voles were found within the study area and therefore no impacts are predicted. However, there is suitable water vole habitat and currently inactive burrows along the central ditches of Hare Moss and the Moss of Auchlea. Therefore, pre construction surveys of these areas will be undertaken to ensure that water vole remain absent.

Amphibians

Direct Mortality

25.5.125 Direct mortality of amphibian species is highly dependant on the time of year that works are conducted. When amphibian species are in their breeding habitat (e.g. early spring/early summer), construction works resulting in destruction or pollution of that waterbody would result in the greatest risk of mortality. However, if construction were to take place from late-summer to early spring, mortality would mainly occur to amphibian species in adjacent terrestrial habitats. The risk of mortality will increase the closer the destruction of terrestrial habitat is to a waterbody. If the loss of amphibians is sufficiently high, then amphibian populations could become locally extinct. Any amphibians in close proximity to the waterbody while migrating or feeding could be trampled or killed by the wheels of machinery. During late October to early March, amphibians present in any hibernacula destroyed during site clearance and top-soiling will be killed or die through exposure.

25.5.126 Amphibian mortality on operational roads is most obvious during breeding migrations in the early spring when hundreds of individuals may be lost on a single night within a short stretch of road (Highways Agency, 2001). A study undertaken by SNH (1994) estimated that 20-40% of breeding amphibians are killed each year from RTAs. The impact of such mortality on the wider population will vary according to a range of factors such as the proximity of the road to the breeding site, the proportion of the population that crosses the road and the volume of traffic on the road (Highways Agency, 2001).

Habitat Loss

25.5.127 The direct loss of breeding ponds is the most obvious potential impact on amphibians. Any loss of aquatic habitat can potentially lead to a reduction of breeding habitat, possibly resulting in a localised decrease in breeding success, especially in areas that have a low pond density. In addition, the loss of pond habitats can have severe impacts on the metapopulation structure of amphibians by reducing the density of ponds within an area and isolating potentially non-viable populations.

25.5.128 Terrestrial habitat loss over 250m from a breeding pond is unlikely to have a significant effect on amphibian populations (English Nature, 2001), while Oldham (1994) concluded that blocks of suitable habitat less than 0.4ha within 250m of a waterbody are unlikely to support a viable population. Valuable amphibian habitat includes semi-improved grassland, scrub and woodland, wet and dry modified bog, swamp, marshy grassland and tall ruderal herb and fern. Loss of this habitat would reduce available refugia, hibernation sites and feeding opportunities and lead to exposure, predation and failure to breed. All of these effects have the potential to reduce recruitment and ultimately population size.

25.5.129 Alteration of natural drainage (e.g. seepage lines, burns and springs) and artificial drainage (e.g. ditches and land drains) systems, as a result of road construction, may have a significant effect on amphibian populations. Water levels in breeding ponds may be critically raised or lowered such that conditions become less suitable or even unsuitable for some amphibian species (Highways Agency, 2001).

Habitat Fragmentation and Isolation

25.5.130 Previous studies have shown roads to be a significant barrier to amphibian dispersal, interrupting migration between terrestrial and aquatic habitats (Voss, 1995). Reduced dispersal between populations can lead to breeding ponds becoming isolated from the terrestrial habitat used by amphibians during non-breeding stages of their life cycle. In addition, the barrier effect of new roads can result in populations becoming isolated, increasing the risk of local extinction and genetic impoverishment (English Nature, 2001). It is possible that amphibian populations living near major roads may be reduced in size dramatically or lost completely after five to ten years exposure (Highways Agency, 2001).

Disturbance

25.5.131 Artificial lighting has been shown to affect the feeding behaviour of nocturnal frogs reducing their visual acuity and ability to find prey (Buchan, 1993). It is reasonable to assume that the effect of light disturbance could also affect nocturnal native amphibian species. If roadside lighting at junctions illuminates areas of feeding habitat adjacent to the road then it may constitute a disturbance impact to amphibians.

Pollution and Other Indirect Impacts

25.5.132 Inorganic diffuse run-off from the road could pollute waterbodies, adversely affecting amphibian populations. The use of salt to de-ice roads in winter may have adverse impacts on amphibians in areas close to the road. There is also the potential for sediment run-off to block rain seepage lines and alter the depth and size of the pond, adversely affecting resident amphibian populations.

Specific Main Impacts

25.5.133 In Section SL1, Greenhowe Pond is located directly under the alignment of the proposed route and as a result will be lost during construction. The surrounding terrestrial habitat S3 will be also lost or severely altered. The operational scheme will also form a barrier to amphibian movements and will isolate the fragments of remaining habitat. Further impacts of disturbance and habitat loss are predicted on terrestrial habitat in S10, although this habitat area will not be fragmented. Pollution and disturbance may affect Turnamiddle Pond, which is within 200m of the alignment.

25.5.134 In Section SL2, impacts of habitat loss are predicted through the destruction and fragmentation of terrestrial habitat within S16. The operational scheme may also result disturbance in S15 and associated ponds.

25.5.135 In Section SL3, permanent habitat loss is predicted in Habitat Areas S24 and S31 and the operational scheme will act as a barrier to amphibian movement, fragmenting valuable Habitat Areas and the amphibian populations they support. Further potential impacts are predicted through disturbance to Eastlands Pond and surrounds during both the construction and operational phases of the scheme.

25.5.136 In Section SL4, no key impacts are predicted as there are no ponds recorded within this section and the amphibian terrestrial habitat is minimal, consisting mainly of hedgerows.

25.5.137 In Section SL5, habitat Loss and disturbance during construction and operation of the proposed scheme are predicted to be potential impacts in areas of terrestrial habitat in S42. Additional terrestrial habitat in S45, adjacent to the scheme, is likely to suffer disturbance and potential pollution impacts associated with the construction and operation of the scheme.

25.5.138 In Section SL6, permanent loss of terrestrial habitat in S48 is predicted to constitute a main impact. Moreover, fragmentation is predicted to occur in the Northern Leg section at N7 and N13 leaving the remnant areas isolated and preventing dispersal between sites. Disturbance from the construction and operation of the scheme is also likely to affect Habitat Areas N2, N3, N8 and N11. Further impacts are predicted through disturbance at Fairley Home Farm Pond and in Habitat Area S48.

Brown Hare

25.5.139 Brown Hare are assumed to occur in low numbers throughout the proposed route corridor. The following is a discussion of likely impact on brown hare in general terms as no specific impacts have been identified.

Direct Mortality

25.5.140 Construction of the road will necessitate the removal of vegetated areas and the clearance of soil using machinery and during this process hare mortality is possible. Leverets will be particularly susceptible to these activities as they are left alone in forms during the day and may be reluctant to move from their places of refuge (Hutchings and Harris, 1996; Tapper and Hobson,, 2002). There is also the potential for hares to be killed through becoming trapped in any pits, piping, chemical containers or wire mesh associated with construction activities. However, significant numbers of hares are unlikely to be killed as a result of these activities. During operation of the road, there is a risk of hare RTAs as hares attempt to cross the carriageway, particularly in areas where suitable habitats are severed.

Habitat Loss

25.5.141 Areas of rough grassland, arable land, scrub and woodland will be lost to the operational scheme, all of which are important to hares. However, there is ample medium value hare habitat in the study area and this impact is not considered significant.

Habitat Fragmentation and Isolation

25.5.142 The operational road will represent a barrier between potential hare populations either side of the alignment which would restrict hare movements in and between available habitats. The operational road may also restrict immigration and emigration, thus decreasing genetic diversity and increasing competition among stable populations

Disturbance

25.5.143 Hares are likely to be disturbed by the construction of the road scheme. Noise from machinery, vehicles and the presence of humans may adversely affect hares, especially breeding females (Tapper and Hobson, 2002). The noise of vehicles during operation may adversely affect hares in the short term. However, in certain areas habituation to the noise is likely to occur in the medium term.

Reptiles

Direct Mortality

25.5.144 Reptile mortality may occur during the construction phase of the road through site clearance and excavations as well as being run-over by construction vehicles. This would constitute an offence under the Wildlife and Countryside Act (1981) (as amended). During the operational phase, there is the potential for mortality through reptiles basking on the roadside or attempting to cross the road and subsequently being run-over.

Habitat Loss

25.5.145 Habitat loss is likely to have a potentially adverse impact on reptiles where the construction of the road will result in the destruction of areas supporting suitable reptile habitat. Temporary habitat loss could also occur through the siting of compounds and storage areas associated with the construction phase of the road.

Habitat Fragmentation and Isolation

25.5.146 Construction of the road will potentially result in areas of suitable reptile habitat being severed, fragmenting and isolating any remaining potential reptile populations. Temporary habitat fragmentation and isolation may occur through the siting of construction compounds.

25.5.147 Operation of the road is predicted to restrict dispersal and may act as a barrier to the colonisation of new areas during operation, which in turn may reduce the genetic diversity of reptile populations making them more vulnerable to stochastic events.

Disturbance

25.5.148 During the construction phase of the road, vibrations from machinery and large vehicles are likely to disturb reptiles and deter them from residing in habitats adjacent to the areas of proposed scheme. The storage of construction materials in sensitive areas, in addition to removing debris such as logs and rubble, could also constitute disturbance to reptiles. The effects could be particularly detrimental if carried out during the breeding season or when reptiles are hibernating.

Specific Main Impacts

25.5.149 In Section SL1, habitat loss and fragmentation would be potential impacts in S3 for reptiles. S10 is immediately adjacent to the alignment and is expected to be adversely impacted upon due to disturbance during both the construction and operational phases.

25.5.150 In Section SL2, habitat loss is a potential impact in S16, as the operational scheme will result in the permanent loss of this suitable reptile habitat. Moreover, the proposed road will act as barrier, fragmenting suitable reptile habitat in S16 and S15.

25.5.151 In Section SL3, the operational scheme is likely to result in adverse impacts on reptiles due to habitat loss in S31 and S24. Habitat Area S31 serves as a potential commuting corridor for reptile dispersal therefore wider reaching severance and fragmentation effects involving S18, S22, S21, S23 and S24 are predicted. Disturbance due to construction activities and the operational road are also likely in S24 and S31.

25.5.152 In Section SL4, reptile habitat is scarce and as such no key impacts are predicted.

25.5.153 In Section SL5, the operational scheme is likely to result in habitat loss and the exacerbation of existing fragmentation and isolation issues in S42. This Habitat Area provides the only potential reptile habitat in this section and these adverse effects are predicted to constitute key impacts.

25.5.154 In Section SL6, permanent loss of potential reptile habitat in S48 would be a potential impact. Moreover, fragmentation will occur in the Northern Leg areas of N7 and N13 leaving the remnant areas isolated and preventing dispersal between sites. Disturbance from the construction and operation of the scheme is also likely to affect Habitat Areas N2, N3, N8 and N11.

Terrestrial Invertebrates

25.5.155 Impacts on terrestrial invertebrates are predicted to occur along the length of the proposed scheme. The following provides a discussion on what the likely types of impacts will be.

Direct Mortality

25.5.156 Work during the construction phase involving large earthworks and heavy machinery will result in the death of a range of ground dwelling invertebrates, particularly slower moving, flightless arthropods, which cannot avoid being crushed by construction machinery. This is unlikely to permanently affect the population dynamics of any community.

25.5.157 The principle cause of direct mortality resulting from operation of the scheme is likely to be through invertebrates, particularly Gastropoda and Diptera having an increased risk of being crushed by vehicles. Although there are no peer reviewed research driven figures for invertebrate roadkill, it is known to have a major impact on roadside arthropod populations (Oxley and Fenton, 1974; Mader, 1984). The only survey conducted to date in the UK was undertaken by the RSPB in 2004 (www.rspb.org.uk/bugcount). The study observed that, in total, one invertebrate was killed for every five miles travelled. This mortality is unlikely to permanently affect the population dynamics and is thus considered not to constitute a main impact.

Habitat Loss

25.5.158 The operational scheme will result in the direct loss of habitat, this will only be a small loss of the total available. However, impacts affecting the integrity of the habitat that maintains several populations of nationally important species may be of a greater impact.

Habitat Fragmentation and Isolation

25.5.159 In addition to the barrier that will be created after the scheme is built, there will also be habitat fragmentation and isolation through the provision for construction compounds, storage facilities and access roads. Although many invertebrates do not travel large distances, this fragmentation and isolation has the potential to have an impact on small-scale population dynamics.

25.5.160 Large roads are absolute barriers to gene flow as shown in forest Carabid populations (Keller and Largiader, 2003) and land snails will not cross even un-paved roads as narrow as 3m (Baur and Baur, 1990). The operational scheme will also result in habitat fragmentation to those invertebrates that attempt to cross the road, but suffer mortality. The road may also restrict immigration and emigration thus decreasing genetic dispersal and increasing competition amongst currently stable populations.

Disturbance

25.5.161 During the operational phase, there will be considerable disturbance from mowing of the verges. Frequent mowing along verges disturbs invertebrates and leads to a loss of over-wintering habitat. The result of shortened vegetation is generally a reduction in the abundance and diversity of most groups and species (Morris, 2000). This disturbance favours a few opportunistic and robust

species, often non-native, to the detriment of those that are slower to adapt (Mader, 1984; Hollifield and Dimmick, 1995; Haskell, 2000). The potential extinction of local ground dwelling invertebrates therefore increases.

Pollution and Other Indirect Impacts

25.5.162 Activities associated with road construction can cause soil compaction, which reduces the presence of terrestrial niches and leads to increased run-off and decreased soil porosity therefore causing soil dwelling invertebrate mortality (Noss, 1995).

25.5.163 During operation, in addition to destroying invertebrate habitat on the area used for the road itself, there will be a reduction in the quality of habitat on road verges by altering vegetation, changing soil dynamics and modifying microclimates.

25.5.164 De-icing salts cause saline pollution from sodium chloride in particular, but also magnesium and calcium chloride, may cause invertebrate mortality from desiccation. These salts also produce ions that alter the soil pH and therefore change the plant communities, which could be detrimental to the invertebrates using this vegetation as habitat.

25.5.165 Run-off from the operational road may contain compounds used in the manufacture of cars including zinc, cadmium and copper. Petroleum products also include heavy metals that could contribute to invertebrate mortality. Earthworms are known to bio-accumulate heavy metals, which will then be passed up the food chain.

25.5.166 Road surfaces tend to absorb solar radiation at a higher rate than natural surfaces, increasing soil and air temperatures (Haskell, 2000). This increased aridity has been known to decrease invertebrate diversity on roadside verges (Grindal and Brigham, 1998).

Specific Main Impacts

25.5.167 As invertebrates are ubiquitous throughout the study area, impacts described above are likely to occur across the scheme. Two main potential impacts have been identified and are described below.

25.5.168 In Section S1, potential changes to the hydrological regime of Hare Moss could result in changes to the vegetation species composition and thus the microhabitats available for invertebrates in this area. This impact is difficult to predict as the nature and magnitude of potential changes to Hare Moss are unknown and this impact will be assessed further, following the completion of additional hydrological studies.

25.5.169 In Section S6, habitat loss and severance at West Hatton Wood constitutes an adverse impact for invertebrates through loss of valuable habitat and as a barrier to dispersal between high quality habitat fragments in this area.

Water Shrew

25.5.170 There are many aspects of road construction and operation that can have adverse impacts on water shrew populations. The DMRB (Highways Agency, 2001) identifies the potential impacts that road developments may have on water shrews, which are discussed below. Water shrew were not found during previous surveys in the Northern Leg probably due to river spates which caused flooding of the sampling tubes (Chapter 10: Ecology and Nature Conservation, Northern Leg). They are however known to be common and widespread so are assumed to be present on suitable watercourses in the study area. The following discussion describes impacts likely to occur along the proposed route corridor.

Direct Mortality

25.5.171 Water shrew could suffer direct mortality during construction through direct habitat loss resulting from site clearance, or through the pollution of watercourses. Water shrew may also become trapped in any small-aperture receptacles left lying around on construction sites, in addition to uncovered pits and trenches. Water shrews are unlikely to cross the carriageway during the operational phase of the road as they are averse to crossing areas of open ground. Therefore, any risk of mortality resulting from traffic is predicted to be low.

Habitat Loss

25.5.172 Habitat loss during construction is likely to be widespread, particularly associated with the installation of culverts and/or bridges on the majority of watercourses crossed by the proposed scheme. However, it should be noted that the amount of habitat loss will represent a small proportion of suitable water shrew habitat (between 30m and 240m of watercourse habitat depending upon the angle at which the road crosses the watercourse and whether the road is in embankment or cutting). At its greatest, this size of habitat loss is equivalent to the size of one to two water shrew territories on each water body. Assuming that there is a water shrew territory on each suitable watercourse impacted by the scheme, it is estimated that a minimum of 31 territories will be lost.

Habitat Fragmentation and Isolation

25.5.173 Habitat fragmentation, isolation and severance of water shrew populations resulting from habitat loss and in-channel works during the construction of culverts and/or bridges is likely to be occur on affected watercourses. The extent of this impact in terms of a total barrier to movements and/or dispersion is dependant on whether effected watercourses are diverted prior construction.

25.5.174 The proposed scheme during operation will represent a barrier between potential populations either side of the alignment restricting dispersal of young, and the movements of males during the breeding season. Both of these impacts restrict gene flow and could result in the loss of isolated fragments of the water shrew population.

Disturbance

25.5.175 Water shrew populations on watercourses and/or other suitable habitats are likely to incur considerable disturbance during construction of the proposed scheme mostly associated with pre-construction habitat clearance of proposed watercourse crossings. It is possible that disturbance may result in the redistribution of some water shrew territories although this will depend on the magnitude of disturbance. Disturbance during operation of the proposed scheme is likely to be minimal and mostly associated with during clearance to gain maintenance access to culverts and/or bridges.

Pollution

25.5.176 Pollution events could occur during the construction of the road. Pollution events include toxic spill events and increased sedimentation of watercourses during the construction of bridges, culverts and watercourse diversions. Increased sedimentation and toxic spills would have an adverse impact on local water shrew population inhabiting the affected watercourse or connected watercourses both directly and indirectly through loss of macroinvertebrate prey. Potential impacts during the operational of the proposed scheme are likely to include toxic spill events and adverse impacts related to road run-off. Run-off from the road could contain PCBs, heavy metals or oils. Elevated levels of these can affect mammalian reproduction rates, directly poison them, decrease aquatic invertebrate abundance or decrease the waterproofing abilities of the water shrew's coat.

Freshwater Habitat

25.5.177 The following discussion addresses generic impacts that could affect the freshwater environment including macroinvertebrates, aquatic habitat and fish. The potential impacts on freshwater pearl mussels are described separately (refer to paragraphs 25.5.220 to 25.5.222).

Point Source and/or Diffuse Organic/Inorganic Pollution

25.5.178 During construction of the proposed scheme there is potential for accidental pollution release to adjacent waterways including oil and fuel from plant, liquid concrete, uncontrolled sewage release and fine sediment release (see below). The effect of any given pollution event is likely to have greater impacts in smaller watercourses that have lower dilution.

25.5.179 Oils, fuels and chemicals can enter watercourses via accidental spillage from storage tanks or leakage from mobile or stationary plant. Oils can form a film on the water surface resulting in an adverse effect on water quality. These oils can interfere with the gills of invertebrates and fish and inorganic pollutants may have a lethal effect on aquatic flora and fauna.

25.5.180 Concrete, cement and admixtures could be released to watercourses through accidental spills or from the washings of plant and machinery. Concrete and cement are highly alkaline and may adversely affect aquatic organisms if the pH is elevated to or maintained above 8.5.

25.5.181 Accidental/uncontrolled release of sewage could result from damage to pipelines during service diversion. Release of sewage to watercourses would result in organic loading and could lead to increased biological oxygen demand and decreases in dissolved oxygen.

25.5.182 Without appropriate mitigation, operational road runoff and accidental spills from traffic are likely to raise levels of pollutants entering the watercourses. This could lead to decreased macroinvertebrate species richness through the loss of pollution sensitive/rare species and ultimately leads to fish kills if toxicity reaches lethal levels.

Increased Sediment Loading and Changes to Sediment Transport

25.5.183 During construction, increased sediment loading to adjacent watercourses could occur in the absence of suitable mitigation. Suspended solids can result from excavations, run-off from stockpiles, plant and wheel washing, run-off from site roads, run-off during embankment construction, earthworks and landscaping. The risk of release of suspended solids into watercourses or drainage ditches is greatest at road crossings where earthworks will be involved in the construction of culverts, bridges and river diversions. Changes in water velocities resulting from temporary stream diversions during construction are also predicted to affect sediment transport.

25.5.184 Sediments can cause damage to aquatic invertebrates and fish through deposition resulting in a smothering effect, reducing microhabitat availability or by interference with feeding and respiratory apparatus. Salmonids have a suspended solids tolerance of around 30mg/L (see Freshwater Survey Report, Appendix A25.9 for more details). Alabaster and Lloyd (1982) summarise that long-term levels of suspended sediment below 25mg/L^{-1} will have no harmful effects on fish. Levels of 25-80mg/L^{-1} are generally acceptable while, 80-400mg/L^{-1} are unlikely to support good fisheries and levels over 400mg/L^{-1} generally will not support substantial fish populations.

25.5.185 During road construction, suspended solids reaching the water column are likely to originate principally from sediment laden run-off. For example, topsoil will be stripped to prepare the ground for road construction, leaving the earth bare. During a rain event, water falling on this surface will pick up loose sediment on its way to the receiving watercourses. Where it is possible to assess these impacts quantitatively, this has been completed using sediment modelling (please refer to Appendix A24.5, Annex 27). Otherwise potential impacts on receiving watercourses have been assessed qualitatively and are addressed in Chapter 24 (Water Environment) and Appendix A24.3 (Fluvial Geomorphology)

25.5.186 Suspended solids may also contain contaminants, which can cause pollution of the receiving watercourse. Sediment smothering can also reduce light availability for aquatic plants, which can lead to die back and in turn increase organic loading and its associated impacts including lowered levels of dissolved oxygen (see above). Increased turbidity can hamper predatory macroinvertebrates' search for prey. Additionally, increased turbidity as sediment is entrained in the water column can lead to decreased dissolved oxygen (DO) levels.

25.5.187 During operation, increased sediment loading could result from road run-off, particularly during and following heavy rain when road drainage systems may not function optimally. In addition, the proposed scheme may result in a substantial change to the discharge regime (see below) and this could permanently alter the sediment transport and geomorphological character of some of the watercourses (see Appendix A24.3: Fluvial Geomorphology). This could indirectly have an impact on aquatic organisms specifically adapted to microhabitats, which may be lost through changes in sediment dynamics. For example, increased scour may adversely affect a caddis fly species, which relies on fine sand to build its case or an area may become unsuitable for salmon egg laying.

Decrease in Stream and Bankside Habitat Complexity

25.5.188 Construction of the proposed scheme involves numerous watercourse crossings and, at each of these crossing points, there is likely to be a degree of habitat simplification/modification. This can occur through culverting, channel straightening, bank reinforcement or re-profiling, river diversion, over deepening and clearing of riparian zone. All of these activities have the potential to reduce habitat and food availability for aquatic species, in turn leading to decreases in species richness and mortality.

25.5.189 In particular, the use of culverts with smooth substrates rather than those which allow the natural river bed to remain substantially reduce in stream habitat complexity and thus niche availability for macroinvertebrates. As the road is likely to be at least 30m wide (wider in the embanked sections), the length of each watercourse to be crossed by culverts is likely to be straightened and the riparian habitat lost will result in reduced channel sinuosity and decreased flow heterogeneity. River diversions will also result in reaches being straightened and riparian habitat loss. More seriously however, some river diversions may substantially reduce the total river length leading to changes in discharge regime and sediment transport (see below), which may in turn simplify in-stream and marginal habitat characteristics and lead to increased erosion and flooding.

25.5.190 Operation of the proposed scheme includes maintenance of the road, verges and culverted areas and this could potentially reduce riparian zone habitat complexity through clearance of vegetation. In addition, the spread of exotic species such as Japanese Knotweed could result in simplification of riparian habitat. In other respects, operation is not likely to substantially affect in-stream and bankside habitat complexity apart from changes to the discharge or sediment transport regimes.

Habitat Fragmentation

25.5.191 Habitat fragmentation in watercourses usually involves some kind of physical barrier, which can stop free movement of fauna. Culverts under duel carriageway roads typically constitute long straightened reaches of smooth substrate with no in-stream or bankside habitat complexity and associated food resources and may also result in changes in slope and faster flow conditions. In addition to habitat modification, substantial shading can also be an impact of long culverts. All of these factors could pose a barrier to fish, otter and invertebrate movement.

25.5.192 In addition to culverts, river diversions can also cause habitat fragmentation by reducing channel sinuosity and potentially changing the discharge regime, which may stop or hamper the movement of fauna which require specific flow conditions to migrate up or down the river system.

25.5.193 Habitat fragmentation is particularly relevant to salmonid fish (i.e. salmon and trout), which need to migrate upstream to breed.

25.5.194 In addition to the habitat fragmentation impacts described above, operation of the proposed scheme may also result in the culverts becoming blocked if not properly maintained, particularly following periods of heavy rain.

Substantial Changes to Discharge Regime

25.5.195 The proposed construction works will generally alter the slope of the surrounding land and slightly increase the local amount of impermeable surface through the construction of the road pavement. This has the potential to increase the total discharge via run-off to the watercourses, possibly constituting an adverse impact on the aquatic ecosystem. Additionally, temporary and permanent river diversions can also substantially alter the discharge regime through changes in slope and channel sinuosity, affecting water velocities and discharge volumes.

25.5.196 Changes to discharge regime can result in substantially changed local habitat and food availability and water quality. Substantial reduction in discharge levels can severely affect flow-reliant species and those sensitive to decreases in dissolved oxygen. Similarly, increased discharge can have adverse impacts on species reliant on slow flow areas such as pools and marginal dead water for feeding and resting (i.e. migratory fish). Increased discharge can also have a microhabitat simplification effect due to scouring and increased flood frequency that can also reduce the number of species able to survive in a variable discharge environment.

25.5.197 Substantial increases or decreases in water velocities of a river can have adverse impacts on the ecosystems it supports. Many species are adapted for specific ranges of water velocities for feeding, breeding, and migratory cues. In addition, changes in discharge regime can substantially alter the benthic microhabitat available and cause substantial changes in water quality parameters, particularly dissolved oxygen and biochemical oxygen demand.

25.5.198 Operation of the road is not predicted to substantially affect the discharge regime of local watercourses except potentially through the maintenance of road drainage and detention ponds if these are to be periodically flushed. However, this impact would be infrequent and temporary.

Specific Main Impacts

25.5.199 The following impacts may result in potentially significantly adverse impacts on the freshwater environment.

25.5.200 In Section SL1, the proposed road drainage system is routed through the northern boundary of Hare Moss to the Burn of Ardoe. As the hydrology of the moss has not been subjected to detailed investigation for this assessment, the potential impacts on the hydrological regime of the moss has not been fully assessed. Any change to the hydrological conditions of the moss have the potential to affect the flow regime of the Burn of Ardoe. This potential impact has not been quantified for this assessment.

25.5.201 In Section SL2, Burnhead Burn is likely to be adversely impacted by realignment and regrading to allow the proposed route to cross the watercourse through habitat loss and simplification. This is predicted to substantially alter the sediment and discharge regime of the burn as it is steepened for a short section which is likely to adversely affect macroinvertebrate and fish both in the burn and in Blaikiewell and Crynoch Burns downstream. This is a particularly serious potential impact due to the Crynoch Burn being located within the River Dee SAC. Increased sediment levels may adversely affect Atlantic salmon, one of the qualifying species of the site.

25.5.202 In Section SL3, Kingcausie Burn is to be realigned and regraded at the crossing of the proposed route and this is predicted to cause localised habitat loss and simplification. This has the potential to alter the sediment and discharge regime of Kingcausie Burn, which could result in increased sediment loads, adversely affecting macroinvertebrates and fish. This is an important potential impact due to its proximity to Crynoch Burn and River Dee SAC where increased sediment levels would be likely to adversely affect Atlantic salmon and freshwater pearl mussels, two of the qualifying species of the site.

25.5.203 The construction of the River Dee crossing has the potential for accidental sediment release e.g. from stored materials or earthmoving. Detailed sediment modelling is required in order to quantify this risk. This assessment has not yet been undertaken but will be reported in the 2007 EARs.

25.5.204 It is possible that noise and vibration from construction works during the sensitive stages of salmonid egg incubation could result in damage to eggs close to the source of the vibration. This would have a high adverse impact locally but only a low adverse impact on the population as a whole. This could also constitute an offence under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Further information on noise and vibration impacts are presented in Appendix A25.9:).

25.5.205 In Sections SL4, Alburn and Bellenden Burn are not proposed to be directly affected by the road alignment. Other watercourses that would be crossed by the proposed scheme in this section are of local and less than local ecological value and are not therefore subject to any key impacts.

25.5.206 In Section SL5, Silver Burn and Gairn Burn would not be crossed by the proposed scheme. Therefore, they are only likely to be affected directly by receiving road drainage. This is not considered to be a significant adverse impact as road drainage would be appropriately treated before it would be discharged to the watercourses.

25.5.207 In Section SL6, Westholme Burn and Borrowstone Burn are of local value and no key impacts on freshwater habitat are predicted.

Freshwater Pearl Mussels

25.5.208 In addition to the general impacts on the freshwater environment outlined above (particularly those relevant to Atlantic salmon as they are crucial to the pearl mussel life cycle), the following impacts specific to freshwater pearl mussels in the River Dee are predicted. The River Dee is proposed to be bridged in such a way that no piers will be located within the river. The construction of this bridge poses potential risk to the pearl mussels directly through sediment release and indirectly through potential adverse impact on salmonids.

25.5.209 Indirect impacts may result due to proposed work on other burns within the area. Kingcausie Burn is proposed to be culverted and re-aligned, resulting in changes to the gradient and as such the discharge regime, sediment loading and sediment transport. Kingcausie Burn flows directly into Crynoch Burn, which itself flows directly into the Dee therefore impacts of sedimentation on Crynoch may potentially lead to impacts the River Dee itself. Sediment release impacts upon Crynoch Burn may adversely affect salmonid populations within the burn (see Appendix A25.9: Freshwater Report) and as such may result in mortality ultimately affecting the pearl mussel populations.

25.5.210 Any outfall to the River Dee proposed as part of the road drainage network poses a potential threat to pearl mussels. The location of this outfall may potentially have an impact on the mussel population through the possible introduction of pollutants, namely copper and zinc.

25.6 Mitigation

Introduction

25.6.1 Principles and objectives for ecological mitigation associated with the AWPR have been developed in discussion with SNH, SEPA and other stakeholders including Transport Scotland, Aberdeenshire Council and the Aberdeen City Council. These are reported in a Mitigation Vision Statement, currently being finalised. The statement provides a framework to facilitate the further development of detailed mitigation measures to address specific impacts. It also outlines proposals for habitat creation outside the study area to offset cumulative habitat loss and fragmentation impacts throughout the scheme.

25.6.2 In general, a hierarchical approach has been adopted for AWPR mitigation measures, which includes the following:

- to avoid adverse impacts in the first instance, for example by not pursuing a particular option, or by devising alternatives where possible;
- where avoidance is not possible, reduce the adverse impacts with the aim of eliminating impacts and reducing each impact to being of neutral significance;
- where adverse residual impacts remain, measures to offset the adverse impacts at the specific site may be required. For example, habitat creation may be required to offset the local, site-specific impacts associated with habitat loss and fragmentation; and
- where localised site-specific mitigation may not be possible through habitat creation or where such measures would be ineffective, it may be possible, with the agreement of statutory consultees, to offset adverse impacts at a wider, regional level. Such measures may include, for example, habitat creation and/or restoration at sites remote from the point of impact or contributions to strategies that contribute to meeting the targets and objectives of Biodiversity Action Plans (UK BAPs or LBAPs).

25.6.3 Current guidelines highlight the importance of an agreed approach to mitigation with the developer prior to the publication of the ES. For example, the Draft IEEM Guidelines for Ecological Impact Assessment (IEEM, 2006) states that 'An EcIA is effectively meaningless if it provides an assessment of the significance of the residual impacts of a scheme based on the proposed mitigation measures being implemented even though these measures have not been agreed by the developer'. Furthermore, the Design Manual for Roads and Bridges (DMRB) 2001, states that 'The aims and objectives of the mitigation and any post construction monitoring should be agreed before the mitigation design process starts'.

25.6.4 The ecological mitigation strategy for the AWPR aims to provide mitigation that reduces the adverse effects of the proposed road, in accordance with UK, Scottish and Local Policies. Articles of legislation relating to the requirements for mitigation are presented in Chapter 10 (Ecology and Nature Conservation) as these are applicable to the entire scheme.

25.6.5 As stated previously, the present assessment does not describe detailed and site-specific mitigation. Generic mitigation includes best practice methods and principles that are applied to the scheme as a whole. As summarised in the opening paragraph, prevention or avoidance of these adverse impacts is the primary aim of ecological mitigation. If this is not practical or possible, measures will be proposed to reduce the impact and if this is also not practical or possible then measures to offset the impact are included in the mitigation strategy (IEEM, 2006). Offsetting measures may be addressed at strategic level, as discussed in Part E (Cumulative Assessment) of the ES.

25.6.6 Mitigation measures such as avoiding sensitive times of year, use of appropriate fencing, adopting best practice procedures for site clearance and ensuring adherence to procedure by the Ecological Clerk of Works (ECoW) will provide efficient safeguards from the potential impacts of the works in most cases. Full details of the generic mitigation required for habitats and individual species are provided in Appendices A25.1 to A25.10. A summary of the generic mitigation measures that apply to all ecological receptors is presented in Table 25.16.

Table 25.16 – Generic Ecological Mitigation Measures

Effect	Generic Mitigation
Avoid	Comply with the requirements of the Ecological Clerk of Works who will be employed on behalf of the Scottish Executive; Where possible, road and associated infrastructure designed to avoid impacts with consultation of the appropriate statutory adviser Ensure that work compounds and access tracks etc. are not located in, or adjacent to, areas that maintain habitat value; Establish site fencing to prevent access to areas outside of working areas, particularly in areas adjacent to features of interest/value; Cover site safety issues including storage of potentially dangerous materials; Pre-construction species surveys of impacted areas, particularly breeding sites to remove animals and therefore prevent direct mortality; Covering of pits or provision of mammal ramps to prevent animals falling in holes and becoming trapped; and Follow Scottish Environment Protection Agency (SEPA) pollution prevention guidelines (PPGS) to prevent pollution of watercourses through siltation or chemicals.
Reduce	Restrict workforce to working areas through the erection of fencing, to prevent additional damage; Best practice methods will be followed throughout; and Timing of works to minimise disturbance i.e. during the breeding season, night-time, etc.
Offset	In collaboration with landscape mitigation (see Chapter 26: Landscape), new landscape planting will comprise native species in appropriate locations along verges and on earthwork slopes to create semi-natural habitat such as species rich grassland, scrub and woodland.

25.6.7 The following outlines the general principles employed during the development of mitigation strategies for impact on habitats and species. All of the mitigation measures described in this chapter have been developed in consultation with the appropriate statutory advisory organisation, i.e. SNH, SEPA etc. It should be noted that although mitigation for roe deer is briefly mentioned in this chapter, this is specifically an animal welfare and road safety issue.

25.6.8 Certain mitigation measures such as habitat creation, fencing and underpasses, may provide mitigation for numerous receptors simultaneously. For example, badgers and otters will use the same underpasses while bats will use underpasses, culverts and overbridges if designed and managed sympathetically through the careful control of lighting and planting.

Generic Mitigation

Terrestrial Habitats

25.6.9 Mitigation of ecological impacts on semi-natural habitats has been incorporated into all stages of the EIA process, including route selection and construction methods. Such measures have prevented unnecessary impacts associated with the majority of important ecological habitats and designated sites.

25.6.10 Where the scheme would result in significant impacts on terrestrial habitats that could not be sufficiently mitigated by generic measures, habitat creation will be implemented to offset these impacts.

25.6.11 Along with general ecological mitigation strategies across the whole of the scheme, habitat creation will also be aimed at contributing directly to biodiversity targets identified in local (LBAP) and national (UK BAP) strategies. For example, Wych elm (LBAP species) will be widely incorporated into roadside planting schemes, wet and riparian woodland (UK and LBAP habitats respectively) will be created along watercourses and localised woodland planting will be designed to improve landscape connectivity for red squirrels (UK and LBAP species).

Badger

25.6.12 Badger underpasses and badger-proof fencing represent the main mitigation techniques in the present scheme for impacts on badgers. Additional mitigation measures that are to be implemented include:

- prevention of direct mortality by sett exclusion. Replacement setts will be created according to SNH guidelines at least nine months prior to destruction of existing setts. In addition, replacement setts must show evidence of being known to the badgers of the affected social group prior to exclusion. Detailed methodologies for sett exclusion and replacement sett design will be contained in a badger exclusion method statement which will be produced for each affected sett;
- provision of underpasses and fencing at strategic locations based upon proximity to existing setts, pathways and areas of high badger activity to prevent RTAs and to reduce habitat fragmentation;
- location of fencing to ensure that badgers have access to areas of new planting for foraging or commuting;
- provision of artificial setts to offset those setts that lie within the footprint of the scheme and will be destroyed; and
- delineation of a 50m buffer around all badger setts (that are not to be excluded and destroyed). No construction activities that constitute 'disturbance' to badgers will take place within a 30m buffer zone. Access and connectivity between such sites will also be maintained.

Bats

25.6.13 Mitigation for bats is aimed at maintaining populations (particularly breeding populations), minimising disturbance, maintaining access for bats to their present foraging habitats, allowing existing populations to expand and colonise new areas and minimising the risk of road traffic accidents involving bats by:

- prevention of direct mortality by the exclusion of roosts that are to be destroyed. A licence must be obtained from the Scottish Executive Environment and Rural Affairs Department (SEERAD) at least a year in advance of development commencing. It is not necessary to demonstrate that bats are using replacement roosts prior to destruction however, replacement roosts must be provided prior to works;
- ensuring that construction activities, including the felling of trees and destruction of buildings, will be timed to avoid periods when bats are sensitive to disturbance, i.e. summer and winter. Such features will be rigorously inspected immediately prior to their removal by licensed ecologists and a precautionary approach will be adopted to prevent any bat mortalities e.g. the sectional felling of trees in autumn;
- the use of screens to protect bats that may be roosting in trees during construction;
- delineating a 50m buffer around all bat roosts (that are not to be excluded and destroyed). No construction activities that constitute 'disturbance' to bats will take place within a 50m buffer zone;
- ensuring that trees that are to be retained must be safeguarded from damage in accordance with the guidance provided in BS 5837 (1991);
- designing, where appropriate, culverts and underpasses for bats that are at least 1.5 m x 1.5 m in cross section (Brinkmann et al., 2003). Previous studies have shown that, in time, appropriately sized structures will be used by bats (Bach and Limpens, 2004). These structures are also to be included as mitigation for badgers and otters. They will be designed and managed appropriately, for example to allow water to flow through or to include lead-in structures or planting in order to increase bat use and thus reduce fragmentation;

- bat boxes will be erected in pre-identified locations. In addition, several buildings will be enhanced to provide roosting potential for bats, thus compensating for habitat loss. Similarly, woodland areas lost as part of the scheme will be replaced at nearby suitable locations and existing areas of habitat enhanced;
- linear habitat planting alongside the scheme will link with bat flyways and within 50m of bat roosts to direct bats over the scheme in an attempt to mitigate against direct road mortality;
- night-time working will not be permitted without agreement from SNH. Carriageway lighting will only be provided where necessary for road safety;
- the use of SUDS to manage pollution incidents; and
- areas of riparian woodland will be created alongside burns to offset habitat loss and minimise disturbance through noise reduction. These woodlands will include species of local importance such as wych elm and aspen as well as willow, birch and alder.

Breeding Birds

25.6.14 The approach to breeding bird mitigation includes the following elements:

- construction activities, including the felling of trees and clearing of scrub, will be timed to avoid periods when birds are nesting (i.e. March to August), thus preventing disturbance to breeding birds. Areas may be pre-felled or cleared in winter to make habitat undesirable for nesting;
- construction activities in the vicinity of key winter bird habitats will be timed to avoid October to March to prevent disturbance to wintering birds;
- areas of habitat will be created to offset habitat loss although these areas will be situated away from the scheme to prevent RTAs. This will include the provision of a grassland buffer either side of the road before any scrub or woodland planting therefore allowing a clear sightline of the traffic;
- planting of dense native tree and scrub species (taking into account direct mortality impacts) to screen noise and vibration disturbance associated with operation of the proposed scheme from birds located within adjacent habitats; and
- sympathetic planting of second (and subsequent) stage attenuation ponds to allow use by wintering birds.

Otter

25.6.15 Mitigation for otters is aimed at maintaining populations (particularly breeding populations), minimising disturbance to otters, maintaining access to their present habitats, to allow existing otter populations to expand and colonise new areas and to minimise the risk of RTAs involving otters by:

- prevention of direct mortality by exclusions of holts that are to be destroyed, and the provision of artificial holt sites and habitat creation will be necessary. Exclusions will be carried out following prescribed measures and in consultation with SNH. The destruction or disturbance of an otter holt/couch requires a special derogation under the European Habitats Directive. A licence to undertake such works will therefore need to be obtained from SEERAD. The licence should be procured at least one year prior to development, and a method statement prepared. Detailed methodologies for holt exclusions and artificial holt design will be outlined in this method statement;
- demarcation of areas where otter activity is recorded within 50m of any construction activities during the construction period;
- restricting construction activities within 50m of otter lying-up sites or watercourses to reduce disturbance;
- the incorporation of bridges or culverts (with mammal ledges) on every watercourse crossing to reduce risk of RTAs and reduce habitat fragmentation;

- the erection of otter-proof fencing wherever the scheme comes within 150m of a watercourse or a known otter commuting route to reduce risk of RTAs;
- areas will be marked off to prevent disturbance to the riparian zone (up to 5m from top bank) during the construction period;
- the creation of artificial otter holts where appropriate, enhancement of existing riparian habitat through fencing-off sections of riverbank (to encourage scrub growth), and the provision of ponds, ox-bows and new stream alignments to offset habitat loss;
- night-time working will not be permitted unless agreed by SNH and carriageway lighting will be reduced or eliminated;
- the use of SUDS to manage pollution incidents; and
- areas of riparian woodland will be created along side burns to offset habitat loss and minimise disturbance through noise reduction. These woodlands will include species of local importance such as wych elm and aspen as well as willow, birch and alder.

Red Squirrel

25.6.16 Mitigation for red squirrels is aimed at maintaining populations (particularly breeding populations) minimising disturbance; allow existing red squirrel populations to expand and colonise new areas; and to minimising the risk of road traffic accidents involving red squirrels. A strategy to ensure adequate protection of red squirrels and their habitats is being developed in liason with SNH:

- all tree clearance works are to be undertaken from September to November only, in order to minimise stress to red squirrels during the breeding season;
- pre-construction surveys to confirm presence/absence of active dreys.
- should any active drey be present in the vicinity of the proposed carriageway or other area of proposed works, no action will be taken without prior agreement with SNH.
- new 'core' areas of woodland will be created for red squirrels to offset the loss of existing habitat. Existing woodland will be managed specifically for red squirrels through removing species favourable to grey squirrels such as beech and hazel and planting trees of different age and species composition, e.g. Scots pine, European larch, Norway spruce, birch, ash and alder. This mitigation strategy will also help to prevent red squirrel populations from becoming isolated, as it will connect woodland areas that are currently fragmented by providing commuting corridors; and
- additional mitigation may include the introduction of a scheme in partnership with conservation authorities to manage grey squirrel numbers. This is likely to involve a regime of humane control in pre-identified target areas and will aim to prevent grey squirrels from becoming established in the study area and beyond.

Water vole

25.6.17 Mitigation for these mammals is aimed at maintaining populations (particularly breeding populations) minimising disturbance; maintaining access to their present habitats, to allow existing populations to expand and colonise new areas by:

- demarcation of areas where water vole activity is recorded within 50m of any construction activities during the construction period.
- were necessary, undertake translocations of any populations that may be isolated by the proposed scheme under licence;
- restricting construction activities within 30m of water vole burrow sites or watercourses not to be directly impacted upon to reduce disturbance;
- the incorporation of bridges and box culverts (with mammal ledges) on every watercourse crossing to reduce risk of RTAs

- minimisation of culvert length to reduce habitat fragmentation;
- areas will be marked off to prevent disturbance to the riparian zone (to 3m from the bank) during the construction period;
- enhancement of existing riparian habitat through fencing-off sections of riverbank (to encourage scrub growth), and the provision of ponds, ox-bows and new stream alignments to offset habitat loss; and
- the use of SUDS to manage pollution incidents.

Amphibians

25.6.18 Mitigation prescribed for other habitats and species such as otters, badgers and birds including habitat creation will also mitigate for the effects of the road scheme on amphibian populations. These include:

- compensatory habitat to offset impacts associated with habitat loss will provide suitable habitats for amphibians, e.g. creation of wet woodland habitats; and
- underpasses provided for badgers and otters will be suitable for amphibian use thus reducing habitat fragmentation.

Brown Hare

25.6.19 Mitigation prescribed for other species such as badgers and birds, including habitat creation, is predicted to also mitigate for the effects of the road scheme on brown hare populations. These are as follows:

- the provision of overpasses, underpasses and fencing as prescribed under mitigation for larger mammals such as badgers, otters and deer to reduce the number of RTAs and reduce fragmentation; and
- compensatory habitat to offset impacts associated with habitat loss will provide suitable habitats for brown hare. This includes the creation of grassland, scrub and woodland habitats as prescribed under mitigation for other species such as birds and red squirrel.

Reptiles

25.6.20 No specific mitigation is proposed for reptiles. However, benefits for reptiles should be achieved through landscaping and creation habitat proposals as these areas can be designed to be suitable for reptiles on south facing road embankments. In addition, areas that have been identified as being of high to moderate potential value to reptiles and are to be lost or severed by the road will be made unsuitable for reptile habitation prior to site clearance.

Terrestrial Invertebrates

25.6.21 No specific mitigation is proposed for terrestrial invertebrates although the mitigation prescribed for other species such as badgers and birds will contribute to mitigating the effects of the scheme on terrestrial invertebrate populations. These are as follows:

- fencing of areas adjacent to construction sites to prevent additional habitat loss on adjacent land; and
- compensatory habitat will be supplied by mitigation for terrestrial habitat loss.

Water Shrew

25.6.22 No specific mitigation is proposed for water shrew, although mitigation prescribed for other species/habitats such as otter, amphibians and freshwater habitat will contribute to mitigating the effects of the scheme on water shrew populations. These include:

- the incorporation of bridges and box culverts (with mammal ledges) on every watercourse crossing to reduce habitat fragmentation;
- areas will be marked off to prevent disturbance to the riparian zone (to 5m from bank) during the construction period;
- enhancement of existing riparian habitat through fencing-off sections of riverbank (to encourage scrub growth), and the provision of ponds, ox-bows and new stream alignments to offset habitat loss;
- the use of SUDS to manage pollution incidents; and
- areas of riparian woodland will be created along side burns to offset habitat loss and minimise disturbance through noise reduction.

Fish

25.6.23 The approach to fish mitigation includes the following elements:

- any activities that require works within salmonid watercourses and/or their de-watering or re-alignment will be avoided where possible. If unavoidable, they will be carried out between April and September in order to reduce disturbance to salmonids;
- fish will be removed from sections of waterways to be de-watered, re-aligned or excavated, using electric fishing and translocated to an appropriate alternative site;
- to salmonids through noise and vibration will be reduced through avoiding the first third of the egg incubation period (mid October to end December). A 'soft start' approach will be adopted in the event of any piling (i.e. for the River Dee crossing). Where a high risk of sediment runoff from construction into watercourses cannot be controlled, or where in-river works are required, this should be carried out between May and September; when salmon redds will not be occupied and fry will be sufficiently mobile to move out of construction.
- night working will be avoided, allowing a quiet period for migratory fish to pass the construction site. Any lights required for construction sites will be directed away from the water;
- bridges with set-back piers will be constructed over the salmonid rivers to prevent damage to salmonid habitat and prevent disturbance to these important fisheries (i.e. the River Dee); and
- adherence to SEPA PPGs and the effective use of SUDS, as detailed in Chapter 24 (Water Environment), will prevent/manage pollution incidents during construction and operation.

Freshwater Pearl Mussels

25.6.24 Mitigation for freshwater pearl mussels is linked to measures taken to prevent adverse impacts on the freshwater environment and salmonid fish populations that support them. In addition, the following mitigation will also be undertaken:

- minimising the duration and spatial extent of works in the vicinity of watercourses supporting freshwater pearl mussels;
- prohibit work that may directly affect mussel populations in the Dee River between 1 May and 10 June;

- the presence of an aquatic ECoW[1] on site during construction, to ensure the implementation of appropriate environmental safeguards;
- progressive rehabilitation of exposed areas throughout the construction period as soon as possible after the work has been completed to minimise risk of sediment release;
- where appropriate the installation of temporary treatment ponds to ensure minimum water quality standards throughout construction; and
- inspection and maintenance of all erosion controls weekly and after heavy rainfall events.

Freshwater Habitat

25.6.25 The approach to aquatic habitat mitigation includes the following elements, in addition to those safeguards detailed in Chapter 24 (Water Environment):

- road drainage treatment to ensure adherence to strict water quality standards;
- realignments to include meander bends, habitat enhancement and retention of similar river lengths where feasible;
- use of depressed invert box culverts which allow the retention of natural substrate and maintenance of similar geomorphological regime; and
- minimisation of culvert length and use of bridges for valuable Habitat Areas to avoid habitat fragmentation and potential barriers for migratory species.

25.7 Recommendations for Further Surveys

Further Surveys due to Limitations

25.7.1 Due to the seasonal constraints and land access issues as detailed in paragraph 25.2.85, there are further surveys to be undertaken and reported which are as follows.

Bats

25.7.2 Further daytime and evening surveys were undertaken in autumn 2006 to establish the status of roosts at different times of the year and to further identify potential hibernacula. Additionally, as stated earlier, due to access issues daytime surveys and emergence surveys were not completed at a number of buildings within the 500m study area during 2006, therefore these surveys must be completed in 2007. These results will be reported in the 2007 EARs.

Breeding Birds

25.7.3 Due to land access issues during the 2006 survey season, the following SOVs and Quadrats will require a complete re-survey for breeding birds from April to June 2007 (refer to Appendix A25.4, Breeding Bird Survey Report):

- Heatherknowe, Burnhead, Cleanhill Wood, Crynoch Burn, River Dee, Beanshill and East Silverburn, SOVs; and
- Quadrat SL-Bb08 - Milltimber and Quadrat SL-Bb10 – Westfield Lodge.

25.7.4 Results of the repeat surveys will be reported in the 2007 EARs.

Wintering Birds

25.7.5 Full wintering bird surveys are being undertaken from October 2006 to February 2007 and will be reported in the 2007 EARs.

[1] Experienced Freshwater Pearl Mussel Worker

Macroinvertebrates

25.7.6 Macroinvertebrate results are based on a single June sampling taken in 2006. To conform with SEPA's sampling protocol, a repeat sample was undertaken in September 20006, however the results were not available in time for publication of this document. These results will be reported in the 2007 EARs.

Further Surveys in response to Baseline Results

25.7.7 Further surveys were also required to respond to the need for additional information identified during the current EIA process, which are as follows.

Otters

25.7.8 Blaikiewell Burn, Crynoch Burn and the River Dee will be subject to continued monitoring for the potential presence of natal holts, spraints, prints and the identification of the level of use of couches and holts every two to three months until the start of construction. In addition, a survey immediately after snowfall will be undertaken to look for overland tracks between January and February 2007 along the following main waterbodies: Burn of Ardoe, Blaikiewell Burn, Crynoch Burn, River Dee, Silverburn, Ord Burn and Upper Beanshill Burn.

Bats

25.7.9 In response to the reported sighting of two Leisler's bats within Kingcausie on a single occasion during the 2006 survey period, and given their rare and vulnerable status in the UK, further survey effort is required to identify roosts and roosting opportunities and to establish the importance of the locality to Leisler's bats. This investigation will be conducted with a view to identifying additional details regarding the potential impacts the scheme will have on bats. These surveys have been performed in autumn 2006 and will continue in summer 2007 and be reported in the EARS.

Water Vole

25.7.10 It is recommended that preconstruction surveys are carried out at the appropriate time of year at Hare Moss and Moss of Auchlea as there remains the low potential for water voles to be present at these sites. Water vole surveys should comprise a thorough search for field signs, following the methodologies described in the Water Vole Report (Appendix A25.7).

25.7.11 In the event that water voles are recorded at Hare Moss or Moss of Auchlea during these surveys, mitigation measures will need to be developed and further survey may be required.

Fish

25.7.12 In addition to fish habitat and electric fishing surveys, a January survey for salmon redds will be undertaken at proposed crossing points to further quantify potential impacts on breeding salmon and to inform the Appropriate Assessment of the River Dee.

Freshwater Pearl Mussels

25.7.13 Freshwater Pearl Mussel surveys were undertaken in wadeable areas of the Dee River and in light of the baseline results further snorkel surveys may be necessary depending on the location of road drainage outfall to the river to inform the impact assessment and to develop appropriate microsited mitigation and inform the Apropriate Assessment of the River Dee.

Other Surveys

25.7.14 No further survey work is required for amphibians, red squirrel, brown hare, reptiles, terrestrial invertebrates or water shrew.

25.8 Residual Impacts

25.8.1 This section describes residual impacts, which are those impacts envisaged as remaining after mitigation measures are implemented. As explained in section 25.6, mitigation for the proposed scheme is described in generic terms only, with limited specific mitigation being detailed at this stage. However, through the consideration of the scheme proposals, survey data and application of professional judgement, a provisional assessment of the risk of significant residual impacts has been undertaken for key features and locations.

Section SL1

25.8.2 An outlier badger sett is located under the proposed alignment in S3 and will have to be closed. This will require a licence to be granted by the Scottish Executive, but is not envisaged to constitute a significant residual impact.

25.8.3 The loss of Greenhowe Pond is significant at a regional scale given the scarcity of this habitat in Aberdeenshire. There is potential to mitigate this impact by equivalent habitat creation close to this locality. Following habitat replacement, residual impacts are not predicted to be significant.

25.8.4 Hare Moss (S10) supports UK BAP habitats and is important for birds, amphibians, bats and may be important to breeding otters (to be determined through ongoing monitoring). The location of road drainage ponds at the northeast corner of Hare Moss and the associated deepening of Jameston Ditch, running along the northern edge of the moss, could result in potentially significant residual impacts through changes to moss habitat and the species it supports. Although the channel is currently periodically cleared of vegetation, there is potential for the proposed modifications to increase drainage to the Burn of Ardoe, which could result in significant changes to the hydrology of the moss. Detailed hydrological studies are required to quantify the potential for impact on the moss. However, in the absence of these data a moderate risk of a significant residual impact on habitats and species remains. In addition, Hare Moss is considered to be a potential site for habitat enhancement to offset the cumulative habitat loss and fragmentation impacts as a result of the scheme. The hydrology of the moss might be altered by the road drainage system, which might compromise the suitability of the moss for any habitat enhancement scheme.

Section SL2

25.8.5 The severance of bat commuting routes in this section between S16 and S15 can be mitigated for by planting trees/scrub to direct them towards the C30K overbridge, provided that this were planted with a vegetated strip (including a hedge). This would create a green bridge which would promote safe road crossing for bats and the Schedule 1 species Barn Owl known to be present south of Greenloaning Wood. It is considered that the implementation of the recommended mitigation would reduce the risk of a significant residual impact to low.

25.8.6 A main badger sett in S13 would be likely lost which would require an exclusion licence and a replacement sett. In addition, this sett is located adjacent to a large area of gorse which should also be monitored to determine its status as a potential sett.

25.8.7 The straightening and deepening of Burnhead Burn has the potential to lead to sediment deposition downstream where this watercourse outflows to Crynoch Burn via Blaikiewell Burn. There is a risk that should sediment reach these watercourses downstream, a significant adverse residual impact could result on Crynoch Burn and the salmon it supports. The repercussions of this potential impact on the Dee River SAC (which includes Crynoch Burn) is discussed in more detail in Section 3 (paragraph 25.8.12).

Section SL3

25.8.8 Kingcausie is a particularly important area ecologically and is considered to be of regional to national importance for a number of key species including red squirrels and bats. Site-specific mitigation measures will prevent hydrological disruption to the terrestrial habitat. There is a risk that

road alignment through this area is likely to result in a high significant adverse residual impact through habitat loss and fragmentation.

25.8.9 Kingcausie is an important area for bats (six species have been sighted) and supports a number of known roosts as well as many potential roost sites, important foraging areas and at least seven commuting routes. Should roosts need to be closed, a licence would need to be obtained from the Scottish Executive to undertake this work. Kingcausie also potentially supports Leisler's bats; if confirmed as a viable population, this would be the most northerly Leisler's bat population in the UK. Unfortunately, bat surveys were incomplete due to land access restrictions and, although there are enough data to be certain that the area provides a core bat habitat in the region, a further year's data are required to determine the location and number of main bat commuting routes and to confirm the presence and status of Leisler's bats in the area. Without these data, it is not possible to provide a detailed description of targeted mitigation, although it is likely that green bridges will form part of the mitigation strategy in this area.

25.8.10 Kingcausie is a SESA supporting the UK BAP habitats wood pasture, parkland, wet woodland and mire fen which is predicted to suffer direct habitat loss and habitat fragmentation from the proposed scheme. The area is important for red squirrels and habitat loss or fragmentation would carry a risk of a high significant adverse impact on this species. This impact could be mitigated for by woodland management and compensatory planting targeted at benefiting red squirrels while ensuring habitats are unsuitable for grey squirrels. Providing this mitigation strategy is successful, the significant residual impacts could be avoided.

25.8.11 Bird surveys were incomplete within Kingcausie also due to land access restrictions. Therefore, it is unclear at this stage whether the area supports barn owl foraging areas and commuting routes, although available habitat is suitable for this species. This will be determined through further surveys in 2007. however, it is considered that, providing sufficient data is obtained and mitigation measures are targeted at appropriate areas, the risk of a significant residual impact remaining for barn owns is Low.

25.8.12 Although mitigation will prevent pollution during construction of the proposed realignment and regrading of Kingcausie Burn, there is a risk of a high significant long-term local impact on the burn with considerable habitat loss and fragmentation. In addition, the regrading of the burn is predicted to alter its geomorphology sufficiently to cause a change in its sediment transport which could potentially result in increased sediment loads entering Crynoch Burn, which is located approximately 50m downstream of the regraded section. This is considered to be a potentially significant adverse residual impact on the complexity of the freshwater habitat which would affect, fish and freshwater macroinvertebrates and indirectly otters through a reduction in prey species in the Crynoch Burn. The section of Crynoch Burn, at the confluence with Kingcausie Burn, is designated as part of the River Dee SAC, a Natura 2000 site under the European Habitats Directive. The potential for impacts on such an important conservation site require that an Appropriate Assessment is prepared under Article 6.3 and 6.4 of the Habitats Directive.

25.8.13 In summary, the predicted ecological impacts at Kingcausie carry substantial risks in two categories. There is insufficient data for bats and birds to provide a detailed assessment of the likely impacts at this site although the area provides excellent habitat for both species. This uncertainty, particularly in the context of bats (and especially with regard to the presence and status of Leisler's bats) means that there is a risk of potentially extensive mitigation requirements, which will not be determined until 2007 surveys are completed. Given the ecological sensitivity of Kingcausie, there is a risk of significant residual impacts for bats following mitigation.

25.8.14 Immediately north of Kingcausie, the River Dee crossing is predicted to result in a loss of an otter couch, which will require an otter development licence and mitigation, including replacement holt sites to ensure that no adverse impact occurs to the local otter population. Additionally, a population of freshwater pearl mussels are located in the area of the River Dee crossing. Their presence will require targeted and rigorous pollution prevention measures (including a contingency plan in the event of accidental release) to ensure that no sediment release occurs during the construction of the bridge. This is also important for Atlantic salmon, which are also susceptible to elevated sediment loads.

25.8.15 Inappropriately timed construction activities associated with the River Dee crossing could alter salmon migration and breeding behaviour. In addition to potential sediment and point source pollution impacts, there is a risk of potential adverse impacts on salmon hearing associated with construction of the Dee River crossing. Vibration also has the potential to damage salmon redds (eggs) buried in the substrate during critical development stage. It is proposed address these issues through a range of mitigation measures including soft starting any piling to allow fish to move away from the area before noise reaches levels that could damage hearing, and prohibiting works during sensitive migration and redd development times. These issues will also continue to be subject to discussion with SNH and other key stakeholders.

25.8.16 As the River Dee is a SAC, there is a need to rigorously demonstrate that there is no adverse impact on otters, freshwater pearl mussels and Atlantic salmon in terms of their current status or future conservation objectives. There remains a level of uncertainty regarding the status of salmon redds at the River Dee crossing point and surveys for these are scheduled to be undertaken in winter 2006/7. If they are present, they will require specific mitigation to ensure they are not subjected to mechanical shock through vibration during the construction phase during their critical development period (November to January).

25.8.17 In addition to the SAC qualifying species, bird surveys recorded the Schedule 1 WCA species kingfisher and preconstruction surveys will be required to ensure no nests are disturbed/destroyed through construction of the proposed scheme. The risk of this is assessed as low as no earth banks are present at the crossing point and these are preferred kingfisher nesting habitat.

25.8.18 It is currently proposed that road treatment ponds in S29 adjacent to Milltimber Burn will be piped across the floodplain to outfall directly into the Dee River, which will require minimal work to take place within the boundaries of the SAC. The potential impacts of these works will be closely examined as part of the Appropriate Assessment. Following the implementation of appropriate construction sequence and targeted mitigation that will be agreed with SEPA and SNH, no significant residual impact is anticipated.

25.8.19 The Deeside Railway District Wildlife Site (S31) is an important linear feature supporting a rare bramble species and is an important bat commuting route. The severance of the Old Deeside Railway Line constitutes a significant habitat fragmentation impact, which it may not be possible to mitigate. As such, the risk of a significant residual impact in this area is Moderate.

Section SL4

25.8.20 A mixed species pipistrelle and brown long eared bat roost lies in the path of the alignment in S32 which is likely to require a bat licence in order to destroy this roost during building demolition. Replacement roosts will be required to mitigate for this loss.

25.8.21 Between S35 and S32/S34 the proposed scheme is predicted to sever two large woodland areas (Milltimber Wood and Guttrie Hill Wood) which support red squirrels, bats and badgers. As the alignment of the road does not allow underpasses to be constructed, as the road in cutting, there is a potential for a significant residual impact for these three species. Recommended specific mitigation would be in the form of a green bridge or dry mammal underpasses in this area and grey squirrel management to mitigate adverse impacts on red squirrels. Given the difficulty of maintaining linkages either side of the Milltimber Junction the risk of residual impacts remaining at this location is assessed as Moderate to High.

25.8.22 Within S36, the road is predicted to sever bat commuting routes. However, this would be possible to mitigate for by planting to direct bats to the Contlaw Road overbridge which would be planted with a vegetated strip (a hedge) to provide a green bridge to direct bats safely over the road. This mitigation measure would also allow effective mitigation for severance impacts on badgers which are particularly important in this area and would otherwise not be possible as the road is in cutting through this section . Providing some specific mitigation at or around this location can address the habitat severance issues for bats and badgers, it is considered that there is a low risk of significant residual impacts.

25.8.23 Also at Contlaw Road, the construction of the proposed scheme is predicted to result in the loss of two pipestrelle roosts. This is likely to require a development licence to undertake roost closure and appropriate mitigation such as replacement roosts and restoration of habitat connectivity.

25.8.24 At Beanshill (S39), a badger sett lies within 50m of the proposed road alignment which will require a licence to ensure that disturbance to this sett is limited. The risk of a significant residual impact associated with this impact is considered to be low.

Section SL5

25.8.25 At Silverburn, the proposed road alignment runs to the east of the Silver Burn catchment along the watershed and severs S40 from S43. As the road runs between the two catchments, no culverted or bridged crossing points are currently proposed. This leads to a potentially significant severance impact on otters in this area as there would be no structures present to allow otters to move across the road safely. This impact could be mitigated for by planting and fencing to encourage otters to cross at the accommodation underpass at ch106000 and at the Silverburn C127 underbridge. Strategic planting could also mitigate for severed bat commuting routes by directing bats to these two underpasses.

25.8.26 Habitat loss in this area includes species rich woodland at Rotten O'Gairn District Wildlife Site at the south of Gairnhill Wood, which is a potentially significant impact that could be offset by habitat creation of equivalent value. This would involve appropriate habitat creation and management to offset these adverse impacts. However, given the difficulty in replacing such habitats it is likely that significant residual impacts are likely to remain in the short-term. A main badger sett is lies in the path of the proposed alignment and will require to be closed and replaced under licence.

25.8.27 The proposed scheme also poses a potentially significant severance impact on red squirrels in this area. The population in Silverburn Wood currently moves freely along tree lines and scrub vegetation into Gairnhill Wood and the road will sever this connection. This could be reduced by a green bridge or offset through planting to the west of Silverburn Wood to connect to the Broomhill plantation. Thus allowing squirrels access to larger foraging areas. This could be combined with grey squirrel management in Silverburn Wood and Gairnhill Wood. Providing these mitigation strategies are successful, it is considered that there is a low risk of a high significant residual impact.

25.8.28 Moss of Auchlea has been identified as of high value to bats and birds, possibly supporting the Schedule 1 species barn owl. The potential for RTAs in this area is high. Adverse impacts could be ameliorated in this area by planting and screening to minimise RTA risk and planting to encourage bat use of the nearby underpass to the south. Pending results of further barn owl surveys, the risk of significant residual impacts is provisionally considered to be low.

Section SL6

25.8.29 Habitat loss at West Hatton Wood District Wildlife Site is predicted to constitute a significant adverse impact. However is possible to offset this through habitat creation elsewhere. Habitat fragmentation at this site is predicted to have an adverse impact on bats and this could be mitigated for by planting up to and along the Fairley-Cloghill overbridge to create a green bridge for safe crossing and to connect the remaining fragments of West Hatton Wood with other important habitat at Cloghill. The loss of tree roosts at Fairley and Derbeth Farm Woods will also constitute a significant adverse impact in a commuting and foraging corridor which will be mitigated by roost replacement and provision of alternative crossing points.

25.9 Post-project Appraisal

25.9.1 The inclusion of monitoring programmes is vital to provide a 'feedback loop' enabling evaluation of the predictions of the ES, the success of mitigation/compensation measures to be judged and post-development problems to be identified and rectified. As well as these 'project-specific' benefits,

monitoring can also provide valuable information for use in future EIAs and for improving the science base of EIAs generally.

25.9.2 Monitoring of mitigation measures (i.e effectiveness of culverts and green bridges for mitigation of fragmentation for protected species) will be performed for five years after completion of the operational phase of the proposed scheme. It will provide for repeatability and control and will have established appropriate timing and frequency in relation to the biodiversity elements being measured and the nature of the intended/implemented project. The main elements in developing a monitoring programme are summarised in Byron (2000).

25.9.3 Environmental Management Plans (EMPs), although not required by UK EIA legislation, can be used to direct proposed EIA mitigation/compensation measures and monitoring procedures on site. They need to include the following:

- prescriptions;
- work programme;
- schedules;
- an appropriate timescale;
- targets;
- monitoring programme;
- mechanism for reviewing the monitoring data; and
- provisions for remedial action if the mitigation/compensation/management targets are not achieved.

25.9.4 An outline EMP will be drawn up in consultation with statuatory consultees and published in the 2007 EARS. A detailed EMP will be prepared prior to construction.

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