Aberdeen Western Peripheral Route

Appendix A10.3 – Bats

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Contents

1 Introduction

1.1 General Background

Proposed Scheme

1.1.1 This report is concerned with the impacts on bat populations associated with the Northern Leg. Cumulative impacts are assessed in a separate report combining the predicted impacts for all habitats and species over the proposed route from Stonehaven to Blackdog (refer to Part E of the Environmental Statement).

1.1.2 To aid the interpretation of the assessment, five component route sections for the Northern Leg have been identified as follows:

- Section NL1 ch314750 – 316000 (Derbeth to Tulloch Road);
- Section NL2 ch316000 – 317400 (SAC Craibstone);
- Section NL3 ch317400 – 322600 (A96 to Nether Kirkton);
- Section NL4 ch322600 – 325370 (Nether Kirkton to Corsehill); and
- Section NL5 ch325370 – 331000 (Corsehill to Blackdog).

1.1.3 Studies on bats were included as part of the Ecological Impact Assessment (EIA) and were undertaken in accordance with the 'Design Manual for Roads and Bridges (DMRB) Volume 11 and the 'Environment Assessment (Scotland) Regulations' 1999 (Highways Agency 2005); along with cognisance of draft Institute of Ecology and Environmental Management (IEEM) guidelines.

1.1.4 These studies included desk-based consultation to collate existing information about bats in the areas affected by the scheme and field surveys to provide current data about the status of bat populations.

Aims

1.1.5 The purpose of the survey was to determine the presence and status of bats in the survey corridor so that an assessment could be made of the impacts of the proposed scheme on bats and appropriate mitigation measures developed. Thus, the aims of the survey were to:

- assess the presence and status of bats in the study area;
- determine the presence of roosts and availability of potential roosts in the study area, including those in trees, buildings and other man-made structures;
- assess the value of features and resources within the survey area for bats;
- assess any impacts the proposed scheme may have upon the local bat population and their habitat; and
- identify appropriate mitigation measures where necessary and determine any residual impacts.

1.2 Background

Bat Biology

1.2.1 There are 16 species of bat (Order Chiroptera) known to be resident in the British Isles, ten of which have been recorded in Scotland (Gorman et al., 1996):

- Common pipistrelle bat (*Pipistrellus pipistrellus*);
- Soprano pipistrelle bat (*Pipistrellus pygmaeus*);
- Nathusius' pipistrelle bat (*Pipistrellus nathusii*);
- Brown long-eared bat (*Plecotus auritus*);
- Noctule bat (*Nyctalus noctula*);
- Leisler's bat (*Nyctalus leisleri*);
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- Whiskered bat (*Myotis mystacinus*); and
- Brandt's bat (*Myotis brandtii*).

1.2.2 Seven of these species have been recorded in Aberdeenshire (Isobel Davidson, Aberdeen Bat Group, pers. comm.), five of which are known to breed there: common and soprano pipistrelle, brown long-eared, Daubenton's and Natterer's bats. There have also been isolated sightings of Nathusius' pipistrelle near Aberdeen and Leisler's bats have been recorded foraging near Peterculter although the status of these species in the region is currently unclear (pers. comm. Rob Raynor, SNH). The three pipistrelle species are collectively referred to hereafter as pipistrelles although each species is known as common, soprano or Nathusius' pipistrelle .

1.2.3 Bats have evolved a number of features connected with their ability to fly and their nocturnal activity patterns (Kunz, 1982). British bats are entirely insectivorous and have developed a complex sonar system known as echolocation that enables bats to find their insect prey and navigate around their environment. Echolocation involves emitting a rapid series of high frequency calls and then interpreting the returning echoes to build up a picture of their surroundings.

1.2.4 Bats' habitat requirements vary widely both on an individual and species level although certain features such as woodland edge and freshwater pools are often focal points for foraging as the highest densities of bats will be found where insects are plentiful (Walsh et al., 1996a and 1996b). Of the bats present in Scotland, Natterer's and brown long-eared bats mainly forage in woodland environments whilst Daubenton's forage chiefly in areas associated with water. Pipistrelle bats are generalist in their feeding strategies and forage around water bodies, woodlands, hedgerows and pasture (Altringham, 2003).

1.2.5 Linear habitat features such as rivers, hedgerows, roads and woodland edges are important to bats, which use these as landmarks in order to commute from one location to another (Schofield and Mitchell-Jones, 2003). Distances that bats travel between roosts and foraging areas are variable both within and between species. For example, brown long-eared bats may travel up to 2.8km from the roost site but spend most of their time foraging within 0.5km of the roost, whereas pipistrelles may forage up to 5.1km from the roost. Other British species may travel further than this (Entwistle et al., 1996).

1.2.6 Bats utilise different roosts at different times of the year. Between late October and March bats hibernate. This requires an unexposed roost with a stable temperature, typically a cave, cellar or tunnel. Around March, the bats emerge and move to their summer roosts, typically within man-made structures or suitable crevices in trees. Some of these roosts are used for substantial periods of time, whereas others serve as 'transitional roosts' and are used for only one or two days. Mating takes place between late August and early December, either at the winter hibernating site or at autumn mating sites. Births occur the following summer. The numbers of bats utilising roosts can vary from single bats to hundreds of bats in a nursery colony or hibernation site (Altringham, 2003).

Legal and Conservation Status

1.2.7 All British bat species and their roosts are protected under Schedule 5 of the Wildlife and Countryside Act 1981. This affords bats protection against intentional killing, injuring or taking and their roosts are protected against damage, destruction or obstruction irrespective of their occupation status. These actions all constitute offences under the Act. In Scotland this has been amended by the Nature Conservation (Scotland) Act 2004 which extends the legal protection afforded to Schedule 5 species such as bats by including the word 'reckless'.

1.2.8 The EU Habitats Directive places a legal requirement on all Member States of the EU to protect specified species and habitats through their own domestic legislation. In the UK this has been implemented by the Conservation (Natural Habitats, & c.) Regulations 1994. All species of bat are included in Annex IV, which requires that they are given full legal protection. Prosecutions for unlawful killing/injuring of bats may confer a fine of up to £5000 per bat and possible imprisonment.

1.2.9 All species of bat, except for the Common pipistrelle, are listed on Appendix II of the Council of Europe Convention on European Wildlife and Natural Habitats (the Bern Convention 1979) to which the UK is a signatory, and which ensures conservation and protection of all wild plant and animal species listed, and special protection to the most vulnerable or threatened. The Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) was adopted in 1979 and provides for the protection through management agreements, of certain migratory species including bats which are listed on Appendix II. The Agreement on the Conservation of Bats in Europe (EUROBATS) came into force in 1994.

1.2.10 Bat populations have declined considerably during the last century with Britain's native species having been subjected to enormous changes in their habitats. Drainage of wetlands, woodland clearance and agricultural intensification have affected bats through loss of roosting sites and reduction in insect abundance and diversity. However more recent research has suggested that the conservation status and estimated UK population size of the seven species known to occur in Aberdeenshire are increasing, stable or unknown, as shown in Table 1.

Table 1 – British Bat Species Populations and Status (Source: MacDonald and Baker 2005; JNCC 2005)

Species	UK (Scotland) Population Estimate	Conservation Status	Population trend
Brown long-eared bat	245,000 (27,500)	Not threatened	No clear trend
Natterer's bat	148,000 (17,500)	Not threatened	Increasing
Daubenton's bat	560,000 (40,000)	Not threatened – conservation concern	Increasing
Common pipistrelle	2,430,000	Not threatened – UK priority species	Increasing
Soprano pipistrelle	130,000	Not threatened – UK priority species	Stable
Nathusius' pipistrelle	16,000	Not known	Not known
Leisler's bat	28,000 (250)	Scarce, Near threatened (IUCN)	No clear trend

1.2.11 Any development that takes place must take into account that there is a legal obligation to ensure that no impacts will cause a decline in bat populations. In addition any development must have regard to the targets and objectives of the Local and UK Biodiversity Action Plans (LBAP and UKBAP) for the species concerned.

1.2.12 *P.pipistrellus* and *P. pygmaeus* are priority species in the UK Biodiversity Action Plan and have a combined National Species Action Plan (Hutson 1993, UK Biodiversity Partnership 2005) which is

in the process of being adopted by the North East Scotland Biodiversity Partnership. Pipistrelles are threatened by reduction in insect prey abundance due to agricultural intensification and loss of suitable habitat and flyways as well as disturbance of roosts and loss of maternity and winter roost sites in buildings and trees. The UK BAP presents the following targets toward which the proposed scheme must have regard to:

- maintain the existing population of *P. pipistrellus* and *P. pygmaeus*;
- maintain the existing geographical range of *P. pipistrellus* and *P. pygmaeus*; and
- restore the population size of *P. pipistrellus* and *P. pygmaeus* to pre-1970 numbers.

1.2.13 The North East Scotland Biodiversity Action Plan (BAP) contains a Local Biodiversity Action Plan (LBAP) for Daubenton's bat which serves to highlight the need to protect this locally important species (Racey, undated). Although Daubenton's bats have relatively widespread distribution across the country they are listed as a species of conservation concern by the Biodiversity Steering Group due to threats from loss of roosts and changes in riparian vegetation and water quality. The LBAP presents a number of targets toward which the proposed scheme must contribute to:

- promote sympathetic management of habitats; and
- maintain up to date records and information on Daubenton's Bat and its habitat by monitoring.

1.2.14 The LBAP lists a number of management prescriptions considered necessary for the attainment of these targets including the identification and proper management of habitat associated with roosts, the improvement of riverine management and development of bankside vegetation and riparian woodland, the erection of bat boxes to supplement natural roosts, the monitoring of bat populations and the offering of advice to landowners on appropriate habitat management practices.

1.2.15 Although Brown long eared and Natterer's bats do not have their own Action Plans in Aberdeenshire they are thought to be rarer than Common and Soprano pipistrelle and Daubenton's bats, especially Natterer's bat for which only a small number of roosts is known. Nathusius' pipistrelle is also believed to be rare and no breeding colonies are known this far north (Dr Sue Swift, pers.comm.).

2 Methods

2.1 Introduction

2.1.1 The level of survey effort was determined through advice from SNH and best practice guidelines (Mitchell-Jones, 2004).

2.2 Consultation

2.2.1 Previous survey data and records form the basis of any site assessment for an EcIA, providing evidence of species that inhabit the study area and a basis for updating records of known populations.

2.2.2 Aberdeen Bat Group, North East Scotland Biological Records Centre (NESBReC), the University of Aberdeen and Scottish Natural Heritage (SNH) were approached for data regarding bats within 2km of the proposed scheme and for their advice and recommendations regarding ecological constraints and opportunities in the study area.

2.3 Field surveys

2.3.1 Bat field surveys were undertaken using two methods: an assessment of the landscape for its potential value to bats, and an evaluation of bat activity carried out at select periods of dusk, dark and dawn. Surveys were carried out by suitably trained and licenced ecologists. Data were recorded onto Ordnance Survey maps; and scale 1:10,000 scale GIS map sheets, which formed the basis for the results (Figures 10.4a - g).

Study Area

2.3.2 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 (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 final survey area and methods were agreed with SNH and extended to include variations in width according to the junction and alignment shape. The results and discussion for the 500m survey area south of the proposed junction at north Kingswells has been included in the Southern Leg report in Appendix A25.3.

Habitat Evaluation

2.3.3 Where access was available, all habitat features of potential value to bats (Jenkins et al., 1998; Walsh and Harris, 1996a and 1996b; Entwistle et al., 1997) were examined and recorded. These features also formed the basis for subsequent emergence and activity surveys. Habitats considered to be of potential value for bats included:

- water features such as ponds, lochs, burns and rivers;
- wet woodlands, grassland/meadow, bog/marsh and other similar wet vegetation;
- edge and linear habitats, such as woodland rides/edges, large hedges, tree lines and paths and dry stone walls (which are the predominant field boundary type in this region); and
- scrub and rough grassland with low agricultural management.

2.3.4 During field surveys, habitat areas including small scale and isolated features such as buildings and trees, and larger scale features such as woodlands and burns were assigned to a category (high, medium or low) according to their potential value to bats as roost or for foraging, commuting or social activity, as described below. Classifying structures, trees and habitat in this way allowed prioritisation for closer examination and emergence/activity surveys. Where no bat activity was subsequently observed during field survey, the habitat assessment formed the basis of the evaluation. Assessment categories are as follows:

- **High**: feature is very likely to have been used in the past or to be used in the future. Large number of suitable roost opportunities offered, high insect abundance or strategic importance by virtue of location near to other features of interest.
- **Medium**: feature has some qualities that may be suitable for bats but some aspect of suitability or context is considered to be sub-optimal, i.e. relatively isolated or exposed feature, inappropriate size, presence of other cavity dwelling species and/ or damp.
- **Low**: feature has little potential for use by bats due to many unfavourable aspects of suitability or context, high levels of disturbance and/ or lack of roost opportunities.

Potential Tree Roosts

2.3.5 The specific time-constraints of the project rendered it impractical to survey the entire area for every potential tree roost. As such, the following protocol was used for recording tree roosts and potential tree roosts:

- within 50m of the proposed scheme: every roost or potential roost was found and evaluated; and
- between 50m and 500m of the proposed scheme: all stand alone trees were evaluated for roost potential and all wooded areas were given an overall assessment of suitability based on composite sampling of trees.

2.3.6 Trees were examined once during the summer and autumn of 2004 and late May 2005 for signs of bats including insect remains, droppings, grease marks, urine stains, the presence of dead or live bats, smoothing or lack of cobwebs; all of which indicate the presence of bats or their resting places (Mitchell-Jones, 2004). In addition trees were assessed for features of potential use as roosts, including loose bark, splits, cracks, woodpecker holes, knot holes and other hollows using an endoscope or binoculars where necessary. Trees were assigned to a roost potential category according to the criteria outlined above. No evening emergence or dawn swarming surveys were undertaken at potential tree roosts and bats emerging from tree roosts were observed only as an incidental part of the summer activity assessment surveys.

Potential Roosts in Structures Other Than Trees

2.3.7 All man-made buildings and structures within the survey area including single buildings, small groups of buildings, outhouses, ice-houses, bridges, culverts, memorials and other walls and rock outcrops which could serve as potential roosts were examined thoroughly externally for signs of bats and potential access points, following English Nature guidelines (Mitchell-Jones, 2004). Internal inspections of buildings were undertaken where external examination was not considered sufficient to establish roost potential or status, and where access was safe and allowed. The exception to this was at Kingswells where the number of buildings with potential as roosts is prohibitively large.

2.3.8 Pipistrelle and brown long-eared bats are considered more likely to roost in buildings such as farmhouses, modern dwelling houses and cottages as such sites are warm enough to support roosting colonies including maternity roosts (Entwistle et al*.,* 1997; Jenkins et al*.,* 1998). Other species preferentially roost in other structures. For example, Natterer's bats prefer gaps in loose mortar in old barns and Daubenton's bats often roost in bridges (Mitchell-Jones, 2004).

2.3.9 Status as a confirmed bat roost was determined by the presence of signs of bats (as for tree roosts above), or through observation of bats emerging. Appropriate people including home owners, farmers and people who regularly use the buildings or area were also asked whether there was a history of bats using the site. Features of potential roost value, including cracks, gaps, holes in roofs, loose boards and potential access points were noted and the feature assigned a roost potential category according to the criteria outlined above.

2.3.10 Evening emergence and dawn swarming surveys were undertaken in order to confirm roost status at seven properties (Sunnybank Cottages, Walton Farm and Sunnybrae, Balgosie, Pitmedden House, Parkhill Pumping Station, Harehill), including all buildings with potential on the property where applicable, throughtout the Northern Leg. These were prioritised according to the findings of daytime surveys, proximity to the proposed road and likelihood of the buildings being used by bats. Only buildings with signs of bats or those assessed as having medium – high potential were surveyed additionally in the evening or morning. At those buildings where emergence and dawn surveys were carried out, roost category was adjusted where necessary to take into account the

findings of the surveys, however no roost categories were downgraded following evening survey based on the precautionary principal.

2.3.11 No underground structures such as caves and mines are present in the survey area, and while there is a disused quarry in the Kirkhill area (NJ 866 137) which could possess crevices and holes suitable for roosting or hibernating bats this was not surveyed for health and safety reasons.

Activity Assessment - Summer

2.3.12 Activity surveys for the Northern Leg of the proposed AWPR were carried out between May and early July 2004, and during late May 2005 using methods recommended by Mitchell-Jones and McLeish (2004):

- evening emergence survey: potential roosts in structures identified during daytime surveys were surveyed from 20-30m before sunset until at least 90 minutes after sunset. Precise timing of emergence surveys was determined according to the onset of sunset, and were followed by;
- activity assessments: a single 2-3 hour transect survey following a pre-defined survey route covering all habitat types within the study area and using a continuous slow-walked pace with stops made only to sufficiently sample any activity; and
- dawn swarming survey: previously identified potential roosts were surveyed from 90 minutes before sunrise until 30 minutes after sunrise (early July 2004).

2.3.13 Bat activity was assessed using a combination of visual observation and detection techniques. Bat detectors are capable of translating high frequency echolocation calls into sounds within humans' audible range (Heterodyne and frequency division [FD] techniques) and recording calls onto minidisk or digital recorders for subsequent analysis on specialist computer software (time expansion [TE] techniques). Stag bat boxes and Duet detectors were used for Heterodyne and FD and Tranquility and Pettersson detectors for TE techniques. Bat calls were interpreted by surveyors in the field (Heterodyne and FD) or in the office (TE) to allow species identification.

2.3.14 Bat activity assessment surveys covered the whole survey area once within the defined survey period and there was no repetition. Activity data including species, number of bats, location, and the behaviour taking place including foraging (F), commuting (C), social calling (SC) were recorded onto field maps. Activity was recorded in terms of bat passes where a bat pass is defined as a single burst of bat echolocation corresponding to a bat flying past the detector.

Activity Assessment - Autumn

2.3.15 Activity assessment surveys for autumn swarming activity were carried out between 27 September and 9 October 2004 at Balgosie and Parkhill Pumping Station to identify whether bats were using these as autumn roosts, as these buildings are empty and considered to offer suitable conditions for hibernating bats. Surveys were carried out using detection equipment as above and commenced 30m before sunset and ended three hours after sunset.

Survey Weather Conditions

2.3.16 Bats will continue to feed in poor weather conditions including mist and light rain, although they will tend to remain torpid if cold accompanies this (Altringham, 2003). As a general rule the ideal conditions for surveys (most productive in terms of the body of data available) is for fine and calm conditions with little or no rain (Kunz, 1982). During the 2004 – 2005 survey period surveys were carried out under the most ideal conditions available within the ecological time-frame and the constraints of the project.

2.4 Survey Limitations

Timing

2.4.1 Summer surveys carried out in 2004 were undertaken during the optimal period for bat activity surveys (DMRB 2001, Mitchell-Jones 2004) and the timing was ideal, coinciding with the use of summer roosts (May to August) and period of maximum activity in the bat year (Altringham, 2003). Similarly, autumn surveys coincided with the recognised September peak in swarming activity, and continued partially into October, also an active month. A second survey period in May 2005 was required in order to monitor roost status and examine buildings.

2.4.2 The data are limited also by the inability to confirm the presence of hibernacula within the survey area as no surveys were undertaken in winter. This was done because bats are most vulnerable to disturbance during hibernation and less likely to survive if they are disturbed.

Access

2.4.3 Only a limited number of buildings were inspected internally for the presence of bats due to the sensitive nature of such survey work. Howemoss has not been surveyed due to access issues and has not therefore been assessed for its value to bats. Internal inspection was not attempted at buildings in the Kirkhill Industrial Estate or Blackdog Industrial Centre for health and safety reasons. The number of buildings with potential as roosts was considered prohibitively large in Kingswells and an overall assessment of roost potential based on a daytime walkover survey along the road was made in conjunction with evening activity surveys to establish the use of the area by bats. Similarly the new Blackdog Estate has not been surveyed for bats as it is in the process of being developed. These areas need to be surveyed prior to works.

Weather Conditions

2.4.4 Survey results are potentially influenced by recent and current weather conditions given that bat activity is reduced in poor weather. The prevailing weather conditions during 2004 late spring-summer field surveys were considered to be sub-optimal with moderate rainfall and temperatures between 9-12°C on at least 50% of survey nights. Finer weather with temperatures of around 12-16°C occurred around 25% of the time and on mixed weather nights. Poor weather experienced during the 2004 summer period has been linked to lower overall bat activity, less successful reproduction and an incidence of grounded bats during this time (A. Youngman, pers.comm.) and the delayed onset of spring 2005 with temperatures as low as 4°C on some survey nights may have been responsible for low activity levels observed during emergence and surveys (Isobel Davidson, Aberdeen Bat Group, pers.comm.) and the evaluation of Habitat Areas takes into account the potential of each habitat to support bats as described above, in order to take into account the fact that greater numbers of bats and more consistent activity would normally be expected.

Roost Location

2.4.5 While staining on trees indicates that bats may use certain trees infrequently, the nomadic nature of tree-dwelling bats (bats may spend only 1.75 days on average in one place before switching roost sites [Cowan, 2003) and the fact that roost sites may be very small, invisible from the ground or have not obvious signs of bats makes tree roosts difficult to locate. Similarly roosts may be difficult to locate in buildings as access points are often very small and well hidden and there may be no external indications that bats use the building.

Habitat Evaluation

2.4.6 Assessment of suitability or potential of Habitat Areas and features to support bats can be subjective, dependent upon the conditions encountered by the surveyor, especially given that bats will often use otherwise unfavourable areas. Assessment methods were standardised by surveyor briefing prior to surveys.

2.5 Assessment of Ecology and Nature Conservation Value

2.5.1 The evaluation section aims to assign a value to the features identified in the context of the bat populations associated with those features. Evaluation of the intrinsic nature conservation value of vegetation and habitat features themselves is included in the Terrestrial Habitats Report in Appendix A10.1) and is not discussed further here.

2.5.2 The ecological value of a species is related to the wider importance of that species at the national level and is used to assess the conservation value of discrete species populations within a given area.

2.5.3 All species of bats are afforded high levels of protection under the EC Habitats Directive and are classified as European Protected Species and therefore considered to be of **international** importance in terms of legislation. The value attributed to a feature or Habitat Area is considered according to whether the site is used by bats, the size of the population and what the area is used for (actual bat areas). Where bats were not detected during field surveys, the value of the habitat or area is assessed in terms of its potential to support roosting, foraging or commuting bats (potential bat areas) based on the potential value to bats (low, medium or high).

2.5.4 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** ecological value. Those sites deemed to be supporting bat populations, such as important foraging habitat or commuting corridors, are evaluated as being of **county** ecological value. Sites with potential to support bat populations considered to appreciably enrich the habitat resource within the local context are evaluated as being of **local** ecological value.

2.5.5 In addition consideration has been given to any conservation designations, consultation results and a review of available literature. The criteria used in the evaluation of features is based on the Ratcliffe Criteria (Ratcliffe, 1977) used in the selection of biological Sites of Special Scientific Interest (SSSI). Sites and features have been classified according to the criteria identified in Table 2.

Table 2 – Evaluation of Ecological Receptor

Ecological Importance	Attributes of Ecological Receptor
International (European)	**Habitats** An **internationally** designated site or candidate site (SPA, pSPA, SAC, cSAC, Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area which meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified 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 an **internationally important species**, which is threatened or rare in the UK. i.e. a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP A regularly occurring, **nationally** significant population/number of any **internationally important species**.
National (Scottish)	**Habitats** A **nationally** designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which meets the published selection criteria for National designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified A viable area of a **priority habitat** identified in the UK BAP, or of 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** 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 guidelines, where these occur Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole Viable areas of key habitat identified as being 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. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or County. **Species** Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km 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.

Ecological Importance	Attributes of Ecological Receptor
Authority Area (e.g. County or District) **City of Aberdeen/ Aberdeenshire**	**Habitats** Sites that are recognised by Local authorities (e.g.) Sites of Interest for Nature Conservation (SINS) and District Wildlife Sites (DWS) County/District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR) selected on County/District ecological criteria (County/District sites where they exist, will often have been identified in Local plans) 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. Sites supporting populations of internationally/nationally/Regionally important species that are not threatened or rare in the region or County, and are not integral to maintaining those populations. Sites/features that are scarce within the County/District or which appreciably enrich the County/ District habitat resource **Species** Any regularly occurring, locally significant population of a species which is listed in a County/District BAP on account of its Regional rarity or localisation A regularly occurring, locally significant population of a County/District important species (particularly during a critical phase of its life cycle)
Local **(Immediate local area or village importance)**	**Habitats** Areas of habitat considered to appreciably enrich the habitat resource within the Local context (survey area, parish or neighbourhood, e.g. species-rich hedgerows, ponds etc). Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution of such habitats 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. Any river with a Habitat Modification Score indicating that it is severely modified or above. 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 **Species** Populations/assemblages of species that appreciable enrich the biodiversity resource within the Local context
Less than Local **(Limited ecological importance)**	Sites that retain habitats and/or species that are of limited ecological importance due to their size, species composition or other factors. Any river classified as impoverished D and/or and with a Habitat Modification Score indicating that it is severely modified.

2.6 Impact Assessment

2.6.1 In the assessment of significance of impact, consideration has been given both to the magnitude of impact and to the sensitivity of the receiving environment or species. The sensitivity of a feature has been determined with reference to its level of importance (see Evaluation section of this report). Impact Assessment is considered within the framework of the five geographical Sections within the Northern Leg (Section NL1 ch3314750 – 316000 Derbeth – Tulloch Road; Section NL2 ch316000 – 317400 SAC Craibstone; Section NL3 ch317400 – 322600 A96 – Nether Kirkton; Section NL4 ch322600 – 325370 Nether Kirkton – Corsehill; Section NL5 ch325370 – 331000 Corsehill - Blackdog).

Impact Magnitude

2.6.2 Methods of impact prediction used included direct measurements, correlations, expert opinion and information from previous developments. Impacts include those that are predicted to be direct,

indirect, temporary, permanent, cumulative, reversible or irreversible. The magnitude of each impact was assessed independently of its value or statutory status. Magnitude criteria are presented in Table 3, and include positive impact criteria in accordance with IEEM guidance (2002).

Table 3 – Impact Magnitude

Impact Magnitude	Criteria
High negative	The change is likely to permanently, adversely affect the integrity of an ecological receptor, in terms of the coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest (at a Regional or higher level).
Medium negative	The change is not likely to permanently adversely affect the ecological receptor's integrity but the effect on the receptor is likely to be substantial in terms of its ecological structure and function and may change its evaluation. Likely to result in changes in the localised distribution of a species but not affect its population status at a Regional level.
Low negative	The change may adversely affect the ecological receptor, but there will probably be no permanent effect on its integrity and/or key attributes and is unlikely to change its evaluation.
Negligible	The change may slightly adversely affect the receptor but will have no permanent effect on the integrity of the receptor or its key attributes. There are no predicted measurable changes to the species assemblage or population and the effect is unlikely to result in an increased vulnerability of the receptor to future impacts.
Positive	The change is likely to benefit the ecological receptor, but may not improve its evaluation
High positive	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value (at a Regional or higher level).

Impact Significance

2.6.3 The significance of an impact has been determined according to the system illustrated in Table 4 whereby the magnitude of the impact and ecological value of the Habitat Area are taken into account. Impact significance greater than or equal to moderate would require mitigation to be undertaken to ameliorate the impact significance to acceptable levels. Impacts can be beneficial or adverse, either improving or decreasing the ecological status health or viability of a species, population or habitat.

Table 4 – Impact Significance Matrix

Magnitude / Importance	High Negative	Medium Negative	Low Negative	Negligible	Positive	High Positive
International	Major	Major	Moderate	Negligible	Moderate	Major
National	Major	Major	Moderate	Negligible	Moderate	Major
Regional	Major	Moderate	Minor	Negligible	Minor	Moderate
County	Moderate	Moderate	Minor	Negligible	Minor	Moderate
Local	Minor	Minor	Minor	Negligible	Minor	Minor
Less than Local	Minor	Negligible	Negligible	Negligible	Negligible	Negligible

2.6.4 The level of significance of impacts predicted on ecological receptors is an important factor in influencing the decision-making process and determining the necessity and/or extent of mitigation measures. Impacts can be beneficial or adverse, either improving or decreasing the ecological status health or viability of a species, population or habitat.

2.6.5 Where direct mortality during construction or due to road traffic casualty has been considered likely the magnitude of impact is assessed as being a high negative magnitude, regardless of the number of bats involved, due to their status as European protected species of international importance although the significance of the impact has been assessed according to the importance of the Habitat Area. Therefore, such impacts will have be assessed as having a Major or Moderate adverse level of significance on the integrity of the receptor and any impact predicted to involve mortality will therefore require specific mitigation measures to address these impacts.

2.6.6 In general, an impact significance greater than or equal to Moderate would require specific mitigation to be undertaken to ameliorate the impact significance to acceptable levels. In this report, however, mitigation measures have been recommended where impacts lower than moderate magnitude have been predicted, due to the high level of legal protection conferred on bats.

3 Baseline

3.1 Existing Data

3.1.1 The North East Scotland Biological Records Centre (NESBReC) and the University of Aberdeen provided no recent data for the survey area, although Aberdeen University have published a number of scientific papers relevant to the area (Rydell et al., 1994). Isobel Davidson of Aberdeen Bat Group provided the data presented in Table 5. No further information was given regarding the precise location of these roosts and the species using them. Three recorded roosts are of strategic importance to the Northern Leg, located in Kingswells and north of Dyce. For the consultation of the former Murtle Route, an additional six roosts were recorded in the Bieldside/Milton of Murtle area.

3.1.2 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 each valley to be impacted by the proposed scheme is relatively small and many of these roosts are likely to be in upland reaches of the Don valley, the Don is considered to be an important resource for this species.

Table 5 – Bat Roost Records in Study Area (data provided by Aberdeen Bat Group)

Km Square	Year	No. of roosts
NJ 89 13	1989	1
NJ 86 06	1998	2
NJ 87 02	2000	2
NJ 87 01	2000	1
NJ 86 01	1991	2
NJ 88 02	1989	2

3.2 Survey Results – Overview

3.2.1 This section of the report and Figures 10.4a to 10.4g present the main findings of field surveys.

3.2.2 Survey results are presented using a spatial framework that is based on a series of Habitat Areas defined by the Terrestrial Habitats Report in Appendix A10.1. Isolated areas of habitat such as water bodies or wetland areas which are of particular value or potential value to bats, groups of smaller features such as buildings or trees with value or potential value to bats; and areas with collective value as a result of their proximity, connectivity or similarity to each other, are described according to their Habitat Area and cross-referenced accordingly. In each case, features within Habitat Areas have been identified regardless of whether or not bats were observed using them.

Bat activity results are shown separately from other results for each of the geographical Sections below; although bat activity results have been incorporated into the descriptions of features of interest to bats.

3.2.3 Figures 10.4a to 10.4g also show habitat of general value to bats including woodland, water bodies and wetland areas; confirmed roosts and features with roost potential are identified with their suitability/roost potential category (assessed as described in section 2.3). Activity survey results are displayed with the location of the recorded activity along with details of behaviour observed (whether the bat was foraging or commuting). Bat flight lines are also marked where bats were observed to fly repeatedly along the same route or more than one bat was observed commuting along a linear landscape feature.

3.3 Survey Results Northern Leg

Survey Results Section NL1 Derbeth – Tulloch Road

3.3.1 Within the seven Habitat Areas in Section NL1, features of value to bats include one anecdotal roost in Newton Farm and roosting opportunities in trees near Brimmond Hill and Newhills. The Section is characterised by farmland with inherently low value to bats, and few features offering shelter for foraging, roosting or commuting. Only 6+ (i.e. at least 6) bat passes were recorded during evening activity surveys (see Table 7), from at least two species (common pipistrelle and Daubenton's bat). Bats have been reported foraging at Kepplestone House, and were observed foraging over a pond at Brimmond Hill and over Gough Burn. Kepplehill Burn offers potential as a foraging area. Commuting routes were identified along Gough Burn and Ashtown Road, which are likely to be of strategic importance to bats which roost and/or forage in the Craibstone Estate. In general low levels of bat activity were recorded in this Section, which reflects the overall exposed nature of Brimmond Hill and the lack of shelter and foraging resources in this area, although the Section lies between Brimmond Country Park, Kingswells and Craibstone which all represent good foraging and roosting habitat.

3.3.2 The bat survey results for Section NL1 of the Northern Leg are shown in Table 6, Table 7 and in Figures 10.4a and 10.4b.

Table 6 – Specific Features within Section NL1 Derbeth – Tulloch Road

Habitat Area	Feature	Feature Type	Description / Additional information
N11	Agricultural fields north of C89c and east of Brimmond Hill	Roost (anecdotal), potential roosts, potential foraging	Large area of small fields connected by intact dry stone walls with scrub and trees providing some foraging habitat. Anecdotal evidence of bat roost of unknown species in buildings of Newton Farm (NJ 868 092). Other tree roost opportunities in rowan trees within 200m of the farm. Overhills Farm includes barns and farm buildings with high roost potential despite exposed nature.
N12	Agricultural fields surrounding Kepplestone Farm	Foraging (anecdotal), Potential foraging and commuting area	Farmland with predominantly improved grassland and dry stone walls and occasional scattered gorse scrub of some value to foraging and commuting bats. Kepplestone House (NJ 934 142) has old buildings including a garage with high potential as roost and anecdotal evidence of bats flying in the yard. Kepplehill Burn offers some potential as foraging and commuting route.
N13	Agricultural fields between Brimmond Hill and Kepplestone Farm	Foraging and potential roosting area	Farmland with predominantly improved grassland and dry stone walls and occasional gorse scrub and scattered broadleaved trees with medium potential as roost. Single Daubenton's bat observed foraging over pond at (NJ 863 093). Kepplehill Burn provides potential foraging resource in the area.
N14	Gough Burn DWS	Commuting route & foraging area	Gough Burn identified as a commuting and foraging route for common pipistrelle bats as per HA N24 connecting foraging and potential roosting habitat at Kepplestone with foraging and roosting opportunities in Craibstone Estate. Area is a mosaic of swamp, wet grassland and scrub habitats with foraging potential but little shelter.

Habitat Area	Feature	Feature Type	Description / Additional information
N15	Agricultural fields between Gough Burn and Newhills Wood		Series of large fields with limited potential for bats
N16	Newhills Wood	Commuting route, Foraging area	Mature coniferous plantation woodland. A bat was observed commuting along Ashtown Road and bats forage along the Newhills plantation.
N17	Agricultural fields and cemetery at Newhills	Potential roosting	Farmland with predominantly arable fields and amenity planting associaterd with Newhills Cemetary with low value to bats. .

Table 7 – Bat activity results Section NL1 Derbeth – Tulloch Road (S – sighting, F – Foraging, C – Commuting, SC – Social calling, PC – personal communication)

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
NJ 863 087	Brimmond Hill	Common pipistrelle	2	S	Along edge of Brimmond Hill scrub
NJ 868 092	Newton Farm	Unknown	Unknown	PC	Around farm
NJ 870 094	Kepplestone Farm	Unknown	Unknown	PC	Around farm
NJ 865 094	Pond near Kepplestone	Daubenton's	1	F	Over pond
NJ 872 098	Ashtown Road	Unknown	1	F/C	Along road

Survey Results Section NL2 SAC Craibstone

3.3.3 Section NL2 area contains 11 Habitat Areas. The Section is characterised by areas of semi natural broad-leaved woodland and blocks of commercial plantation woodland in the Craibstone Estate, connecting areas of agricultural land and amenity grassland. The woodland areas are considered to provide an excellent habitat resource with strategic importance due to their location in a green corridor which includes Tyrebagger and Kirkhill Forest to the west and north. Although no roosts have been identified in this area potential roosts were recorded in woodland areas on the Craibstone Estate and in buildings in the area.

3.3.4 Fifteen bat passes from two species (common and soprano pipistrelle s) were recorded in this Section and two commuting routes were identified along Gough Burn and adjacent woodland areas, woodland in the west of the SAC campus and along Green Burn. Foraging areas were identified adjacent to Gough Burn and woodlands, in woodlands west of the SAC campus, woodland along Craibstone Burn and Green Burn, and in the farmland adjacent to the woodland in the SAC.

3.3.5 The bat survey results for Section NL2 are shown in Table 8 and Table 9 and in Figure 10.4b..

Table 8 – Specific Features within Section NL2 SAC Craibstone

Habitat Area	Feature	Feature Type	Description / Additional information
N18	Agricultural fields between Gough Burn and golf course	Commuting and foraging area	Farmland with improved grassland and riparian habitats adjacent to Gough Burn. Gough Burn identified as a commuting and foraging route for common pipistrelle bats connecting foraging habitat at Kepplestone with foraging and roosting opportunities in Craibstone Estate.

Habitat Area	Feature	Feature Type	Description / Additional information
N19	Craibstone Golf Course	Commuting and foraging area	Extensive area of mown grassland with scattered tree saplings with no roost potential and limited foraging potential. Gough Burn passes through eastern edge of Habitat Area, with associated commuting and foraging routes, connecting areas where bat activity was observed as per N16/37/43
N20	Agricultural fields between Newhills Wood and Craibstone Estate		Small area of farmland with limited value to bats
N21	Parkhead Wood	Potential commuting route and foraging area	Small block of mature conifer plantation with limited roosting potential and low foraging potential although the woodland provides some shelter for bats foraging and commuting along Craibstone Burn and provides connectivity between the Craibstone Estate and West Woods, Tyrebagger and Kirkhill Forest to the west. Commuting pipistrelle bats recorded along the burn near the edge of Parkhead Wood.
N22	West Woods	Potential commuting route and foraging area	Extensive area of commercial conifer plantation the majority of which lies to the west of the study area. Rides provide edge habitat suitable for foraging bats and the wood provides connectivity between the Craibstone Estate and Tyrebagger/Kirkhill to the West. Commuting pipistrelle bats recorded to the east of the woods.
N23	Woodland/Farm-land west of C88c, north of Parkhead Wood	Commuting area, potential foraging area	Mosaic of farmland and small blocks of plantation woodland with associated rides between suitable for small-scale foraging. Common and soprano pipistrelle bats observed commuting along edge of woodland north/south along minor road.
N24	Woodland along Gough Burn	Commuting and foraging route, potential roosts	Woodland area with semi-mature mixed plantation and semi-natural broadleaved woodland providing edge habitat considered to be optimal for foraging bats. Gough Burn identified as a commuting and foraging route for common pipistrelle bats connecting foraging habitat at Kepplestone with foraging and roosting opportunities in the Craibstone Estate. Sunnybank cottages (NJ 875 112) and nearby farm buildings provide medium roost potential and nearby line of beech trees although no bats were observed emerging or swarming during surveys; young woodland provide additional foraging and roost potential.
N25	Woodland in west of SAC Campus	Foraging and commuting area, potential roosting	Two areas of woodland with semi-mature mixed plantation and semi-natural broadleaved woodland with associated high roost potential including in a number of dead tree stumps with woodpecker holes. Pipistrelle bats observed foraging at the woodland edges and commuting along the road to the east.
N26	Woodland along Craibstone Burn	Foraging, commuting, potential roosting	Semi-mature mixed woodland plantation and semi-natural broadleaved woodland with associated high roost potential and excellent foraging opportunities. Craibstone Burn and Craibstone Pond provide a reliable source of freshwater invertebrate prey suitable for Daubenton's bats. Pipistrelle bat observed foraging along the burn which is also used for commuting and provides connectivity with woodland areas to the west. Craibstone area comprises a number of farm buildings with medium potential as roost.
N27	Woodland along Green Burn	Foraging & commuting area; potential roost	Relatively small area of semi-mature mixed plantation woodland including a strip of mature broadleaved woodland including beech, elm and sycamore with high roost potential alongside Green Burn. A number of houses including Chapel Croft (NJ 867 110) provide roost opportunities. Burn used by commuting and foraging pipistrelle bats and provides connectivity between the Craibstone Estate and West Woods, Tyrebagger and Kirkhill Forest to the west.
N28	Agricultural land in SAC campus east of C88c Road	Foraging & commuting area, potential roosts	Farmland within the SAC campus. Soprano and common pipistrelle bats recorded foraging and commuting along the woodland edges around the fields. Fields have low inherent value to bats. SAC campus buildings have low – medium potential for roosting bats.

Table 9 – Bat activity results Section NL2 SAC Craibstone

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
NJ 868 102	Gough Burn	Common pipistrelle	3	S	Along burn
NJ 868 104	Craibstone	Unknown	1	F	Along woodland edge
NJ 869 106	Craibstone	Soprano pipistrelle	3	F	Around edges
NJ 866 107	Craibstone	Unknown	1	C	Around edges
NJ 868 109	Craibstone	Common pipistrelle	1	C	Around edges
NJ 866 109	Craibstone	Unknown	1	S	Near pond
NJ 869 107	Craibstone	Unknown	1	F	Around edges
NJ 869 112	Green Burn	Pipistrelle	3	S/C	Along burn

Survey Results Section NL3 A96 – Nether Kirkton

3.3.6 There are 20 Habitat Areas in Section NL3 of the Northern Leg. The Section is characterised by large open and exposed areas of farmland and extensive areas of mixed-age conifer plantation woodland including Kirkhill Forest, Standingstones Wood, East Woodland and Monument Wood, with the best foraging and roost potential along Bogenjoss Burn.

3.3.7 Bat roosts have been identified at Walton Farm (soprano pipistrelle s) (NJ 873 114) and at Sunnybrae Cottage (NJ875 112). Daytime surveys also identified three potential hibernacula in this Section; at Balgosie, a pump house in East Woodlands and a derelict stone cottage. Bogenjoss Burn is likely to be an important commuting route for bats which also forage along the River Don; Kirkhill Forest, Standingstones Wood and East Woodlands are considered to be of strategic importance to bats roosting in Aberdeen due to their location in a green corridor which also includes the Craibstone Estate.

3.3.8 Evening surveys identified 41 bats and bat passes from at least 3 species (common and soprano pipistrelle s, Daubenton's bats). Commuting routes were identified along Kirkhill Forest South near the potential roost at Balgosie; around Standingstones Farm, along Bogenjoss Burn and East Woodlands. Foraging areas were identified at Standingstones Wood, Bogenjoss Burn, East Woodlands and Monument Wood.

3.3.9 The results from Section NL3 are shown in Table 10, Table 11 and in Figures 10..4b – 10.4d.

Table 10 – Specific Features within Section NL3 A96 – Nether Kirkton

Habitat Area	Feature	Feature Type	Description / Additional information
N29	Agricultural land northeast of Dyce Drive		Small area of farmland with little value to bats.
N30	Agricultural land between A96 and Dyce Drive	Roosts	Extensive area of farmland with large fields of low inherent value to bats. Walton Farm (NJ 873 114) is a soprano pipistrelle bat roost and high common and soprano pipistrelle bat activity recorded around cottages and barns at the farm. Nearby Sunnybrae cottage (NJ 875 112) is a roost for unknown bat species.
N31	Chapelbrae Wood	Potential foraging and roosting	Small area of semi-mature broadleaved woodland plantation that provides a number of roost opportunities and foraging potential.

Habitat Area	Feature	Feature Type	Description / Additional information
N32	Agricultural land between Newton and Upper Coarsehill	Potential commuting, foraging and roosting in cottages	Large area of farmland with arable, improved and semi-improved grassland, dry stone walls, scattered scrub and species-rich grass verges offering some shelter and limited foraging potential for bats commuting between Kirkhill and Dyce. Nearby cottages at Corsehill have medium roost potential and are connected to Chapelbrae Wood (N31) by a line of trees.
N33	Agricultural land south of Standingstones Wood and east of Kirkhill Forest	Commuting, potential roost and hiberna-culum, potential foraging	Farmland that includes large arable fields, species rich hay meadows and verges, dry stone walls and Howemoss Burn provide some shelter and limited foraging potential. Kirkhill Industrial Estate immediately to the east of the Habitat Area has low potential for roosting and foraging and bats are unlikely to commute east-west in this area. Balgosie (NJ 861 140) is a derelict stone farmhouse with intact chimney and run down farm buildings and underground storage area with many roosting opportunities including suitability as hibernaculum. Pipistrelle bat observed passing north-south near buildings but not emerging or swarming. Howemoss Farm has not been surveyed (See limitations section 2.4)
N34	Kirkhill Forest South	Potential foraging and commuting	Forest has low inherent potential for roosting bats but the edges provide shelter for foraging and commuting. Bats observed commuting nearby as per N33.
N35	Standingstones Wood	Foraging and potential roosting area	Blocks of spruce and larch woodland and felled/regenerating coniferous plantation and mosaic scrub shown to be used extensively by commuting and foraging Soprano & Common Pipistrelle s.
N36	Farburn Wood DWS	Foraging area	Small area of mature broad-leaved woodland with medium – high roost potential. Bats recorded presumed foraging along field drains and at the woodland edges. Standingstones farm nearby has high potential for roosting as per N39.
N37	Kirkhill Forest North	Foraging area	Large area of commercial conifer plantation with localised areas of marshy grassland, scrub and wet woodland with low overall roosting potential but providing suitable foraging areas for a small number of pipistrelle bats.
N38	Open habitats along Bogenjoss Burn within Kirkhill Forest	Foraging area	Mosaic of grassland, marsh and wet habitats alongside burn used by small numbers of foraging and commuting pipistrelle bats.
N39	Agricultural fields around Standingstones Farm	Potential roost, commuting area	Arable farmland has low inherent potential for foraging and roosting bats. Adjacent Standingstones Farm has high potential as bat roost including barns and mature ash trees with suitable cavities. Bats observed around farm and commuting from Kirkhill Forest along network of dry stone walls and scrub areas.
N40	Lower Overton Wood	Potential foraging area	Commercial conifer plantation, mixed plantation and young broadleaved woodland provide potential for foraging bats. Contiguous with Bogenjoss Burn and Kirkhill forest which are used regularly by foraging and commuting bats.
N41	Agricultural fields between Lower Overton Wood and East Woodland	Potential roost and hibernac-ulum Potential foraging	There is a derelict stone cottage (NJ 860 140) with many roosting opportunities in ivy, under window openings. Cracks between bricks in chimney provide potential hibernaculum.Bogenjoss House has medium potential for roosting bats. Farmland between forest areas provides some areas of scrub with limited foraging potential; within 100m of Bogenjoss Burn which is a known bat commuting and foraging route.
N42	Bogenjoss Burn downstream of Kirkhill Forest	Foraging and commuting route	Linear habitats including marshy grassland and riparian broadleaved woodland along the valley bottom provide excellent quality foraging and commuting resource. Bats observed commuting along Bogenjoss Burn and likely to use whole of burn including toward Pitmedden House and Kirkhill Forest and Lower Overton Wood.

Habitat Area	Feature	Feature Type	Description / Additional information
N43	East Woodlands	Foraging and commuting area and potential roost and hibernac-ulum	Area of conifer plantation , broadleaved woodland and mature beech trees including rowan and ash trees with medium-high roost potential and bat foraging activity along Bogenjoss Burn towards Pitmedden House (NJ 862 148). Concrete pump house next to burn with potential as hibernaculum.
N44	Agricultural fields west of Bogenjoss Burn		Arable farmland and grassland provide limited value to bats which are likely to commute and feed along the burn.
N45	Bogenjoss Burn and grounds of Pitmedden House	Commuting route & potential roosts	Pitmedden House and nearby farm buildings, cottages and old houses have medium - high potential as roost. Bat social activity and commuting observed along Bogenjoss Burn and in the woodland nearby but not emerging. Mixed semi-mature woodland (including pine, beech and fir) with medium potential as roost along burn.
N46	Agricultural fields south-east of Bogenjoss Burn	Commuting route	Farmland with occasional areas of scrub, grassland and mature trees which provide some foraging potential but little cover for bats. Single bat observed flying toward Upper Kirkton along field boundary.
N47	Monument Wood	Foraging, commuting, potential roosts, potential hibernac-ulum	Commercial conifer plantation with individual ash and rowan trees with medium potential as roost. Near Scots pine and larch plantation with medium roost potential. Soprano pipistrelles observed foraging and commuting along edges of woodland. 100-year old stone memorial structure (NJ 863 144) with many gaps, loose mortar and cracks situated at edge of woodland has high potential as roost/ hibernaculum.
N48	Agricultural fields between Monument Wood and Lower Overton Wood	Potential commuting route	Farmland and network of field boundaries has some potential for commuting route between Monument Wood and Lower Overton Wood. No activity recorded.

Table 11 – Bat activity results Section NL3 A96 – Nether Kirkton

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
NJ 872 115	Walton Farm	Common & soprano pipistrelle	7	S/C	Around buildings
NJ 858 122	Balgosie	Unknown	1	C	Commuting overhead
NJ 862 126	Farburn Wood	Unknown	4	S	Along track/ditch and around woodland edges
NJ 858 127	Standingstones Wood	Unknown	5	S	Foraging at field edges
NJ 859 128	Standingstones Farm	Common pipistrelle	2	S	Along field boundaries
NJ 862 129	Standingstones Farm	Common soprano pipistrelle	4	S/C	Around farm
NJ 856 128	Kirkhill Forest	Unknown	2	S	Around edges
NJ 861 133	Kirkhill Forest	Unknown	1	C	Along track near stone circle
NJ 856 134	Kirkhill Forest	Pipistrelle	1	S	In clearing
NJ 862 136	Kirkhill Forest	Pipistrelle	3	C	Along bogenjoss

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
					burn
NJ 857 136	Kirkhill Forest	Unknown	1	S	Along road
NJ 858 143	Bogenjoss Burn	Unknown	2	S	Along burn
NJ 860 146	Bogenjoss Burn	Unknown	2	SC	Along burn and woods
NJ 863 146	Bogenjoss Burn	Unknown	1	S	Along burn and woods
NJ 864 147	Pitmedden House	Unknown	1	S	In woods
NJ 864 143	Monument Wood	Soprano pipistrelle	1	S	Around edges of wood
NJ 865 144	Monument Wood	Soprano pipistrelle	1	S	Around edges of wood
NJ 867 144	Monument Wood	Soprano pipistrelle	1	S	Around edges of wood
NJ 867 147	Fields near Bogenjoss Burn	Unknown	1	S	Along field boundary

Survey Results Section NL4 Nether Kirkton - Corsehill

3.3.10 Section NL4 of the Northern Leg contains 22 Habitat Areas; features of value to bats include one potentially large roost at Parkhill Pumping Station, a potential hibernacula in a WW2 pillbox near Dyce Drive and many more potential roosts within trees and buildings within the Section. The Section is characterised by large areas of agricultural land and scattered shelterbelts and woodland areas; extensive areas of broad-leaved and mixed woodland at Goval Wood and Goval Belt, the Parkhill Estate, Skate Wood and Den Wood exist at the edges of the study area. The River Don provides an important source of freshwater invertebrate prey connecting foraging and roosting resources up- and downstream. Goval Burn, the Formartine and Buchan Way and Goval Belt also provide diverse foraging opportunities and enhance connectivity between foraging and roosting areas.

3.3.11 At least 35 bats and bat passes from four species (common and soprano pipistrelle s, brown long-eared and Daubenton's bats) were recorded within this Section and commuting routes were identified along the River Don, along Goval Burn, Goval Belt, the Formartine and Buchan Way, near Meadowhead Burn and Newpark Steading, of bats presumed to commute between potential roosts and foraging areas in the Goval and Red Moss areas. Foraging areas were identified around Upper Kirkton, along the River Don and banks, the edges of Goval Wood, along Goval Burn, Goval Reservoir and Goval Mill Lade, along the Formartine and Buchan Way and Goval Belt.

3.3.12 The results from Section NL4 of the Northern Leg are shown in Table 12 and Table 13 and in Figures 10.4d – 10.4e..

Table 12 – Specific Features within Section NL4 Nether Kirkton - Corsehill

Habitat Area	Feature	Feature Type	Description / Additional information
N49	Agricultural fields and quarry north of railway	Foraging, potential roost	Farmland of limited value to bats; quarry ponds exposed and provide sub-optimal and isolated foraging resource. Potential roosts in mature beech trees along tracks – two pipistrelle bats observed flying along field boundaries north of works. Bats likely to forage preferably along the Don.

Habitat Area	Feature	Feature Type	Description / Additional information
N50	Agricultural fields on either side of Dyce Drive south of railway line	Foraging and commuting area & potential roost and hibernac-ulum	Extensive area of farmland and blocks of broadleaved plantation woodland and gorse scrub. A number of farms, cottages and standard trees to north and south of existing road with high potential as roost. WW2 pill box near railway bridge has potential as hibernaculum (NJ 874 145). Pipistrelle bats observed flying along line of mature beech trees near gravel pit and commuting north from Upper Kirkton.
N51	Agricultural fields on southwest bank of River Don Valley	Potential foraging area	Marshy grassland and flood plain grassland habitats provide potential foraging habitat adjacent to the River Don which is extensively used by bats as per N8.
N52	Banks of the River Don - DWS	Foraging and commuting area & potential roost	River Don Banks and adjacent mixed copse (birch, alder, sycamore and pine) have overall low roost potential due to paucity of suitable crevices aside from an over mature willow tree overhanging river (high roost potential). Many soprano and common pipistrelle and Daubenton's bats observed foraging and commuting over and along the river which is an important known commuting route connecting Habitat Areas up- and downstream. The Don Valley includes a significant proportion of Britain's known Daubenton's bat roosts (Racey, undated).
N53	Woodland around Goval House	Foraging and potential roosting	Mature broad-leafed woodland and house, barns and garages provide high potential roost opportunities and foraging area adjacent to the River Don. Bats observed foraging around the trees and along the river as per N8.
N54	Farmland between River Don and B977	Foraging and potential commuting	Large arable fields have low inherent value to bats but scattered scrub and shelterbelts enhance the value by providing potential for foraging and commuting. Foraging bats observed in shelterbelt of mature broadleaved and conifer trees adjacent to the River Don, and around Place of Goval which has high potential as roost.
N55	Agricultural fields surrounding Goval Farm	Potential foraging, roosting and commuting	Large fields have low inherent value to bats but scattered scrub and dry stone wall network enhance the value by providing some potential for foraging and commuting. Old farmhouses and barns at Goval Farm (NJ 886 151) including sheltered storage houses with high potential for roosts. Common pipistrelle bat observed foraging along Goval Burn within 200m.
N56	Goval Wood	Foraging and potential roosting	Diverse habitat including mature broad-leaved woodland, wet woodland and grassland ideal for foraging. Two bats observed foraging and flying along woodland edges.
N57	Plantation north of Goval Wood	Potential foraging	Semi-mature commercial coniferous plantation with some potential for foraging. Strategically situated near areas of extensive bat activity around Goval and the River Don and connected to Goval Reservoir by Goval Belt.
N58	Goval Belt	Foraging and commuting area and potential roosting area	Shelterbelt of mature broad-leaved coppice woodland with high potential for roosting. Bats observed foraging within the woodland and commuting along the woodland edges and adjacent to the reservoir. Connects features at Goval Burn with Goval Wood.
N59	Agricultural fields north of Goval Belt		Arable farmland and grassland provide limited value to bats.
N60	Agricultural fields south of Goval Belt between A947 and Formartine and Buchan Way	Potential foraging area	Arable farmland and grassland provide limited value to bats although riparian habitats alongside Goval Burn and Goval Mill Lade provide ideal foraging habitat and connectivity between Habitat Areas as per N61.

Habitat Area	Feature	Feature Type	Description / Additional information
N61	Goval Burn and Goval Mill Lade	Roost and foraging/ commuting area	Goval Burn and reservoir have marginal habitats including woodland and grassland used by foraging and commuting bats. Riparian habitat includes several mature Scots pine, ash and beech trees with high roost potential. Parkhill Pumping Station (NJ 888 147) is disused and in poor state of repair adjacent to river and tree lines. four common pipistrelle bats observed emerging from roof tiles of building and arriving at the pumping station from the Lade. All four bats dispersed along Goval Burn. Common pipistrelle observed commuting along Goval Mill Lade to the north of the pumping station and commuting along Goval Burn.
N62	Formartine and Buchan Way	Commuting route, potential roosting	Disused railway with species-rich grassland and scrub embankments and cuttings providing excellent habitat for insect prey used by foraging soprano and common pipistrelle bats. Small mature and immature mixed woodland adjacent to Goval Burn and disused railway has two dead and hollow trees with high potential for roost, and pipistrelle and brown long eared bats observed using the area.
N63	Park Hill Estate	Foraging and commuting, potential roosting.	Broad-leaved woodland and mature beech plantation and parkland with high potential for foraging and roosting. Large loch to the south east of the woodland has sheltered edges ideal for foraging Daubenton's bats situated near the River Don. Common pipistrelle bats observed foraging and commuting alongside the B977 nearby.
N64	Agricultural fields southeast of Formartine and Buchan Way		Small area of arable farmland and grassland provides limited value to bats.
N65	Skate Wood	Potential roosting and foraging	Area of mature birch and rowan woodland with diverse ground layer providing ideal shelter and insect prey for foraging bats. Strategically situated in green corridor which includes the River Don, Park Hill Estate, Littlejohn's Wood and Red Moss and potential commuting routes along Corsehill Burn. Listed as an Important Local Wildlife Site under the Scottish Wildlife Action Project indicating its overall quality.
N66	Roadside plantation and mature pine avenue at Little Goval	Potential foraging and commuting	Mixed plantation and avenue of mature pine trees forming a shelterbelt suitable for bats navigating between the B977 and Waulkmill, the Formartine and Buchan Way and Goval which are used by foraging and commuting bats.
N67	Den Wood and roadside plantations	Potential roosting, foraging and commuting	Conifer plantation with mature and young blocks which provide limited shelter for foraging and commuting. Strategically situated on a green corridor which includes the River Don and Park Hill Estate to the south and Littlejohn's Wood and Red Moss to the north. A number of residential properties to the south of the B977 road have medium roost potential.
N68	Agricultural fields between B977 and Meadowhead Burn	Potential commuting	Agricultural fields provide no shelter and are of very limited value to foraging bats aside from Corsehill pond but network of dry stone walls and burn provide features along which to commute between Littlejohns Wood and Goval/Waulkmill.
N69	Agricultural fields north of Meadowhead burn and east of Formartine and Buchan Way	Commuting and foraging route & potential roosts	Arable and pasture fields have limited inherent value to bats although network of dry stone walls and farm access tracks with species rich verges and mature trees suitable for commuting. Brown long eared bat observed commuting along field boundaries toward several farms at North Waulkmill (NJ 897 154) with high roost potential. Common pipistrelle bats observed in farm yards. Meadowhead Farm buildings have high roost potential due to abundant small access points, and the owner reports that bats regularly fly around the courtyard.
N70	Agricultural fields east of B997 at Newpark Steading	Commuting and potential foraging	Extensive area of farmland including pasture, marshy grassland and burns has some potential for foraging although little shelter is provided. Bat commuting routes connecting Red Moss with foraging resources at Goval and the Formartine and Buchan Way pass along road adjacent to Newpark Steading.

Table 13 – Bat activity results Section NL4 Nether Kirkton - Corsehill

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
NJ 873 142	Upper Kirkton	Unknown	1	S	Towards quarry
NJ 874 146	Near Quarry	Pipistrelle	4	S	Along beech lined track and near houses
NJ 875 150	North of works	Pipistrelle	2	S	Around field boundaries
NJ 880 146	River Don	Daubenton's bats	3	F	Along River Don; also circling in pairs
NJ 891 145	River Don	Common pipistrelle	1	S	Along River Don banks
Nj 879 146	Place of Goval	Pipistrelle	1	S	Around house
NJ 881 146	River Don Banks	Soprano pipistrelle	2	F	Along River Don banks and shelterbelt
NJ 885 146	Goval Villa	Unknown	Unknown	PC	Around garden
NJ 882 152	Goval Wood	Unknown	2	F/S	Along woodland edge and wet area
NJ 890 143	B977	Common pipistrelle	2	C/F	Along banks and nearby roads
NJ 894 146	B977	Common pipistrelle	2	C/F	Along B977
NJ 892 147	Wood south of Goval	Brown long-eared & common pipistrelle	2	S	Around wood
NJ 889 150	Goval Mill Lade	Common pipistrelle	1	C	Along canal
NJ 895 152	Formartine and Buchan Way	Unknown	3	C/F	Along path
NJ 894 147	Goval Burn	Unknown	1	C	Along river
NJ 893 154	Goval Belt & reservoir	Unknown	3	F/SC	Along woods
NJ 895 156	Goval Burn	Unknown	1	S	Along burn
NJ 898 152	Meadowhead Farm	Unknown	Unknown	PC	Around farmyard
NJ 897 156	North Waulkmill Farm	Common pipistrelle	2	S	Around farmyard
NJ 897 155	Near South Waulkmill	Brown long-eared	2	S	Along track
NJ 902 154	West of Waulkmill	Common pipistrelle	Unknown	C/S	Along field boundaries

Survey Results Section NL5 Corsehill - Blackdog

3.3.13 Section NL5 of the Northern Leg contains 25 Habitat Areas. The Section is characterised by large and relatively exposed areas of farmland, with extensive areas of mixed and broad-leaved woodland at Red Moss and formerly Littlejohn's Wood which form part of an important green corridor also including Den Wood and Corsehill Wood to the west. The south of the Section includes three large lochs (Bishop's, Lily and Corby Lochs) and to the east tree lines around

Cranfield provide an extensively used foraging and commuting resource in an area otherwise sparse in alternative resources. Harehill and Blackdog Burns provide some connectivity between Habitat Areas but few roosting and foraging resources around Blackdog are considered suitable for bats due to their exposed nature. Two roosts were identified within this Section in a tree at Cranfield and anecdotal evidence of a roost in a cottage at Harehill.

3.3.14 Activity surveys revealed 71 bat passes fom four species (common and soprano pipistrelles, brown long-eared and *Myotis* bats, presumed to be Daubenton's). Commuting routes were identified around Littlejohn's Wood, along the B999, around Red Moss and Lochgreens, along shelterbelts and tree lines at Cranfield and along Harehill and Blackdog Burns. Foraging areas were also identified at Littlejohn's Wood, around Red Moss, Corby Loch and Newton of Shielhill, along tree lines and shelterbelts around Cranfield, along the burns and at Harehill.

3.3.15 The results from Section NL5 are shown in Table 14, Table 15 and in Figures 10.4e to 10.4g.

Table 14 – Specific Features within Section NL5 Corsehill - Blackdog

Habitat Area	Feature	Feature Type	Description / Additional information
N71	Corsehill Wood	Commuting, potential roosting and foraging	Small area of broad-leaved plantation woodland connected along green corridor to Den Wood and Park Hill Estate to the south and Littlejohn's Wood to the north. Corsehill Croft and other cottages in the Habitat Area have medium roost potential due to the presence of loose roof slates and other gaps. Two bats recorded alongside the plantation including commuting activity.
N72	Littlejohn's Wood	Foraging and commuting area and potential roosting area	Largely deforested conifer plantation with mature beech edges with medium potential as roost and some regenerating birch woodland offering limited shelter and foraging opportunities. Common and soprano pipistrelle bats observed foraging in the area & commuting routes follow B997 and B977 roads. Littlejohn's Wood is strategically placed in a green corridor between Red Moss woodland to the north and Den Wood and Parkhill Estate to the south.
N74	Woodland at Red Moss north of B977	Foraging, commuting and potential roosting area	Red Moss is an extensive mature broad-leaved woodland with localised areas of wet woodland and grassland providing a diverse mosaic of habitat types and excellent foraging potential. Red Moss forms part of a larger green corridor running south through Littlejohn's Wood, Den Wood and the Parkhill Estate. A number of pipistrelle and brown long-eared bat commuting routes pass through the woodland.
N75	Raised bog at Red Moss north of B977	Potential foraging area	Lowland raised bog habitat provides some foraging opportunities including sheltered wet ground near the woodland edges important for bats roosting in Red Moss.
N76	Farmland and bare ground at Moss-Side north of B977	Commuting and potential roosting area	Small fields are of limited value to bats although old cottage and warehouse provide medium potential roost opportunities. Pipistrelle bat commuting routes and sightings recorded in the area which is immediately adjacent to Red Moss wood which is extensively used by and an important resource for bats.
N78	Mosaic of scrub and grassland west of Moss Belt	Commuting and potential foraging and roosting area	Mosaic of habitat types provide shelter and excellent foraging opportunities along the roadside including mature beech trees and scattered gorse providing important connectivity between areas of Red Moss and Littlejohn's Wood. Row of modern houses provide limited roost potential but a number of beech trees have knot holes and splits suitable for roost. Pipistrelle commuting routes pass along B977 adjacent to the area.
N79	Moss Belt Plantation	Foraging area, potential roosts	Shelterbelt of mature mixed plantation including mature beech tree edges with medium – high roost potential. A number of bats observed foraging along the woodland edges and toward Lochgreens Farm (NJ 919 152) and commuting along the B977. The plantation is of strategic importance to bats flying between Red Moss and Littlejohn's Wood.

Habitat Area	Feature	Feature Type	Description / Additional information
N80	Agricultural Fields between B977 and Loch Hills Quarry	Commuting and potential roosting area	Arable fields have low value to bats although Lochgreens pond, scattered scrub and network of walls provide some opportunities for foraging and commuting bats. Lines of mature beech trees alongside the B977 road provide excellent roosting opportunities. A bat was observed presumed foraging over a pond with marshy grassland and scrub at Loch Hills Farm (NJ 912 146); commuting bats observed along field boundaries and tracks.
N81	Loch Hills Quarry	Potential foraging area	Quarry has low inherent value to bats with high disturbance levels and sparse foraging habitat. Commuting routes and pipistrelle bat activity recorded at nearby Loch Hills Farm pond (NJ 911 149) as per N80.
N82	Red Moss south of B977	Foraging area, potential roosts	Extensive area of wet ground and bog habitats, scrub and woodland connected to Red Moss and providing excellent foraging habitat. Modern houses on the western edge of the woodland have high potential for roost and bats (common and soprano pipistrelle and brown long-eared bats) sighted along the edges of the woodland to the south and along the field ditch system.
N83	Woodland between Red Moss and Lochgreens Farm	Foraging area, potential roosts	Mature broad-leaved woodland encroaching onto bog habitats provides continuity of foraging and roosting resource provided in Red Moss and woodland areas and connected via green corridor to features in the west and south including Littlejohn's Wood. Many suitable roosting opportunities available in cavities in trees; bats observed foraging around the southern edges of the wood.
N84	Agricultural fields south of Lochgreens Farm	Commuting routes, potential roost	Farmland with large arable fields offers little potential for bats but small beech copse enhances the foraging habitat resource for bats which were observed commuting between Corby/Lily Lochs and Red Moss as per N80. Red Moss Burn has commuting potential between the Lochs and Red Moss. Lochgreens Farm and outbuildings (NJ 919 152) including old chimney stack have medium-high potential as roost.
N85	Corby and Lily Lochs and associated habitats – SSSI, DWS and SINS	Foraging area	Lochs provide diverse habitat range including open water suitable for Daubenton's bat foraging; associated swamp, mire and heath habitats around perimeter also provide a reliable source of invertebrate prey and scrub and trees including willow and alder provide some shelter. Common pipistrelle bats observed foraging at nearby Leuchlands Croft Plantation. Likely to be used by bats roosting in Red Moss.
N86	Agricultural fields between Red Moss and Newtonhill Farm	Foraging, potential roosts.	Large area of farmland of limited inherent value to bats but foraging observed along track and 3 sightings of soprano pipistrelle bats including foraging recorded around Newtonhill Farm (NJ 930 151) where a number of mature and dead sycamore and ash trees offer medium potential for roost.
N87	Agricultural fields between Lochgreens Road and Gravel Pit	Foraging, commuting and potential roosting	Extensive area of farmland of improved grassland and some arable fields of limited value to bats. Localised habitats including Leuchlands Croft mature conifer plantation enhance the foraging and roosting resource. Foraging pipistrelle bats observed around the croft and commuting between there and Corby Loch as per N85.
N88	Newton of Shielhill DWS	Foraging area	Small area including pond and swamp with marginal vegetation and gorse scrub adjacent to new broad-leaved woodland plantation. *Myotis* sp. recorded foraging over pond which is close to shelterbelts at Cranhill used extensively by bats as per N90.
N89	Agricultural fields between unclassified road and B999 (north)	Potential foraging	Predominantly arable farmland with dry stone walls and conifer plantation woodland with limited value to bats. Small ponds and marshy grassland enhance the foraging resource for bats which commute and forage along tree lines nearby but outwith the site as per N90.

Habitat Area	Feature	Feature Type	Description / Additional information
N90	Agricultural fields between unclassified road and B999 (south)	Foraging, commuting and potential roosting area	Arable fields and improved grassland have low inherent value to bats but lines of mature sycamore and beech trees form boundary features and shelterbelts used extensively by commuting and foraging common and soprano pipistrelle bats (at least 24 bat passes recorded). A number of trees are considered to provide suitable crevices for roost and nearby farms Backhill of Cranbog (NJ 933 147), Cranfield (NJ 942 141) and Newton of Shielhill (NJ 934 142) also have medium potential for roost and high levels of pipistrelle activity.
N91	Agricultural fields adjacent to Blackdog Burn east of B999	Roost, foraging and commuting area	Farmland with improved grassland and gorse scrub and patches of broadleaved woodland plantation extensively used by foraging and commuting pipistrelle bats as per N90. Bats also observed commuting and foraging along Blackdog Burn which provides suitable foraging habitat. Small number of bat droppings (species unknown) present in a hole in a mature sycamore adjacent to the B999 (NJ 943 144) indicating the presence of a small roost. Butterywells provides a small area of high value roosting and foraging habitat including mature broadleaved trees, a pond and buildings with gaps under the soffits.
N92	Agricultural fields between B999 and Harehill Farm	Potential foraging, commuting and roosting area	Arable fields with occasional mature trees including scots pine with medium roost potential; dry stone walls and gorse scrub with limited value to bats. Bats foraging and commuting along Blackdog and Harehill burns and shelterbelts in Cranfield and along the B999 (as per N90 and N91) are likely to use these foraging resources occasionally.
N93	Agricultural fields between Harehill Farm and A90 south of Blackdog Burn	Roost (anecdotal), foraging area	Farmland and dry stone wall network with mixed plantation woodland blocks shown to be used by foraging common and soprano pipistrelle bats, provide shelter and insect prey in an otherwise exposed area. Anecdotal evidence from homeowner of 3 bats roosting in chimney in 2004 at Harehill House (NJ 950 140) and despite some bat activity around the houses none were observed emerging. Houses have high potential for roosting and are surrounded by mixed woodland. Soprano pipistrelle bats also sighted along Blackdog Burn adjacent to the A90.
N94	Agricultural fields west of A90 north of Blackdog Burn		Farmland with arable fields and gorse scrub are of limited value to bats.
N95	Grassland east of A90, south of Blackdog		Open improved grassland and young conifer plantations are of very limited value to bats
N96	Agricultural fields west of A90 either side of Potterton Road	Potential roosting and foraging	Arable and improved grassland fields with localised gorse scrub, grassland and young broad-leaved woodland plantation provide some limited foraging resources for bats in otherwise barren landscape. Isolated from other features of value. Middlefield Farm has high potential as roosts in buildings due to the presence of suitable cracks.
N97	Agricultural fields east of A90 north of Blackdog	Potential roosting	Farmland, grassland and young conifer plantation provide very limited and exposed resource for bats. Modern housing in Blackdog estate has some potential for roosting pipistrelle bats although exposed on cliff top; there are a number of trees including standing dead trees with roost potential around Easter Hatton.

Table 15 – Bat activity results for the Northern Leg Section NL5

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
NJ 907 147	Corsehill Wood	Unknown	2	C/S	Alongside plantation woodland and Littlejohn's Wood
NJ 905 152	Littlejohn's Wood	Common	4+	F/C	At woodland

Grid Reference	Habitat	Species	Number of bats/passes	Activity	Notes
		pipistrelle			edges and in wood
NJ 911 149	Pond to north of Loch Hills Farm	Common & soprano pipistrelle	2	F/C	Over pond and along field boundaries
NJ 915 155	Moss Belt	Common & soprano pipistrelle	5	F/S	Along woodland edges and in wood
NJ 923 153	Red Moss	Common & soprano pipistrelle & brown long-eared	5	F	Along woodland edges
NJ 927 146	Leuchlands Croft/Corby Loch	Common pipistrelle	5	F/C	Towards Corby and Lily lochs
NJ 930 151	Newtonhill Farm	Soprano pipistrelle	3	F	Over scrub
NJ 931 150	Track	Soprano pipistrelle	1	F	Around farmyard
NJ 932 144	Track	Soprano pipistrelle	1	S	Along track
NJ 932 142	Pond	Soprano pipistrelle	1	F	Along track
NJ 934 143	Newton of Shielhill	Unknown	Unknown	PC	Around the courtyard
NJ 936 143	Newton of Shielhill	*Myotis* (probably Daubenton's)	1	F	Over pond
NJ 936 145	Backhill of Cranbog	Common pipistrelle	2	C	Along track
NJ 937 147	Backhill of Cranbog	Common & soprano pipistrelle	4	F	Towards farm
NJ 939 144	Tree lines, Cranfield	Common pipistrelle	2	F	Along tree line
NJ 940 143	Tree lines, Cranfield	Common pipistrelle	7	F/S	Along tree line
NJ 940 144	Tree lines, Cranfield	Common pipistrelle	3	S	Along tree line, continuous
NJ 942 143	Tree lines, Cranfield	Common & soprano pipistrelle	6	S/F	Along tree line, continuous
NJ 942 141	Cranfield Farm	Common pipistrelle	3	F	Around farmyard
NJ 944 142	Cranfield	Common & soprano pipistrelle	7	F/S	Along tree line
NJ 950 139	Harehill	Common & soprano pipistrelle	3	F	Around trees and houses
NJ 949 142	Harehill	Soprano pipistrelle	1	S	Near house
NJ 952 141	Harehill	Pipistrelle	1	S	Around copse
NJ 955 141	Blackdog Burn	Soprano pipistrelle	2	S	Along burn

3.4 Survey Results Summary

3.4.1 A number of features of value to bats have been identified within the 86 Habitat Areas in the Northern Leg between Derbeth and Blackdog. The Northern Leg is characterised by large areas of open arable and pastoral farmland with limited roosting and foraging opportunities interspersed with smaller fragments of roosting, foraging and commuting habitat including burns, shelterbelts, woodlands, walls and buildings. Extensive areas of woodland exist in the Craibstone Estate, Kirkhill and Red Moss areas and areas of open and flowing water exist at the River Don, Goval Reservoir, loch in Parkhill estate, Lily and Corby Lochs.

3.4.2 The main woodland features within this leg are: Kepplestone, Craibstone, East Woodlands, Kirkhill Forest, Goval Belt, Littlejohns Wood (now largely deforested) and Red Moss. Water features offering aquatic invertebrate prey and bankside vegetation suitable for foraging bats include those at Gough Burn, Craibstone Burn, Green Burn, Bogenjoss Burn, the River Don, Goval Burn and Reservoir, Corby and Lily Lochs, Blackdog, Cranhill and Harehill Burns.

3.4.3 Six bat roosts were identified within the 500m survey area including five in buildings (Newton Farm (anecdotal), Walton Farm, Sunnybrae Cottage, Parkhill Pumping Station and a cottage in Harehill near Blackdog (anecdotal)) and one in a tree near Cranfield. In addition one of the recorded roosts provided by the Aberdeen Bat Group (see Table 5) lies just outside the survey area north of Dyce. Buildings considered to offer conditions suitable for roosting include those at Kepplestone House, buildings in the Craibstone area, Chapel of Stoneywood, Coarsehill, Standingstones Farm, Pitmedden House, pill box in Upper Kirkton, Goval Farm, Waulkmill, Lochgreen Farm, cottages in Harehill and at Middleton and Middlefield farms. In addition two derelict cottages at Balgosie and Pitmedden, a concrete pumphouse in East Woodlands and stone memorial in Monument Wood are considered to offer potential as hibernacula.

3.4.4 A total of 189 bat passes and three areas with an unkown number of bat sightings were recorded over the whole of the Northern Leg. Section NL5 of the Northern Leg contained the greatest concentrations of bat activity and the least was recorded in Section 2. Bat activity was concentrated in and around woodland and wet areas. Features of concentrated bat activity include Walton Farm (7 bats), Standingstones Wood (9 bats), wet areas of Kirkhill Forest (8 bats), Bogenjoss Burn (5 bats), Upper Kirkton (4 bats), the River Don and banks (6 bats), the B900 (4 bats), Goval Burn and canal (6 bats), Waulkmill (4 bats), Littlejohn's Wood (6 bats), Red Moss (10 bats), Leuchlands Croft and Corby Loch (5 bats), Backhill of Cranbog (6 bats), tree lines in Cranfield (25 bats) and Harehill (5 bats). Smaller numbers of bats were observed foraging, commuting and displaying social activity in predictable areas away from these main areas.

3.4.5 Commuting routes where bat activity was observed between Habitat Areas or repeated bat activity observed along linear features were identified along tree lines along Gough Burn, Ashtown Road, Green Burn, Bogenjoss Burn, between Upper Kirkton and the quarry and along the River Don. Commuting routes were also identified along Goval Burn, the Formartine and Buchan Way, Goval Belt, around Littlejohn's Wood and Red Moss, south of Lochgreens and connecting Blackdog Burn with tree lines at Cranfield. In addition foraging routes were identified around the Craibstone estate, Walton Farm, Standingstones Wood, the edges of Kirkhill Forest, Littlejohn's Wood, along Moss Belt and Leuchlands Croft Plantation.

3.4.6 The majority of observations were of soprano and common pipistrelle bats which are the commonest bats in the region, although brown long-eared bats were recorded in woods south of Goval Burn, near Waulkmill and Red Moss and Daubenton's bats were sighted over a pond in Kepplestone and at the River Don; a *Myotis* bat assumed to be Daubenton's bat was also recorded foraging at Newton of Shielhill.

3.4.7 Daytime habitat assessment and evening emergence surveys revealed many potential roost sites in structures and trees within the survey corridor, and a number of buildings with evidence of use by bats. Despite a thorough assessment of trees including evening emergence and dawn swarming

surveys and close examination of potential roost holes where these were accessible, few tree roosts were identified in proportion to the number of trees surveyed. This is likely to be due to the difficulties associated with confirming tree roosts and the transient nature of tree roost opccupation (see section 2.3). While Daubenton's bat roosts are likely to be located throughout the Don valley (Rydell et al., 1994) the most productive foraging habitat is likely to be in the lower reaches, including the reaches within the survey corridor (pers.comm Rob Raynor, SNH).

3.4.8 Four of the seven bat species known to be present in Aberdeenshire were observed during field surveys exhibiting a range of behaviour including foraging, commuting and emerging from roosts. Bat activity was observed along the entire survey corridor, with increased activity in certain predictable areas. Many landscape features such as tree-lined pathways and roads were used by common and soprano pipistrelle bats; high Daubenton's bat activity in relation to other bat species was observed around water features and wet woodland areas while thickets and denser woodland areas were used by brown long-eared bats as well as *Myotis* spp. (probably Daubenton's bat) and pipistrelle bats.

3.4.9 Feeding behaviour was observed in specific and predictable areas including at woodland edges and over water features such as burns and lochs (Walsh, 1996a & 1996b) and the lowest activity was observed in areas of high intensity arable agricultural land and industrial/residential areas with little vegetation and areas isolated from roost opportunities or linear habitat features.

3.4.10 Populations of bats are considered to be sparse in Aberdeen (pers. comm. G. McGowan, NES) so where more than two bats were observed at a time this is considered to represent a locally significant number of bats.

4 Evaluation

4.1 Introduction

4.1.1 Features within 500m of the proposed scheme considered to be of importance to bats have been described in the results section of this report in the context of each Habitat Area in the five geographical Sections of the Northern Leg. The evaluation section aims to assign a value to the Habitat Areas identified in the context of their actual or potential value to bats as described in Section 2.4.6. Habitat areas have been evaluated according to whether the site is an actual or potential bat habitat where R denotes roost or potential roost, C – commuting or potential commuting, F – foraging or potential for foraging, H – hibernating or potential for hibernating. Where bats were observed using a feature within a Habitat Area the importance of the species and the size of the population were assessed and, where bats were not recorded, the value of the habitat was assessed, using the evaluation of ecological receptor indicators and methods described in section 2.4.6 above.

4.1.2 The proposed scheme runs predominantly through agricultural land managed for pasture and arable farming, and many of the woodlands within the survey area are coniferous plantation; which are both considered to be of low value to bats (as reflected by the results of evening activity surveys). However there are a number of areas of suitable habitat including broadleaved woodland, tree lines and water features which are important because of their inherent value for bats seeking insect prey or roost sites, and also strategically due to their position or location within the landscape. Each Habitat Area has been evaluated separately but an overall summary value has been reached for each geographical Section within the Northern Leg according to its value to bats.

4.2 Evaluation Northern Leg

Evaluation – Section NL1 Derbeth – Tulloch Road

4.2.1 Of the seven Habitat Areas in this Section one is assessed as being of regional value due to the presence of an anecdotal roost at Newton Farm. Four are assessed as being of County importance due to their role in supporting foraging and commuting bats. These Habitat Areas are likely to be of strategic importance to bats by providing foraging opportunities and linear features between Kingswells and the Craibstone estate. Two Habitat Areas in this Section have been assessed as being of less than local value as bats were not observed using these areas which are exposed and provide limited resources suitable for foraging, commuting or roosting.

4.2.2 Section NL1 of the Northern Leg is therefore evaluated as being of Regional importance to bats as the roost maintains a population of an internationally important species (likely to be pipistrelle bats) which is not threatened or rare in the region or county. The evaluation of Habitat Areas in Section NL1 are shown in Table 16.

Table 16 – Evaluation of features in Section NL1 Derbeth – Tulloch Road

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N11 Agricultural fields north of C89c and east of Brimmond Hill	R (anecdotal)	R, F	Regional	Building roost maintains a small population of internationally important species that is not threatened or rare in the region or county.
N12 Agricultural fields surrounding Kepplestone Farm	F (anecdotal)	F, C	County	Site recognised by Local authority as DWS and SINS. Kepplestone House and scrub support a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining the population
N13 Agricultural fields between Brimmond Hill and Kepple-stone Farm	F	R	County	Pond supports a population of internationally important species (Daubenton's bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Trees provide shelter which is scarce in the locality, Kepplehill Burn provides potential foraging resource.
N14 Gough Burn DWS	C, F		County	Site recognised by Local authority as DWS and SINS. Gough Burn and adjacent habitats support a population of internationally important species (common pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Gough Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and foraging resource.
N15 Agricultural fields between Gough Burn and Newhills Wood			Less than Local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N16 Newhills Wood	C, F		County	Ashtown Road supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Road appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas including Newhills Wood and Craibstone estate.
N17 Agricultural fields and cemetery at Newhills		R	Local	Area of habitat including farm buildings with roost potential considered to appreciably enrich the habitat resource within the Local context.

Evaluation – Section NL2 SAC Craibstone

4.2.3 Of the 11 Habitat Areas within this Section one is evaluated as being of less than Local importance, two of Local importance and eight of county importance. No features were evaluated as being of higher importance due to the absence of roosts and the small numbers of bats involved using Habitat Areas within this Section. However, the overall value of this Section of the Northern Leg must take into consideration the importance of green corridors as the Craibstone Estate is strategically situated between roosting opportunities in Aberdeen and foraging opportunities and shelter at Kirkhill Forest to the west; and the Craibstone Estate provides habitat which is considered to be of high value to bats. Section NL2 of the Northern Leg is therefore considered to be of **County** importance to bats as the Section supports populations of internationally important species which are not threatened or rare in the region or county and is not integral to maintaining these populations.

4.2.4 The evaluation of Habitat Areas in Section NL2 is shown in Table 17.

Table 17 – Evaluation of features in Section NL2 SAC Craibstone

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N18 Agricultural fields between Gough Burn and golf course	C, F		County	Gough Burn and riparian habitats support a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations Gough Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and foraging resource, as per N14.
N19 Craibstone Golf Course	C, F		County	Gough Burn, which flows through the golf course, supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations as per N14/N24. Gough Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and foraging resource, as per N14. Golf course retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities; and is considered to have lower value per se.

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N20 Agricultural fields between Newhills Wood and Craibstone Estate			Less than Local	Fields retain habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.
N21 Parkhead Wood		C, F	Local	Area of habitat considered to appreciably enrich the habitat resource within the Local context by connecting higher value habitats and providing shelter.
N22 West Woods		C, F	Local	Area of habitat considered to appreciably enrich the habitat resource within the Local context by connecting higher value habitats and providing shelter.
N23 Woodland/Farmland west of C88c, north of Parkhead Wood	C	F	County	Site supports populations of internationally important species (soprano and common pipistrelle s) that are not threatened or rare in the region or county, and is not integral to maintaining those populations
N24 Woodland along Gough Burn	C, F	R	County	Gough Burn recognised by Local authority as DWS and SINS. Site supports populations of internationally important species (common pipistrelle s) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Semi-natural broadleaved woodland and burn habitat appreciably enriches the county habitat resource for foraging and roosting bats
N25 Woodland in west of SAC Campus	F, C	R	County	Site supports populations of internationally important species (pipistrelle s) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Semi-natural broadleaved woodland habitat appreciably enriches the county habitat resource for foraging and roosting bats.
N26 Woodland along Craibstone Burn	F, C	R	County	Site supports populations of internationally important species (pipistrelles and Daubenton's bats) that are not threatened or rare in the region or county, and is not integral to maintaining those populations. Semi-natural broadleaved woodland, pond and burn habitat appreciably enriches the county habitat resource for foraging and roosting bats.
N27 Woodland along Green Burn	F, C	R	County	Site supports populations of internationally important species that are not threatened or rare in the region or county, and is not integral to maintaining those populations. Mature broadleaved woodland and riparian habitat appreciably enrich the county habitat resource for foraging and roosting bats.
N28 Agricultural land in SAC campus east of C88c Road	F, C	R	County	Site supports populations of internationally important species (pipistrelle s) that are not threatened or rare in the region or county, and is not integral to maintaining those populations Value of these fields reflects value of woodland edge and burn habitats for foraging and commuting bats.

Evaluation - Section NL3 A96 – Nether Kirkton

4.2.5 Within the 20 Habitat Areas in Section 3 of the Northern Leg two are considered to be of less than Local importance, five of Local importance, 12 of county importance and one of Regional importance. These evaluations reflect the presence of roosts at Walton Farm and Sunnybrae, and the presence of small numbers of bats foraging and commuting around parts of Kirkhill Forest, although agricultural land and conifer plantation woodland which characterise much of this Section are considered to be of low overall value to bats. The overall value of this Section of the Northern Leg takes into consideration the location of Kirkhill Forest and other woodland areas on a green corridor which also includes the Craibstone estate (as per Section NL2 evaluation) and the Section (with the exception of the two roosts which are of **Regional** importance as discussed) is considered to be of **County** importance to bats as it supports populations of internationally important species that are not threatened or rare in the region or county and are not integral to maintaining these populations.

4.2.6 The evaluation of Habitat Areas in Section NL3 is shown in Table 18.

Table 18 – Evaluation of features in Section NL3 A96 – Nether Kirkton

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N29 Agricultural land northeast of Dyce Drive			Less than Local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.
N30 Agricultural land between A96 and Dyce Drive	2 R		Regional	Roost in Walton Farm maintains a population of internationally important species (soprano pipistrelle s) that is not threatened or rare in the region or county. Roost at Sunnybrae maintains a population of internationally important species that is not threatened or rare in the region or county.
N31 Chapelbrae Wood		F, R	Local	Area of semi-mature broadleaved woodland and tree lines considered to appreciably enrich the habitat resource within the Local context by providing potential roost and foraging in area otherwise sparse in similar resources.
N32 Agricultural land between Newton and Upper Coarsehill		C, F, R	Local	Species-rich verges, wall network, cottages and scrub habitat considered to appreciably enrich the habitat resource within the Local context.
N33 Agricultural land south of Standingstone s Wood and east of Kirkhill Forest	C	R, H, F	County	Forest edge supports a population of internationally important species (pipistrelle bat) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Building appreciably enriches the county habitat resource by providing suitable conditions for hibernating bats.
N34 Kirkhill Forest South		F, C	Local	Forest edges considered to appreciably enrich the foraging and commuting resource within the Local context.

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N35 Standing-stones Wood	F	R	County	Standingstones Wood supports populations of internationally important species (soprano and common pipistrelle s) that are not threatened or rare in the region or county, and is not integral to maintaining those populations. Woodland and buildings enhance County habitat resource providing shelter, roost opportunities and diverse habitat structure including scrub and wet areas supporting high invertebrate diversity within area of otherwise low value habitat (conifer plantation).
N36 Farburn Wood	F	R	County	Farburn Wood supports population of internationally important species that are not threatened or rare in the region or county, and is not integral to maintaining those populations.
N37 Kirkhill Forest North	F		County	Site supports a population of internationally important species (pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N38 Open habitats along Bogenjoss Burn within Kirkhill Forest	F		County	Bogenjoss Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas used by bats further downstream as per N40. Woodland and associated wet areas enrich County habitat resource providing shelter, and bat foraging habitat supporting diverse invertebrate life. Scrub provides shelter and supports invertebrates good for foraging bats (Mortimer et al. 2000).
N39 Agricultural fields around Standingstones Farm	C	R	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Forest edge and wall network appreciably enrich the county habitat resource by providing linear habitat connecting Habitat Areas.
N40 Lower Overton Wood		F	Local	Area of habitat considered to appreciably enrich the foraging resource within the Local context.
N41 Agricultural fields between Lower Overton Wood and East Woodland		R, H, F	County	Derelict building appreciably enriches the county habitat resource by providing suitable conditions for hibernating bats in area used by bats.
N42 Bogenjoss Burn downstream of Kirkhill Forest	F, C		County	Burn supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and excellent foraging habitat.
N43 East Woodlands	F, C	R, H	County	Burn supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. East Woodland and concrete pump house appreciably enriches the county habitat resource by providing excellent foraging and roosting/hibernating habitat.
N44 Agricultural fields west of Bogenjoss Burn			Less than local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities – these are provided by the nearby Bogenjoss Burn.

Habitat Area	Actual Activity	Potential activity	Evaluation	Reason for Evaluation
N45 Bogenjoss Burn and grounds of Pitmedden House	C, S	R	County	Bogenjoss Burn and woodland habitat (in combination with N61) support a population of internationally important species not threatened or rare in the region or county, and not integral to maintaining those populations. Burn appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and excellent foraging habitat.
N46 Agricultural fields south-east of Bogenjoss Burn	C		County	Site supports a small population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N47 Monument Wood	F, C	R, H	County	Monument Wood supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Monument appreciably enriches the county habitat resource by providing suitable conditions for hibernating bats.
N48 Agricultural fields between Monument Wood and Lower Overton Wood		C	Local	Network of field boundaries considered to appreciably enrich the commuting resource within the Local context.

Evaluation – Section NL4 Nether Kirkton - Corsehill

4.2.7 Of the 22 Habitat Areas in Section NL4 of the Northern Leg, two are considered to be of less than Local importance, six of local importance, 12 of County importance, one of regional and one of national importance. The relatively high proportion of Habitat Areas of county importance or above is a reflection of the fact that bats have been observed using many of the features within this Section, in particular those to the east of the River Don; the River Don and Goval Burn including the pipistrelle bat roost at Parkhill Pumping Station and incorporating the value placed on the Don and Dee valleys (Racey, undated) are considered to maintain regularly occurring, regionally significant numbers of internationally important species of bats including Daubenton's and pipistrelle bats. Good connectivity between features in the landscape including via Goval Belt and the Formartine and Buchan Way ensure that foraging and roosting resources are accessible to bats. The bat populations in this Section are therefore considered to be of **National** importance.

4.2.8 The evaluation of Habitat Areas in Section NL4 is shown in Table 19.

Table 19 – Evaluation of features in Section NL4 Nether Kirkton - Corsehill

Habitat Area	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N49 Agricultural fields and quarry north of railway	F	R	County	Site supports a small population of internationally important species (pipistrelle) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.

Habitat Area	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N50 Agricultural fields on either side of Dyce Drive south of railway line	F, C	R, H	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Pill box appreciably enriches the county habitat resource by providing suitable conditions for hibernating bats.
N51 Agricultural fields on southwest bank of River Don Valley		F	Local	Area of habitat considered to appreciably enrich the foraging resource within the Local context by extending the habitat provided by the River Don.
N52 Banks of the River Don - DWS	F, C	R	National	River Don and banks maintain regularly occurring, Regionally significant numbers of internationally important species (pipistrelles and Daubenton's bats) considered integral to maintaining these populations by maintaining a foraging and commuting route of National importance and supporting maternity roosts for Daubenton's bats of National significance.
N53 Woodland around Goval House	F	R	County	Site supports populations of internationally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations.
N54 Farmland between River Don and B977	F	C	County	Shelterbelts adjacent to River Don (N8) support a population of internationally important species (pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N55 Agricultural fields surrounding Goval Farm		R, F, C	Local	Scrub habitat, wall network and farm buildings considered to appreciably enrich the habitat resource within the Local context by connecting higher value habitats and providing foraging and roosting potential.
N56 Goval Wood	F	R	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Woodland habitats considered to appreciably enrich the county habitat resource.
N57 Plantat-ion north of Goval Wood		F	Local	Plantation edges considered to appreciably enrich the habitat resource within the Local context.
N58 Goval Belt	F, C	R	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Woodland strip appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas including Goval Burn and Reservoir, and woodlands at the Hill of Goval, and providing foraging habitat.
N59 Agricultural fields north of Goval Belt			Less than Local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.

Habitat Area	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N60 Agricultural fields south of Goval Belt between A947 and Formartine and Buchan Way		F	County	Riparian habitat along Goval Burn and Goval Mill Lade considered to appreciably enrich the County habitat resource in conjunction with N61 by connecting higher value habitats and providing shelter.
N61 Goval Burn and Goval Mill Lade	R, F, C		Regional	Parkhill Pumping Station maintains a population of internationally important species (common pipistrelle bats) that is not threatened or rare in the region or county.
N62 Formartine and Buchan Way	C	R	County	Site recognised by Local authority as DWS Track and scrub supports populations of internationally important species (brown long-eared and pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Track appreciably enriches the county habitat resource by providing linear habitat connecting Habitat Areas and foraging habitat.
N63 Park Hill Estate	F, C	R	County	Site supports a population of internationally important species (common pipistrelle) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Broad-leaved woodland and loch appreciably enrich the county habitat resource for foraging bats.
N64 Agricultural fields southeast of Formartine and Buchan Way			Less than Local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.
N65 Skate Wood		R, F	County	Site recognised as Local wildlife site. Mature broad-leaved woodland appreciably enriches the county habitat resource by providing excellent foraging and roosting habitat and strategically placed connecting habitat between areas used by bats.
N66 Roadside plantation and mature pine avenue at Little Goval		F, C	Local	Tree lines and plantation considered to appreciably enrich the habitat resource within the Local context by connecting higher value habitats and providing shelter suitable for commuting bats.
N67 Den Wood and roadside plantations		R, F, C	Local	Plantation woodland and buildings considered to appreciably enrich the habitat resource within the Local context by connecting higher value habitats and providing shelter suitable for roosting, foraging and commuting bats.
N68 Agricultural fields between B977 and Meadowhead Burn		C	Local	Wall network, pond and burn considered to appreciably enrich the habitat resource within the Local context by providing linear landscape elements along which to commute.

Habitat Area	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N69 Agricultural fields north of Meadow-head burn and east of Formartine and Buchan Way	C, F	R	County	Field boundaries and farms (North Waulkmill and Meadowhead) support a population of internationally important species (brown long-eared and pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N70 Agricultural fields east of B997 at Newpark Steading	C	F	County	Field boundaries support a population of internationally important species (brown long-eared bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.

Evaluation – Section NL5 Corsehill - Blackdog

4.2.9 Of the 25 Habitat Areas in Section NL5, four are considered to be of less than Local importance, four of Local importance, 14 of county importance and three of Regional importance. Although areas of high value habitat in this Section (including at Red Moss and shelterbelts at Cranfield) are separated by low value agricultural land with high exposure levels and little shelter, many bats were observed using these resources which reflects the importance of maintaining green corridors including that between Littlejohn's Wood and features in Section NL4. Section NL5 is considered to be of **Regional** importance as it maintains populations of internationally important species that are not threatened or rare in the region or county.

4.2.10 The evaluation of Habitat Areas in Section NL5 are shown in Table 20.

Table 20 – Evaluation of Habitat Areas in Section NL5 Corsehill - Blackdog

Feature number	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N71 Corsehill Wood	C	R, F	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Wood appreciably enriches the county habitat resource providing foraging and commuting resource especially since felling in Littlejohn's Wood.
N72 Littlejohn's Wood	F, C	R	County	Site recognised by Local authority as DWS. Site supports a populations of internationally important species (soprano and common pipistrelle bats) that are not threatened or rare in the region or county, and is not integral to maintaining those populations. Wood and remnants including lines of mature beech trees considered to appreciably enrich the county habitat resource by providing connecting habitat between Red Moss and Den Wood, and foraging and roosting resource.
N74 Woodland at Red Moss north of B977	F, C	R	County	Woodland supports populations of internationally important species (pipistrelle and brown long-eared bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Woodland appreciably enriches the county habitat resource by providing excellent foraging and roosting resource along green corridor.

Feature number	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N75 Raised bog at Red Moss north of B977		F	Local	Area of bog habitat considered to appreciably enrich the habitat resource within the Local context by providing foraging resource at edges of Red Moss Wood.
N76 Farmland and bare ground at Moss-Side north of B977	C	R	County	Site supports a population of internationally important species (pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N78 Mosaic of scrub and grassland west of Moss Belt	C	F, R	County	Site supports a population of internationally important species (pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Diverse habitat types including mature beech shelterbelt considered to appreciably enrich the county habitat resource by providing connectivity and foraging/roosting resource.
N79 Moss Belt Plantation	F	R	County	Plantation supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Plantation appreciably enriches the county habitat resource by providing roosting and foraging habitat of strategic importance.
N80 Agricultural Fields between B977 and Loch Hills Quarry	C, F	R	County	Pond supports a small population of an internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N81 Loch Hills Quarry		F	Less than local	Site retains habitats of limited ecological importance due to high levels of exposure.
N82 Red Moss south of B977	F	R	County	Site supports populations of internationally important species (soprano and common pipistrelle and brown long-eared bats) that are not threatened or rare in the region or county, and is not integral to maintaining those populations. Buildings, wet habitats, scrub and woodland appreciably enrich the county habitat resource providing excellent foraging and roosting habitat.
N83 Woodland between Red Moss and Lochgreens Farm	F	R	County	Woodland supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Woodland appreciably enriches the county habitat resource by connecting areas of habitat and providing suitable roosting and foraging opportunities.
N84 Agricultural fields south of Lochgreens Farm	C	R	County	Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N85 Corby and Lily Lochs and associated habitats – SSSI, DWS and SINS	F		County	Site recognised by Local authority as DWS and SINS. Site supports a population of internationally important species that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Lochs appreciably enrich the county habitat resource by providing high quality aquatic foraging opportunities.

Feature number	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N86 Agricultural fields between Red Moss and Newtonhill Farm	F	R	County	Site supports a population of internationally important species (soprano pipistrelle) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N87 Agricultural fields between Lochgreens Road and Gravel Pit	F, C	R	County	Site supports a population of internationally important species (pipistrelle bats) that is not threatened or rare in the region or county, and is not integral to maintaining those populations.
N88 Newton of Shielhill DWS	F		County	Site recognised by Local authority as DWS. Site supports a population of internationally important species (*Myotis* sp.) that is not threatened or rare in the region or county, and is not integral to maintaining those populations. Diverse habitat types appreciably enrich the county habitat resource by providing excellent foraging habitat.
N89 Agricultural fields between unclassified road and B999 (north)		F	Local	Area of habitat considered to appreciably enrich the habitat resource within the Local context by providing shelter and foraging resource.
N90 Agricultural fields between unclassified road and B999 (south)	F, C	R	Regional	Tree lines in conjunction with trees and roost in N91 maintain populations of internationally important species (common and soprano pipistrelle bats) that are not threatened or rare in the region or county. Tree lines provide connectivity between isolated roosting and foraging Habitat Areas at Red Moss and Harehill.
N91 Agricultural fields adjacent to Blackdog Burn east of B999	R, F, C		Regional	Tree lines and roost, in conjunction with N90 maintain populations of internationally important species (common and soprano pipistrelle bats) that are not threatened or rare in the region or county.
N92 Agricultural fields between B999 and Harehill Farm		F, C, R	Local	Mature trees, walls and scrub considered to appreciably enrich the habitat resource within the Local context.
N93 Agricultural fields between Harehill Farm and A90 south of Blackdog Burn	F, R (anecdotal)		Regional	Site once maintained and has potential to maintain a population of internationally important species that is not threatened or rare in the region or county.
N94 Agricultural fields west of A90 north of Blackdog Burn			Less than local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.
N95 Grassland east of A90, south of Blackdog			Less than local	Site retains habitats of limited ecological importance due to lack of foraging habitats, commuting routes and roosting opportunities.

Feature number	Actual Activity	Potential Activity	Evaluation	Reason for Evaluation
N96 Agricultural fields west of A90 either side of Potterton Road		R, F	Local	Farm buildings, scrub, grassland and broadleaved woodland habitat considered to appreciably enrich the habitat resource within the Local context by providing shelter and foraging opportunities in area of otherwise high exposure.
N97 Agricultural fields east of A90 north of Blackdog		R	Less than Local	Site retains habitats of limited ecological importance due to lack of foraging and commuting habitat and high levels of exposure.

Evaluation Summary

4.2.11 Over the whole of the Northern Leg 11 Habitat Areas were considered to be of less than local, 17 of local, 50 of county, six of Regional and one (the River Don) of National importance by virtue of its importance as a foraging and commuting route connecting Habitat Areas including bat roosts across the region. All of the Habitat Areas considered to be of Regional value contain bat roosts which maintain populations of internationally important species; and one (Cranfield tree lines) were considered on the basis of the numbers of bats observed alone. The dominance of county-important Habitat Areas reflects the fact that most resources within the Northern Leg study area with the potential to support foraging or commuting bats were observed being used by bats during evening surveys. Due to the presence of only small numbers of bats in such areas these were not considered to be of higher value. Where bats were not observed using Habitat Areas, but where the resources provide habitat of potential value to bats, for example due to their size or in terms of the foraging resource or shelter they provide, the Habitat Areas are considered to be of Local ecological value importance that they provide. The 11 areas of less than Local importance to bats were considered to lack any significant resources suitable for roosting, foraging or commuting.

4.2.12 Of the five geographical Sections within the Northern Leg of the proposed scheme Section NL4 and Section NL5 are considered to be the most important in terms of the size, quality and nature of habitats they provide and the number of bats observed within these Sections. Section NL1 is considered to be of relatively low value to bats despite the presence of an anecdotal roost, due to the paucity of other features within the Section considered suitable to support bats. Section NL2 and NL3 (with the exception of the roosts at Walton Farm and Sunnybrae which are of Regional importance) are considered to be of county importance as they provide a green corridor which includes the Craibstone Estate and Kirkhill Forest although plantation conifer woodland is generally considered to be of low overall value to bats (Walsh et al*.,* 1996a & 1996b).

5 Impact Assessment

5.1 Introduction

5.1.1 This section of the report will assess the magnitude and significance of impacts that the proposed scheme is likely to have on bats, their roosts, feeding habitat, reproduction and behaviour. Impact assessment is a crucial stage of EIA as the type and extent of mitigation required will depend on the likely impacts of the proposed scheme on bat populations and the features they use (Mitchell-Jones, 1994).

5.1.2 There are a number of different types of impact associated with road schemes and DMRB outlines key potential impacts resulting from roads and bridges (DMRB, 2001). These guidelines outline the possible effects road development may have on bats and bat populations, including the following:

- Direct habitat loss through land take including loss of roost and foraging areas;

- Severance of habitat features including habitat fragmentation, isolation and severance of connectivity between habitat fragments;
- Road traffic related mortality (RTA);
- Disruption to Local hydrology and associated degradation of wetland foraging areas;
- Polluted runoff;
- Effects of road lighting; and
- Habitat creation.

5.1.3 Potential impacts resulting from the proposed scheme vary in their effects on bat populations depending on the size of the population and the scale, extent, duration and persistent nature of the impact. In general, impacts that affect the number, distribution and suitability of roost opportunities and those that influence the availability of insect prey can be expected to have impacts on the behaviour and viability of bat populations within the route corridor. The size of the roost or population to be affected will also affect the significance of the impact. The most significant impacts are those which will involve the destruction of roosts and direct bat mortality. This is exacerbated by the relatively low availability of alternative roost sites around the landscape and the disproportionately large impact on bat populations a small number of displacements or deaths may have on bat communities in the area.

5.1.4 Impacts can be broadly categorised into those occurring during construction and those which arise as a result of the operation of the road, whether or not these impact directly or indirectly onto bats or their habitats. Impacts which arise during the construction phase and which are brought about as a result of temporary construction activities are considered to be of short – medium term in duration, and impacts are assessed on the basis that bats and their habitat will return to their initial state during the operation of the road. Impacts which are irreversible and permanent in their nature and those which are likely to endure into the operational phase of the road (including the loss of roosting and foraging opportunities for bats) are considered to be longer-term impacts although their effects on local bat populations may arise during the construction of the road. The impacts associated with the construction and operation phases are discussed as such below. In addition indirect impacts may occur as a secondary result of development.

5.1.5 Within each geographic Section the specific characteristics of potential impacts of the road with respect to the features of value to bats (see Section 2.6) are considered using the criteria listed in Table 3. Aspects of road design including bridges, underpasses, junctions and embankments are also considered in the assessment of impacts as are the potential consequences of construction methods and the location of plant and attenuation.

5.1.6 The specific impacts of road construction and operation vary in their significance in relation to the area of the habitat or feature impacted. While the loss and severance of woodland corners, edges and tree lines may represent only a small area of habitat the implications for bats using these areas may be disproportionately large.

5.2 Generic and Indirect Impacts

5.2.1 Indirect impacts and generic impacts which are likely to apply throughout the proposed scheme have been identified and are described below according to the impact and the stage (construction or operation). In cases where generic impacts are likely to be larger due to cumulative effects or the nature of the feature in question this has been assessed in a separate report.

5.2.2 The magnitude of generic impacts is predicted to increase in proximity to roosts and the distance of proposed construction and operation activities from roosts must be established prior to work commencing in order that impacts may be assessed.

Direct Mortality

5.2.3 Bats are relatively long-lived, 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 making bat populations particularly susceptible to impacts that compromise their numbers or ability to reproduce (Kunz, 1982).

Construction

5.2.4 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 confers an additional risk of prosecution if bats are killed or roosts destroyed, as bats and their resting places are protected by law (see Section 1.2).

Operation

5.2.5 There is a risk of road traffic accidents (RTA) 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 these 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 the bat species present in Aberdeenshire fly relatively low above the ground when commuting (Bach et al., 2004).

5.2.6 Highway projects can cause bat traffic casualties for a number of reasons including severance of a bat commuting route either directly or indirectly by eg; lighting. Placement of a new road close to a roost / s which may encourage bats to use new features parallel with the route as new flightlines. Air turbulence caused by fast and large road traffic is though to suck nearby bats into the path of oncoming vehicles. Lighting can encourage some species (e.g. noctules, pipistrelles and Leisler's bats) to forage close to highways as prey is attracted to roadside lighting. It is though that juveniles may be at greater risk due to their inexperience (Highways Agency, 2005).

Habitat Loss

5.2.7 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 broadleaved 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 – long term following the construction period the quality of the habitat may be reduced, especially if the connectivity between remaining patches is also compromised.

5.2.8 Bats use linear features such as rivers, hedgerows and treelines as commuting routes between roosts and foraging grounds (Limpens & 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 (Warren et al., 2000) as per impacts of direct mortality and fragmentation.

Construction

5.2.9 In the short to medium term habitat loss will be manifested through land-take for the siting of compounds, access roads and other construction activities. The locations of construction activities are not known but the impact assessment identifies potential habitat loss impacts that could be expected due to such activities.

Operation

5.2.10 Permanent habitat loss will be caused by the permanent road structure and associated embankments, cuttings and slip roads..The loss of high value foraging and commuting habitat may affect the viability of an area to support bats in the long term.

5.2.11 The loss of roosts during the construction phase of the scheme is regarded as an operational impact, since their loss has an immediate and permanent impact on using the roosting. Furthermore, the proximity of a roost to the operating road may affect the long-term suitability of the roost for use by bats as even subtle alterations in air flow, the accessibility of roost entrances and the availability of nearby shelter can affect bats' use of a roost or the likelihood of the roost being used.

5.2.12 It is assumed that burn realignment will involve the permanent restructuring of the burn and loss of geomorphological and vegetation features suitable for supporting insect prey, and will therefore represent the permanent loss of foraging habitat into the operational phase.

5.2.13 Habitat enhancement may be an indirect result of construction for example the provision of attenuation ponds for the settling of road runoff may enhance the value of areas for bats by creating new drinking and foraging opportunities on maturation where they previously did not exist.

5.2.14 Aside from direct loss of roosts / roost access, high way schemes may damage foraging habitat either by direct land-take and fragmentation, or by indirectly severing commuting routes form roosts, polluting watercourses and water bodies or through the effects of light spillage (Highways Agency, 2005).

5.2.15 In addition the modification of commuting routes by habitat loss may cause bats to fly into the path of oncoming traffic, leading to direct mortality due to Road Traffic Accidents (RTAs) as per the direct mortality and habitat fragmentation sections.

Habitat Fragmentation and Isolation

5.2.16 Many of the impacts of habitat fragmentation and isolation are common to the construction and operation phases, and also to the impacts of habitat loss and direct mortality. Impacts include the loss of hedges, fences and tree lines used for navigation by bats, which may be a particularly significant impact to low flying bats including pipistrelle and *Myotis* species, and brown long-eared bats (Limpens & 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 100m of a maternity roost as pregnant females may need to feed closer to the roost (Racey & 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.

Construction

5.2.17 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 construction activities for the proposed AWPR are not known but the impact

assessment identifies potential habitat fragmentation and isolation impacts that could be expected due to such activities.

Operation

5.2.18 Where the road or junctions pass directly through habitat used by bats areas of 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. Although mitigation measures may restore some connectivity it is likely that some degree of connectivity will be lost in the long term with implications for bats' navigation around the landscape and access to resources.

5.2.19 Long term impacts of the proposed scheme will include the presence of lanes of moving traffic which will 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 positive 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 (pers. comm. Rob Raynor, SNH).

Disturbance

5.2.20 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.

Construction

5.2.21 Increased human presence and the use of heavy machinery, especially due to felling and earthworks, is likely to cause extra dust, noise and vibration which will cause disturbance to roosting bats and may even cause bats to abandon a roost, especially if works take place at night.

5.2.22 Night-time working involving floodlighting may cause disruption of foraging and commuting behaviour (Rydell & 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.

5.2.23 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.

Operation

5.2.24 While fast-flying bat species including Leisler's bats, and also pipistrelle bats, may be attracted to the insects which feed over street lamps, slower flying species including brown long-eared, Natterer's and Daubenton's bats, are likely to avoid areas once street lights have been installed (Rydell & Racey 1993). It is not known how much lighting provision there is likely to be along the proposed scheme although the provision of lighting at junctions and along the carriageway would be likely to have wide-ranging implications on the distribution and foraging behaviour of bats, especially if used along river corridors, and near woodland edges.

5.2.25 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 etc (Schofield & Mitchell-Jones, 2003).

Pollution

Construction

5.2.26 During construction fluctuation in water regimes in 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 as per Geomorphology and Freshwater reports in Appendices B8 and B10.16. Such fluctuations are likely to result in modification of the insect prey availability with subsequent consequences for foraging bats. Pollution and impacts affecting aquatic habitats are dealt with fully in the Otter and River Habitats reports in Appendices B10.6 and B10.16, and are therefore not covered in detail in this report.

5.2.27 The introduction of dust and particulate matter (PM_{10}) into the atmosphere during construction has the potential to affect the availability and abundance of bats' insect prey as well as causing other health risks to the bats using the area.

Operation

5.2.28 Long term alterations in the sediment load and channel morphology of water features due to road surface runoff, and alteration of water quality due to runoff and spills during road construction and operation may affect the availability of insects. Insects are sensitive to changes in water quality over time and suitability of water and wetland features for foraging especially by Daubenton's and Pipistrelle bats which rely on the insect prey that such habitats provide (Rydell et al., 1994). In addition spills of a toxic nature may pollute drinking water directly and oil on the surface of water would reduce its suitability for drinking. The impacts due to pollution have been covered in the otter and river habitat reports.

5.2.29 Maintenance of the highway, such as resurfacing, may involve temporary disturbance if night-time working is used or if verge habitats and associated foraging areas are altered. The effects of pollution are covered in the preceding section.

Positive Impacts

5.2.30 Few positive impacts are likely to arise as a result of the proposed scheme in the absence of sensitively designed mitigation measures, and many of the potential positive impacts will be balanced by adverse impacts as a result of the construction and operation of the road.

5.2.31 The creation of a linear feature through the landscape may potentially provide linear habitat suitable for connecting alternative foraging and roosting areas only if sensitive mitigation planting alongside the road is also included in the design of the scheme. However bats are unlikely to use a road and roadside habitats in preference to existing linear features including drystone dykes, tree lines and waterways, and care must be taken in order to avoid increasing the risk of traffic casualties by attracting bats to the road, as indicated earlier.

5.2.32 Road lighting has the potential to attract insects and is considered a reliable food source, and while Plecotus and *Myotis* species tend to avoid lights to escape predation, Pipistrelle bats will swarm around lamps and feed on insects (Rydell & Racey, 1993). However it has been observed that such behaviour is associated with an increased risk of road traffic casualties as well as a potential increased risk of predation (Highway Agency, 2005).

5.2.33 The proposed scheme will result in reduced traffic flows on existing roads which currently lack mitigation measures. Although no bat RTAs have been recorded in the study area it is likely that a number of incidents go unrecorded. The reduction in traffic speeds along unmitigated roads may thereby help to reduce direct road mortality on these roads. However this positive impact is unlikely to be outweigh direct mortality as a result of other iimpacts of the road.

5.2.34 Characterisation of Specific Impacts

5.2.35 A precautionary principle has been adopted whereby Habitat Areas where bat activity was not recorded in the fiels, have been evaluated according to their potential value for bats, as described in Section 2.4.6 of this report.

5.2.36 The impact significance of actions which pose a threat to bats themselves including direct mortality and disturbance of roosting bats have been assessed according to the importance of the species to be impacted (as defined in section 2.5.2) and the likely impact on the population if the activity were to take place.

5.2.37 The impacts referred to in this report refer only to the potential to affect bats and their behaviour and viability; the impacts on the inherent ecological value of the habitats in question can be found in the Terrestrial Habitats Report (Appendix A10.1) and the Freshwater Reports (Appendix A10.16) and will not be discussed further in this report.

5.2.38 Many impacts within the following tables are recurrent, and although this is repetitive, it provides a thorough assessment of the impacts upon each specific Habitat Area in terms of bats.

5.3 Specific Impacts Section NL1 Derbeth - Tulloch Road

5.3.1 Within Section NL1 of the Northern Leg, the risk of direct mortality is predicted where the road passes between a roost and roosting opportunities at Newton Farm and Kepplestone Wood, and at Ashtown Road which is to be severed by the scheme and where a bat commuting route has been identified. No roosts are to be lost in this Section and while habitat loss is to be undertaken at Brimmond Hill, Kepplestone and Gough Burn this is not likely to involve the destruction of roosts and is likely to affect only the suitability of these areas for foraging. There is likely to be disturbance at Newton Farm and Kepplestone; during construction as a result of activities disrupting roosts and potential roosts, foraging areas and flight lines, and during operation as a result of noise and lights on the road, which are likely to reduce the suitability of these areas for bats although bats are likely to adapt to the disturbance in the long term.

5.3.2 Pollution is likely to be an issue at Kepplehill Burn and Gough Burn, although its effects are likely to be reversible in the medium – long term. Potential positive impacts are limited to the provision of new flight lines between potentially important Habitat Areas including Brimmond Hill/Dykeside, and Gough Burn/the Craibstone Estate, through an area which at present has low value for bats.

5.3.3 The specific impacts for Section NL1 of the Northern Leg are shown in Table 21.

Table 21 – Assessment of Potential Impacts Section NL1 Derbeth – Tulloch Road

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N11 Agricultural fields north of C89c and east of Brimmond Hill	Regional	0m – scheme passes through west of Habitat Area and within 100m of Newton Farm	Construction	Disturbance of roost in Newton Farm due construction of North Kingswells Junction	Medium Negative	Moderate adverse
			Operation	Risk of RTA if bats try to cross between roost and foraging sites at Kepplestone Wood	High Negative	Major adverse
				Proposed scheme will act as barrier to bats commuting between Kepplestone Wood and roost opportunities in the garage at Kepplestone House and Newton Farm	Medium Negative	Moderate adverse
				Road lighting on embanked section of road and at Kepplestone bridge likely to impact on farm	Medium Negative	Moderate adverse
N12 Agricultural fields surrounding Kepplestone Farm	County	0m – scheme passes through west of Habitat Area within 100m of Kepplestone Farm	Construction	Disturbance along woodland edges and Kepplehill Burn during construction of Kingswells Junction and due to lighting	Medium Negative	Moderate adverse
				Some risk of alteration of water quality and suitability as foraging ground during construction	Medium Negative	Moderate Adverse
			Operation	Loss of >0.5 ha scrub and associated foraging habitat	Low Negative	Minor adverse
				Proposed scheme will act as barrier to bats commuting between Kepplestone Wood and roost opportunities in the garage at Kepplestone House and Newton Farm	Medium Negative	Moderate adverse
				Some risk of alteration of water quality and suitability as foraging ground from road runoff	Medium Negative	Moderate Adverse
N13 Agricultural fields between Brimmond Hill and Kepple-stone Farm	County	0m – scheme passes through east of area within 200m of pond	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
			Operation	Proposed scheme will act as barrier to bats commuting between Kepplestone Wood and roost opportunities in the garage at Kepplestone House and Newton Farm	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N14 Gough Burn DWS	County	0m – scheme passes eastern edge of Habitat Area	Construction	Low risk of alteration of water quality and suitability as foraging ground during construction as Habitat Area upstream of road	Low Negative	Minor Adverse
			Operation	Severance of Gough Burn as per N19/N24 will disrupt foraging and commuting route Low risk of alteration of water quality and suitability as foraging ground from road runoff as area upstream of road	Medium Negative Low Negative	Moderate Adverse Minor Adverse
N15 Agricultural fields between Gough Burn and Newhills Wood	Less than Local	0m – scheme passes through Habitat Area	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
			Operation	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
N16 Newhills Wood	County	0m – scheme severs road and commuting route	Construction	Disruption of flight lines along road and known flight route along Ashtown Road if site compounds located nearby.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties due to severance of flight route along Ashtown Road Proposed scheme will act as a barrier to bats flying along road and field boundaries along known flight route	High Negative Medium Negative	Moderate adverse Moderate adverse
N17 Agricultural fields and cemetery at Newhills	Local	200 m	Construction	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible

5.4 Specific Impacts Section NL2 SAC Craibstone

5.4.1 Within Section NL2 of the Northern Leg the risk of direct mortality is highest due to demolition at Sunnybank cottages and felling on the Craibstone Estate especially where mature trees are to be felled adjacent to Gough, Craibstone and Green Burns, although no known roosts are to be impacted under the proposals. Much of the habitat loss in this Section will involve the felling of low value conifer and mixed plantation woodland to the west of the SAC campus although small areas of higher value broadleaved woodland along Gough, Craibstone and Green Burn will be lost and fragmented under the scheme. This is likely to have both short term impacts on the behaviour of bats using the area and on the suitability of the remaining habitat to support populations of foraging and roosting bats; and also longer term and irreversible impacts due to the fragmentation of the remaining habitat and reduced accessibility of the resources in the area. This is likely to be compounded by the severance of flight lines along Gough Burn, Craibstone Burn and Green Burn under the proposed scheme. These watercourses are also likely to be subjected to pollution during construction and operation of the road if measures are not taken to reduce these impacts. The reduction in water quality this would cause, although it may be reversible in the medium – long term, would further disrupt the suitability of these burns as foraging areas, effectively resulting in the loss of foraging habitat beyond the extent of construction activities in the medium term. Disturbance to roosting and foraging bats is likely during construction in Section NL2, especially if night works are used.

5.4.2 The specific impacts for Section NL2 of the Northern Leg are shown in Table 22.

Table 22 – Assessment of Potential Impacts Section NL2 SAC Craibstone

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N18 Agricultural fields between Gough Burn and golf course	County	0m – scheme passes over eastern edge of Habitat Area	Construction	Disruption of flight lines along Ashtown Road and known flight route as per N16/N24 Low risk of alteration of water quality and suitability as foraging ground during construction as area is upstream of road	Medium Negative Low Negative	Moderate adverse Minor Adverse
			Operation	Severance of Gough Burn as per N19/N24 will disrupt foraging and commuting route along burn and reduce accessibility of foraging and roosting areas either side. Low risk of alteration of water quality and suitability as foraging ground from road runoff as area is upstream of road	Medium Negative Low Negative	Moderate Adverse Minor Adverse
N19 Craibstone Golf Course	County	0m – scheme passes over eastern edge of Habitat Area at Gough Burn	Construction	Disruption of flight lines along Gough Burn as per N14/N17/N24 Medium risk of alteration of water quality and suitability as foraging ground from road runoff	Medium Negative Medium Negative	Moderate adverse Moderate Adverse
			Operation	Loss of <0.5 ha of wet grassland, scrub and swamp habitat and associated foraging opportunities as per N24 Severance of Gough Burn as per N24 will disrupt foraging and commuting route along burn and reduce accessibility of foraging and roosting areas either side. Medium risk of alteration of water quality and suitability as foraging ground from road runoff	Medium Negative Medium Negative Medium Negative	Moderate adverse Moderate Adverse Moderate adverse
N20 Agricultural fields between Newhills Wood and Craibstone Estate	Less than local	0m – scheme passes over westernmost edge of Habitat Area	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
			Operation	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
N21	Local	250 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
Parkhead Wood			Operation	Indirect severance from Craibstone Estate if bats are unable to cross road	Medium Negative	Minor Adverse
N22 West Woods	Local	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Indirect severance from Craibstone Estate along green corridor if bats are unable to cross road	Medium Negative	Minor Adverse
N23 Woodland/Farmland west of C88c, north of Parkhead Wood	County	200 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Indirect severance from Craibstone Estate along green corridor if bats are unable to cross road	Medium Negative	Moderate Adverse
N24 Woodland along Gough Burn	County	0m – scheme severs Gough Burn and through Sunnybank Cottages	Construction	Generic mortality risk if bats roosting in area to be felled or buildings to be demolished	High Negative	Moderate adverse
				Some risk of alteration of water quality during construction	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties due to severance of flight route	High Negative	Moderate adverse
				Demolition of Sunnybank Cottages and adjacent farm buildings and loss of <0.5 ha riparian and broadleaved habitat along with associated roosting and foraging opportunities in construction of road and Craibstone College Access.	High Negative	Moderate adverse
				Effective severance of known flight route along watercourse	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground downstream due to runoff from road	Medium Negative	Moderate adverse
N25 Woodland in west of SAC Campus	County	0m – scheme severs woodland areas	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Disturbance possible if bats roosting in adjacent trees	Medium Negative	Moderate adverse
			Operation	Risk of road traffic accidents due to severance of woodland and flight lines	High Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Loss of approximately 2ha of semi-mature mixed plantation and semi-natural broadleaved woodland and associated roost and foraging opportunities including dead trees in area used by bats.	Medium Negative	Moderate adverse
				Severance and fragmentation of woodland: approximately 2.5ha to be isolated to east of scheme. Associated severance of probable commuting and foraging routes between roosts and foraging features and severance along a green corridor. Effective loss of woodland areas if bats cannot cross.	Medium Negative	Moderate adverse
N26 Woodland along Craibstone Burn	County	0m – scheme severs woodland and Burn	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Disturbance possible if bats roosting in adjacent trees, and due to disruption of flight lines during construction	Medium Negative	Moderate adverse
				Medium risk of alteration of water quality during construction	Medium Negative	Moderate adverse
			Operation	Risk of road traffic accidents due to severance of woodland and flight lines	High Negative	Moderate adverse
				Loss of approximately 3ha of semi-mature mixed plantation and semi-natural broadleaved woodland and associated roost and foraging opportunities in area used by bats.	Medium Negative	Moderate adverse
				Loss of some aquatic foraging/commuting habitat at Craibstone Burn and some risk of alteration of water quality during construction	Medium Negative	Moderate adverse
				Severance and fragmentation of high value woodland: approximately 2.5ha to be isolated to east of scheme. Associated severance of commuting and foraging routes along a green corridor. Effective loss of woodland areas if bats cannot cross.	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality of Craibstone Burn and pond and suitability as foraging ground downstream due to runoff from road	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N27 Woodland along Green Burn	County	0m – scheme crosses Burn	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Disturbance possible if bats roosting in adjacent trees and buildings especially due to construction of A96 Junction and slip roads	Medium Negative	Moderate adverse
				Disruption of flight lines along Green Burn and known flight route	Medium Negative	Moderate adverse
				Medium risk of alteration of water quality during construction	Medium Negative	Moderate adverse
			Operation	Risk of RTA due to severance of burn and flight route	High Negative	Moderate adverse
				Loss of approximately 100m of mixed broadleaved woodland and associated roosting, foraging and linear habitat in area used by bats	Medium Negative	Moderate adverse
				Woodland strip and Green Burn and associated linear habitat to be severed - effective loss of woodland on either side if bats cannot cross	Medium Negative	Moderate adverse
				Disturbance due to lighting from A96 junction likely	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality in Green Burn and suitability as foraging ground due to runoff from road	Medium Negative	Moderate adverse
N28 Agricultural land in SAC campus east of C88c Road	County	0m – scheme including A96 Junction crosses Habitat Area	Construction	Disruption of flight lines along Craibstone Burn as per N26	Medium Negative	Moderate adverse
			Operation	Risk of road traffic accidents due to severance of woodland and flight lines as per N26	High Negative	Moderate adverse
				Disturbance of foraging and commuting bats due to junction lighting	Medium Negative	Moderate adverse

5.5 Specific Impacts Section NL3 A96 – Nether Kirkton

5.5.1 Within Section NL3 of the Northern Leg direct mortality of bats may be an issue during construction at Standingstones Wood, East Woodlands, along Bogenjoss Burn and Monument Wood where trees suitable for roost have been identified which will be felled under the proposed scheme.

5.5.2 Habitat to be lost includes walls and species rich verges near Standingstones Wood, woodland at Standingstones Wood, conifer plantation at Kirkhill Forest, riparian and freshwater habitat along Bogenjoss Burn and woodland at East Woodlands with associated foraging potential and shelter.The loss of high value riparian woodland along Bogenjoss Burn and at East Woodlands is particularly likely to have long-lasting impacts on the suitability and extent of the foraging habitat there, in particular given the relative scarcity of such habitats in the locality. Standingstones Wood, Kirkhill Forest and Bogenjoss Burn will also be subject to fragmentation, a permanent and irreversible impact which could affect the availability of resources to bats which roost on the southern side of the road in particular, and which currently depend on the resources which the woodland and burn habitats provide, as these would be isolated from the south by the road. Severance of probable flight lines and isolation of Habitat Areas is predicted to occur between Standingstones Wood/Kirkhill Forest and Farburn Wood/Dyce, along Bogenjoss Burn and between East Woodlands and Monument Wood which will persist into the operation of the road if provision is not made for bats to cross.

5.5.3 Howemoss Burn, and in particular Bogenjoss Burn which is a regularly used and sheltered bat foraging and commuting area, are likely to be at risk of pollution during construction and operation if measures are not taken to protect these watercourses. Disturbance to roosting, foraging or commuting bats may be an issue at Walton Farm and Sunnybrae which are known bat roosts; and also where felling and construction are due to be undertaken at Chapelbrae Wood and Coarsehill, Balgosie, Kirkhill Forest, Standingstones Wood, East Woodlands, Bogenjoss Burn and Monument Wood, especially during construction and if night works are used.

5.5.4 The specific impacts for Section NL3 of the Northern Leg are shown in Table 23.

Table 23 – Assessment of Potential Impacts Section NL3 A96 - Nether Kirkton

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N29 Agricultural land northeast of Dyce Drive	Less than Local	500 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road	Negligible	Negligible
N30 Agricultural land between A96 and Dyce Drive	Regional	0m – scheme passes through Habitat Area	Construction	Disruption of probable flight lines between farms and foraging opportunities in Kirkhill area Disturbance possible if bats roosting in Walton Farm especially due to proximity to A96 junction and isolation from Sunnybrae by Kirkhill Industrial Estate Link Road	Low Negative Medium Negative	Minor adverse Moderate adverse
			Operation	Disturbance due to junction lighting	Medium Negative	Moderate adverse
N31 Chapelbrae Wood	Local	100 m	Construction	Disturbance possible if bats roosting in Chapelbrae Wood especially during construction of A96 junction and South Kirkhill Industrial Estate Link Road.	Medium Negative	Minor adverse
			Operation	No impacts predicted due to distance from scheme and lack of resources on opposite side of road	Negligible	Negligible
N32 Agricultural land between Newton and Upper Coarsehill	Local	0m – scheme passes through Habitat Area	Construction	Disturbance possible if bats roosting in Corsehill especially during construction of A96 junction and South Kirkhill Industrial Estate Link Road.	Medium Negative	Minor adverse
			Operation	No impacts predicted due to distance from scheme and lack of resources on opposite side of road	Negligible	Negligible
N33 Agricultural land south of Standingstones Wood and east of Kirkhill Forest	County	0m – scheme passes through Habitat Area	Construction	Disturbance possible if bats roosting in Balgosie Farm or commuting and foraging along forest edges especially during construction of South Kirkhill Junction, embankments and South Kirkhill Industrial Estate Link Road. Medium – high risk of alteration of water quality and suitability as foraging ground along length of Howemoss burn during construction	Medium Negative Low Negative	Moderate adverse Minor adverse
			Operation	Disturbance likely due to effects of lighting at junction if bats roosting in Balgosie	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Medium – high risk of alteration of water quality and suitability as foraging ground along length of burn due to runoff from road	Low Negative	Minor adverse
N34 Kirkhill Forest South	Local	Within 100 m	Construction	Disturbance possible if bats commuting and foraging along forest edges especially during construction of South Kirkhill Junction, embankments and South Kirkhill Industrial Estate Link Road.	Medium Negative	Minor adverse
			Operation	Indirect severance of potential commuting routes between forest and Dyce/roosts at Walton and Sunnybrae.	Low Negative	Minor adverse
N35 Standing-stones Wood	County	0m – scheme severs eastern part of woodland	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Additional disturbance to foraging and commuting likely as a result of earthworks in construction; disruption of probable flight lines between Standingstones Wood and Farburn Wood.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute between woodland fragments	High Negative	Moderate adverse
				Loss of approximately 2.25ha of birch scrub and regenerating conifer plantation, scrub and associated foraging habitat in area used by bats	Medium Negative	Moderate adverse
				Severance of Standingstones Wood and probable commuting routes between Kirkhill Forest and roosting and foraging habitat at Howemoss and Standingstones Farms, Farburn Wood and Dyce.	Medium Negative	Moderate adverse
				Fragmentation of Standingstones Wood - approximately 5ha of scrub and associated foraging opportunities to be isolated east of the road	Medium Negative	Moderate adverse
N36 Farburn Wood	County	300m	Construction	Disruption of probable flight lines between Farburn Wood and Standingstones Wood.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute between woodland areas over road	High Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Severance of probable commuting routes between Kirkhill Forest/Standingstones Wood and Farburn Wood and isolation of wood from roost and foraging opportunities on the other side of the road.	Medium Negative	Moderate adverse
N37 Kirkhill Forest North	County	0m – scheme severs eastern part of Habitat Area	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Additional disturbance to foraging and commuting bats in forest rides and edges likely during construction of road and Kirkhill Overbridge.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to cross between woodland fragments	High Negative	Moderate adverse
				Loss of approximately 2ha of low value commercial conifer plantation and localised semi-natural grassland and scrub habitats and associated foraging habitat in area used by bats	Medium Negative	Moderate adverse
				Severance of probable commuting and foraging routes between woodland fragments and along Bogenjoss Burn as perN38.	Medium Negative	Moderate adverse
				Fragmentation of Kirkhill Forest - approximately 5ha of plantation woodland and semi-natural grassland and scrub and associated foraging opportunities to be isolated east of the road.	Medium Negative	Moderate adverse
N38 Open habitats along Bogenjoss Burn within Kirkhill Forest	County	0m – scheme severs Burn	Construction	Disturbance likely to foraging and commuting bats in forest rides and edges and along the burn during construction and during burn realignment	High Negative	Moderate adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground downstream during construction	Medium Negative	Moderate adverse
			Operation	Bogenjoss Burn to be extensively realigned and associated disruption to aquatic habitat and suitability for foraging	High Negative	Moderate adverse
				Severance of forest and alteration of commuting routes along forest edges and Bogenjoss Burn as per N37	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Medium – high risk of alteration of water quality and suitability as foraging ground downstream due to runoff from road	Medium Negative	Moderate adverse
N39 Agricultural fields around Standingstones Farm	County	0m – scheme severs western parts of Habitat Area	Construction	Disruption of probable flight lines between Kirkhill Forest/Standingstones Wood and farms and Farburn Wood and Dyce.	Medium Negative	Moderate adverse
			Operation	Severance of probable commuting routes between Kirkhill Forest/Standingstones Wood and Farburn Wood and isolation of roost and foraging opportunities on either side of the road as per N36.	Medium Negative	Moderate adverse
N40 Lower Overton Wood	Local	200 m	Construction	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible
			Operation	Scheme will isolate Lower Overton Wood from foraging and roosting resources in Kirkhill Forest and Bogenjoss Burn	Medium Negative	Minor adverse
N41 Agricultural fields between Lower Overton Wood and East Woodland	County	0m – scheme severs Habitat Area approximately in half	Construction	Disruption of probable flight lines between Kirkhill Forest and Monument Wood. Disturbance possible if bats roosting in Bogenjoss House or derelict cottage during earthworks (ch320500 – 321500)	Medium Negative Medium Negative	Moderate adverse Moderate adverse
			Operation	Proposed scheme will isolate cottage from Bogenjoss Burn and East Woodland and associated foraging/roosting opportunities	Medium Negative	Moderate adverse
N42 Bogenjoss Burn downstream of Kirkhill Forest	County	0m – scheme severs burn in two places	Construction	Generic mortality risk if bats roosting in area to be felled Disturbance likely to foraging and commuting bats along burn as a result of earthworks during construction (ch320500 – 321500) Medium – high risk of alteration of water quality and suitability as foraging ground along length of burn during construction	High Negative High Negative Medium Negative	Moderate adverse Moderate adverse Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along Bogenjoss Burn and over road	High Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Bogenjoss Burn to be extensively realigned and associated disruption to aquatic habitat and suitability for foraging	High Negative	Moderate adverse
				Loss of approximately 5ha of mixed and riparian woodland and conifer plantation and associated foraging and roosting opportunities	Medium Negative	Moderate adverse
				Severance of burn and alteration of commuting and foraging routes along burn as per N38	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground along length of burn due to runoff from road	Medium Negative	Moderate adverse
N43 East Woodlands	County	0m – scheme crosses eastern edge of woodland	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Additional disturbance to foraging and commuting bats (including those using Bogenjoss Burn as per N42) likely during construction of road and due to earthworks (ch320500 – 321500)	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute over road	High Negative	Moderate adverse
				Loss of <0.5 ha of conifer plantation, broad-leaved woodland plantation and mature beech trees with associated roosting and foraging habitat at woodland edge	Medium Negative	Moderate adverse
				Severance of probable commuting and foraging routes between East Woodland and Monument Wood and along Bogenjoss Burn as per N47/ N38.	Medium Negative	Moderate adverse
N44 Agricultural fields west of Bogenjoss Burn	Less than local	100 – 200m	Construction	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligilbe
N45 Bogenjoss Burn and	County	200 m	Construction	Disturbance likely to foraging and commuting bats along burn as a result of earthworks during construction (ch320500 – 321500)	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
grounds of Pitmedden House				Medium – high risk of alteration of water quality and suitability as foraging ground along length of burn due to runoff from road	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute over road	High Negative	Moderate adverse
				Bogenjoss Burn to be extensively realigned upstream as per N38/ N42 with associated disruption to aquatic habitat and suitability for foraging	High Negative	Moderate adverse
				Severance of burn and alteration of commuting and foraging routes along burn as per N38 / N42, and toward Monument Wood as per N47	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground along length of burn due to runoff from road	Medium Negative	Moderate adverse
N46 Agricultural fields south-east of Bogenjoss Burn	County	0m – scheme crosses through southern edge of Habitat Area	Construction	Some loss of scrub and tree habitat due to earthworks (ch320500 – 321500)	Low Negative	Minor adverse
			Operation	Some loss of scrub and tree habitat due to road construction	Low Negative	Minor adverse
N47 Monument Wood	County	0m – Scheme passes through northern edges of woodland	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Moderate adverse
				Additional disturbance to foraging and commuting bats likely during construction of road and due to earthworks (ch320500 – 321500)	Medium Negative	Moderate adverse
				Disruption of probable flight lines between Monument Wood and Bogenjoss Burn/Pitmedden House.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute over road	High Negative	Moderate adverse
				Loss of <0.5 ha of low value commercial conifer plantation with associated foraging habitat at woodland edge	Low Negative	Minor adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Isolation of woodland from resources to north of road including East Woodland, Monument Wood and Bogenjoss Burn and severance of probable commuting and foraging routes as per N43 / N42 / N45.	Medium Negative	Moderate adverse
N48 Agricultural fields between Monument Wood and Lower Overton Wood	Local	100 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	No direct impacts predicted	Negligible	Negligible

5.6 Specific Impacts Section NL4 Nether Kirkton - Corsehill

5.6.1 Within the 22 Habitat Areas of Section NL4 of the Northern Leg direct mortality may be an issue during felling of mature trees alongside Goval Burn and Goval Mill Lade or, during operation, due to RTA at Nether Kirkton, Parkhill Pumping Station which is a known bat roost within 50m of the scheme; and along Goval Belt which is already severed by the A947.

5.6.2 Disturbance due to construction of the road is possible if bats are roosting in buildings at Nether Kirkton or Parkhill Pumping Station; the behaviour of foraging and commuting bats on the River Don, Goval Belt, Goval Burn and Mill Lade, the Formartine and Buchan Way and near Newpark Steading are also likely to be affected due to road construction and improvements to the A947 and B999. In particular the disturbance during construction at the River Don is likely to result in the effective severance and loss of up- or downstream foraging grounds in this important foraging area if bats cannot fly through, with short and medium term impacts on bat behaviour along this feature.

5.6.3 Permanent and irreversible loss of high value roosting and foraging habitat within this Section will be restricted to a few trees on the Don Banks, Goval Belt, Goval Burn and Mill Lade, the Formartine and Buchan Way, Parkhill Estate and Little Goval, although the longer term impact that this may have on bats in the area is likely to be higher given the overall paucity of woodland habitat and shelter in this Section and the likely disruption of established flight lines. Temporary loss of aquatic habitat due to the severance of the River Don is likely to have impacts on bat foraging and commuting behaviour in the area. The road will sever flight lines between Nether and Upper Kirkton, the Don and floodplain, between Goval Wood, Goval Belt and the reservoir along Goval Burn and Mill Lade, between Parkhill Estate and Goval, and between Skate Wood and Littlejohn's Wood along a green corridor. This is likely to have permanent implications for bats which currently forage and roost on opposite sides of the road, effectively isolating the habitats either side of the road and reducing accessibility if bats cannot cross.

5.6.4 Pollution during construction and operation of the road may affect the foraging habitat at the River Don and along Goval Burn and Goval Mill Lade and Corsehill Burn, an impact which is likely to be reversible but the risk of which will continue into the operation of the road.

5.6.5 The specific impacts for Section NL4 of the Northern Leg are shown in Table 24.

Table 24 – Assessment of Potential Impacts Section NL4 Nether Kirkton - Corsehill

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N49 Agricultural fields and quarry north of railway	County	200 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will further sever probable commuting routes between Habitat Area and roost and foraging resources in Nether Kirkton as per N50.	Medium Negative	Moderate adverse
N50 Agricultural fields on either side of Dyce Drive south of railway line	County	0m – scheme passes through Habitat Area	Construction	Disruption of flight lines between Habitat Area and River Don as per N49.	Medium Negative	Moderate adverse
				Disturbance likely due to construction of Pitmedden Road Underbridge and earthworks (ch322200 – 323000) if bats roosting in houses.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute over road	High Negative	Moderate adverse
				Scheme will further sever commuting routes between Upper Kirkton and roost and foraging resources in area N49.	Medium Negative	Moderate adverse
				Reduction in suitability of WWII pillbox as roost/hibernaculum	Low Negative	Minor adverse
N51 Agricultural fields on southwest bank of River Don Valley	Local	0m – scheme passes through Habitat Area	Construction	Disturbance of bats flying along Don and floodplain likely due to earthworks (ch322200 – 323000) and during construction of Don Crossing as per N52	Medium Negative	Minor adverse
			Operation	Minimal loss of marshy grassland and improved farmland with associated foraging potential during construction	Low Negative	Minor adverse
				Scheme likely to act as barrier to bats flying NW/SE along the Don and banks as per N52	Medium Negative	Minor adverse
N52 Banks of the River Don - DWS	National	0m – scheme passes over the River Don	Construction	Generic mortality risk if bats roosting in trees to be felled	High Negative	Major adverse
				River to be effectively severed during bridge construction, acting as barrier to bats flying along the watercourse and affecting territories and disrupting foraging behaviour.	High Negative	Major adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Medium – high risk of alteration of water quality and suitability as foraging ground during construction of Don Crossing.	High Negative	Major adverse
			Operation	Some risk of RTA if bats attempt to fly over the bridge	High Negative	Major adverse
				Loss of aquatic foraging habitat along river and loss of approximately 0.1ha of species-rich grassland, scub and associated foraging opportunities along banks. Loss of mature willow and associated potential roost	Medium Negative	Major adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground downstream due to runoff from road	Medium Negative	Major adverse
				Road lighting on the bridge likely to reflect onto water and may affect behaviour of bats flying along watercourse	Medium Negative	Major adverse
N53 Woodland around Goval House	County	500 m	Construction	No direct impacts predicted due to distance upstream of the proposed scheme	Negligible	Negligible
			Operation	River to be effectively severed downstream of Habitat Area as per N52, acting as barrier to bats flying along the watercourse and affecting territories and foraging behaviour in area used extensively by bats	Medium Negative	Moderate adverse
N54 Farmland between River Don and B977	County	0m – scheme passes through Habitat Area	Construction	Generic mortality risk if bats roosting in trees to be felled	High Negative	Moderate adverse
				Disturbance of bats flying along Don and floodplain likely during construction of Don Crossing and access track as per N52	Medium Negative	Moderate adverse
			Operation	Loss of <0.5 ha of shelterbelt, scrub and plantation woodland and associated roosting and foraging opportunities along banks of the River Don.	Medium Negative	Moderate adverse
				Scheme likely to act as barrier to bats flying NW/SE along the Don and banks as per N52	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N55 Agricultural fields surrounding Goval Farm	Local	0m – scheme passes through the Habitat Area and within 200m of Goval Farm	Construction	Disruption of possible flight lines between north and south of the road Disturbance possible if bats roosting in Goval Farm due to earthworks (ch323700 – 324050) and B977 Overbridge construction	Low Negative Medium Negative	Minor adverse Minor adverse
			Operation	Scheme severs area from foraging and commuting opportunities along Goval burn and Goval Mill Lade. B977 Overbridge may provide alternative safe commuting route over proposed scheme	Medium Negative Negligible	Minor adverse Negligible
N56 Goval Wood	County	400 m	Construction	No direct impacts predicted due to distance from the proposed scheme	Negligible	Negligible
			Operation	Scheme will sever Goval Wood from Habitat Areas and in the south including along Goval burn and Goval Mill Lade.	Low Negative	Minor adverse
N57 Plantation north of Goval Wood	Local	>500 m	Construction	No direct impacts predicted due to distance from the proposed scheme	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from the proposed scheme	Negligible	Negligible
N58 Goval Belt	County	300m (A947 improvements pass through woodland)	Construction	Generic mortality risk if bats roosting in trees to be felled Disruption of commuting route and foraging route alongside woodland due to A947 improvements	High Negative Medium Negative	Moderate adverse Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along Goval Belt Loss of approximately 0.25ha high value broadleaved woodland due to A947 road improvements Further severance of Goval Belt by road improvements and commuting route between Goval Wood and Goval Burn and reservoir in area used by bats.	High Negative Low Negative Medium Negative	Moderate adverse Minor adverse Moderate adverse
N59 Agricultural	Less than Local	300m (A947 road	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
fields north of Goval Belt		improvements pass through Habitat Area)	Operation	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
N60 Agricultural fields south of Goval Belt between A947 and Formartine and Buchan Way	County	0m (scheme passes through Habitat Area)	Construction	Generic mortality risk if bats roosting in trees to be felled as per N61	High Negative	Moderate adverse
				Disruption of commuting and foraging routes alongside burn and Mill Lade due to road construction and A947 improvements as per N61	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along canal and burn as per N61	High Negative	Moderate adverse
				Minimal loss of riparian habitat alongside Goval Burn and Goval Mill Lade and associated loss of foraging, commuting and roost potential as per N61	Medium Negative	Moderate adverse
				Severance of tree lines, burn and canal and associated commuting routes between Goval Reservoir and Goval Wood along Goval Belt, and between Goval Reservoir and the River Don and roost at Parkhill Pumping Station as per N61	Medium Negative	Moderate adverse
N61 Goval Burn and The Lade	Regional	0m – scheme passes over the Burn and the Lade; A947 improvements also cross burn and canal	Construction	Generic mortality risk if bats roosting in trees to be felled	High Negative	Major adverse
				Disturbance of roosting bats in Pumping station and trees likely due to vibration, noise and human presence especially during works to aquaduct.	High Negative	Major adverse
				Disruption of commuting route and foraging routes along burn and canal due to A947 improvements and road construction	Medium Negative	Moderate adverse
				Alteration of aquaduct and canal, and associated insect availability in area used by bats due to construction. Some risk of alteration of water quality and suitability as foraging ground due to construction	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along canal and burn	High Negative	Major adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
				Loss of 300m riparian habitat along burn and canal including mature trees and associated shelter, foraging and roosting habitat due to construction of road, A947 improvements and embankment	Medium Negative	Moderate adverse
				Reduction in suitablility of Parkhill Pumping Station as roost	High Negative	Major adverse
				Severance of tree lines, burn and canal and associated commuting routes between Goval Reservoir and Goval Wood along Goval Belt, and between Goval Reservoir and the River Don and roost at Parkhill Pumping Station	Medium Negative	Moderate adverse
				Moderate – high risk of alteration of water quality and suitability as foraging ground due to runoff from road	Medium Negative	Moderate adverse
N62 Formartine and Buchan Way	County	0m – scheme crosses the Formartine and Buchan Way	Construction	Disruption of commuting route and foraging routes along path due to A947 improvements and road construction	Medium Negative	Moderate adverse
			Operation	Loss of 300m scrub and species rich verge habitat and associated foraging habitat and fragmentation of foraging and commuting route	Medium Negative	Moderate adverse
				Some disturbance as a result of lighting on A947 Goval Junction	Medium Negative	Moderate adverse
N63 Park Hill Estate	County	0m – A947 improvements pass through Habitat Area	Construction	Generic mortality risk if bats roosting in trees to be felled	High Negative	Moderate adverse
				Disruption of probable commuting routes toward Goval area due to A947 improvements and road construction	Medium Negative	Moderate adverse
				Disturbance likely if bats roosting in trees to be retained due to junction construction	Medium Negative	Moderate adverse
			Operation	Loss of <0.5 ha of mature broad-leaved woodland and associated roosting and foraging opportunities due to construction of A947 improvements.	Low Negative	Minor adverse
				A947 improvements will sever Parkhill Loch and woodland from foraging and roosting opportunities in Goval area	Medium Negative	Moderate adverse
N64 Agricultural	Less than local	0m – scheme passes through	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
fields southeast of Formartine and Buchan Way		northernmost part of Habitat Area	Operation	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
N65 Skate Wood	County	250 m; junction at Meadowhead within 10 m	Construction	Some disturbance if bats roosting or foraging at edges of Skate Wood due to junction construction and earthworks (ch324500 – 325400)	Medium Negative	Moderate adverse
			Operation	Indirect severance as scheme will act as barrier between wood and potential roosts in Waulkmill and Goval	Low Negative	Minor adverse
N66 Roadside plantation and mature pine avenue at Little Goval	Local	0m – junction passes through Habitat Area	Construction	Generic mortality risk if bats roosting in trees to be felled Disturbance likely if bats roosting or foraging along plantation or tree lines due to junction construction and earthworks (ch324500 – 325400)	High Negative Medium Negative	Minor adverse Minor adverse
			Operation	Loss of <50m of pine shelterbelt and associated foraging and commuting opportunities due to junction construction Scheme will sever tree line and probable commuting route with possible RTA risk	Low Negative Medium Negative	Minor adverse Minor adverse
N67 Den Wood and roadside plantations	Local	300m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting north toward Littlejohn's Wood and Red Moss along green corridor as per N71 and N72	Medium Negative	Minor adverse
N68 Agricultural fields between B977 and Meadowhead Burn	Local	0m – scheme passes through Habitat Area	Construction	Disruption of probable commuting routes between Goval and Littlejohn's Wood due to road construction	Medium Negative	Minor adverse
			Operation	Loss of Corsehill pond and associated potential foraging resource Scheme will act as barrier between Waulkmill, Littlejohn's Wood and Red Moss; and Den Wood and the Parkhill Estate along green corridor as per N69, N71 and N72 although impacts on bats likely to be minimal in agricultural area.	Medium negative Low Negative	Minor adverse Minor adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N69 Agricultural fields north of Meadowhead burn and east of Formartine and Buchan Way	County	0m – scheme passes through southern edge of Habitat Area	Construction	Disturbance likely if bats roosting in Meadowhead Farm	Medium Negative	Moderate adverse
				Disruption of known flight lines between farms and Formartine and Buchan Way	Medium Negative	Moderate adverse
				Moderate risk of alteration of water quality and suitability as foraging ground or commuting route due to construction	Low negative	Minor adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along burn and path	High Negative	Moderate adverse
				Isolation of farms from foraging and roosting opportunities in Skate Wood and the Parkhill Estate to the south of the scheme	Medium Negative	Moderate adverse
				Moderate risk of alteration of water quality and suitability as foraging ground or commuting route due to construction	Low negative	Minor adverse
N70 Agricultural fields east of B997 at Newpark Steading	County	300m – improvements to access track immediately adjacent	Construction	Disturbance likely if bats roosting in Newpark Steading or foraging along edge of Littlejohn's Wood as per N72	Medium Negative	Moderate adverse
			Operation	Scheme will act as barrier to bats commuting north toward Littlejohn's Wood and Red Moss along green corridor as per N67 and N71	Medium Negative	Moderate adverse

5.7 Specific Impacts Section NL5 Corsehill - Blackdog

5.7.1 Within the 25 Habitat Areas of Section NL5 of the Northern Leg direct mortality is likely to be an issue during felling of mature trees along the edges of Littlejohn's Wood and at the tree lines at Cranfield, especially where a known tree roost is to due to be destroyed. During operation the severance of flight routes alongside Corsehill and Littlejohn's Woods, Lochgreens Road, Red Moss Burn, between Newtonhills and Newton of Shielhill, and along the tree lines at Cranfield may result in RTA where bats are likely to attempt to cross the road. Although the loss of habitat *per se* is considered to be minimal the effective loss of habitat either side of the road is likely to result in permanent and long-term adverse impacts on those populations of bats which depend on the provision of such commuting routes to access the resources either side of the road. In particular where the road is due to pass between potential roosting areas such as Red Moss and foraging areas such as Corby Loch, although the direct impacts on these features are expected to be minimal. In addition habitat fragmentation at the partially felled Littlejohn's Wood, and Cranfield tree lines, may permanently affect the value of these features for bats.

5.7.2 Disturbance to roosting bats may be an issue at Littlejohn's Wood and Red Moss where improvements and alteration of junction layout is proposed on the B977, and also at Lochgreens Farm and trees at Cranfield if bats are roosting in trees, or at Blackdog if buildings are being used as roost. Temporary and longer term disruption of flight lines is also likely along commuting routes at Corsehill Wood, Littlejohns Wood, Loch Hills Quarry road, Red Moss Burn, near Backhill of Cranbog and at Cranfield.

5.7.3 Pollution as a result of construction activity and runoff from the road is likely to affect Red Moss Burn (and, indirectly, Corby Loch) and Blackdog Burn with potential adverse medium-term impacts on the bats which use these features for foraging and commuting if provision is not made to prevent the degradation of watercourses.

5.7.4 The specific impacts for Section NL5 of the Northern Leg are shown in Table 25.

Table 25 – Assessment of Potential Impacts Section NL5 Corsehill – Blackdog

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N71 Corsehill Wood	County	0m – scheme passes through Habitat Area	Construction	Disruption of known flight lines along road at edge of Littlejohn's Wood and disturbance of probable foraging routes and flight lines alongside wood during construction.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to commute along woodland edge	High Negative	Moderate adverse
				Minimal loss of broadleaved plantation woodland and associated foraging potential	Low negative	Minor adverse
				Scheme will act as barrier to bats commuting north toward Littlejohn's Wood and Red Moss and south toward Den Wood and Parkhill Estate along green corridor as per N67 and N72	Medium Negative	Moderate adverse
N72 Littlejohn's Wood	County	0m – scheme passes through woodland	Construction	Generic mortality risk if bats roosting in trees to be felled	High Negative	Moderate adverse
				Possible disturbance if bats roosting in adjacent trees, especially due to junction improvement and construction of B977 East Overbridge	Medium Negative	Moderate adverse
				Disruption of known flight lines along road at edge of Littlejohn's Wood and disturbance of probable foraging routes and flight lines alongside wood during construction as per N71.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties due to severance of flight lines	High Negative	Moderate adverse
				Loss of approximately 11.5ha of largely felled woodland including 70m of mature beech tree line and associated roost and foraging opportunities in area used by bats.	Medium Negative	Moderate adverse
				Severance of known bat commuting and foraging route along a green corridor	High Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N74 Woodland at Red Moss north of B977	County	300 m; B977 improvements immediately adjacent	Construction	Possible disturbance if bats roosting in adjacent trees, especially due to B977 improvements Disruption of known flight lines along road at edge of Littlejohn's Wood and disturbance of probable foraging routes and flight lines alongside wood during construction as per N71.	Medium Negative Medium Negative	Moderate adverse Moderate adverse
			Operation	Some risk of road traffic casualties due to severance of flight lines as per N72 Severance of known bat commuting and foraging route along a green corridor as per N72	High Negative High Negative	Moderate adverse Moderate adverse
N75 Raised bog at Red Moss north of B977	Local	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting south toward Den Wood along green corridor as per N71 and N72	Medium Negative	Minor adverse
N76 Farmland and bare ground at Moss-Side north of B977	County	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting south toward Den Wood along green corridor as per N71 and N72	Medium Negative	Moderate adverse
N78 Mosaic of scrub and grassland west of Moss Belt	County	200 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting north/ south toward Den Wood along green corridor as per N71 and N72 and Corby/Lily Lochs as per N80/ N84	Medium Negative	Moderate adverse
N79 Moss Belt Plantation	County	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting north/ south toward Den Wood along green corridor as per N71 and N72 and Corby/Lily Lochs as per N80/ N84	Medium Negative	Moderate adverse
N80 Agricultural Fields between B977 and	County	0m – scheme passes through Habitat Area	Construction	Disruption of known flight lines along track and field boundaries between Red Moss and Loch Hills/ Corby and Lily Lochs as per N84. Disturbance of flight lines alongside wood during Lochgreens overbridge construction as per N71.	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
Loch Hills Quarry			Operation	Some risk of road traffic casualties due to severance of flight lines	High Negative	Moderate adverse
				Loss of Lochgreens pond and associated foraging opportunities	Medium Negative	Moderate adverse
				Severance of known bat commuting route. Scheme will act as barrier to bats commuting north/ south toward Den Wood along green corridor as per N71 and N72 and Corby/Lily Lochs as per N84	High Negative	Moderate adverse
N81 Loch Hills Quarry	Less than local	300 m	Construction	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road and lack of resources for bats	Negligible	Negligible
N82 Red Moss south of B977	County	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting south toward Corby/ Lily Lochs as per N84	Low Negative	Minor adverse
N83 Woodland between Red Moss and Lochgreens Farm	County	300 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting south toward Corby/ Lily Lochs as per N84	Low Negative	Minor adverse
N84 Agricultural fields south of Lochgreens Farm	County	0m – scheme passes through Habitat Area	Construction	Some disturbance possible if bats roosting in Lochgreens Farm	Low Negative	Minor adverse
				Disruption of known flight lines along track and field boundaries between Red Moss and Loch Hills/ Corby and Lily Lochs as per N80. Disturbance of flight lines alongside wood during Lochgreens overbridge construction as per N71.	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to cross the road	High Negative	Moderate adverse
				Scheme will act as barrier to bats commuting south toward Corby/ Lily Lochs as per N84	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
N85 Corby and Lily Lochs and associated habitats – SSSI, DWS and SINS	County	100 m	Construction	Disruption of probable commuting routes north to Red Moss during road construction as per N84 Low risk of alteration of water quality and suitability as foraging ground during construction	Medium Negative Low Negative	Moderate adverse Minor adverse
			Operation	Some risk of road traffic casualties if bats continue to cross the road as per N84 Scheme will act as barrier to bats commuting north toward Red Moss as per N84 Low risk of alteration of water quality and suitability as foraging ground due to runoff from road; attenuation as per N84 will offset.	High Negative Medium Negative Low Negative	Moderate adverse Moderate adverse Minor adverse
N86 Agricultural fields between Red Moss and Newtonhill Farm	County	100m from cuutting	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Scheme will act as barrier to bats commuting south toward Corby and Lily Lochs as per N84/N85, and toward Newton of Shielhill as per N87/N90	Medium Negative	Moderate adverse
N87 Agricultural fields between Lochgreens Road and Gravel Pit	County	0m – scheme crosses Habitat Area	Construction	Disruption of probable commuting routes during road construction	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties if bats continue to cross the road as per N84 Severance of probable commuting acting as barrier to bats commuting north toward Red Moss as per N84 and south toward Newton of Shielhill as per N90 and Corby and Lily Lochs as per N84/N85	High Negative Medium Negative	Moderate adverse Moderate adverse
N88 Newton of Shielhill DWS	County	400 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	Severance of probable commuting route – road will act as barrier to bats commuting north toward Red Moss as per N84 and south toward Newton of Shielhill as per N90 and Corby and Lily Lochs as per N84/N85	Medium Negative	Moderate adverse
N89	Local	300 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
Agricultural fields between unclassified road and B999 (north)			Operation	No direct impacts predicted due to distance from road	Negligible	Negligible
N90 Agricultural fields between unclassified road and B999 (south)	Regional	0m – scheme passes through habiatat area	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Major adverse
				Possible disturbance of bats roosting in adjacent trees, especially during construction of B999 Overbridge (ch32800 – 329500)	Medium Negative	Moderate adverse
				Disruption of commuting routes during road and B999 Overbridge construction	Medium Negative	Moderate adverse
			Operation	Some risk of road traffic casualties due to severance of flight lines	High Negative	Major adverse
				Possible disturbance if bats roosting in adjacent trees, and reduction in roost suitability due to operation	Medium Negative	Moderate adverse
				Loss of approximately 100m of mature trees and roost and associated roosting, foraging and linear habitat features along and adjacent to B999 Aberdeen – Tarves Road in area extensively used by bats	Medium Negative	Moderate adverse
				Proposed scheme and associated cutting will sever extensively used flight lines in an area otherwise sparse in alternative roost/linear features	High Negative	Major adverse
N91 Agricultural fields adjacent to Blackdog Burn east of B999	Regional	0m – scheme passes through habiatat area	Construction	Generic mortality risk if bats roosting in area to be felled	High Negative	Major adverse
				Possible disturbance of bats roosting in adjacent trees, especially during construction of B999 Overbridge (ch32800 – 329500)	Medium Negative	Moderate adverse
				Disruption of commuting routes during road and B999 Overbridge construction	Medium Negative	Moderate adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground of Blackdog Burn downstream during construction	Medium Negative	Moderate adverse

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
			Operation	Some risk of road traffic casualties due to severance of flight lines	High Negative	Major adverse
				Loss of tree roost	High Negative	Major adverse
				Loss of approximately 150m of mature trees and roost and associated roosting, foraging and linear habitat features along and adjacent to B999 Aberdeen – Tarves Road and alongside burns in area extensively used by bats	Medium Negative	Moderate adverse
				Possible disturbance if bats roosting in adjacent trees, and reduction in roost suitability due to operation	Medium Negative	Moderate adverse
				Proposed scheme and associated cutting will sever extensively used flight lines in an area otherwise sparse in alternative roost/linear features	High Negative	Major adverse
				Medium – high risk of alteration of water quality and suitability as foraging ground downstream due to runoff from road	Medium Negative	Moderate adverse
N92 Agricultural fields between B999 and Harehill Farm	Local	200 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road	Negligible	Negligible
N93 Agricultural fields between Harehill Farm and A90 south of Blackdog Burn	Regional	200 m	Construction	No direct impacts predicted due to distance from road	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road	Negligible	Negligible
N94 Agricultural	Less than local	0m – scheme passes thorugh	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible

Habitat Area	Evaluation	Distance from scheme (m)	Phase of Scheme	Impacts	Impact Magnitude	Impact significance
fields west of A90 north of Blackdog Burn		Habitat Area	Operation	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
N95 Grassland east of A90, south of Blackdog	Less than local	0m – A90 improvements and site accesses immediately adjacent	Construction	No direct impacts predicted due to lack of resources of value to bats adjacent to road	Negligible	Negligible
			Operation	No direct impacts predicted due to distance from road	Negligible	Negligible
N96 Agricultural fields west of A90 either side of Potterton Road	Local	0m – A90 improvements and junction immediately adjacent to Habitat Area	Construction	Some disturbance likely due to construction of Blackdog A90 junction if bats roosting in farm buildings	Medium Negative	Minor adverse
			Operation	Some disturbance likely as a result of lighting at the Blackdog A90 junction	Medium Negative	Minor adverse
N97 Agricultural fields east of A90 north of Blackdog	Less than Local	0m – A90 improvements and junction immediately adjacent to Habitat Area	Construction	No impacts predicted due to lack of resources for bats	Negligible	Negligible
			Operation	No impacts predicted due to lack of resources for bats	Negligible	Negligible

5.8 Impact Assessment Summary

5.8.1 The scheme is likely to result in the greatest direct impact on bats and bat populations in the Northern Leg by way of direct mortality as a result of roost and potential roost loss and RTA. Small changes in the distribution of roosts, the number of bats and the accessibility and distribution of resources in relation to the road may have wide ranging implications for the survival of bat populations on larger scales. The effects of disturbance both as a results of noise, vibration, lighting and increased human presence as well as the construction activities themselves on roosts and flyways can affect the readiness with which bats utilise such features with subsequent implications for the availability and distribution of suitable roosting and commuting areas.

5.8.2 The effects of habitat severance, isolation and fragmentation are also important issues to bats which use large home ranges and different habitats within the landscape; as optimal roosting and foraging habitat is scarce it is important to retain connectivity between the best habitats especially for those species which avoid open situations in favour of sheltered corridors. The construction of roads can act as a barrier to the free movement of bats between such habitats and interrupt flight paths (Bach et al*,.* 2004). The proposed scheme is likely to result in an increase in the number of bats that may be killed on the road and a reduction in the viability of Habitat Areas to support bat populations. Similarly the reduction in suitability of freshwater habitat as a result of pollution incidents during construction and operation of the new road scheme which crosses a number of watercourses, may influence the value of such watercourses if the availability of insect prey changes.

5.8.3 In general the proposed scheme passes through agricultural land of low overall value to bats or Habitat Areas where small numbers of bats are involved or the distance of the proposed scheme from features of value to bats are large enough that impacts are considered to be minimal. This is reflected by impacts of less than moderate significance for many Habitat Areas; potential positive impacts associated with road construction on local bat populations are limited to the creation of edge habitat where woodland habitats are to be fragmented, and the reduction in traffic speeds on existing roads. However the overall impacts of the proposed scheme are predicted to be adverse.

6 Mitigation and Recommendations

6.1 Introduction

6.1.1 This section of the report suggests measures that may be used to prevent, reduce or offset environmental effects of development on the bat species and habitat features stated above, in accordance with the EIA regulations. Where impacts cannot be prevented or reduced to acceptable levels, compensation works must be carried out to offset the adverse effects. The level of mitigation should be proportionate to the size and scale of impact predicted and the status of the bat population to be impacted. Habitat loss should be compensated for on a like-for-like basis by providing equivalent habitat in terms of area of land, numbers of trees and the species of tree or shrub to be lost.

6.1.2 The Bat Mitigation Guidelines (Mitchell-Jones, 2004), Habitat Management for Bats (Entwistle et al*.,* 2001) and the Design Manual for Roads and Bridges (HA 80/99) as well as British Standards and National Planning Policy Guidelines (NPPG) and consultation with the Aberdeen Bat Group and SNH were used in the design of mitigation measures for bats.

6.1.3 Mitigation has been proposed for some features where the impact significance has been predicted to be of less than moderate significance as they assume a precautionary principal (that bats are present) and that the generic mitigation proposed is good practice with minimal effort.

6.1.4 Specific mitigation measures for each of the five geographical Sections have been indicated in Tables 27 – 31 below. Impacts associated with the construction (C) and Operation (O) of the proposed scheme have been summarised with the magnitude and impact significance in brackets in the tables. Many of the mitigation measures to be implemented apply to both the construction and operation phases; the specific impacts section above gives details.

6.1.5 Generic mitigation has not been displayed graphically in the figures; specific mitigation including the location of bat boxes, structures to be enhanced and crossing points are illustrated in Figures 10.3a-g. Specific mitigation proposals including areas of habitat creation are illustrated in the Landscape and Ecological Mitigation Proposalse in Figures 11.5a-p.

6.2 Generic Mitigation

6.2.1 Generic mitigation measures are described in Table 26 and will be adopted along the entire route. Specific mitigation recommendations required in addition to generic measures and relating to individual Habitat Areas within each geographic Section are addressed in Tables 27 – 30. A precautionary approach has been adopted whereby mitigation has been recommended wherever a significant adverse impact on bats and bat populations has been predicted, even in areas where no bats were recorded in surveys. Survey limitations including adverse weather conditions during surveys and the difficulty in locating roosts (see section 2.4) have also been taken into account in the design of mitigation measures. This approach is necessary due to the seriousness of offences made under UK and European law in relation to bats and to ensure that the targets and objectives of the UK and Local BAPs (see Section 1.2) are met and to ensure there is no overall decline in bat populations.

6.2.2 It is recommended that a pre-construction Bat Mitigation Strategy be developed to ensure that effective and appropriate mitigation can be planned and implemented before any impacts on bats are likely to occur. This would include the regular monitoring of potential roost sites, including trees and buildings, which are likely to be affected by the scheme. Such a strategy will ensure mitigation is effectively undertaken and avoid delays in construction programming due to bat mitigation measures. For each Section of the route, the Bat Mitigation Strategy will include detailed method

statements to cover all mitigation measures required to prevent, reduce and offset identified impacts.

6.2.3 Mitigation should aim in the first instance to avoid direct mortality and disturbance of bats by appropriate timing and methods of working. Where this is unavoidable, license applications must be made to SEERAD under the advice of Scottish Natural Heritage. As licence applications take time to process mitigation measures must be agreed so that the favourable conservation status of bats is maintained throughout the life of the proposed scheme. In most instances, liaison with the statutory bodies and licence applications should be made at least a year prior to commencement of pre-construction works. This will allow time for site visits and/or further work to confirm the approach required e.g. roost replacement. Replacement roosts must be provided prior to works and it is vital that bats are excluded effectively from the structure to be removed (Mitchell-Jones 2004).

6.2.4 Habitat enhancement works including roost provision should be in place and be shown to be effective prior to commencement of construction so that alternative roosts can be established before old roosts are lost. In the long term habitat maintenance and management should be given priority to ensure that the population will persist, and post-development monitoring of bat populations should be undertaken to assess the success of the scheme and to inform continuing management plans.

6.2.5 Many of the generic mitigation measures are common for the construction and operation stages of the proposed scheme and have therefore been discussed in general terms in Table 26 below.

Table 26 – Generic mitigation measures

Impact	Mitigation type	Construction
Direct mortality	Prevent	Direct mortality to be prevented by detailed surveys by licenced bat workers to locate roosts in built structures and trees prior to construction including all 13 properties to be demolished. Felling and demolition must take into account findings of examination. If bats are likely to be disturbed, works must cease and advice must be sought from SNH including an application for a SEERAD licence (DMRB, 2001). Felling and demolition must be carried out by experienced contractors and under the supervision of licensed bat workers. Trees with roost potential must be removed by soft felling with retention of features suitable for roosts to provide natural roost opportunities in newly created/modified areas (Cowan, 2003). Limbs must be removed and lowered in sections using straps and with cracks wedged open, and left lying on the ground for 24 hours (48 in cold weather) prior to removal from site to allow any concealed bats to disperse. Road traffic casualties must be avoided by the provision of safe crossing points for bats. Where the road severs flight lines, and in particular where the road is on an embankment, planting will reduce the risk of collision with oncoming vehicles by forcing bats to fly over the top. Planting in the central reservation should be provided for wide roads to encourage bats to fly high over the road. Bridges and culverts have also been shown to be used as safe crossing points by bats (Bach et al. 2004) where they are enhanced by guiding or sheltering vegetation or structures along the bridge. Crossing points include 'up and over' hedges and trees between 2 – 6m high, alterations to proposed underpasses (see Badger report and Otter report) and sensitive design of road and right of way crossing points to enable bats to use them will be used to prevent bats flying over the road.
	Reduce	Demolition and felling must be undertaken outside sensitive times of year which are mid May – October for maternity roosts, the end of October and mid April for hibernacula and mid April – mid May and October for potential roosts with unknown status. Monitoring of bats' use of crossings including underpasses, overbridges and culverts must be undertaken regularly during the operation of the road to assess whether additional provision is necessary to reduce RTA. Monitoring of bat activity will be a key requisite of operational aftercare management contracts.
	Offset	Where current or past signs of bat roosts are discovered in trees or buildings to be unavoidably removed, replacement roosts must be provided and monitored with emergence counts prior to removal. Removal of roosts must proceed when bats are not in residence. Exclusion of the colony may be attempted by blocking access points after natural dispersion and before their return (DMRB, 2001). The site specific exclusion methods will be detailed as part of the licence agreement. Where alternative crossing points are provided tree planting must be positioned to guide bats toward the crossing point. In locations not identified as crossing points,roadside planting must use trees which do not produce nectar or attract insect prey and must be at least 10m from the road to ensure bats do not try to cross (Lemaire & Arthur, 1999).
Habitat loss	Prevent	Habitat loss will be prevented by removal of trees and buildings only where there is no alternative, and within the minimum area necessary. Works compounds, storage sites and access roads must be located at least 30m from roosts and avoid areas of woodland, wetland and scrub to prevent degradation of valuable bat habitat. Where loss or degradation of valuable habitat is unavoidable and where watercourses are realigned they must be returned to their former quality or improved once construction is complete. Works must follow BS 5837 (1991) guidance for trees in relation to construction, to avoid damage to the tree. Trees to be retained must be safeguarded from damage according to BS 5837 (1991).

Impact	Mitigation type	Construction
	Reduce	Some felled trees must be left in areas of woodland clearance to provide foraging habitat and egg laying habitat for insect prey larvae. Loss of aquatic habitats must be kept to a minimum including retention of bankside vegetation, natural water features including pools and riffles, and dredging must be kept to a minimum as it destroys vegetation and associated insect abundance. This will help meet conservation targets for Daubenton's bats in line with the LBAP. Maintenance works on newly planted habitat will include coppicing and pollarding to provide future roost opportunities and maximise prey diversity for foraging bats (Entwistle et al*.,* 2001). Freshwater habitats including attenuation ponds and drainage channels, and woodland edge and hedgerow habitats, especially those within 1km of roosts, must be managed to increase prey diversity to maintain value as flight lines and foraging areas. Maintenance of existing habitat of value to bats to be retained and creation of new habitat. Landscape planting must be undertaken using locally obtained native species typical of the area. increase the value of existing woodland features by avoiding monoculture planting to provide diversity to support a variety of insects.
	Offset	Where older trees and those with suitable crevices are to be lost (due to construction and operation phases) bat boxes will be erected to provide alternative roost sites and offset those to be lost until replacement trees have matured. Bat boxes have been shown to be readily used by the types of species recorded along the survey corridor e.g. Daubenton's bat and pipistrelle species (DMRB 2001). Many more replacement roosts will be needed than the number of trees and buildings to be lost in order to increase the likelihood of being discovered and used by bats and to replace roosts which may be abandoned due to proximity to the road. It is recommended that boxes be installed at a ratio of 4 boxes per tree with roost potential to be replaced. Bat boxes must be located according to the following criteria in order to increase the likelihood of bats using them: Boxes must be sited at least 30m away from the proposed scheme to prevent attracting bats to the road. A mixture of box types must be used to cater for seasonal and species requirements (Mitchell-Jones., 2004). Durable woodcrete (Schwegler) boxes require less maintenance, are longer lived than wooden boxes and offer greater protection against adverse weather conditions (Cowan., 2003). Further surveys to determine species and location may be required to enable species specific bat box mitigation. - Boxes must be sheltered from extreme weather conditions and positioned in a range of different aspects to ensure a range of temperature conditions. - Boxes should be sited in areas where bats feed frequently and should be planned to maximise the chances of bats finding them, for example near existing flight lines. - Obstructions including overhanging vegetation should not restrict access to the roost. There should be at least a 3m clear drop under the box and 1m space in front, above and to the sides. - Boxes must be placed 4-5m above the ground to avoid disturbance including vandalism and taking into account that boxes will need to be monitored. - Provision of nursery roosts and hibernacula is particularly important as they are harder to find. Loss of long term foraging and roost habitat must be offset by compensation planting of broadleaved trees (oak, ash, beech) of local provenance on a like for like basis. More trees must be planted than are to be removed during works to increase chances of trees reaching maturity. Habitat creation recommended for other species for example birds and otters will also benefit bats. Habitat creation schemes will contribute toward targets in Local and National BAPs for Pipistrelles and Daubenton's bats.

Impact	Mitigation type	Construction
		A bat box monitoring and maintenance programme should be established in conjunction with the Local bat group and monitoring should continue during the aftercare and operation of the road. Bat boxes should be monitored by suitably licenced bat workers twice a year in April/May and September to avoid disturbance to bats with young and hibernating bats (Mitchell-Jones, 2004). The species and number of bats should be recorded and bat boxes not used within three years must be repositioned In alternative sites nearby.
Habitat Fragmentation and Isolation	Prevent	Habitat fragmentation and isolation must be avoided during construction by sensitive location of works compounds and storage sites so access to important areas of bat habitat or roosts is not compromised. The operational scheme must not prevent bats from moving freely within and between available Habitat Areas. This includes maintaining connectivity between foraging and roost areas and retention of known flyways. Culverts and tunnels have been shown to be used by bats including pipistrelles, Natterer's and Daubenton's bats, which have also been recorded flying longer distances to use tunnels rather than flying directly over a motorway, even where the tunnel is narrow or long, supporting their role in conservation of connectivity of landscapes (Bach et al., 2004). Underpasses and culverts including those which have been identified in the badger report will be provided at suitable locations where flyways are known to cross the proposed scheme. These must be at least 1.5m x 1.5m in cross section (Brinkmann et al., 2003) and preferably allow water to flow through and include lead-in structures or planting in order to increase chances of being used.
	Reduce	New and diversionary flight lines must provide roost opportunities to provide resting points for energy expensive detours. Woodcrete bat boxes will be provided in (Schwegler IFQ 56.5 x 35 x 8.5 cm dimensions) non structural elements of bridges to provide roosting habitat. Woodland rides must be maintained and natural regeneration encouraged in gaps to offset isolation in the long term.
	Offset	Habitat fragmentation will be offset by the provision of vegetation along verges and embankments to establish connectivity of landscape features for bats. Habitat creation must aim to fill in existing gaps in linear vegetation features and new areas of woodland must adjoin existing blocks or act as stepping stones between neighbouring woods or connecting tree lines (Entwistle et al., 2001) Where planting is recommended to provide continuity of habitat temporary fencing must be provided to maintain flight lines until trees have matured. This will have the added advantage of providing shelter for insects enabling bats to forage en route. Barriers and environmental corridors must be designed with consideration to DMRB (2001). As per direct mortality a crossing monitoring programme should be established to assess its success.
Disturbance	Prevent	Site compounds and construction activities including plant and accesses must be confined to the minimum area required for the works and temporary work areas and according to construction standards. In particular they must not be sited on areas of important habitat for bats or within 30m of roosts to prevent disturbance to bats using these areas. Roosts must be identified to contractors to ensure that they are not accidentally disturbed. Trees to be retained must be safeguarded from damage according to BS 5837 (1991). Night works must be avoided during construction if bats are present in particular during the summer months (May to September) when disturbance to bats during peak activity times and when nursing young may influence behaviour. Night working will only be undertaken with the agreement of SNH. Bat roosts must not be directly illuminated, and lighting must be avoided altogether near woodland edges and ponds. If a building or tree containing a roost is to be illuminated there must be a curfew point at which lights are switched off (bat emergence time and during peak activity times). Roosts must not be illuminated after 8.30 pm between May and September. The advice of bat specialists will be sought in the design of junction lighting

Impact	Mitigation type	Construction
	Reduce	As for Direct mortality thorough inspection of buildings and trees within 30m of works must be carried out prior to works to establish roost status. Where roosts are identified in close proximity to the road barriers must be erected to avoid disturbance by lighting, vibration, noise (including night working) and to avoid traffic accidents Night working (between sunset and sunrise) must be avoided near to roosts to prevent alteration of bat emergence and social behaviour. The level of and provision of lighting including roadside and works must be kept to a minimum according to BS 5489 and the ILE Guidance for the Reduction of Light Pollution (1992). Low pressure sodium lamps must be used in preference to high pressure sodium or mercury lamps and the brightness must be kept as low as possible by directing the beam downwards using hoods and limiting the height of lighting columns.
	Offset	Provision of alternative roosts (see bat box criteria above) where disturbance to current roosts is likely to be unavoidable (due to the road being less than 30m away). Natural screens will be provided along the scheme to offset disturbance caused by noise and vibration (see also Landscape and Visual Reports, chapters 11 and 12).
Pollution	Prevent	Site management practices to minimise the risks of secondary impacts to habitat adjacent to the proposed route must be adopted. Surface and foul water must be appropriately drained and stored. Chemicals, oils and fuels must be kept safely stored and away from water features and waste must be appropriately managed. Sites must be restored fully on completion of works and contractors must adhere to SEPA PPG guidelines (SEPA, Feb 2003) with respect to preventing pollution incidents near watercourses and water features. PPG 1 – General guide to prevention of water pollution PPG 3 – Use and design of oil separators PPG 5 – works in, near or liable to affect watercourses PPG 6 – Working at construction and demolition sites. PPG 21 – Pollution Incident Response Planning Details regarding pollution control can be found in the Otter Report (Appendix A10.6) and Freshwater Ecology report (Appendix A10.16) Road run-off must not cause deterioration in the quality of receiving water, in particular the biological water quality in line with SEPA environmental quality standards and the EU Water Framework Directive (See Aquatic Habitats report). Road run-off must be kept from water features using SUDS techniques including collection in treatment facilities including petrol interceptors, silt traps and balancing ponds according to SEPA PPC guidelines (SEPA, Feb 2003) as per mitigation during the construction phase.
	Reduce	Levels of dust, especially if contaminated with potential chemical toxins, must be minimised so that this does not build up significantly on trees and scrub vegetation.
	Offset	Provision must be made for the collection and settling of runoff and for the Negligibleisation of pollution to avoid deterioration in water quality and insect abundance, in line with SEPA environmental quality standards and the EU Water Framework Directive (See Aquatic Habitats report).

6.3 Specific Mitigation Proposals Section NL1 Derbeth - Tulloch Road

6.3.1 In addition to generic mitigation measures to be provided along the route the impacts due to construction of the road must also include the use of screens to protect bats which may be roosting at Newton and Kepplestone Farms. The loss of habitat is predicted to be minimal in this Section but loss of broadleaved woodland will be offset by habitat creation in the following locations including the provision of roadside tree planting and bridge/culvert enhancement:

- North Kingswells Junction
- between North Kingswells Junction and Kepplestone
- along Ashtown Road

6.3.2 During the operation phase RTAs are to be prevented by keeping the cutting open to the north of Kepplestone House so bats are not attracted to the road. Locations which have the potential to act as crossings will be enhanced for use by bats by tree planting at the following locations:

- North Kingswells Junction (ch315000)
- Kepplehill Burn Culvert (ch315200)
- Kepplestone Overbridge (ch315600)
- Ashtown Overbridge (ch316000)
- Gough Burn Culvert (ch316390)

6.3.3 Sensitive planting either side of the road at culverts and crossing points will provide connectivity between commuting routes and encourage bats to fly over the road at safe crossing places. Kepplehill and Gough Burns will be protected from pollution incidents and lighting will be kept to a minimum at North Kingswells Junction to minimise potential impacts on foraging and commuting bats.

6.3.4 The mitigation measures with regard to Section NL1 are given comprehensive consideration in Table 27 and illustrated in Figures 11.5a - 11.5b.

Table 27 – Specific mitigation proposals Section NL1 Derbeth - Tulloch Road

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
N11 Agricultural fields north of C89c and east of Brimmond Hill	Direct mortality risk due to RTA (High Negative/Major) Disturbance due to construction and operation (Medium negative/Moderate adverse) Indirect severance due to operation (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of North Kingswells Junction, including lighting; following survey of farm buildings for roosting bats. Screen and sensitive siting of site compounds if bats roosting. Lighting to be kept to minimum and alternative roost to be provided if disturbance unavoidable Generic mitigation to prevent RTA and severance effects through provision of safe crossing points at North Kingswells Junction (ch315000). Proposed tree planting for screening (as per Landscape Report, Chapter 11) alongside road will provide linear habitat along which bats may commute toward safe crossing points including Kepplehill Burn Culvert, and force bats to fly up and over road. Provision of crossing points in this area will enable bats to reach important habitat resources on either side of the scheme. Cutting to remain open to prevent bats from crossing. Generic mitigation for monitoring crossing (Figure 11.5a)
N12 Agricultural fields surrounding Kepplestone Farm	Disturbance due to construction (Medium negative/Moderate adverse) Habitat loss (Low Negative/Minor adverse) Indirect severance (Medium Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (Medium Negative/Moderate adverse)	Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining construction to minimum area necessary and avoidance of night works and lighting. Screen and sensitive siting of site compounds if bats roosting. Generic mitigation to prevent severance effects through provision of safe crossing point at Kepplestone Overbridge (ch315600) and Kepplehill Burn Culvert (ch315200). Proposed tree planting for screening (as per Landscape Report, Chapter 11) alongside road toward the overbridge will provide “up and over” planting to encourage bats to use crossing point and fly over the cutting. Similarly planting between the culvert and North Kingswells Junction as per Landscape Report, Chapter 11, must be shaped toward the culvert to direct bats toward the entrance and encourage them to cross there. Generic mitigation for monitoring crossings. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution at Kepplehill Burn during construction and operation. (Figure 11.5a)
N13 Agricultural fields between Brimmond Hill and Kepplestone Farm	Indirect severance due to operation (Medium Negative/Moderate adverse)	Severance effects to be prevented through provision of safe crossing point at Kepplehill Overbridge as per N12. Generic mitigation for monitoring crossing (Figure 11.5a)
N14 Gough Burn DWS	Pollution during construction and operation (Low Negative/Minor adverse) Severance during operation (Medium Negative/Moderate adverse)	Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution at Gough Burn during construction and operation including provision of attenuation as per N20/N24. Provision of attenuation ponds as per N20/N24 will provide alternative aquatic foraging area for bats to offset wet habitats lost downstream of Habitat Area. Severance effects to be prevented through provision of safe crossing points at Kepplestone Overbridge as per N12, Gough Burn Culvert as per N20/N24 and Ashtown Road overbridge as per N16 which will enable retention of accessibility of important bat habitat to the east and west of the scheme. Generic mitigation for monitoring crossings Proposed mixed planting for screening eith er side of the road (ch316000 – 316400) will provide linear habitat along which bats

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
		may commute toward safe crossing points and enhance value of area for foraging bats as per N16. (Figure 11.5b)
N15 Agricultural fields between Gough Burn and Newhills Wood	No impacts predicted	Alternative crossing points at Kepplestone Overbridge and Ashtown Road overbridge may be used by bats if enhanced as per N16. (Figure 11.5b)
N16 Newhills Wood	Direct mortality due to RTA (High Negative/Moderate adverse) Severance due to operation (Medium Negative/Moderate adverse) Flight line disruption (Medium negative/moderate)	Flight line disruption and disturbance to foraging and commuting bats along Ashtown Road to be reduced by confining construction to minimum area necessary and avoidance of night works and lighting. RTA and habitat severance effects to be prevented by provision of safe crossing point at Ashtown Road Overbridge (ch316000). Bridge to be enhanced by sensitive tree planting on embankments and alongside Ashtown Road to encourage use of overbridge as safe crossing point along a known bat flight route. Severance effects will be offset by enhancement of Ashtown Overbridge (ch316000) by planting on embankments and alongside Ashtown Road to encourage use of overbridge as safe crossing point. Planting as per Landscape Report (Chapter 11) between ch316000-316400 will provide a feature along which bats may commute between safe crossing points. (Figure 11.5b)
N17 Agricultural fields and cemetery at Newhills	No impacts predicted (Negligible)	No additional mitigation required

6.4 Specific Mitigation Proposals Section NL2 SAC Craibstone

6.4.1 In addition to generic mitigation measures to be implemented in Section NL2 Craibstone of the Northern Leg, considerable compensation to offset the loss of habitat is proposed in the Craibstone Estate including mixed woodland planting and conifer woodland with localised broadleaved woodland which will provide a diverse foraging resource in the short – long term and integrate woodland areas providing connectivity between woodland areas. In addition bat boxes suitable for small bats are to be provided in fragments of woodland to be retained on either side of the road in the Craibstone Estate to offset the loss of potential roosts in trees and the demolition of Sunnybank Cottages which will require survey to check for roosting bats. The provision of attenuation ponds and riparian woodland planting adjacent to the A96 junction will offset habitat loss and potential pollution incidents along Craibstone and Green Burns as well as providing valuable foraging habitat for bats.

6.4.2 During operation of the road severance will be offset by the provision of an enhanced overbridge and culverts which will retain commuting routes for bats commuting along woodland edges and the burns at the following locations:

- Ashtown Road Overbridge (ch316000)
- Gough Burn Culvert (ch316390)
- Craibstone Burn Culvert (ch316990)
- Green Burn Culvert (ch317330 and A96 culverts)

6.4.3 Linear planting of mixed woodland and planting in blocks either side of the road will also introduce shelter and linear routes along which bats may navigate between woodland fragments and crossing points as well as forcing bats to fly up over the road which will reduce the potential impacts of RTA.

6.4.4 The mitigation measures with regard to Section NL2 are given comprehensive consideration in Table 28 and illustrated in Figure 11.5b and 11.5c.

Table 28 – Specific mitigation proposals Section NL2 SAC Craibstone

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
N18 Agricultural fields between Gough Burn and golf course	Severance and flight line disruption due to construction and operation (Medium Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (Low Negative/Minor adverse)	Flight line disruption and disturbance to foraging and commuting bats along Ashtown Road to be reduced by confining construction to minimum area necessary and avoidance of night works and lighting as per N16. Severance effects to be offset through provision of Ashtown Road Overbridge as per N16 (ch316000) and Gough Burn Culvert (ch316400) as per N24. Bridge to be enhanced by planting on embankments and alongside Ashtown Road to encourage use of overbridge as safe crossing point as per N16. Planting as per Landscape Report (Chapter 11) between ch316000-316400 either side of the road will provide a feature along which bats may commute between safe crossing points. Generic mitigation for monitoring crossings. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution of Gough Burn during construction and operation. (Figure 11.5b)
N19 Craibstone Golf Course	Habitat Loss due to operation (Medium Negative/Moderate adverse) Flight line disruption and severance (Medium Negative/Moderate adverse) Alteration of water quality due to construction and operation (Medium Negative/Low adverse)	Proposed areas of planting for screening and to offset habitat loss and fragmentation including enhanced attenuation ponds both sides of the road (ch316450 - 317260) in HA N25 / N28 will provide linear habitat along which bats may commute toward safe crossing points and enhance value of area for foraging bats. Cutting to be kept open to prevent direct road crossings. Severance effects to be prevented through provision of Gough Burn Culvert (ch.316390) as safe crossing point as per N24. Generic mitigation for monitoring crossings. Flight line disruption and disturbance to foraging and commuting bats along Ashtown Road to be reduced as per N16. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation. (Figure 11.5c)
N20 Agricultural fields between Newhills Wood and Craibstone Estate	No impacts predicted (Negligible)	Provision of Gough Burn Culvert (ch316390) as per N24 and linear mixed woodland planting along the road (ch316400 – 316900) as per Landscape Report, Chapter 11, N25 and N28 will provide linear feature integrating woodland areas reducing the overall impacts on bats. (Figure 11.5b & 11.5c)
N21 Parkhead Wood	Indirect severance due to operation (Medium Negative/Minor adverse)	Severance effects to be reduced through provision of Craibstone Burn Culvert (ch316390) as per N22. Planting to the west of the road as per N25 will enhance value of the woodland area by providing linear feature along which bats may commute toward safe crossing points and to integrate woodland areas. (Figure 11.5c)
N22 West Woods	Indirect severance due to operation (Medium Negative/Minor adverse)	Severance effects to be reduced through provision of Craibstone Burn Culvert (ch316390) and Green Burn Culvert 1 (ch317330) as per N25/N30. Bats will benefit from habitat creation to the west of the road between ch316450 – 317260 in HA N25 / N28 as planting of mixed and conifer woodland with localised broadleaved woodland will integrate and link Habitat Areas and crossing points and provide linear habitat along the road along which bats may commute.

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
		(Figure 11.5c)
N23 Woodland/Farmland west of C88c, north of Parkhead Wood	Indirect severance due to operation (Medium Negative/Moderate adverse)	Severance effects to be prevented through provision of Craibstone Burn Culvert (ch316390) and Green Burn Culvert 1 (ch317330) as per N21 and N27. Bats will benefit from habitat creation to the west of the road between ch316450 - 317260 in HA N25 / N28. (Figure 11.5c)
N24 Woodland along Gough Burn	Direct mortality due to construction and operation (High Negative/Moderate adverse) Cottage demolition & habitat loss due to construction (High Negative/Moderate adverse) Habitat loss due to operation (Medium Negative/Moderate adverse) Water quality alteration risk due to construction and operation (Medium Negative/Moderate adverse) Severance of flight route (medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss and demolition. This includes carrying out further surveys to establish the extent of use of the buildings by bats prior to demolition. Loss of potential roosts in trees and buildings will be prevented by sensitive location of works compounds and retention of trees of value in an alternative location in Craibstone Estate. Construction to be confined to minimum area necessary during construction. RTA and habitat severance effects to be prevented/offset through provision of Gough Burn Culvert (ch316390), the entrance of which must be planted with shrubs which attract insects to encourage bats to find the culvert. Provision of mixed woodland planting alongside east of road (ch316400 – 317000) for screening and linkage between woodland areas as per Landscape Report, Chapter 11 will provide linear habitat integrating woodland areas which bats may use for crossing. Cutting/Embankment to remain open all along this section to prevent direct road crossings apart from at culverted burns and other designated crossing points. Generic mitigation for monitoring crossings. Schwegler 1FF, 2F and 2F-DPF bat boxes must be provided in existing trees and on buildings in the Craibstone Estate and along Gough Burn to provide alternative roost opportunities to offset those lost in demolition of Sunnybank cottages. Generic mitigation for maintenance and monitoring of artificial roosts and newly created habitat. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution at Gough Burn during construction and operation. (Figure 11.5c)
N25 Woodland in west of SAC Campus	Direct mortality due to construction and RTA (High Negative/Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Disturbance due to road construction (Medium Negative/Moderate adverse) Severance & fragmentation (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and habitat severance effects to be prevented/offset through provision of Craibstone Burn Culvert (ch316990) the entrance of which must be planted with shrubs which attract insects to encourage bats to find the culvert; and the bridge at ch317050. Provision of areas of mixed planting alongside the road for screening and linkage between woodland areas as per Landscape Report, Chapter 11 (ch316450 - 317000 either side of the road will provide linear habitat along which bats may commute toward safe crossing points and integrate Habitat Areas and crossing points Cutting/Embankment to remain open all along this section to prevent direct road crossings apart from at culverted burns and other designated crossing points. Generic mitigation for monitoring crossings. Habitat loss and fragmentation will be offset by proposed areas of planting in HA N25/N28 including riparian woodland around attenuation ponds, linear mixed planting to and coniferous with localised broadleaved woodland planting to the south of the proposed A96 Junction slip road. Planting will also integrate woodland areas and provide edge habitat and diversity Loss of potential roost sites will be offset by provision of Schwegler 2F-DPF, 2F and 1FF bat boxes suitable for Pipistrelle bats within existing wooded areas both sides of the road, equating to potential roosts to be lost.. Generic mitigation for maintenance and aftercare of newly created habitat. Generic mitigation to prevent and reduce effects of disturbance due to construction, including lighting following survey of trees for roosting bats. Provision of screens to reduce impacts on remaining woodland areas.

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
		(Figure 11.5c)
N26 Woodland along Craibstone Burn	Direct mortality due to construction and RTA (High Negative/ Moderate adverse) Habitat loss due to operation (Medium Negative/Moderate adverse) Disturbance due to road construction (Medium Negative/Moderate adverse) Severance & fragmentation (medium Negative/Moderate adverse) water quality deterioration risk due to construction and operation (medium negative/moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and habitat severance effects to be prevented/offset through provision of Craibstone Burn Culvert (ch316990), as per N21, and the bridge at ch317050). Provision of mixed woodland planting alongside the road for screening and linkage between woodland areas as per Landscape Report, Chapter 11 and as per N25/N28 will provide linear habitat along which bats may commute toward safe crossing points and integrate Habitat Areas and crossing points. Cutting/Embankment to remain open all along this section to prevent direct road crossings apart from at culverted burns and other designated crossing points. Generic mitigation for monitoring crossings. Habitat loss and fragmentation will be offset by mixed conifer and broadleaved woodland planting in HA N25/N28 including riparian woodland around attenuation ponds, linear mixed woodland planting and coniferous with localised broadleaved woodland planting to the south of the proposed A96 Junction slip road. Planting will also integrate woodland areas and crossing points and provide edge habitat and diversity. Loss of potential roost sites will be offset by provision of Schwegler 2F-DPF, 2F and 1FF bat boxes suitable for Pipistrelle bats within existing wooded areas both sides of the road, equating to potential roosts to be lost. Generic mitigation for maintenance and aftercare of newly created habitat and monitoring artificial roosts. Generic mitigation to prevent and reduce effects of disturbance due to construction, including lighting following survey of trees for roosting bats. Provision of screens to reduce impacts on remaining woodland areas. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation. (Figure 11.5c)
N27 Woodland along Green Burn	Direct mortality due to construction and RTA (High Negative/ Moderate adverse) Habitat loss due to operation (Medium Negative/Moderate adverse) Severance & fragmentation (medium Negative/Moderate adverse) Flight line disruption (medium negative/moderate adverse) Disturbance due to construction and operation (Medium Negative/Moderate adverse) Water quality deterioration risk due to construction and operation (medium negative/moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and habitat severance/fragmentation effects to be prevented/offset through provision of Green Burn Culvert (ch317330) which must be well planted with shrubs and insect-attracting plants to encourage use and direct bats toward it. Provision of mixed woodland planting alongside west of road for screening and linkage between woodland areas as per Landscape Report, Chapter 11 (ch.317200 – A96) and attenuation pond provision in HA N28 will provide linear habitat along which bats may commute toward safe crossing points and enhance culvert so bats are more likely to fly through Cutting/Embankment to remain open all along this section to prevent direct road crossings apart from at culverted burns and other designated crossing points. Generic mitigation for monitoring crossings. Habitat loss including aquatic habitat loss will be offset by mixed woodland planting and mixed and riparian woodland around attenuation ponds as per N25/N28. Loss of potential roost sites will be offset by provision of Schwegler 2F-DPF, 2F and 1FF bat boxes suitable for Pipistrelle bats within existing wooded areas both sides of the road, equating to potential roosts to be lost. Generic mitigation for maintenance and aftercare of newly created habitat and for monitoring artificial roosts. Generic mitigation to prevent and reduce effects of disturbance due to construction, including lighting following survey of trees and buildings for roosting bats. Provision of screens to reduce impacts on remaining woodland areas. Earthworks to be confined to minimum area necessary and night works and lighting to be avoided. Generic mitigation to reduce the impacts of lighting at the junction Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation, including due to realignment of Green Burn. (Figure 11.5c)

Habitat Area	Impact Magnitude / Significance	Site-specific Mitigation
N28 Agricultural land in SAC campus east of C88c Road	Direct mortality due to RTA (High negative/Moderate adverse)– Flight line disruption due to construction (Medium Negative/Moderate adverse) Disturbance due to junction lighting duering operation (Medium Negative/Moderate adverse)	RTA and habitat severance/fragmentation effects to be prevented/offset through provision of Green Burn Culvert (ch317330) as per N25/ N27. Provision of mixed woodland planting alongside the road at the top of the cutting for screening and linkage between woodland areas south of link road as per Landscape Report, Chapter 11 will provide linear habitat along which bats may commute toward safe crossing points including Green Burn Culvert, and force bats to fly high over the road. Generic mitigation for maintenance and aftercare of newly created habitat and for monitoring crossings. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Generic mitigation to reduce the impacts of lighting at the junction Proposed attenuation ponds and 1.3ha riparian woodland planting at ch317100 – 317260 will enhance foraging resources in the area including providing aquatic habitat suitable for foraging. (Figure 11.5c)

6.5 Specific Mitigation Proposals Section NL3 A96 – Nether Kirkton

6.5.1 During the construction phase in Section NL3 of the Northern Leg additional mitigation will be required to protect bats roosting at Walton and Sunnybrae Farms with screening; and potentially at Balgosie and farms at Howemoss and Standingstones and the pump house in East Woodlands if surveys find that bats are roosting here. Planting to compensate for loss of habitat will be undertaken alongside the road at South Kirkhill which will also act as a navigation aid to bats crossing the road at South Kirkhill Junction; riparian woodland planting along the realigned Bogenjoss Burn will contribute toward restoring freshwater foraging grounds in the medium – long term and planting north of Monument Wood will offset habitat loss and fragmentation effects here. Bat boxes must be provided to offset the loss of potential roost sites in the following locations:

- Standingstones Wood
- East Woodlands
- Monument Wood

6.5.2 Enhancement of a pumping house in East Woodland will also enhance the roost resource in the woodland. In addition the proposed attenuation ponds at the A96 and adjacent to Bogenjoss Burn will enhance the foraging resource in these areas for bats.

6.5.3 During the operation phase lighting must be kept to a minimum at the A96 and South Kirkhill Junctions to minimise potential disturbance impacts on nearby roosts and potential roosts. Severance effects and RTA are to be prevented and offset by the provision of crossing points at the following locations:

- Wildlife Overbridge (ch319960)
- Green Overbridge (ch320190)
- Bogenjoss Burn culverts (ch319950, 320100, 320200, 320450, 320520)

6.5.4 However the long culvert at Bogenjoss Burn (ch320870) is likely to be prohibitively long to provide sufficient connectivity between the east and west of the road at Bogenjoss.

6.5.5 The mitigation measures with regard to Section NL3 given comprehensive consideration in Table 29 and illustrated in Figures 11.5c - 11.5h.

Table 29 – Specific mitigation proposals Section NL3 A96 – Nether Kirkton

Habitat Area	Impact Magnitude /Significance	Construction
N29 Agricultural land northeast of Dyce Drive	No impacts predicted (Negligible)	No additional mitigation required
N30 Agricultural land between A96 and Dyce Drive	Disturbance due to construction (Medium Negative/Moderate adverse) Flight line disruption (low negative/minor adverse)	Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of screens to reduce impacts on roosts at Walton Farm and Sunnybrae if disturbance likely during construction. Generic mitigation to prevent and reduce effects of disturbance due to construction of A96 Junction, including lighting; following survey of farm buildings for roosting bats. Schwegler 1FF and wooden bat box provision in Chapelbrae Wood (HA N31) to offset reduction in suitability of potential roost due to presence of the road. Generic mitigation to reduce the impacts of lighting at the junction. Generic mitigation for monitoring crossings and artificial roosts. (Figure 11.5c)
N31 Chapelbrae Wood	Disturbance due to construction (Medium Negative/Minor adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of A96 Junction, including lighting; following survey of trees for roosting bats; provision of screen if bats roosting. Bats will also benefit from the provision of bat boxes in Chapelbrae Wood as per N30. (Figure 11.5e)
N32 Agricultural land between Newton and Upper Coarsehill	Disturbance due to construction (Medium Negative/Minor adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of A96 Junction, including lighting; following survey of buildings for roosting bats. Bat box provision in Chapelbrae Wood (HA N31) to offset reduction in suitability of potential roosts due to presence of the road. Generic mitigation for monitoring artificial roosts. (Figure 11.5e)
N33 Agricultural land south of Standingstones Wood and east of Kirkhill Forest	Disturbance due to construction and operation (Medium Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (low Negative/minor adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of Junction, including lighting; following survey of farm buildings at Howemoss/Balgosie for roosting bats. Sensitive siting of works compounds if bats roosting in Howemoss or Balgosie. Generic mitigation to reduce the impacts of lighting at the junction and use of screens if roosts likely to be disturbed. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation. 10m gap to be retained between planting and the road edge (ch318800 – 319550) either side of the road north and south of South Kirkhill Junction and planting for landscape and ecology purposes to consist of species which do not attract bats to prevent bats being attracted to the road. Generic mitigation for monitoring crossings. (Figure 11.5e & 11.5f)
N34 Kirkhill Forest South	Disturbance due to construction (Medium Negative/Moderate adverse) Indirect severance due to operation (Low	Generic mitigation to prevent and reduce effects of disturbance due to construction of South Kirkhill Junction including earthworks and lighting. Generic mitigation for monitoring crossings as per N33. (Figure 11.5e & 11.5f)

Habitat Area	Impact Magnitude /Significance	Construction
	Negative/Minor adverse)	
N35 Standingstones Wood	Direct mortality due to construction and RTA (High Negative/Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Habitat severance and fragmentation (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA risk, habitat severance and fragmentation effects to be reduced by keeping the cutting open between potential crossing points both sides to prevent bats from flying across as per N33. Habitat loss will be offset by provision of woodland planting (ch318900 – 319130) to the west of the road. This will enhance the fragmented area of woodland and overall value of the woodland and scrub at Howemoss providing roosting and foraging habitat in the long term and enhance the value of plantation woodland foraging if broadleaved woodland planting is also undertaken. Loss of potential roost sites will be offset by provision of Schwegler 2F bat boxes suitable for pipistrelles and other small bats within existing Standingstones Wood and Farburn Wood each side of the scheme, equating to potential roosts to be lost. Generic mitigation for maintenance and aftercare of newly created habitat and for monitoring artificial roosts. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5f)
N36 Farburn Wood	Direct mortality due to RTA (High Negative/Moderate adverse) Severance and flight line disruption due to construction and operation (Medium Negative/Moderate)	RTA risk, habitat severance and fragmentation effects to be prevented/offset by keeping the cutting open between potential crossing points to prevent bats from flying across and foraging near the road as per N35. Generic mitigation for monitoring crossings. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5f)
N37 Kirkhill Forest North	Direct mortality due to construction and RTA (High Negative/Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Habitat severance and fragmentation (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and habitat fragmentation and severance effects to be prevented/offset through provision of a Wildlife Overbridge 7.5m wide at ch319960 with a species rich shrub and tall herb layer to encourage insects and enhance the chances of bats flying over; and Kirkhill green bridge at ch320190 with integrated 4m wildlife corridor, again planted with species attractive to insects. In addition culverts along the realigned Bogenjoss Burn ch319950, 320100, 320200, 320450 and 320520 may be used by commuting bats retaining some connectivity. Generic mitigation for monitoring crossing. Habitat loss will be offset by mixed woodland planting (ch318900 – 319130) west of the road as per N35. To a certain extent creation of conifer woodland at ch319430-319700 in HA N39 as per red squirrel report in appendix A10.7 may enhance the area by providing shelter and edge habitat. This will enhance the fragmented area of woodland and overall value of the woodland providing shelter, roosting and foraging habitat in the long term. Riparian and scrub woodland planting alongside Bogenjoss Burn as per N38 will also help offset habitat loss and enhance the value of the area for foraging and commuting bats. Generic mitigation for maintenance and aftercare of newly created habitat. Generic mitigation to prevent and reduce effects of disturbance including to foraging and commuting bats due to construction of road, including bridge construction to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5f)
N38	Burn realignment (High	Realigned Bogenjoss Burn to be planted with riparian and scrub woodland habitat on either side of the burn between ch319950 and

Habitat Area	Impact Magnitude /Significance	Construction
Open habitats along Bogenjoss Burn within Kirkhill Forest	Negative/Moderate adverse) Severance and flight line disruption due to operation (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/ Moderate adverse) Deterioration in water quality due to construction and operation (Medium Negative/Moderate adverse)	328050 west of the road. This will restore the overall value of this area for bats and encourage the use of the box culverts for crossing. Proposed planting east of the road must be undertaken in such a way that bats are not encouraged to cross away from safe crossing points. The old alignment of the burn to be retained at the current state to maintain the edge habitat this provides. Generic mitigation for maintenance and aftercare of newly created habitat. Generic mitigation to prevent habitat fragmentation and severance effects through provision of a Wildlife Overbridge at ch319960 and Kirkhill green bridge at ch320190 as per N37. In addition culverts along the realigned Bogenjoss Burn ch319950, 320100, 320200, 320450 and 320520 may be used by commuting bats retaining some connectivity as per N37. Generic mitigation for monitoring crossing. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of screens to reduce impacts on potential roosts. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation. (Figure 11.5f & 11.5g)
N39 Agricultural fields around Standingstones Farm	Flight line disruption and severance due to construction and operation (Medium Negative/Moderate adverse)	Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Screens to be provided at farm if disturbance to roosting bats likely following survey for roosting bats. Sensitive siting of works compounds disturbance of roosting bats likely following survey of farm buildings for roosting bats. Severance of flight routes to be offset by provision of alternative safe crossing points including provision of a Wildlife Overbridge at ch319960 and Kirkhill green bridge at ch320190 as per N37. In addition culverts along the realigned Bogenjoss Burn may be used by commuting bats retaining some connectivity as per N38. (Figure 11.5f & 11.5g)
N40 Lower Overton Wood	Isolation and severance due to operation (Medium Negtative/Minor adverse)	Retention of connectivity between Habitat Areas by provision of crossing points as per N37/N38 will reduce impacts of probable flight line disruption and severance. (Figure 11.5g)
N41 Agricultural fields between Lower Overton Wood and East Woodland	Isolation of Habitat Areas and severance of probable flight routes (Medium Negtative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Disturbance due to earthworks if bats roosting (Medium Negative/Moderate adverse)	Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Generic mitigation to prevent and reduce effects of disturbance due to construction of road including earthworks; following survey of house and cottage for roosting bats. Provision of screens and sensitive siting of works compounds if roosting bats likely to be disturbed. Retention of connectivity between Habitat Areas by provision of crossing points as per N37 and N38 will reduce impacts of probable flight line disruption and severance. Planting must not be undertaken within 10m of the road so bats are not attracted to the road. (Figure 11.5g)
N42 Bogenjoss Burn downstream of Kirkhill	Direct mortality due to construction and RTA (High Negative/ Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. Generic mitigation to prevent RTA and habitat fragmentation and severance effects through provision of a Wildlife Overbridge at ch319960 and Kirkhill green bridge at ch320190 as per N37. In addition culverts along the realigned Bogenjoss Burn ch319950, 320100, 320200, 320450 and 320520 may be used

Habitat Area	Impact Magnitude /Significance	Construction
Forest	Habitat loss (Medium Negative/Moderate adverse) Burn realignment (High Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (Medium Negative/Moderate adverse) Disturbance to commuting and foraging bats (High Negative/Moderate adverse) Severance of flight routes (Medium Negative/Moderate adverse)	by commuting bats retaining some connectivity as per N37. Oversized culvert at ch320900 unlikely to be used by bats due to its length. Mixed woodland planting to the west of the proposed scheme (ch320500 – 320900) between the severed sections of Bogenjoss Burn will retain connectivity along the burn. Generic mitigation for monitoring crossing Realigned Bogenjoss Burn to be planted with riparian and scrub woodland habitat on either side of the burn between ch319950 and 328050 west of the road as per N38 and scrub woodland between ch320450-320950 east of the road which must be planted in such a way that bats are not encouraged to cross the road away from safe crossing points. Bats will also benefit from mitigation including bat box provision and conversion of pump house into hibernaculum as per N43. This will increase the overall value of this area for bats and encourage the use of the box culverts. Existing riparian vegetation must be retained where possible. Generic mitigation for maintenance and aftercare of newly created habitat Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution due to construction and operation, including provision of attenuation ponds at ch321000. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5g)
N43 East Woodlands	Direct mortality due to construction and RTA (High Negative/ Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Severance due to operation (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. Generic mitigation to prevent RTA and habitat fragmentation and severance effects through provision of a Wildlife Overbridge at ch319960 and Kirkhill green bridge at ch320190 as per N37. In addition culverts along the realigned Bogenjoss Burn ch319950, 320100, 320200, 320450 and 320520 may be used by commuting bats retaining some connectivity as per N37. Oversized culvert at ch320900 unlikely to be used by bats due to its length. Mixed woodland planting to the west of the proposed scheme (ch320500 – 320900) between the severed sections of Bogenjoss Burn will retain connectivity along the burn. Generic mitigation for monitoring crossings. Generic mitigation to prevent and reduce effects of disturbance to foraging and commuting bats due to road construction including earthworks. Loss of potential roost trees will be prevented by sensitive location of works compounds and retention of trees of value in tree in an alternative location in East Woodlands and offset by provision of Schwegler 1FF, 2F and 2F-DPF bat boxes suitable for Pipistrelles, Daubenton's and brown long eared bats. Boxes to be located within existing wooded areas (East Woodlands, around Pitmedden House and in Monument Wood) on either side of the proposed scheme, equating to potential roosts to be lost. Generic mitigation for monitoring artificial roosts. The existing disused concrete pump house within the woodland has the potential to be converted into a hibernaculum with minimal effort. Installation of a door with a gap of three ins near to the top, and the provision of crevices using bat bricks may improve the suitability for hibernating, and the presence of running water inside the structure will maintain high humidity. This will contribute toward LBAP targets for Daubenton's bats. Generic mitigation for maintenance and aftercare of newly created habitat. Reduce: Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution due to construction and operation including provision of attenuation ponds at ch321000. (Figure 11.5g)
N44 Agricultural fields west of Bogenjoss Burn	No impacts predicted (Negligible)	No additional mitigation required

Habitat Area	Impact Magnitude /Significance	Construction
N45 Bogenjoss Burn and grounds of Pitmedden House	Direct mortality due to RTA– (High Negative/ Moderate adverse) Burn realignment (High Negative/Moderate adverse) Severance of flight routes (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (Medium Negative/Moderate adverse)	Generic mitigation to prevent RTA and severance effects through provision of a Wildlife Overbridge at ch319960 and Kirkhill green bridge at ch320190 as per N37. In addition culverts along the realigned Bogenjoss Burn ch319950, 320100, 320200, 320450 and 320520 may be used by commuting bats retaining some connectivity upstream as per N37. Oversized culvert at ch320900 unlikely to be used by bats due to its length. Mixed woodland planting to the west of the proposed scheme (ch320500 – 320900) in HA N41 and N43 between the severed sections of Bogenjoss Burn will retain connectivity along the burn. Generic mitigation for monitoring crossings. Realigned Bogenjoss Burn to be planted with riparian and scrub woodland habitat on either side of the burn and the road as per N38/N42. Bats will also benefit from mixed woodland planting along the embankment between ch320500 – 320900 . This will increase the overall value of this area for bats and encourage the use of the box culverts as well as providing alternative commuting routes adjacent to the road connecting fragments of the burn. Existing riparian vegetation to be retained where possible. Bats will also benefit from mitigation including bat box provision, conversion of pump house into hibernaculum and attenuation as per N43.Planting not to be undertaken within 10m of the road. Generic mitigation for maintenance and aftercare of newly created habitat. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution due to construction and operation, including provision of attenuation ponds at ch321000. (Figure 11.5g)
N46 Agricultural fields south-east of Bogenjoss Burn	Habitat loss due to construction and operation (Low Negative/Minor adverse)	Generic mitigation and mitigation to be provided in HA N42/N45/N47 will offset loss of scrub and trees. (Figure 11.5g)

Habitat Area	Impact Magnitude /Significance	Construction
N47 Monument Wood	Direct mortality due to construction and RTA (High Negative/ Moderate adverse) Habitat loss (Low Negative/Minor adverse) Flight line disruption (Medium Negative/Moderate adverse) Isolation and severance due to operation (Medium Negative/Moderate adverse Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. Risk of RTA lowered as road is in cutting (ch321500 – 321900) which must remain open to deter direct crossings. Schwegler 1FF, 2F and 2F-DPF bat boxes will be provided within the existing Monument Wood and in trees around Pitmedden House, equating to potential roosts to be effectively lost due to severance of the wood and disturbance of the tree. Bats will also benefit from provision of areas of mixed woodland planting between ch321630-322130 north of the road which will increase the overall suitability of the area for foraging bats in the long term. No planting to be undertaken within 10m of the road to prevent bats from crossing. Generic mitigation for maintenance and aftercare of newly created habitat and monitoring artificial roosts. Isolation of Monument Wood from features to the north will be offset by provision of safe crossing points at Bogenjoss Burn as per N45 with scrub planting along the road either side to encourage bats to use the crossing. Conifer woodland block to be planted north of the road (ch321490-321520) as per red squirrel report in Appendix A10.7 may provide an alternative commuting route between Pitmedden House (HA N45)and newly created foraging habitat in HA N50 in the long term. Mixed woodland planting alongside the road to the east of Bogenjoss Burn as per Landscape Report, Chapter 11 may also be used by bats commuting between Habitat Areas and reduce effects of fragmentation and force bats to fly high over the road. Generic mitigation to monitor crossings. Generic mitigation to prevent and reduce effects of disturbance due to construction including earthworks. (Figure 11.5g & 11.5h)
N48 Agricultural fields between Monument Wood and Lower Overton Wood	No impacts predicted (Negligible)	No additional mitigation required

6.6 Specific Mitigation Proposals Section NL4 Nether Kirkton – Corsehill

6.6.1 In addition to generic mitigation measures to be implemented at Section NL4 of the Northern Leg specific mitigation measures to prevent, reduce and offset adverse impacts during construction include the provision of screens at Upper kirkton, Goval Farm, Parkhill Pumping Station and Meadowhead Farm if bats are found to be roosting and minimum use of lighting in construction and operation. Tree planting between Parkhill Pumping Station and the proposed road must be employed to prevent bats emerging from the roost colliding with oncoming traffic, and directing bats up onto the Lade. RTA is also to be prevented by sensitive tree planting at Goval Belt and between the improved A947 and Little Goval Junctions where bat flight lines will be severed by the road.

6.6.2 Bat boxes must be provided in the following locations to mitigate against loss of potential roosts and to offset the reduction in suitability of potential roosts as a result of disturbance from the road:

- Upper Kirkton
- Goval Belt
- Along Goval Burn and Mill Lade
- Parkhill Estate

6.6.3 The Don Crossing and bridges where Goval Burn flows under the B977 and A947 will be enhanced with bat bricks and bat boxes to provide permanent roost opportunities and to encourage bats to continue to fly along the burn rather than along the road. Enhancement of Goval Burn by habitat creation and retention of riparian habitat will deter bats from flying near the road. Attenuation ponds to be provided at the River Don and Goval Burn/Corsehill Burn may extend the foraging habitat resource along these watercourses as well as mitigating against potential deterioration in water quality when planted with riparian vegetation. Severance of flight lines and habitats will be addressed by provision of safe crossing points including the following:

- Pitmedden Underbridge (ch322600)
- Don Crossing (a wide span bridge which bats may fly under in the operation phase), (ch323100)
- Goval Burn Bridge (ch323600)
- Goval Mill Lade (ch323900)
- Corsehill Burn Culvert (ch324500, 324600)
- A947 Overbridges. (ch324400)

6.6.4 Linear scrub planting alongside the road will direct bats toward these crossing points.

6.6.5 The mitigation measures with regard to the Section NL4 ch322600 – 325370 Nether Kirkton – Corsehill are given comprehensive consideration in Table 30 and illustrated in Figure 11.5h - 11.5k.

Table 30 – Specific mitigation proposals Section NL4 Nether Kirkton - Corsehill

Habitat Area	Impact Magnitude /Significance	Construction
N49 Agricultural fields and quarry north of railway	Severance due to operation (Medium Negative/Moderate adverse)	Severance effects will be offset by provision of scrub woodland alongside the road on the embankment (leaving a gap between the verge and the road so bats are not attracted to the road) between ch322200 – 322700 as per Landscape Report, Chapter 11 to direct bats toward safe crossing point at Pitmedden Road underbridge (ch322600). (Figure 11.5h)
N50 Agricultural fields on either side of Dyce Drive south of railway line	Direct mortality due to RTA (High Negative/Moderate adverse) Severance of flight routes (Medium Negative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Disturbance due to construction and operation (Medium Negative/Moderate adverse)	RTA and severance to be prevented by provision of safe crossing point at Pitmedden Road Underbridge (ch322600) and cutting to be kept open to prevent direct crossings away from safe crossings. Flight line disruption and disturbance to commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Generic mitigation to prevent and reduce effects of disturbance due to construction of Pitmedden Road Underbridge. Provision of screens to reduce impacts on potential roosts following survey of buildings for roosting bats. Severance of flight routes will be offset by provision of scrub woodland of shrubs that do not attract insects alongside the road on the embankment as per Landscape Report, Chapter 11 (ch322300 – 322700) to direct bats toward safe crossing point at Pitmedden Road underbridge and prevent direct crossings. Planting between ch321800 – 322150 to the north of the road as per N47 will prevent direct road crossings at the cutting (ch321630 – 322130) and encourage bats to fly along the road toward safe crossing points as per N49 and provide foraging resources north of the road so bats do not have to cross. Generic mitigation for maintenance and aftercare of newly created habitat. Generic mitigation for monitoring crossing. Reduction in suitability of pill box and buildings for roosting will be offset by provision of alternative roost opportunities suitable for pipistrelle bats and Daubenton's bats (Schwegler 1FF) suitable for Pipistrelle and *Myotis* spp. on both sides of the road in Nether and Upper Kirkton Bats will also benefit from mitigation to be implemented as per N47. Generic mitigation for monitoring artificial roosts. (Figure 11.5h)
N51 Agricultural fields on southwest bank of River Don Valley	Habitat loss (Low Negative/Minor adverse) Disturbance due to construction (Medium Negative/Moderate adverse) Severance due to operation (Medium negative/Minor)	Mitigation as per N52 will offset habitat loss in this Habitat Area. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of high span bridge as per N52 will retain potential foraging and commuting route along riverbank. (Figure 11.5h & 11.5i)
N52 Banks of the River Don - DWS	Direct mortality due to construction and operation (High Negative/Major adverse) Aquatic habitat loss (Medium Negative/Major adverse) Severance of River and flight	Generic mitigation to prevent and reduce mortality associated with habitat loss. Flight line disruption and disturbance to foraging and commuting bats to be reduced by avoidance of night works and lighting during bridge construction and maintaining access points through the bridge which bats can pass through. Loss of freshwater habitats and potential foraging area to be reduced by sensitive siting of works and retention of bankside trees and natural features including pools and riffles as per otter and fish reports in appendices A10.6 and A10.10. Mature willow tree to be relocated elsewhere on the Don bank to retain potential roost. Loss of marshy grassland and grassland and potential foraging area to

Habitat Area	Impact Magnitude /Significance	Construction
	routes due to construction (High Negative/Major adverse) Water quality deterioration risk due to construction and operation (Medium negative/ Major adverse) Disturbance due to construction and bridge lighting (Medium Negative/ Major adverse)	be reduced by sensitive siting of works. Loss of tree and potential roost to be offset by provision of perches and crevices in the non-structural elements of the Don Crossing which bats may use for roost, including bat bricks and Schwegler 1FQ bat boxes. This will contribute toward attainment of LBAP targets for Daubenton's bats. Generic mitigation for monitoring crossing point and artificial roosts. Loss of potential foraging habitat to be reduced by sensitive siting of works and is unlikely to be compromised in the long term. Severance of river habitat will be prevented by River Don Crossing being high enough (i.e. high span bridge with set back piers) so that bats can continue to move freely along the river corridor. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation including provision of attenuation ponds at ch323000. Generic mitigation measures to minimise effects of road lighting. A 10m buffer zone either side of the river has been agreed with SNH within which disturbance must be kept to a minimum. (Figure 11.5i)
N53 Woodland around Goval House	Severance due to operation (Medium Negative/Moderate adverse)	Severance of river habitat will be prevented by River Don Crossing being high enough (i.e. high span bridge with set back piers) so that bats can continue to move freely along the river corridor as per N52. (Figure 11.5i)
N54 Farmland between River Don and B977	Direct mortality due to construction (High Negative/ Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse) Barrier effect due to operation (Medium negative/Moderate Adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. Loss of woodland habitat to be offset by provision of roosting and perching opportunities in the Don Crossing as per N52. Provision of perches and crevices in the existing B977 bridge over Goval Burn which bats may use for roost, including bat bricks and Schwegler 1FQ bat boxes will contribute toward attainment of LBAP targets for Daubenton's bats. Generic mitigation for maintenance and aftercare of newly created habitat and monitoring artificial roosts. Scrub woodland planting alongside the road and embankment as per Landscape Report in Chapter 11 will help direct bats to safe crossing points and alternative foraging areas. Flight line disruption and disturbance to foraging and commuting bats to be reduced by avoidance of night works and lighting during bridge construction and design of a high span bridge as per N52. (Figure 11.5i)
N55 Agricultural fields surrounding Goval Farm	Flight line disruption due to construction (Low Negative/Minor adverse) Habitat isolation and severance due to operation (Medium Negtative/Minor adverse) Disturbance if bats roosting (Medium Negative/Minor adverse)	Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of screens to reduce impacts on roosts and watercourses as per N61. Generic mitigation to prevent and reduce effects of disturbance due to construction of of road B977 West Overbridge, including earthworks and lighting; following survey of farm buildings for roosting bats, including sensitive siting of works compounds. Severance of possible flight routes and isolation of Goval Wood from features to the south will be offset by provision of scrub planting as per Landscape Report, Chapter 11 on embankment of B977 Overbridge (ch323600) and linear scrub planting of shrubs which do not attract insects along the road to force bats to fly high over the road or commute to alternative crossings at the Don Crossing, B977 Overbridge and Goval Mill Lade. Cutting to be kept open between ch323650 – 324050 to deter bats from flying over. Generic mitigation for monitoring crossings. Generic mitigation for maintenance and aftercare of newly created habitat Provision of perches and crevices as per N54 in the existing B977 bridge over Goval Burn which bats may use for roost, including bat bricks and Schwegler 1FQ bat boxes will contribute toward attainment of LBAP targets for Daubenton's bats. Generic mitigation for monitoring artificial roosts.

Habitat Area	Impact Magnitude /Significance	Construction
		(Figure 11.5i & 11.5j)
N56 Goval Wood	Habitat Isolation due to operation (Low Negtative/Minor adverse)	Mitigation to be provided as per N55 and N58 will mitigate against isolation of Goval Wood from features south of the road and measures to be implemented along the River Don as per N52/N54 will also maintain this as a flight route. (Figure 11.5j)
N57 Plantation north of Goval Wood	No impacts predicted (Negligible)	No additional mitigation required
N58 Goval Belt	Direct mortality due to construction and RTA (High Negative/ Moderate adverse) Habitat loss (Low Negative/Minor adverse) Severance of flight routes (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA risk to be avoided by planting of mature standard trees on either side of the road and sensitive shaping of proposed landscape woodland planting to encourage bats to fly over the road. RTA is unlikely to increase as fewer bats will attempt to cross a wider road. Generic mitigation to monitor crossings. Loss of potential roosting habitat will be offset by provision of Schwegler 2F bat boxes and wooden bat boxes in trees to be retained either side of the improved A947. Generic mitigation for monitoring artificial roosts. Effects of flight line severance to be reduced by planting 'up and over' trees on either side of the road on the embankment along the edges of Goval Belt to encourage bats to fly over the road above traffic. Generic mitigation for maintenance and aftercare of newly created habitat. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of screens either side of the road to force bats to fly over the road during construction. Disturbance to woodland edges to be avoided including sensitive location of site access and storage areas. (Figure 11.5j)
N59 Agricultural fields north of Goval Belt	No impacts predicted (Negligible)	No additional mitigation required
N60 Agricultural fields south of Goval Belt between A947 and Formartine and Buchan Way	Direct mortality due to construction and operation (High Negative/Moderate adverse) Riparian habitat loss (Medium Negative/Moderate adverse) Flight line disruption due to construction (Medium Negative/Moderate adverse) Severance due to operation (High Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and severance to be prevented by retention of the Goval Lade Aquaduct (ch323950), and provision of the A947 Goval Overbridge, Goval Burn Culvert (ch324600) and the Formartine and Buchan Way (ch324600) as per N61 and N62; the culvert entrances should be enhanced by sensitive insect-attracting shrub planting shaped toward the entrances to enable bats commuting along the road to find them. Generic mitigation for monitoring artificial roosts and crossings. Loss of potential roost trees will be prevented by sensitive location of works compounds and retention of trees of value in an alternative location along Goval Burn. Loss of riparian woodland will be offset by provision of riparian woodland planting between ch324400-324500 north and south of the road and bats will also benefit from provision of attenuation ponds at ch324300 to be planted with riparian habitat as per Landscape Report, Chapter 11 and. Loss of potential roost sites will be offset by provision of Schwegler 1FF, 2F, 2F-DPF and wooden boxes suitable for Pipistrelle and *Myotis* spp. on both sides of the road along Goval Burn, equating to potential roosts to be lost, as per N61. Habitat loss to be offset by provision of perches and crevices in the existing A947 bridge over Goval Burn which bats may use for roost, including bat bricks and Schwegler 1FQ bat boxes will contribute toward attainment of LBAP targets for Daubenton's bats. Generic mitigation for maintenance and aftercare of newly created habitat and monitoring artificial roosts.

Habitat Area	Impact Magnitude /Significance	Construction
		Flight line disruption and disturbance to foraging and commuting bats alonf Goval Burn and The Lade to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting as per N61. (Figure 11.5j)
N61 Goval Burn and The Lade	Direct mortality due to construction and operation (High Negative/Major adverse) Riparian habitat loss and burn realignment (Medium Negative/Moderate adverse) Flight line disruption due to construction (Medium Negative/Moderate adverse) Severance due to operation (Medium Negative/Moderate adverse) Disturbance of roosting bats due to construction and operation (High Negative/Major adverse) Deterioration of water quality risk due to construction and operation (Medium Negative/Moderate adverse) Reduction in suitability as roost (High Negative/Major adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA and severance to be prevented by provision safe crossing points to be retained at the Goval Lade Aquaduct (ch323950), and those to be provided at the A947 Goval Overbridge, Goval Burn Culvert (ch324600) and the Formartine and Buchan Way (ch324600) as per N60 and N62; the culvert entrances must be enhanced by sensitive insect-attracting shrub planting to enable bats commuting along the road to find them. Tree planting to be provided immediately between the road and Parkhill Pumping Station to encourage bats leaving the roost to fly up onto the aquaduct. Generic mitigation for monitoring crossings. Loss of high value foraging habitat will be prevented by retention of bankside trees and natural features including riffles and pools and planting of riparian woodland as per N60 and the otter report in Appendix A10.6. Loss of roost habitat will be offset by provision of bat boxes (Schwegler 1FF, 2F, 2F-DPF and wooden) suitable for pipistrelle and Daubenton's bats in trees to be retained alongside Goval Burn to provide roost opportunities as per N60. Reduction in suitability of Parkhill Pumping Station as roost will be offset by enhancement of B977 (ch323700) and A947 (ch324400) road bridges over Goval Burn by installation of bat bricks to make them suitable for Daubenton's bat summer roosts. Provision of bat boxes and addition of cavities inside building including bat bricks and Schwegler 1FQ bat boxes, plus measures to exclude human presence to improve the suitability for the building for roosting bats throughout the year. Loss of potential roost trees will be prevented by sensitive location of works compounds and retention of trees of value in an alternative location along Goval Burn. Loss of freshwater habitat will be offset by provision of attenuation ponds at ch324300. Generic mitigation for monitoring artificial roosts and for maintenance and aftercare of newly created habitat. Roost survey must be undertaken at Parkhill Pumping Station to establish extent of use. Alternative roost must be provided nearby to offset loss of roost if building disturbed during works and bats excluded if disturbance or mortality likely during construction. Screens to be provided during works to prevent bats flying directly onto road. Works must be restricted to a time of year when bats are unlikely to be present and night works to be avoided with SNH advice. Generic mitigation to prevent and reduce effects of disturbance including lighting, noise and vibration on roost in pumping station and effects of disturbance on adjacent wooded areas due to construction of the A947 Goval junction and SEERAD licence to be obtained if bats are likely to be disturbed during works. Flight line disruption and disturbance to foraging and commuting bats along Goval Burn and The Lade to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting and provision of screens if works likely to disturb flyways. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution of Goval Burn and Mill Lade during construction and operation including provision of attenuation ponds at the A947 Goval Junction. Generic mitigation measures to minimise effects of road lighting at the A947 Goval Junction. (Figure 11.5j)
N62 Formartine and Buchan Way	Flight line disruption due to construction (Medium Negative/Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Disturbance due to	Flight line disruption and disturbance to foraging and commuting bats to be reduced by avoidance of night works and lighting during bridge construction and maintaining access through the bridge which bats flying along the Formartine & Buchan Way can pass through. RTA and severance to be prevented by retention of the flyway along the the Formartine and Buchan Way by provision of an oversized tunnel at ch324600 and over the B947 which bats may fly through/over. Scrub woodland planting alongside the road as per Landscape Report, Chapter 11 between Goval Burn and Goval Junction will encourage bats to fly along the road toward alternative safe crossing points along Goval Burn and the Formartine and Buchan Way as per N60 and N62. A 10m gap between planted woodland and the road must be retained to prevent direct road crossings. Generic mitigation for monitoring crossings.

Habitat Area	Impact Magnitude /Significance	Construction
	construction and operation (Medium Negative/moderate adverse)	Loss of species rich verge and scrub foraging habitat will be offset by riparian woodland planting alongside Goval Burn as per N61. Provision of perches and crevices in the existing A947 bridge and alongside Goval Burn as per N60 and N61 which bats may use for roost, will contribute toward attainment of LBAP targets for Daubenton's bats and enhance roost availability for bats foraging along the Formartine & Buchan Way. Generic mitigation for monitoring artificial roosts and for maintenance and aftercare of newly created habitat. Generic mitigation measures to minimise effects of road lighting at the A947 Goval Junction. (Figure 11.5j)
N63 Park Hill Estate	Direct mortality risk due to construction (High Negative/Moderate adverse) Habitat loss (Low Negative/Minor adverse) Isolation of Habitat Areas (Medium Negative/Moderate adverse) Flight line disruption due to construction (Medium Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. Loss of potential roosts in mature trees will be offset by provision of bat boxes (Schwegler 1FF, 2F, 2F-DPF and wooden) suitable for pipistrelle and Daubenton's bats in trees to be retained in Park Hill Estate to provide roost opportunities. Bats will benefit from provision of mixed woodland planting along the B977 to the existing River Don Crossing as per Landscape Report, Chapter 11, which will retain connectivity between estate and the River Don and retain a similar level of connectivity to eexisting levels via the Formartine & Buchan Way and the River Don. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining junction construction to minimum area necessary and avoidance of night works and lighting. Provision of screens to reduce impacts on trees following survey for roosts. (Figure 11.5j)
N64 Agricultural fields southeast of Formartine and Buchan Way	No impacts predicted (Negligible)	No further mitigation required
N65 Skate Wood	Disturbance due to construction (Medium Negative/Moderate adverse) Indirect severance due to operation (Low negative/minor adverse)	Generic mitigation to reduce effects of disturbance due to construction of Goval Junction and earthworks. Severance and isolation of Habitat Areas to be offset by provision of crossing points over the proposed scheme including Corsehill Burn Culvert at ch325005 and as per N70/N71, retention of existing trees in the centre of the proposed roundabout at the A947 Goval Junction and scrub planting along the road as per Landscape Report, Chapter 11, to encourage bats to fly high over the road and commute between safe crossing points. (Figure 11.5j)
N66 Roadside plantation and mature pine avenue at Little Goval	Direct mortality due to construction (High Negative/Minor adverse) Habitat loss (Low	Generic mitigation to prevent and reduce mortality associated with habitat loss. Loss of low value woodland will be offset as per N61. Severance and isolation of Habitat Areas to be offset by provision of crossing points over the proposed scheme as per HA N65.

Habitat Area	Impact Magnitude /Significance	Construction
	Negative/Minor adverse) Severance of probable flight routes (Medium Negative/Minor adverse) Disturbance due to road construction and earthworks(Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of the A947 Goval Junction, including lighting; following survey of trees for roosting bats. (Figure 11.5j)
N67 Den Wood and roadside plantations	Indirect severance due to operation (Medium Negative/Moderate adverse)	Mitigation as per N71/N72 will mitigate against severance effects by provision of alternative crossing at the B977 Overbridge (ch325950) where planting must be shaped sensitively to encourage bats to fly over using the bridge. (Figure 11.5j)
N68 Agricultural fields between B977 and Meadowhead Burn	Loss of pond (Medium Negative/Minor adverse) Flight line disruption (Medium Negative/Minor adverse) Indirect severance (Low Negative/Minor adverse)	Loss of pond will be offset by pond creation in Corsehill south of the road in N71 (ch325450) as per Otter report in Appendix 10.6. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Mitigation to be provided as per N69, N71 and N72 will provide alternative crossing points for bats which will retain some connectivity between each side of the road. (Figure 11.5j & 11.5k)
N69 Agricultural fields north of Meadowhead burn and east of Formartine and Buchan Way	Direct mortality due to RTA (High Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse) Isolation and severance due to operation (Medium Negtative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Alteration of water quality due to construction and operation (Low Negative/Minor adverse)	RTA and severance effects to be prevented/offset by provision of safe crossing points under the proposed scheme including Corsehill Burn Culvert at ch325050, retention of existing trees in the centre of the proposed roundabout at the A947 Goval Junction as per N65 and retention of the Formartine and Buchan Way flyways as per N62. Generic mitigation to prevent and reduce effects of disturbance due to road construction and earthworks including a temporary screen to protect bats roosting in Meadowhead Farm following survey to identify the roost status. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation (Figure 11.5j)
N70 Agricultural fields east of B997 at Newpark	Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce effects of disturbance due to junction improvements, including earthworks and lighting; following survey of adjacent trees and farm buildings for roosting bats. Habitat severance effects to be prevented by enhancement of B977 Overbridge (ch325950) as per N72. Generic mitigation for

Habitat Area	Impact Magnitude /Significance	Construction
Steading	Severance due to operation (Medium Negative/Moderate adverse)	monitoring of crossing. Stoppage of the old Newmachar Church Road will reduce disturbance and RTA risk to the south of Newpark Steading. (Figure 11.5j & 11.5k)

6.7 Specific Mitigation Proposals Section NL5 Corsehill - Blackdog

6.7.1 Specific mitigation proposals in addition to generic measures to be implemented throughout Section NL5 include minimal habitat creation to offset that lost under the proposals due to the low value of the predominantly agricultural land through which the scheme passes, the fact that much of the woodland at Littlejohns Wood has been felled and due to retention of trees of potential value to roosting bats at Cranfield and along Blackdog Burn. However replanting of much of Littlejohn's Wood and provision of bat boxes in trees to be retained in Littlejohns Wood and around Cranfield will restore foraging opportunities lost and offset the loss of trees of potential value to roosting bats. Proposed habitat creation at the A90 Blackdog Junction will enhance foraging opportunities for bats in the long term.

6.7.2 The road is to remain open with no planting where possible to prevent bats from being attracted to it, although additional crossing points will be provided at the following locations will enable bats to cross:

- B977 Overbridge (ch325950)
- Lochgreens Overbridge (ch3267050)
- Red Moss Burn Culvert (ch327500)
- Newtonhill Overbridge (ch328550)
- B999 Overbridge (ch329500)
- Blackdog Burn Culvert (ch329950 and A90)

6.7.3 Linear planting and habitat enhancement to encourage the use of crossings by bats is particularly important at the B999 overbridge which will provide important connectivity and a safe crossing point for bats commuting between Red Moss and features to the south of the road along a green corridor.

6.7.4 The provision of attenuation ponds near Corby Loch and at Blackdog/Harehill Burns will increase the likelihood of bats using these crossing points and enhance the value of these areas for foraging bats including Daubenton's bats which have not otherwise been recorded in these areas. In addition disturbance to bats found roosting near Blackdog must be minimised by sensitive location of access roads and lighting.

6.7.5 The mitigation measures with regard to Section NL5 are given comprehensive consideration in Table 31 and illustrated in Figure 11.5k – 11.5p.

Table 31 – Specific mitigation proposals Section NL5 Corsehill - Blackdog

Habitat Area	Impact Magnitude /Significance	Construction
N71 Corsehill Wood	Direct mortality due to RTA (High Negative/Moderate adverse) Habitat loss (Low Negative/Minor adverse) Severance of flight routes (Medium Negative/Moderate adverse) Flight line disruption due to construction (Medium Negative/Moderate adverse)	RTA and severance effects to be prevented by enhancement of B977 Overbridge (ch325950) as per N72 .will encourage use of the bridge as a safe crossing point and retention of flight lines along a green corridor as per N72. Generic mitigation for monitoring of crossing. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Bats will also benefit from provision of artificial roosts and replanting to extend Corsehill Wood as per N72, road stoppage as per N69 and pond creation as per N68. Generic mitigation for maintenance and aftercare of newly created habitat (Figure 11.5k)
N72 Littlejohn's Wood	Direct mortality due to construction and RTA (High Negative/Moderate adverse) Habitat loss (Medium Negative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Severance of flight routes (High Negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss. RTA effects will be reduced by the road being in a cutting at Littlejohns Wood, and severance effects to be prevented by enhancement of B977 Overbridge (ch325950) where planting to offset habitat loss for other protected species should be shaped to encourage bats to fly up onto bridge. Planting of mature standard trees with crowns that reach over the carriageway, and retention of a gap adjacent to the road to prevent bats flying directly onto the road will encourage use of the bridge as a safe crossing point and retention of flight lines along a green corridor. Generic mitigation for monitoring of crossing and for maintenance and aftercare of newly created habitat. Bats will also benefit from road stoppage as per N69. Loss of mature beech trees must be avoided where possible to provide roosting and foraging habitat for bats in Littlejohn's Wood Habitat loss will be offset by replanting of mixed woodland between ch325720-325900 south of the road; and by provision of Schwegler 1FF bat boxes suitable for Pipistrelle and brown long eared bats within emaining fragments of Littlejohns Wood and Den Wood either side of the proposed road, equating to potential roosts to be lost. Heavy standard tree planting as per Landscape Report in Chapter 11 will also enhance the area for foraging and roosting in the long term. Generic mitigation for monitoring artificial roosts. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5k)
N74 Woodland at Red Moss north of B977	Direct mortality due to RTA (High negative/Moderate adverse) Disturbance due to construction (Medium Negative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Severance due to operation (High Negative/Moderate	RTA and habitat severance effects to be prevented enhancement of the B977 overbridge as per N71. Generic mitigation to prevent and reduce effects of disturbance due to construction of B977 junction, embankment and lighting; following survey of trees for roosting bats. Provision of screens if bats likely to be roosting nearby. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. (Figure 11.5k & 11.5l)

Habitat Area	Impact Magnitude /Significance	Construction
	adverse)	
N75 Raised bog at Red Moss north of B977	Indirect severance due to operation (Medium Negative/Minor adverse)	Severance and barrier effects to be reduced by provision of crossing point at B977 Overbridge as per N72, and Lochgreens Overbridge at ch326700 as per HA N80/ N84. (Figure 11.5k & 11.5l)
N76 Farmland and bare ground at Moss-Side north of B977	Indirect severance due to operation (Low Negative/Minor adverse)	Severance and barrier effects to be reduced by provision of crossing point at B977 Overbridge as per N72, and Lochgreens Overbridge at ch326700 as per HA N80/ N84. (Figure 11.5k & 11.5l)
N78 Mosaic of scrub and grassland west of Moss Belt	Indirect severance due to operation (Low Negative/Minor adverse)	Severance and barrier effects to be reduced by provision of crossing point at B977 Overbridge as per N72, and Lochgreens Overbridge at ch326700 as per HA N80/ N84 (Figure 11.5k & 11.5l)
N79 Moss Belt Plantation	Indirect severance due to operation (Low Negative/Minor adverse)	Severance and barrier effects to be reduced by provision of crossing point at B977 Overbridge as per N72, and Lochgreens Overbridge at ch326700 as per HA N80/ N84. (Figure 11.5k & 11.5l)
N80 Agricultural Fields between B977 and Loch Hills Quarry	Direct mortality due to RTA (High Negative/Moderate adverse)– Loss of pond (Medium Negative/Moderate adverse) Severance due to operation (High Negative/Moderate adverse) Flight line disruption due to construction (Medium Negative/Moderate adverse)	RTA to be prevented by retention of Lochgreens flyway through provision of Lochgreens Overbridge (ch326700). Proposed tree planting along field boundaries including along Lochgreens Road as per Landscape Report, Chapter 11 will encourage bats commuting along Lochgreens Road to use crossing point and direct bats toward the crossing if shaped sensitively. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting. Provision of screens to reduce impacts on roosts. Severance and barrier effects to be reduced by provision of crossing point at B977 Overbridge which will be enhanced by planting along the embankment of the B977 as per N72, and Lochgreens Overbridge. Loss of pond will be offset by creation of planting around attenuation ponds as per N84. Generic mitigation for monitoring crossing. Generic mitigation for maintenance and aftercare of newly created habitat (Figure 11.5k &11.5l)
N81 Loch Hills Quarry	No impacts predicted (Negligible)	No additional mitigation required
N82 Red Moss south of B977	Indirect severance due to operation (Low Negative/Minor adverse)	Mitigation measures to be implemented for N80/N84 will reduce effects of severance. (Figure 11.5k & 11.5l)
N83	Indirect severance due to operation (Low Negative/Minor	Mitigation measures to be implemented for N80/N84 will reduce effects of severance.

Habitat Area	Impact Magnitude /Significance	Construction
Woodland between Red Moss and Lochgreens Farm	adverse)	(Figure 11.5k & 11.5l)
N84 Agricultural fields south of Lochgreens Farm	Direct mortality due to RTA (High Negative/Moderate adverse) Indirect severance (Medium Negative/Moderate adverse) Flight line disruption (Medium Negative/Moderate adverse) Disturbance due to construction (Low negative/Minor adverse)	RTA and severance effects to be prevented by retention of Lochgreens flyway through provision of Lochgreens Overbridge (ch326700). Proposed tree planting along field boundaries including along Lochgreens Road as per Landscape Report, Chapter 11 will encourage bats to use crossing point. Generic mitigation for monitoring crossing. Severance and isolation effects to be reduced by shaping newly created habitat as per Landscape Report in Chapter 11 at Lochgreens Overbridge (ch326700) as per N80 and Red Moss Burn Culvert (ch327500) to retain commuting routes between Red Moss and Corby/Lily Lochs. Attenuation ponds at ch327500 to be planted with riparian habitat and in conjunction with sensitive shrub planting leading to the culvert, encourage bats to cross at Red Moss Burn Culvert. Generic mitigation for maintenance and aftercare of newly created habitat. Generic mitigation to prevent and reduce effects of disturbance due to construction of Lochgreens Overbridge, including lighting; following survey of farm buildings for roosting bats. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting especially along Lochgreens Road and Red Moss Burn (Figure 11.5k & 11.5l)
N85 Corby and Lily Lochs and associated habitats – SSSI, DWS and SINS	Direct mortality due to RTA (High Negative/Moderate adverse) Indirect severance (Medium Negative/Moderate adverse) Probable flight line disruption (Medium Negative/Moderate adverse) Water quality deterioration risk due to construction and operation (Low negative/Minor adverse)	RTA to be prevented by retention of Lochgreens flyway through provision of Lochgreens Overbridge and Red Moss Burn Culvert as per N80/N84. Generic mitigation for monitoring crossing. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting especially along Lochgreens Road and Red Moss Burn. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation including provision of attenuation at ch327500 as per N84. Severance and flight line disruption effects to be reduced by provision of tree planting along field boundaries adjacent to Lochgreens Road and enhancement of Lochgreens Overbridge as per N80 and Red Moss Burn Culvert as per N84 to retain commuting routes between Red Moss and Corby/Lily Lochs. (Figure 11.5k & 11.5l)
N86 Agricultural fields between Red Moss and Newtonhill Farm	Indirect severance due to operation (Medium Negative/Moderate adverse)	Indirect severance effects will be offset by provision of alternative crossing points as per N84/N87/ N90. Generic mitigation for monitoring crossings. (Figure 11.5l)
N87 Agricultural fields between Lochgreens Road and Gravel Pit	Direct mortality due to RTA (High Negative/Moderate adverse) Severance due to operation (Medium Negative/Moderate adverse)	RTA to be prevented by provision of Red Moss Burn Culvert (ch327500) as per N84 and Newtonhill Overbridge (ch328550) as safe crossing points. The road is in a cutting along most of this section and planting must not take place on the cutting to deter bats from the road. Generic mitigation for monitoring crossings. Flight line disruption and disturbance to foraging and commuting bats to be reduced by confining earthworks to minimum area necessary and avoidance of night works and lighting especially along Red Moss Burn and Leughlands – Cranbog – Shielhill Road.

Habitat Area	Impact Magnitude /Significance	Construction
	Probable flight line disruption (Medium Negative/Moderate adverse)	Generic mitigation for maintenance and aftercare of newly created habitat (Figure 11.5l)
N88 Newton of Shielhill DWS	Indirect severance due to operation (Medium Negative/Moderate adverse)	Severance and isolation be offset by provision of Red Moss Burn Culvert (ch327500) as per N84 and Newtonhill Overbridge (ch328550) as per N87 to retain commuting routes between Red Moss and Corby/Lily Lochs. Generic mitigation for monitoring crossing. (Figure 11.5l & 11.5m)
N89 Agricultural fields between unclassified road and B999 (north)	No impacts predicted (Negligible)	No additional mitigation required
N90 Agricultural fields between unclassified road and B999 (south)	Direct mortality due to construction and RTA (High Negative/Major adverse) Habitat loss (Medium Negative/Moderate adverse) Severance of flight routes (High Negative/Major adverse) Flight line disruption (Medium Negative/Moderate adverse) Disturbance due to construction and operation (Medium Negative/Moderate adverse)	Generic mitigation to prevent and reduce mortality associated with habitat loss including survey for roosting bats; existing tree lines to be retained where possible. RTA and habitat severance effects to be prevented by leaving the cutting open between Newtonhill Overbridge and the B999 Overbridge on both sides of the proposed road as per N87/N91. The existing lines of trees running parallel to the road must be maintained to retain flight lines away from the road so bats are not attracted directly to the road. The B999 overbridge embankment will be enhanced by planting of heavy standard mature beech trees as per landscape report, Chapter 11. Bats are then likely to continue using these routes and the safe crossing point. Planting must be shaped toward the crossings to encourage bats to fly high over the road ideally with crowns touching either side to retain connectivity either side of the road. Generic mitigation for monitoring crossings. Loss of potential roost sites will be prevented by retention of features of value in tree at an alternative location to be confirmed on existing trees to be retained. Loss of potential roost sites will be offset by provision of wooden bat boxes suitable for Pipistrelles within existing tree lines and farm buildings to be retained, equating to potential roosts to be lost. Loss of high value foraging and roosting habitat will be offset by tree planting along B999 as per Landscape Report, Chapter 11 reflecting those lost and to enhance flight lines and connectivity between habitat fragments in an otherwise barren landscape. Planting must not take place within 10m of the proposed scheme away from overbridges or on the cutting to prevent RTA. Bat boxes (Schwegler 2F and Wooden suitable for pipistrelle bats) to be provided on trees to be retained along tracks to north and south of the road to offset loss of roosting opportunities during felling. Generic mitigation for monitoring artificial roosts and for maintenance and aftercare of newly created habitat Generic mitigation to prevent and reduce effects of disturbance due to construction of Newtonhill and B999 Overbridges on adjacent tree lines including use of screens if bats roosting. (Figure 11.5l - 11.5n)
N91 Agricultural fields adjacent to Blackdog Burn east of B999	Direct mortality due to construction and RTA (High Negative/Major adverse) Loss of roost (High	Generic mitigation to prevent and reduce mortality associated with habitat loss including survey for roosting bats; existing tree lines to be retained where possible. Tree roost to be lost must be surveyed and SNH advice sought including licence application to destroy roost. RTA and severance effects to be prevented by provision of safe crossing point at the B999 Overbridge as per N90, and the Blackdog Burn Culvert at ch329950. Blackdog Burn Culvert will be enhanced by riparian woodland planting and scrub either side of the road to encourage use by bats; planting must be shaped to enable bats to find the safe crossing. Generic

Habitat Area	Impact Magnitude /Significance	Construction
	Negative/Major adverse) Habitat loss (Medium Negative/Moderate adverse) Severance of flight routes (High Negative/Major adverse) Flight line disruption (Medium Negative/Moderate adverse) Disturbance due to construction and operation (Medium Negative/Moderate adverse) Alteration of water quality risk due to construction and operation (Medium Negative/Moderate adverse)	mitigation for monitoring crossings. Habitat loss and modification along the Burns will be prevented by retention of bankside habitat where possible (see also Otter Report in Appendix 10.6). Where unavoidable habitat loss will be offset by planting alongside the burns and around attenuation (ch329900 – 330000 either side of the road. Generic mitigation for maintenance and aftercare of newly created habitat Bat boxes (Schwegler 2F and Wooden suitable for pipistrelle bats) to be provided on trees to be retained along tracks to north and south of the road to offset loss of roosting opportunities during felling. Generic mitigation for monitoring artificial roosts. Generic mitigation to prevent and reduce effects of disturbance on adjacent trees including use of screens if bats roosting. Generic mitigation measures to prevent and reduce impacts associated with water quality/pollution during construction and operation including attenuation pond pprovision at ch329900. (Figure 11.5m & 11.5n)
N92 Agricultural fields between B999 and Harehill Farm	No impacts predicted (Negligible)	Bats using the area will benefit from provision of foraging opportunities in the way of attenuation ponds as per N91. (Figure 11.5n)
N93 Agricultural fields between Harehill Farm and A90 south of Blackdog Burn	No impacts predicted (Negligible)	Bats using the area will benefit from provision of foraging opportunities in the way of attenuation ponds as per N91. (Figure 11.5n)
N94 Agricultural fields west of A90 north of Blackdog Burn	No impacts predicted (Negligible)	No additional mitigation required
N95 Grassland east of A90, south of Blackdog	No impacts predicted (Negligible)	Bats using the area may benefit from provision of foraging opportunities in the way of attenuation ponds at the A90 Blackdog junction, especially given the low overall value of this area for bats at present. (Figure 11.5n)
N96 Agricultural fields west of A90 either side of Potterton Road	Disturbance due to construction and operation (Medium Negative/Minor adverse)	Generic mitigation to prevent and reduce effects of disturbance due to construction of A90 Blackdog Junction, including earthworks and lighting; following survey of farm buildings for roosting bats. Junction llighting to be kept to a minimum to advoid disturbance to bats using the area. Bats using the area may benefit from provision of foraging opportunities in the way of attenuation ponds and riparian woodland

Habitat Area	Impact Magnitude /Significance	Construction
		planting either side of the road at the A90 Blackdog junction, especially given the low overall value of this area for bats at present. Bats may benefit from reduced traffic speeds on the A90. (Figure 11.5o & 11.5p)
N97 Agricultural fields east of A90 north of Blackdog	No impacts predicted (Negligible)	Bats using the area may benefit from provision of foraging opportunities in the way of attenuation ponds and riparian woodland planting either side of the road at the A90 Blackdog junction, especially given the low overall value of this area for bats at present. (Figure 11.5o & 11.5p)

6.8 Mitigation Summary

6.8.1 In summary, the findings of pre-works surveys must be taken into consideration and mitigation measures to protect bats and their roosts during construction must be implemented prior to works commencing. During operation, mitigation measures must be in place prior to the road being opened to traffic.

6.8.2 Where roosts are to be lost it is essential that a SEERAD licence be obtained at least a year in advance of development commencing and replacement roosts must be provided and bats effectively excluded prior to works commencing ((Mitchell-Jones, 2004). In general replacement roost and roost opportunity provision may be achieved by a sensitive bat box provision scheme with effective monitoring into the operation of the road, with bat brick provision in existing bridges and where significant roosts are threatened with disturbance.

6.8.3 In general, most of the habitat to be lost during construction of the proposed scheme is of low value to bats but where habitat of value or potential value to roosting, commuting or foraging bats is to be lost this will be offset by planting and habitat creation including provision of attenuation ponds and replacement roosts (bat boxes and bat bricks). Where planting adjacent to the road has been proposed as part of the ecological or landscape mitigation proposals this must be carried out sensitively so that attractive linear features perpendicular to the road are maintained where safe crossing points are to be provided; and with wide verges of poor quality habitat including amenity grassland to deter bats from foraging along the road. Where felling and demolition are to take place pre-works monitoring must be undertaken. This will enable bats to be taken into consideration in the design of appropriate mitigation including appropriate exclusion methods and the location of replacement roosts. Appropriate locations for alternative roosts must be established by surveying existing wooded areas and buildings at least one year prior to construction and after the finalisation of construction plans so that boxes can be erected in the same year.

6.8.4 Survey results must also take into account the necessity of measures to minimise disturbance to roosting, foraging and commuting bats including sensitive location of site compounds, provision of screens, keeping night works to a minimum and restricting works to times of the year when bats are unlikely to be present. Research has shown that certain types of lighting can deter bats (Rydell & Racey, 1993) and the impacts of lighting must therefore be minimised in sensitive Habitat Areas and at junctions throughout operation of the scheme. In addition the influence of runoff and spills on watercourses must be minimised by the provision of settling tanks and attenuation ponds which will buffer watercourses against pollution risk.

6.8.5 Evidence shows that bats will use culverts, tunnels and bridges to cross roads, even if they are long and narrow, and especially if they are enhanced by planting or if there is water flowing through (Bach et al*.,* 2004). It is therefore important to provide suitable designed crossing points so that bats may cross the road safely and continue using flyways for foraging and commuting between Habitat Areas.

6.8.6 An ecological clerk of works must be implemented through the construction period to ensure that all requirements of the mitigation strategy is being followed; and all personnel must be aware of the need for mitigation. All mitigation measures once implemented must be monitored in order to establish whether measures in place are successful and that bats are not being adversely affected. Annual maintenance and monitoring will be required during the post-construction and operational phase into the medium and long term must be carried out by the appointed contractors as a contractual requirement of the post-construction and operational phases of the road (Term Maintenance Contract). This must include bat box inspection, activity surveys at known road crossing points and RTA surveys. Where measures are not sufficient consideration must be given to alternative measures including additional provision for road crossings, planting and roost provision.

7 Residual Impacts

7.1 Introduction

7.1.1 In this section of the report, the impacts that persist after the implementation of mitigation measures detailed above are discussed by generic impacts and by geographical Section. Where possible the effects of these must be monitored and further mitigation measures be decided. The impacts are assessed as described in Section 2.6.

Direct mortality

7.1.2 If the mitigation measures described above are implemented successfully and considerable effort is made to find roosts prior to felling and demolition works the risk of accidental deaths of bats should be minimal and is not predicted to compromise the long term viability of the bat population. The magnitude and significance of this residual impact is expected to be **Negligible**.

7.1.3 During the operational phase of the road there may be isolated incidences of RTA although the reduction in traffic volumes along existing roads which lack appropriate mitigation is expected to offset this with no overall impact on the viability of the bat population. In addition bats are expected to gradually adapt to the new landscape and the provision of safe crossing points including bridges, underpasses and box culverts in combination with the provision of planting at the most sensitive areas. Although the impact of direct mortality on bats is of high negative magnitude to individual bats due to their legal status (see section 1.2) it is considered that over the entire route corridor and over the whole population of bats of all species the significance associated with this residual impact is of **Low Negative/Minor** significance as impacts of direct mortality are unlikely to change the viability of local bat communities or the ecological value of local populations.

Habitat Loss

7.1.4 Bats are sensitive to change and vulnerable in terms of population impacts therefore may not survive short and medium term loss of roosting and foraging habitat, with newly created habitat unlikely to provide good quality foraging and roosting habitat or shelter for commuting bats until it is mature. Habitat loss is therefore considered to be of **Low Negative/Minor** magnitude and significance in the short and medium term. In the long term loss and alteration of existing habitats will be balanced by habitat creation and enhancement including tree planting, bat box provision and creation of hibernacula, edge habitat and planting around areas of attenuation providing foraging and future roosting opportunities in areas which previously lacked them. If the mitigation measures are implemented successfully the proposed scheme is unlikely to result in significant loss of valuable areas of bat habitat in the long term. The proposed scheme passes largely through agricultural land of low value to bats. Tree roosts to be destroyed under the proposals are likely to be small due to the size of the cavities they contain, and if these and potential roost sites in buildings and trees to be removed are replaced on a 1:4 basis and with enough time for bats to find them prior to their removal as described above, bats are expected to gradually accept the roost provided (Mitchell-Jones 2004). This will be beneficial to the bat population in the area and may result in residual impacts of **Negligible** or **Low negative/Minor** significance in the long term.

Habitat Fragmentation & Isolation

7.1.5 Despite the incorporation of bridges and culverts enhanced by planting to guide bats toward safe crossing points the construction of the proposed scheme will cause some severance of commuting routes and foraging habitat in the short term until habitat has time to mature and due to bats' use of small scale habitat features and tendency to avoid more open spaces including wide roads. Despite the provision of alternative crossing routes these are unlikely to be of benefit to bats unless fencing and planting are sensitively installed to reduce the likelihood of RTA and to guide bats toward crossing points; they are likely to be used only when the habitat matures and when bats

have had time to become accustomed to the new landscape. There is predicted to be a residual impact of **Low Negative/Minor** magnitude and significance as a result of the barrier effect of the dual carriageway in the short to medium term during the operation of the road. Although research has suggested that bats will use culverts even if they are long and narrow (Bach et al. 2004) it is likely that proposed culverts greater than 100m in length would be prohibitively long for bats to fly through, especially when water levels are high, and in the medium term until bats have located them and habitat has matured; therefore the effects of severance are likely to be higher in these cases, as at Kepplehill Burn Culvert, Craibstone Burn Culvert, Green Burn Culvert and Bogenjoss Burn Culvert 6. The effects of severance are likely to be exacerbated further by the positioning of a number of culverts in a short space, including at Green Burn and Bogenjoss Burn. This will have the added effect of reducing the value of foraging habitat along burns by restricting the ease with which bats can move. However bats are expected to gradually find alternative routes and new features along which to echolocate, provided mitigation planting, in particular at crossing points and linear features including riparian habitat are sensitively provided and maintained. Woodland habitat creation and the provision of linear habitats are expected to provide and even enhance connectivity between habitat fragments on each side of the road and along its length in the long term especially if post-construction monitoring is effectively carried out. Habitat fragmentation and isolation are therefore considered likely to leave a residual impact of **Low Negative/Minor** magnitude/significance in the long term.

Disturbance

7.1.6 The overall level of disturbance both during the construction and operation stages of the road including that due to construction activities such as felling and earthworks adjacent to roosts and foraging/commuting areas, and also due to lighting, noise, vibration and increased human presence, is expected to be greater than current levels although the phasing of construction works is predicted to reduce the magnitude of impacts on individual features. However the impacts associated with the construction phase are temporary and will be reduced to a minimal level by the mitigation measures proposed, especially if considerable effort is made to locate roosts prior to works commencing and work near roosts and at night is limited. During operation the effects of lighting is only predicted to be an issue at major junctions and may even be of benefit to foraging bats. The residual impacts of disturbance are therefore predicted to be of **Low Negative/Minor or Negligible** magnitude and significance in the long term.

Pollution/Other

7.1.7 The implementation of measures to prevent pollutants and runoff from entering watercourses during construction and operational phases of the road will result in a residual impact of **Negligible** magnitude and significance by best practice limiting the scale and spread of pollution events. The only areas of potential **Minor** impacts remaining are those where major realignments are taking place during construction.

7.2 Residual Impacts Section NL1 Derbeth - Tulloch Road

7.2.1 Residual impacts in this Section are likely to be minimal due to the overall low value of the area for bats. However there is potential for direct mortality as a result of RTA where the road severs roosting and foraging habitat at Newon Farm and Ashtown Road if bats do not readily use the enhanced overbridges to be provided. Habitat fragmentation and isolation is likely to result in a residual impact of **Minor** significance west of Kepplestone Farm as the length of Kepplehill Burn Culvert is likely to limit its value as a potential crossing point; and at Ashtown Road where probable commuting areas are to be disrupted. Provision of planting alongside the road at Ashtown Road and shaping landscape planting to direct bats toward crossing points will help offset this impact, as well as opening up the Kepplestone/Brimmond Hill area to bats. Residual impacts due to disturbance may be of **Minor** significance at Newton Farm where the presence of the road may reduce the suitability of the building as a roost; and at Ashtown Road where disruption of flight lines is likely. The residual impacts for Section NL1 are shown in Table 32.

Table 32 – Assessment of Residual Impacts Section NL1 Derbeth – Tulloch Road

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Direct Mortality	N11	n/a	Major	n/a	Minor
	N16	n/a	Moderate	n/a	Minor
Habitat Loss	N12	n/a	Minor	n/a	Negligible
Habitat Fragmentation & Isolation	N11	n/a	Moderate	n/a	Minor
	N12	n/a	Moderate	n/a	Minor
	N13	n/a	Moderate	n/a	Minor
	N14	n/a	Moderate	n/a	Minor
	N16	n/a	Moderate	n/a	Minor
Disturbance	N11	Moderate	Moderate	Minor	Negligible
	N12	Moderate	n/a	Negligible	n/a
	N16	Moderate	n/a	Negligible	n/a
Pollution	N12	Moderate	Moderate	Negligible	Negligible
	N14	Minor	Minor	Negligible	Negligible

7.3 Residual Impacts Section NL2 SAC Craibstone

7.3.1 The proposed scheme is expected to have lasting impacts on connectivity between Habitat Areas along a green corridor that includes Kirkhill Forest and Tyrebagger to the west of the study area. Despite the provision of culverts at Gough Burn, Craibstone Burn and Green Burn only Gough Burn is likely to be of value to bats in the short term due to the length of Craibstone and Green Burn culverts. Habitat severance and the loss of mature broad-leaved woodland and riparian habitat, is likely to have a residual impact of **Minor** adverse significance in this Section during the operation phase and into the long term, particularly where the highest value habitat exists along Gough, Craibstone and Green Burns. Major realignment of Green Burn may result in a residual impact of **Minor** significance for pollution during construction although mitigation measures including best practice and attenuation will reduce this impact to **Negligible** in the long term during operation. The

effects of disturbance and RTA are likely to persist into the operation of the scheme leaving a residual impact of **Minor** adverse significance near the A96 junction. The residual impacts for Section NL2 are shown in Table 33.

Table 33 - Assessment of Residual Impacts Section NL2

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Direct Mortality	N24	Moderate	Moderate	Negligible	Minor
	N25	Moderate	Moderate	Negligible	Minor
	N26	Moderate	Moderate	Negligible	Minor
	N27	Moderate	Moderate	Negligible	Minor
	N28	n/a	Moderate	n/a	Minor
Habitat Loss	N19	n/a	Moderate	n/a	Minor
	N24	n/a	Moderate	n/a	Minor
	N25	n/a	Moderate	n/a	Minor
	N26	n/a	Moderate	n/a	Minor
	N27	n/a	Moderate	n/a	Minor
Habitat Fragmentation & Isolation	N18	n/a	Moderate	n/a	Negligible
	N19	n/a	Moderate	n/a	Negligible
	N21	n/a	Minor	n/a	Negligible
	N22	n/a	Minor	n/a	Negligible
	N23	n/a	Moderate	n/a	Minor
	N24	n/a	Moderate	n/a	Minor
	N25	n/a	Moderate	n/a	Minor
	N26	n/a	Moderate	n/a	Minor
	N27	n/a	Moderate	n/a	Minor
Disturbance	N18	Moderate	n/a	Negligible	n/a
	N19	Moderate	n/a	Negligible	n/a
	N25	Moderate	n/a	Negligible	n/a
	N26	Moderate	n/a	Negligible	n/a
	N27	Moderate	Moderate	Minor	Minor
	N28	Moderate	Moderate	Minor	Minor
Pollution	N18	Minor	Minor	Negligible	Negligible
	N19	Moderate	Moderate	Negligible	Negligible
	N24	Moderate	Moderate	Negligible	Negligible
	N26	Moderate	Moderate	Negligible	Negligible
	N27	Moderate	Moderate	Minor	Negligible

7.4 Residual Impacts Section NL3 A96 – Nether Kirkton

7.4.1 Direct mortality is likely to result in a residual impact of **Minor** significance at Standingstones Wood, Farburn Wood, Kirkhill, Bogenjoss Burn, East Woodlands and Monument Wood if roosts are

destroyed or if bats cannot cross safely. Severance, habitat loss and disruption of flight lines including deterioration in water quality during construction; channel modification and Bogenjoss burn realignment as well as the confining of the burn to a number of culverts is likely to result in a residual impact of **Minor** significance at Bogenjoss Burn and East Woodlands until riparian habitat has matured, although the provision of attenuation ponds will reduce Pollution impacts to **Negligible** in the operation phase. Similarly, a residual impact of **Minor** adverse due to Habitat Severance is predicted under the current proposals as there is a lack of opportunities for crossing north-south over the road between Bogenjoss Burn and Monument Wood, effectively isolating the low value Monument Wood from resources north of the road although habitat creation north of the road will offset habitat fragmentation impacts. Disturbance is likely to remain an issue of **Minor** significance at the roosts at Walton Farm and Sunnybrae, and at Standingstones Wood, Bogenjoss Burn, Overton and Monument Wood where bats are known to forage and commute. The residual impacts for Section NL3 are shown in Table 34.

Table 34 - Assessment of Residual Impacts Section NL3

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Direct Mortality	N35	Moderate	Moderate	Negligible	Minor
	N36	n/a	Moderate	n/a	Minor
	N37	Moderate	Moderate	Negligible	Minor
	N42	Moderate	Moderate	Negligible	Minor
	N43	Moderate	Moderate	Negligible	Minor
	N45	n/a	Moderate	n/a	Minor
	N47	Moderate	Moderate	Negligible	Minor
Habitat Loss	N35	n/a	Moderate	n/a	Negligible
	N37	n/a	Moderate	n/a	Negligible
	N38	n/a	Moderate	n/a	Minor
	N42	n/a	Moderate	n/a	Minor
	N43	n/a	Moderate	n/a	Minor
	N44	n/a	Moderate	n/a	Minor
	N45	n/a	Moderate	n/a	Minor
	N46	n/a	Minor	n/a	Negligible
	N47	n/a	Minor	n/a	Negligible
Habitat Fragmentation & Isolation	N34	n/a	Minor	n/a	Minor
	N35	n/a	Moderate	n/a	Minor
	N36	n/a	Moderate	n/a	Minor
	N37	n/a	Moderate	n/a	Minor
	N38	n/a	Moderate	n/a	Minor
	N39	n/a	Moderate	n/a	Minor
	N40	n/a	Moderate	n/a	Minor
	N41	n/a	Moderate	n/a	Minor
	N42	n/a	Moderate	n/a	Minor
	N43	n/a	Moderate	n/a	Minor

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
	N45	n/a	Moderate	n/a	Minor
	N47	n/a	Moderate	n/a	Minor
Disturbance	N30	Minor-Moderate	Moderate	Negligible	Minor
	N31	Minor	n/a	Negligible	n/a
	N32	Minor	n/a	Negligible	n/a
	N33	Moderate	Moderate	Negligible	Negligible
	N34	Minor	n/a	Negligible	n/a
	N35	Moderate	n/a	Minor	n/a
	N37	Moderate	n/a	Negligible	n/a
	N38	Moderate	n/a	Minor	n/a
	N39	Moderate	n/a	Negligible	n/a
	N41	Moderate	n/a	Minor	n/a
	N42	Moderate	n/a	Minor	n/a
	N43	Moderate	n/a	Minor	n/a
	N45	Moderate	n/a	Minor	n/a
	N47	Moderate	n/a	Minor	n/a
Pollution	N33	Moderate	Moderate	Minor	Negligible
	N38	Moderate	Moderate	Minor	Negligible
	N42	Moderate	Moderate	Minor	Negligible
	N45	Moderate	Moderate	Minor	Negligible

7.5 Residual Impacts Section NL4 Nether Kirkton - Corsehill

7.5.1 The impacts of Direct Mortality at the River Don will be offset by the provision of a high span bridge (which will retain access points during the construction phase) which bats can fly under and which will maintain important flight routes, therefore resulting in a habitat loss residual impact of **Negligible** significance. Residual impacts of **Minor** significance are likely to persist into the operation phase due to RTAs at Goval Belt until 'up and over' planting matures due to the severance of flight lines. Habitat Loss impacts are likely to be of **Negligible** significance across the route Section as habitat creation of riparian habitat and provision of bat boxes around Goval will offset the impacts of habitat loss in the long term. The effects of severance along the A947 at Goval Belt are expected to persist in the short – medium term thus isolating Goval Wood from Goval Burn, Mill Lade and Reservoir via a known flight route; and similarly at Parkhill Pumping Station where a flight route over the Lade is likely to be severed, although the creation of 'up and over' habitat planting will reduce the risk of RTA and enable bats to cross safely in the long term reducing the significance of this impact to **Negligible**. Similarly the severance of bat habitat at Nether Kirkton and Den Wood and between the Parkhill Estate and Goval area are expected to result in a residual impact of **Minor** significance as there are few suitable crossing points in this area. Severance, and other disruptions along Goval Burn including the confining of the burn to a number of culverts is likely to result in a residual impact of **Minor** significance in the short-medium term until riparian habitat has matured and bats have grown used to the newly provided crossing points. Despite precautions taken to avoid disturbance to roosting bats including the provision of screens and alternative roosting opportunities it is likely that some degree of noise, vibrations and human presence during construction will be unavoidable at Parkhill pumping station due to the proximity to the road. This may result in the roost being less suitable for bats, resulting in a residual impact of **Minor** significance. The residual impacts for Section NL4 are shown in Table 35.

Table 35 - Assessment of Residual Impacts Section NL4

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Direct Mortality	N50	n/a	Moderate	n/a	Negligible
	N52	Major	Major	Negligible	Negligible
	N54	Moderate	n/a	Negligible	n/a
	N58	Moderate	Moderate	Negligible	Minor
	N60	Moderate	Moderate	Negligible	Negligible
	N61	Major	Major	Negligible	Minor
	N63	Moderate	Moderate	Negligible	Negligible
	N66	Minor	n/a	Negligible	n/a
	N69	n/a	Moderate	n/a	Minor
Habitat Loss	N51	n/a	Minor	n/a	Negligible
	N52	n/a	Major	n/a	Negligible
	N54	n/a	Moderate	n/a	Negligible
	N58	n/a	Minor	n/a	Negligible
	N60	n/a	Moderate	n/a	Negligible
	N61	n/a	Moderate	n/a	Negligible
	N62	n/a	Moderate	n/a	Negligible
	N63	n/a	Minor	n/a	Negligible
	N66	n/a	Minor	n/a	Negligible
	N68	n/a	Minor	n/a	Negligible
Habitat Fragmentation & Isolation	N49	n/a	Moderate	n/a	Minor
	N50	n/a	Moderate	n/a	Minor
	N51	n/a	Minor	n/a	Negligible
	N52	n/a	Major	n/a	Negligible
	N53	n/a	Moderate	n/a	Negligible
	N54	n/a	Moderate	n/a	Negligible
	N55	n/a	Minor	n/a	Minor/Negligible
	N56	n/a	Minor	n/a	Negligible
	N58	n/a	Moderate	n/a	Minor/Negligible
	N60	n/a	Moderate	n/a	Negligible
	N61	n/a	Moderate	n/a	Negligible
	N62	n/a	Moderate	n/a	Negligible
	N63	n/a	Moderate	n/a	Negligible
	N65	n/a	Minor	n/a	Negligible
	N66	n/a	Minor	n/a	Negligible
	N67	n/a	Moderate	n/a	Minor
	N68	n/a	Minor	n/a	Minor
	N69	n/a	Moderate	n/a	Negligible

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
	N70	n/a	Moderate	n/a	Minor
Disturbance	N50	Moderate	Moderate	Minor	Negligible
	N51	Moderate	n/a	Negligible	n/a
	N52	Major	Major	Negligible	Negligible
	N54	Moderate	Moderate	Minor	Minor
	N55	Minor- Moderate	n/a	Minor	n/a
	N58	Moderate	n/a	Minor	n/a
	N60	Moderate	n/a	Minor	n/a
	N61	Moderate-Major	Major	Minor	Minor
	N62	Moderate	Moderate	Minor	Negligible
	N63	Moderate	n/a	Minor	n/a
	N65	Moderate	n/a	Negligible	n/a
	N66	Minor	n/a	Negligible	n/a
	N68	Minor	n/a	Negligible	n/a
	N69	Moderate	n/a	Negligible	n/a
	N70	Moderate	n/a	Minor	n/a
Pollution	N52	Major	Major	Negligible	Negligible
	N61	Moderate	Moderate	Negligible	Negligible
	N69	Minor	Minor	Negligible	Negligible

7.6 Residual Impacts Section NL5 Corsehill - Blackdog

7.6.1 The road is likely to cause a residual impact of **Minor** significance where it severs habitats along a green corridor at Littlejohn's Wood, despite the provision of a crossing point; and at the tree lines at Cranbog due to the number of bats involved.

7.6.2 Although habitat loss is expected to be minimal in this Section the effects of severance and indirect isolation of Habitat Areas in particular between Red Moss/Littlejohn's Wood and Den Wood, the Parkhill Estate and Corby/Lily Lochs are expected to affect the behaviour of bats flying along this green corridor. Severance of flight lines and increased disturbance at Cranfield during the operation of the road are also expected to result in alteration of bat use of these areas despite the provision of linear roadside planting to direct bats toward safe crossing points at the B977 East Overbridge, Newtonhill Overbridge and B999 overbridge. Residual impacts are therefore expected to be of **Minor** significance. Pollution is likely to be of **Negligible** significance in this Section if mitigation measures are implemented appropriately, and the provision of attenuation features at Blackdog may enhance the area for bats. The residual impacts for Section NL5 are shown in Table 36 – Residual Impacts – Section NL5.

Table 36 – Residual Impacts – Section NL5

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Direct Mortality	N71	n/a	Moderate	n/a	Minor
	N72	Moderate	Moderate	Negligible	Minor

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
	N74	n/a	Moderate	n/a	Minor
	N80	n/a	Moderate	n/a	Minor
	N84	n/a	Moderate	n/a	Minor
	N85	n/a	Moderate	n/a	Minor
	N87	n/a	Moderate	n/a	Minor
	N90	Major	Major	Negligible	Minor
	N91	Major	Major	Negligible	Minor
Habitat Loss	N71	n/a	Minor	n/a	Negligible
	N72	n/a	Moderate	n/a	Negligible
	N80	n/a	Moderate	n/a	Negligible
	N90	n/a	Moderate	n/a	Minor
	N91	n/a	Moderate/Major	n/a	Minor
Habitat Fragmentation & Isolation	N71	n/a	Moderate	n/a	Minor
	N72	n/a	Moderate	n/a	Minor
	N74	n/a	Moderate	n/a	Minor
	N75	n/a	Minor	n/a	Negligible
	N76	n/a	Minor	n/a	Negligible
	N77	n/a	Minor	n/a	Negligible
	N78	n/a	Minor	n/a	Negligible
	N79	n/a	Minor	n/a	Negligible
	N80	n/a	Moderate	n/a	Negligible
	N82	n/a	Minor	n/a	Negligible
	N83	n/a	Minor	n/a	Negligible
	N84	n/a	Moderate	n/a	Negligible
	N85	n/a	Moderate	n/a	Minor
	N86	n/a	Moderate	n/a	Negligible
	N87	n/a	Moderate	n/a	Negligible
	N88	n/a	Moderate	n/a	Negligible
	N90	n/a	Major	n/a	Minor
	N91	n/a	Major	n/a	Minor
Disturbance	N71	Moderate	n/a	Minor	n/a
	N72	Moderate	n/a	Minor	n/a
	N74	Moderate	n/a	Minor	n/a
	N80	Moderate	n/a	Minor	n/a
	N84	Minor-Moderate	n/a	Negligible-minor	n/a
	N87	Moderate	n/a	Minor	n/a
	N90	Moderate	Moderate	Minor	Minor
	N91	Moderate	Moderate	Minor	Minor
	N96	Minor	n/a	Negligible	n/a

Reason for impact	Habitat Area	Significance prior to mitigation (Construction)	Significance prior to mitigation (operation)	Significance after mitigation (Construction)	Significance after mitigation (operation)
Pollution	N85	Minor	Minor	Negligible	Negligible
	N91	Moderate	Moderate	Negligible	Negligible

7.7 Residual Impacts Summary

7.7.1 If the mitigation measures proposed in the Mitigation section are fully and successfully implemented the adverse impacts predicted to arise as a result of the development will be reduced, leaving residual impacts of **Negligible** or **Minor adverse** significance in the long term. Despite these measures some adverse impacts will persist as a result of short term habitat loss in key areas and due to the severance of suitable habitats. However the phased nature of the scheme and the provision of alternative habitat and safe crossing points between Habitat Areas mean that bats are likely to adapt to changes over time and become accustomed to the modifications. With these measures, the construction and operation of the road are not expected to compromise the long-term survival and viability of the bat population throughout the Northern Leg.

7.7.2 While some residual adverse impacts in the development of a road scheme of this nature are inevitable there are also likely to be a number of positive effects as a result of the scheme. An important benefit to bat populations is likely to be the reduction in RTA as a result of reduced traffic flows on the existing road network. Benefits to bat populations also include habitat creation and enhancement including that which comes about as a secondary result of construction, for example the provision of attenuation ponds and the presence of the scheme itself acting as a linear landscape feature. The enhancement of habitat value especially as a result of sensitive management and aftercare continued into the operation of the road is expected to provide suitable resources for bats when new areas of habitat mature thus maintaining the Local populations bat species in favourable condition.

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9 Glossary of Terms and Acronyms

DMRB – Design Manual for Roads and Bridges – Highways Agency guidelines to be taken into account when planning a road development

DWS – District Wildlife Site

EcIA – Ecological Impact Assessment – Statutory requirement for the assessment of impacts of proposed development schemes on ecological receptors

Echolocation – Ultrasonic signal used by bats to navigate and locate insect prey

Flight Line (also flyway) – a route, usually along linear or habitat feature, which is used by bats for commuting between landscape features

Hibernation – Extended period of torpor undertaken over the winter

LBAP – Local Biodiversity Action Plan. Local targets and objectives for named species of conservation concern.

Roost – any resting site used by bats including maternity roosts which are used by females and their young, hibernacula which are used during winter hibernation and transitional roosts which may be used at any time

RTA – Road traffic Accident

SINS – Site of Interest to Natural Science

SNH – Scottish Natural Heritage, Government Agency concerned with the

SSSI – Site of Special Scientific Interest

Torpor – physiological state which bats use to conserve energy during the day and during poor weather conditions

UK BAP – UK Biodiversity Action Plan. National targets and objectives for named species which may be adopted by Local authorities to influence management decisions with regard to species of conservation concern.