Appendix A10.10 – Brown Hare

B0010332 June 2006

Jacobs U.K. Limited 95 Bothwell Street, Glasgow G2 7HX

Tel 0141 204 2511 Fax 0141 226 3109

Contents

1 Introduction

1.1 Proposed Scheme

1.1.1 Jacobs has been commissioned by Aberdeen City Council to undertake a Stage 3 Environmental Impact Assessment (EIA) of the proposed Aberdeen Western Peripheral Route (AWPR) near Aberdeen. The AWPR is a new 45km dual carriageway proposed jointly by Transport Scotland, Aberdeen City Council and Aberdeenshire Council. The scheme comprises the following key elements:

- **Northern Leg:** North Kingswells to Blackdog.
- **Southern Leg**: Charleston to North Kingswells.
- **Fastlink:** Stonehaven to Blaikiewell.

1.1.2 For ease of discussion, reports have been divided into three separate appendices using the three road sections described above. 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.

1.1.3 This report is concerned with the impacts on brown hare populations associated with the Northern Leg.

1.1.4 To aid the interpretation of the assessment, these three sections have been further sub-divided, the five component route sections for the Northern Leg are 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).

1.1.5 These studies included desk-based consultation to collate existing information about brown hare populations in the area affected by the scheme and field surveys to provide current data about the status of brown hare populations.

1.2 Survey Aims

1.2.1 The purpose of the survey was to determine the presence and status of brown hare in the survey corridor so that an assessment could be made as to what impacts the road would have on hares. The aims of the survey were to:

- assess the presence and status of brown hares in the study area;
- assess the quality of habitat present and evaluate the importance of the area to hares;
- assess any impacts the road development may have upon the local hare population; and
- identify appropriate mitigation measures and determine any residual impacts.

1.3 Background

Biology

1.3.1 The brown hare is a member of the *Leporidae* family, which also includes rabbits. The brown hare is not native to Britain but was introduced by the Romans approximately 2000 years ago. The mountain hare (*Lepus timidus*) is the only native species of hare in Britain although this is now mainly confined to the Scottish Highlands. The brown hare is widespread throughout Britain but it is absent from northwest Scotland and the Scottish Highlands. Open country is the brown hare's favoured environment and in Western Europe arable land is their natural habitat (Tapper & Hobson, 2002; McBride, 1988).

1.3.2 Brown hares are largely nocturnal although, during the summer, activity extends to early evenings and mornings. Brown hares cover wide areas to graze on grasses, cereals and herbs, resting during the day while they digest the previous night's forage. Unlike rabbits, hares do not use burrows but make a small depression (form) in the ground among long grass where they spend most of the day. These are usually in open fields although woodlands may be used during the winter as they offer greater protection from adverse weather conditions. Although generally solitary, hares will occasionally gather into loose groups while feeding. Hares do not appear to practice scent marking or other territorial behaviour but males do show a loose dominance hierarchy, though not as prominent as in rabbits. The breeding season usually lasts from February to September and a female can produce up to four litters a year, each consisting of two to four young (leverets) (URL1; Tapper & Hobson, 2002; McBride, 1988).

Status

1.3.3 The brown hare is a moderately common farmland species in Britain, although it appears to have experienced a substantial decline since the early 1960s with current UK population estimates varying between 750,000 and 1,250,000 (URL1). Anecdotal evidence from hunting estates however, suggests that hare numbers have remained stable over the last decade, perhaps due to the management regime on the hunting. Factors causing decline or loss include conversion of grassland to arable, loss of habitat diversity in the agricultural landscape and changes in planting and cropping regimes e.g. planting of cereals in the autumn (URL3).

1.3.4 Brown hares receive little legal protection partly because they are game animals and can be managed by farmers and landowners, and partly because they are a minor pest and can damage crops and young tree plantations. Hares are, however, protected by a complex set of older acts such as the Game Laws, the Ground Game Act 1880 and the Hare Preservation Act 1892 (URL1; Tapper & Hobson. 2002. There are no laws forbidding cruelty to hares other than that afforded under the Wild Mammals (Protection) Act 1996 (URL2). The brown hare is a UK Biodiversity Action Plan (BAP) species and is a priority species in the North East Scotland Local BAP. The objectives and targets of the BAPs are to:

- maintain existing populations; and
- expand existing populations, doubling spring numbers the UK by 2010.

2 Methods

2.1 Previous Survey Information

2.1.1 A desk-based study was undertaken and comprised a review of all available data. This included consultations with relevant statutory bodies and local interest groups including Scottish Natural Heritage (SNH) and North East Scotland Biological Records Centre (NESBReC), as well as a search of internet sources.

2.2 Survey Methods

2.2.1 Hare activity within 500m of the proposed scheme were assessed by collating incidental records made by a team of ecologists whilst conducting other animal and plant surveys over a fifteen week period. This involved recording signs indicative of the presence of hare including form depressions, prints, droppings and sightings. In addition to the daytime incidental reports, there were a number of crepuscular and/or nocturnal incidental opportunities (bat, squirrel, birds) therefore, these results can be used as an indicator of relative abundance. This methodology was approved by SNH prior to the commencement of the survey.

Dates of Survey

2.2.2 Observations were made during ecological surveys conducted between 24th March and 10th July 2004. Most surveys were conducted during daylight hours although some records were collected during early morning and late evening.

Habitat Evaluation

2.2.3 In addition to the hare surveys, data relating to the size and types of habitat in the route corridor was recorded so that a general assessment could be made as to the suitability of the habitat for hares. This involved a review of the Phase 1 Habitat Report (see Appendix A10.1) to obtain data on land parcel classifications and a general overview of the habitat quality based on survey findings.

2.2.4 Factors that are likely to influence the survival of the local hare population are judged to be of the greatest importance when evaluating habitat value. Areas possessing or allowing access to optimal foraging and resting habitat are judged to be of key importance. Areas possessing sub-optimal foraging habitat but other habitat qualities (e.g. low levels of disturbance and good cover) are less important as they are less likely to be vital to local hare survival. Details of how values of importance to the local hare population were derived are given below:

- **High Value** - Optimal foraging habitat owing to abundance of small (<1 ha) cereal fields coupled with suitable habitat for cover e.g. pockets of woodland and rank grassland.
- **Medium Value** - Despite abundant source of food, location is considered sub-optimal due to lack of resting and shelter areas.
- **Low Value** - Location offers marginal foraging resources and/or poor habitat/cover.

2.3 Survey Limitations

2.3.1 Although there were opportunities for nocturnal incidental sightings, individuals may have gone un-noticed. However, while no specific surveys were undertaken for hares surveyors were in the field on a daily basis for in excess of three months (covering the main months of hare activity) recording everything observed. It is therefore likely that the survey results are a reliable indication of the distribution of hares in the area.

2.4 Assessment of Nature Conservation Value

2.4.1 The ecological value of each site with nature conservation interest was determined by reference to any designations and the results of the consultations, literature review and field surveys. The criteria used were based on the Ratcliffe Criteria (Ratcliffe 1977) used in the selection of biological Sites of Special Scientific Interest (SSSIs). Sites and features were classified according to the general criteria identified in Table 1.

Table 1 – 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. **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**. Sites maintaining populations of **internationally/nationally important species** that are not threatened or rare in the region or county.
Authority Area (e.g. County or District) (Aberdeenshire / City of Aberdeen)	**Habitats** Sites 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

Ecological Importance	Attributes of Ecological Receptor
	A diverse and/or ecologically valuable hedgerow network Semi-natural ancient woodland greater than 0.25 ha. Any river classified as good A2 or fair B and likely to support coarse fishery. Any river with a Habitat Modification Score indicating that it is significantly modified or above **Species** Any regularly occurring, locally significant population of a species 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) 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
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. **Species** Populations/assemblages of species that appreciable enrich the biodiversity resource within the local context Sites supporting populations of **county/district important species** that are not threatened or rare in the region or county, and are not integral to maintaining those populations
Less than Local (Limited ecological importance)	Sites that retain habitats and/or species 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

Impact Assessment

2.4.2 In the assessment of significance of impact, consideration has been given both to the magnitude of impact and to the sensitivity of the receptor environment or species. The sensitivity of a feature was determined with reference to its level of importance although other elements have been taken into account where appropriate.

Impact magnitude

2.4.3 The magnitude of an impact has been assessed for each element of the development. 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. A definition of the magnitude impacts is presented in Table 2.

Table 2 – 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.

Impact Magnitude	Criteria
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 be significant in terms of its ecological objectives. Likely to result in changes in the localised or temporary distribution of a species but not affect its population status at a regional scale or permanently.
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 be significant in terms of its ecological objectives.
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, and/or enhance the biodiversity resource of the receptor.
High positive	The change is likely to restore an ecological receptor to favourable conservation status, contribute to meeting BAP objectives (local and national) and/or create a feature that is of recognisable value for biodiversity.

Impact Significance

2.4.4 The significance of an impact has been determined according to the system illustrated in Table 3. Impact significance greater than or equal to moderate would require mitigation to be undertaken to ameliorate the impact significance to acceptable levels.

Table 3 – Impact significance

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
Authority Area	Moderate	Moderate	Minor	Negligible	Minor	Moderate
Local	Minor	Minor	Minor	Negligible	Minor	Minor
Less than Local	Minor	Negligible	Negligible	Negligible	Negligible	Negligible

2.4.5 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.

3 Baseline

3.1 Data Search

3.1.1 Consultations with the relevant bodies revealed no records of hares in the area.

3.2 Habitat Area Evaluation

Habitat Valuation

3.2.1 Much of the survey area offers good habitat provision, with a mixture of pasture, woodland, cereals, root crops and set-aside. This allows hares to graze different crops and grass when conditions are

right. Furthermore, during the summer long cereals provide good cover for adults and leverets and pasture areas provide good grazing conditions. In the winter root crops and winter cereals provide cover and food and the woodlands shelter from severe weather. Some of the fields are, however, quite large (>2 ha) meaning that hares need to move greater distances to get the best feeding and shelter conditions in specific seasons. The value of the habitat across the study area in general terms is assessed as between **low** - **medium value** to hares (see Phase 1 Habitat Report in Appendix A10.1 for further details regarding distribution of habitats and land use classification). Habitat Area W52 in Section NL3 is assessed as being of **high value** to hares due to the species rich meadows and the mixture of crops that provide optimal foraging conditions, and also the large extent of resting habitat available.

3.3 Survey Results

Field observations

3.3.1 Twelve hare sightings were recorded within the study area. Three of these sightings were individual sightings from three separate ecologists in the same field at NJ 862125 (see Figure 10.10b) adjacent to Howemoss Farm. The remaining sightings may represent different animals, they may be repeat observations of the same hare. All hare sightings are shown on Figures 10.10a -d. An additional 20 hares have been reported in the vicinity of Hillhead of Derbeth and West Brimmondside (Local farmer, pers.comm). Further details of the baseline results are presented in Table 4.

4 Evaluation

4.1 Ecological Evaluation of Hare

4.1.1 Brown hare have no legal protection from humane killing or for their nature conservation value. They are however a UKBAP species and a NES LBAP species due to their general decline caused by changes in farming practices and hunting. Brown hare are therefore considered to be a species of **County** importance and any high value habitat that has the potential to support substantial populations will be evaluated as being of **County** value. Habitat that is of medium or low value but that has the potential to support a small population will be assessed as being of **Local** value

4.2 Survey Results Summary

4.2.1 The following table presents the description of the suitable hare habitat followed by an evaluation of its ecological importance

4.2.2 Habitat areas that are not included in the table are unsuitable for the brown hare and therefore of no importance here.

Table 4 – Summary of ecological evaluations for hare

Habitat Areas	Hare Sightings	Features supporting Brown Hare	Evaluation of Habitat	Overall evaluation
Section NL1				
N2, N3 and N6-N8	Yes	Extensive areas of arable fields and improved pasture provide potential foraging habitat. Shelter in the form of coniferous plantation woodland, semi-natural broad-leaved woodland and gorse scrub.	Medium	Local
N12-N15 and N17	Yes. Habitat areas N13	Arable fields and improved grassland with some scattered scrub and drystone walls that	Medium	Local

Habitat Areas	Hare Sightings	Features supporting Brown Hare	Evaluation of Habitat	Overall evaluation
		provide shelter.		
Section NL2				
N18- N28	Yes. Habitat area N19	Area surrounding Craibstone has requisite foraging and shelter but may but unsuitable due to disturbance.	Low	Less than local
Section NL3				
N30-N32		Arable fields and improved grassland with some semi-improved acid grassland for foraging and resting, and shelter in the form of semi-mature broadleaved woodland.	Medium	Local
N33	Yes. Habitat areas N33 and N34	Arable and improved grassland with some semi-improved acid grassland and shelter in the form of coniferous plantation and broad-leaved semi-natural woodland with bracken.	High	County
N39		Arable fields and improved grassland with some poor semi-improved acid grassland and shelter provided by plantation coniferous woodland, dry stone walls and scattered scrub.	Medium	Local
N44, N45 and N46 N48		Arable and improved grassland. Shelter in the form of mixed woodland plantation and broad-leaved semi-natural woodland	Medium	Local
Section NL4				
N49-N51		Arable fields and improved grassland with localised areas of broad-leaved woodland plantation and scattered scrub	Medium	Local
N55, N54 and N56		Goval woods and surrounding area provide improved and semi-improved acid grassland. Broad-leaved semi-natural woodland, bracken and scrub provide shelter.	Medium	Local
N59-N60		Arable fields and improved grassland with broad-leaved woodland.	Medium	Local
N64 and N68-N73		Arable fields and improved and marshy grassland shelter provided by broad-leaved semi-natural woodland and scattered scrub.	Medium	Local
Section NL5				
N76, N80, N84, N86 and N87	Yes. Habitat area N84	Arable fields and improved grassland provide foraging and resting habitat. Shelter provided by woodland and scattered scrub	Medium	Local
N89-N93		Arable and improved fields between Hare Hill Farm and Black Dog Burn, shelter is provided by scattered scrub.	Medium	Local

Evaluation Summary

Section NL1 (ch314750 – 316000 (Derbeth to Tulloch Road)

4.2.3 The range of habitats within this section provide suitable foraging areas in arable fields and grass lands. The plantations, scrub and dry stone walls provide shelter from bad weather, disturbance and predators. The habitat in this section is assessed as being of **medium** quality for brown hares, and the population assessed as of **local** importance.

Section NL2 (ch316000 – 317400 (SAC Craibstone)

4.2.4 The habitat in this section provides the requisite foraging potential and offers cover, but may be unsuitable due to disturbance. This area is assigned **low** habitat area value and the brown hare population is assigned as **less than local** importance.

Section NL3 (ch317400 – 322600 (A96 to Nether Kirkton)

4.2.5 This section has a mixture of habitats that are suitable for brown hares. It is predominantly farmland made up of arable and improved grasslands, with some less managed fields and species rich meadows. There are stands of scrub and mixed and broadleaved plantation woodland. This area is assigned a **high** habitat area value and the brown hare population is assigned **county** importance.

Section NL4 (ch322600 – 325370 (Nether Kirkton to Corsehill)

4.2.6 The arable fields, semi-improved acid grassland, bracken, scrub and broad-leaved semi-natural woodland and scattered scrub offers potentially good foraging and resting habitat. The section is assigned a **medium** habitat area value and the brown hare population is assigned **local** importance.

Section NL5 (ch325370– 331000 (Corsehill to Blackdog)

4.2.7 Arable and improved grasslands provide suitable foraging areas and the scattered scrub and woodland provide shelter. This section is assigned a **low** habitat area value and the brown hare population in this area is assigned **local** importance.

5 Potential impacts

5.1 Introduction

5.1.1 The potential impacts from the route alignment are thought to be consistent throughout the five sections of the route. Therefore there is no need to address the impacts for each section separately, instead the impacts shall be outlined for the route corridor as a whole and not divided into sections.

5.2 Generic Impact Assessment

5.2.1 The range of potential nature conservation impacts of road schemes, and their significance, will depend on the individual circumstances of each scheme. However, it is possible to identify a number of main areas of concern, which have general applicability (Highways Agency, 1999). These generic impacts are described in this section before assessing impacts specific to the proposed scheme. In addition, impacts during the construction and operational phases of the proposed scheme are discussed separately. It should be noted that the impacts associated with the operational phase of the scheme are considered to be permanent, whereas temporary impacts,

which are only apparent while the road is being built, are discussed in association with the construction phase.

Direct Mortality During Construction

5.2.2 Construction of the road will necessitate the removal of vegetated areas and the clearance of soil using machinery and it is therefore possible that hares will be killed. Leverets will be particularly susceptible to these activities as they are left alone in forms during the day and may be reluctant to move from their places of refuge (URL2; URL3). There is also the potential for hares to be killed through becoming trapped in any pits, piping, chemical containers or wire mesh associated with construction activities. However, significant numbers of hares are unlikely to be killed as a result of these activities. Direct mortality resulting from construction is assessed as causing a negative impact of **low** magnitude on the local brown hare population, representing an impact of **minor** significance for the proposed route.

Direct Mortality During Operation

5.2.3 Hares may be killed as they attempt to cross the operational road, the likelihood of this being increased by the fact that the road runs through several areas that are likely to support hare populations. Direct mortality resulting from operation could potentially represent a negative impact of **medium** magnitude on the local brown hare population, representing a negative impact of **moderate** significance in Section NL3 and minor impact significance along the remainder of the proposed route.

Habitat Loss During Construction

5.2.4 Works associated with the construction of the proposed scheme include the excavation provision of temporary works compounds, and access roads. The magnitude of impact associated with the habitat loss during the construction phase is regarded as being **low negative**, as there is sufficient suitable hare habitat in the area. The significance of these impacts is assessed as being **minor negative** along the proposed route.

Habitat Loss During Operation

5.2.5 Areas of rough grassland, arable land, scrub and woodland – all of which are important to hares – will be lost during construction, but this constitutes an operational impact since the loss is permanent. The proposed road traverses mainly agricultural land and pasture constituting a loss of 44ha and 147ha respectively (Table 5). There is however ample medium value hare habitat in the study area and thus the magnitude of this negative impact is considered to be **low** representing an impact of **minor** significance for the proposed route.

Table 5 – Habitat loss resulting from operational scheme

Land class	Total Area to be lost (ha)
Woodland	27.5
Scrub	2.1
Arable	43.9
Grassland (pasture/semi-improved)	146.7

Habitat Fragmentation and Isolation During Construction

5.2.6 Construction of the road will necessitate the provision of construction compounds, storage facilities and access roads. These may prevent hares from moving freely in and between existing areas of habitat. This impact is however temporary and the magnitude is therefore considered as **low** resulting in an impact of **minor** significance along the proposed route.

Habitat Fragmentation and Isolation During Operation

5.2.7 The operational road will represent a barrier between potential hare populations either side of the alignment, restricting hares' movements in and between available habitats. The operational road may also restrict immigration and emigration thus decreasing genetic diversity and increasing competition among stable populations. This would potentially result in a negative impact of **medium** magnitude upon the local brown hare population representing an impact of **moderate** significance in Section NL3 and minor significance in the remainder of the route.

Disturbance During Construction

5.2.8 Hares are likely to be disturbed by the construction of the road scheme. Noise from machinery and vehicles, and the presence of humans may adversely affect hares, especially breeding females (Tapper & Hobson, 2002). Consideration will need to be given to avoid the inappropriate siting of construction compounds or soil storage sites, which could exacerbate such impacts. The magnitude of this disturbance is assessed as **low negative** representing an impact of **minor** significance for the proposed route.

Disturbance During Operation

5.2.9 The operational impact of disturbance upon brown hare is likely to be **low negative** as disturbance will only be in areas directly adjacent to the road and avoidance by hare is the most likely course of action. It is therefore considered as being of **minor** significance for the proposed route.

Pollution and Other Indirect Impacts During Construction and Operation

5.2.10 There is the risk of accidental spillages occurring during the construction and operational phases. Run-off from the operational road may also contain pollutants such as heavy metals or hydrocarbons. These events have the potential to kill hares both directly and indirectly. Hares may come into contact with toxic pollutants and die or they may be poisoned through eating contaminated vegetation (URL3). The magnitude of this impact is regarded as **low negative** representing an impact of **minor** significance for the proposed route.

5.3 Specific Impacts

5.3.1 Brown hares will be most susceptible to the generic impacts outlined in paragraphs 5.2.2 to 5.2.10 in the vicinity of Hillhead of Derbeth – Habitat Areas N13 and N17 (chainage 315000 - 316500) and Standingstones Wood – Habitat Areas N33 and N34 (chainage 319000-320000), these being the areas with greatest hare activity in the study area (see Figures 10.10). In particular, hares may be prevented from reaching valuable woodland habitat such as Standingstones Wood, which could influence winter survival rates. Approximately 220ha of terrestrial habitat will be lost to the operational scheme, much of this being of medium value to hares.

5.4 Impact Assessment Summary

5.4.1 The greatest impact associated with the scheme is direct mortality caused by leverets being killed during site clearance and hares being killed as they attempt to cross the operational road. The road passing through areas of habitat frequented by hares increases the likelihood of such events occurring.

Table 6 – Summary of impact assessment during construction

Generic Impact	Magnitude	Significance
Direct mortality	Low negative	Minor
Habitat loss	Low negative	Minor
Habitat fragmentation and isolation	Low negative	Minor
Disturbance	Low negative	Minor
Pollution and other indirect effects	Low negative	Minor

Table 7 – Summary of impact assessment during operation

Generic Impact	Magnitude	Significance
Direct mortality	Med negative	Moderate
Habitat loss	Low negative	Minor
Habitat fragmentation and isolation	Med negative	Moderate
Disturbance	Low	Minor
Pollution and other indirect effects	Low negative	Minor

6 Mitigation

6.1 Introduction

6.1.1 Where impacts on a receptor species and their habitats are predicted to be of greater than or equal to moderate significance, specific measures must be taken to prevent, reduce or offset any activities during construction and operational stages in order to ameliorate the impact significance to acceptable levels. In the case of brown hares, the majority of impacts will be of minor significance, meaning there is no obligation to mitigate for these adverse affects. There are however several impacts that will be of moderate significance but mitigation measures proposed for other species will reduce these adverse effects of the road scheme upon brown hare. These mitigation measures are outlined below:

6.2 Generic Mitigation

Direct Mortality

6.2.1 Direct mortality of hares during the **construction** phase should be avoided through implementation of Best Practice, including some of the following actions:

- The presence of an ecological clerk of works during vegetation removal and cutting operations in habitat areas identified as supporting protected species that may, potentially support hares (see Badger, Otter and Red Squirrel Reports in Appendices A10.2, A10.6 and A10.7)
- Pits should either be covered or have mammal ramps positioned in them to allow any trapped animals to escape (see Badger and Otter Reports in Appendices A10.2 and A10.6).
- The working corridor will be fenced with temporary fencing to protect and prevent damage and disturbance to suitable habitat areas for otters and red squirrels (see Otter and Red Squirrel Reports in Appendices A10.6 and A10.7) will mitigate for areas of brown hare habitat.
- The creation of temporary underpasses under access roads, as prescribed under mitigation for badgers and otters (see Badger and Otter Reports in Appendices A10.2 and A10.6).

6.2.2 Direct mortality of hares during the **operational** phase of the road should be avoided through the implementation of the following:

- The provision of green bridges, wildlife overpasses, culverts, underpasses and fencing as prescribed under mitigation for badgers, otters and red squirrel (see Badger, Otter and Red Squirrel Reports in Appendices A10.2, A10.6 and A10.7) to allow animals to cross the proposed route without risk of direct mortality. These structures will also provide mitigation for brown hare. The twenty five proposed culverts are between 5m and 175m in length; the longer culverts may not be as effective as the shorter culverts in providing mitigation for the effects of fragmentation.

Habitat Loss

6.2.3 In order to mitigate for loss of habitat resulting from the **construction** and **operational** phase of the scheme, the following measures will be implemented:

- The siting of temporary works compounds, stored soil and access roads will be designed to minimise loss of brown hare habitat. Ideally these sites should be located away from the areas identified as offering good hare habitat, where hare sightings were recorded and at least 30 m away from any pockets of woodland. A full list of woodland areas that should be avoided can be found in the Phase 1 Habitat Survey Report in Appendix A10.1. Sections of the route particularly important to avoid include the land between chainages 313000-316300, 318500-320000, and 326800-327500.
- Compensatory habitat to offset impacts associated with habitat loss will provide suitable shelter for brown hare, including creation of scrub and woodland habitats as prescribed under mitigation for other species such as otters, badgers and red squirrel (see Badger, Otter and Red Squirrel Reports in Appendices A10.2, A10.6 and A10.7). The existing arable and grassland surrounding the proposed scheme is likely to provide sufficient foraging areas for brown hares.

Habitat Fragmentation & Isolation

6.2.4 The impacts of habitat fragmentation and isolation resulting from the **construction** and **operation** phases will be mitigated for through the provision of culverts, green bridges, wildlife overbridges and underpasses for badger and otter (see Badger and Otter Reports in Appendices A10.2 and A10.6).

Disturbance

6.2.5 Disturbance of brown hare during the **construction** phase will be unavoidable. Generic 'best practices' will help to reduce disturbance factors to represent an impact of minor significance and does not require any further mitigation.

Pollution and Other Indirect Impacts

6.2.6 Drainage systems should be implemented to divert run-off into drains, soak-aways and balancing ponds thus avoiding pollution of surrounding terrestrial habitat. In general, contractors must adhere to SEPA best practice guidelines with regards to preventing pollution incidents. The relevant guidelines include:

- PPG1: General guide to the prevention of water pollution
- PPG3: The use and design of oil separators
- PPG5: Works in, near, or liable to affect watercourses
- PPG6: Working at construction and demolition sites

6.2.7 The design of attenuation ponds will incorporate habitat creation in surrounding areas to include grassland and woodland habitats. Such habitats will provide suitable habitats for brown hare populations.

6.3 Mitigation Summary

6.3.1 It is of primary importance to provide appropriate fencing, green bridges, wildlife overpasses, culverts and underpasses so that hares are able to pass freely under or over the road, thus avoiding numerous road casualties and allowing animals to move freely in available habitat. It will also be highly important to maintain existing suitable blocks of habitat so that the hare population can remain stable.

7 Residual Impacts

Direct Mortality

7.1.1 If the mitigation measures outlined above are implemented then the road scheme should not compromise the long-term survival of hares in the study area. However, despite the provision of fencing, green bridges, wildlife overpasses, culverts and underpasses some hares may continue to attempt to cross the road and subsequently get hit by vehicles. The magnitude of this impact is **low negative** and the significance is **minor**.

Habitat Loss

7.1.2 The road will result in the loss of arable land, woodland and grassland. However, there is ample existing habitat for hares in the study area, and in conjunction with the creation of suitable habitat areas adjacent to the route and the careful siting of construction compounds this will ensure that the magnitude of this impact will be is **low negative** and the significance is **minor**.

Habitat Fragmentation and Isolation

7.1.3 Despite the provision of green bridges, wildlife overpasses, culverts and underpasses, the road will still act as a barrier to brown hare populations. This impact is therefore assessed as being reduced to **low negative** magnitude and the significance of the impact to **minor.**

Disturbance

7.1.4 Disturbance will be unavoidable, although if basic measures are followed such as siting temporary compounds and machinery away from areas inhabited by hares, as indicated in the mitigation section, disturbance can be alleviated. Ecological and landscape planting will further reduce disturbance during the operational phase. The residual impacts are assessed as being is **low negative** and the significance is **minor.**

Pollution and Other Indirect Impacts

7.1.5 The implementation of the mitigation suggested should ensure that no pollutants escape into brown hare habitat and therefore the magnitude and significance of impact associated with these are assessed as being reduced to **negligible**.

Table 8 – Residual impacts summary table

Generic Impact	Magnitude	Significance
Direct mortality	Low negative	Minor
Habitat loss	Low negative	Minor
Habitat fragmentation and isolation	Low negative	Minor
Disturbance	Low negative	Minor
Pollution and other indirect effects	Negligible	Negligible

8 References

Highways Agency (1999). Design Manual for Roads and Bridges, Volume 10. HMSO, London.

McBride, A. (1988). Rabbits & Hares. Whittet Books, London.

Ratcliffe, D.A. (ed). (1977). A Nature Conservation Review, Vol 2. Cambridge University Press, Cambridge.

Tapper, S. & Hobson, D. (2002). Conserving the Brown Hare. Game Conservancy Trust, Fordingbridge.

URL1 www.abdn.ac.uk/mammal/brown_hare.shtml.

URL2 www.workingforwildlife.org.uk/reserves/hare.htm.

URL3 www.uk.bap.org.uk

URL4 www.searchnbn.net/

9 Abbreviation List

AWPR – Aberdeen Western Peripheral Route

BAP – Biodiversity Action Plan

DMRB – Design Manual for Roads and Bridges

LBAP – Local Biodiversity Action Plan

NBN – National Biodiversity Network

NESBReC – North East Scotland Biological Records Centre

SNH – Scottish Natural Heritage

10 Glossary of Terms

Form – this is a shallow depression the hare scrapes in the ground in which it crouches flat during the day. The form may be alongside a hedge, in short grass, scrub or a ploughed furrow.

Incidental Sightings – the recorded sightings of hares or their field signs made by the ecologists whilst performing a different survey.

Leveret – is a young hare. They are born fully furred and with their eyes open. They are independent after approximately three weeks.

Nocturnal – refers to any animal that is active at night. The brown hare is most active after dark.

Phase 1 Habitat Survey – this identifies the different habitats that are contained within or make up a site, and the key plant species for each of those habitat types.

Route Corridor – a determined area around the route alignment.