Appendix A25.5 – Otter Report

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1 Introduction

1.1 General Background

1.1.1 This report is one of the appendices supporting Chapter 25 (Ecology and Nature Conservation) of the AWPR Environmental Statement (ES). It considers the potential impacts on otter populations associated with the Southern Leg of the proposed scheme. The results of the surveys carried out for the purpose of this assessment are also presented and are shown on Figures A25.7a-h.

1.1.2 The six component route sections in this report for the Southern Leg of the proposed scheme are as follows:

- Section SL1: Charleston to Bishopston (ch207200 - 203150);
- Section SL2: Bishopston to Burnhead (ch203150 - 200600);
- Section SL3: Burnhead to the A93 (ch200600 - 102870);
- Section SL4: A93 to Beanshill (ch102870 - 105900);
- Section SL5: Beanshill to South Kingswells Junction (ch105900 - 108500); and
- Section SL6: South Kingswells Junction to Derbeth Overhills (ch108500 - 111200).

1.1.3 All tables and figures are structured in this manner.

1.1.4 The Ecological Impact Assessment (EcIA) was undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 10 and 11 (Highways Agency, 2001) and the Environmental Impact Assessment (Scotland) Regulations 1999, along with cognisance of draft Institute of Ecology and Environmental Management (IEEM) guidelines (IEEM, 2002).

1.1.5 These studies included desk-based consultation to collate existing information about otter populations in the study area for the proposed scheme and field surveys to provide current data about the status of otter populations and the habitats that support them.

1.1.6 Data from these studies were also collated to provide information to undertake an Appropriate Assessment of the proposed scheme on the River Dee Special Area of Conservation (SAC) in relation to the requirements of Article 6.3 and 6.4 of the EU Habitats Directive.

1.1.7 Cumulative impacts are assessed in a separate report combining the predicted impacts for all habitats and species over the proposed route (refer to Part E: Cumulative Assessment, of the ES).

Aims

1.1.8 The purpose of the assessment was to:

- assess the presence and status of otter populations and their habitats in the study area;
- assess the quality of riparian habitat present and evaluate the importance of the area for otters;
- assess potential impacts of the proposed scheme on the local otter population; and
- identify appropriate mitigation measures.

1.2 Background to Assessment

Biology

1.2.1 Otter are members of the Mustelidae family, which also includes weasel, stoat, badger, polecat and mink. There are 13 species of otter worldwide although only the European otter *Lutra lutra* L. is native to Britain (Mason and Macdonald, 1986). The diet of otter varies but fish generally comprise over 80% with other prey including birds, amphibians, molluscs, crustaceans and small mammals. In the Dee and Don catchments in Aberdeenshire, otter diet consists of over 90% fish, mostly salmonids (Kruuk et al.et al, 1993). Otter generally favour riparian habitat although they may travel several miles over land to reach waterbodies or to cross between river catchments. In Britain otters tend to be largely nocturnal where they occur in fresh water habitats (Kruuk, 1995; Environment Agency, 1999; Grogan et al.et al, 2001) and diurnal in coastal areas (Kruuk, 1995).

1.2.2 Otter occupy a home range, which is a well-defined area where otters feed, rest and reproduce (Woodroffe, 2001). The size of an otter's range depends on the quality of the habitat and food supply (Kruuk, 1995). A typical home range may include a river, side streams, ponds and adjacent woodlands and wetlands. Radio-tracking showed that in the Dee catchment, male home range sizes averaged 32km but may be as long as 80km, with female ranges averaging 20km (Kruuk, 1995). Female and young otter foraged and spent most of their time in small burns and lakes while males were usually based on larger rivers such as the River Dee, with frequent forays into the female areas (Kruuk, 1995). Otters mark their range by defecating (sprainting) in these areas. Otter spraint (faeces) is often found in conspicuous locations such as under bridges, on prominent rocks and overhanging tree roots or boughs (Mason and Macdonald, 1986; Environment Agency, 1999), and is generally located near important resources (Kruuk, 1995).

1.2.3 Home ranges may contain up to 30 resting sites and several sites may be used in an area with a plentiful food supply. These sites take a variety of forms including underground dens or 'holts', such as cavities in the roots of bankside trees, piles of logs, flood debris, drains, caves and holes in rock-falls. Otter holts sometimes have one entrance underwater and at least one entrance above the high water mark, but may be located well away from the water's edge. The more secure sites used for breeding are usually safe from disturbance and frequent flooding, and may be some distance from water with females taking care not to leave any signs of their presence. Instead of holts, otters may frequently use resting sites above ground in reed beds, tall herb vegetation and scrub. These above ground resting sites are often referred to as 'couches' (Environment Agency, 1999). Some individuals use mostly couches, even for breeding, and rarely use holts. On average along burns in Aberdeenshire, otters spend 58% of day-time resting periods in couches (Kruuk et al*.,* 1998).

1.2.4 Typically, foraging activity occurs either nocturnally or at dawn or dusk. Male otter have been known to travel up to 30km overnight in search of food or potential mates, lying up during the day at any number of the resting sites (Woodroffe, 2001).

Status and Legal Protection

1.2.5 The otter was once widespread throughout Britain. Between the 1950s and 1970s, populations declined rapidly due to the pollution of watercourses, especially by organochlorines such as dieldrin (Jefferies, 1989). The decline now appears to have halted as a result of national and international legislation to protect otters as well as positive conservation management (Environment Agency, 1999). However, the otter is still classified by the International Union for the Conservation of Nature (IUCN) as a 'vulnerable' species, and numbers of otters killed on UK roads are of serious concern (Philcox et al*.,* 1999).

1.2.6 In the UK, otter are fully protected under the Wildlife and Countryside Act (1981) (as amended) through inclusion in Schedule 5. The Nature Conservation (Scotland) Act (2004) extends the protection of birds, animals and plants by revising Part 1 of the Wildlife and Countryside Act (1981) (as amended) to include the term. Otter are also included in Schedule 2 of the Conservation (Natural Habitats, etc.) Regulations 1994 (Regulation 38). Under the above legislation, it is an offence to *inter alia*: intentionally and/or recklessly kill, injure or take otter; deliberately disturb otter; and/or intentionally or recklessly obstruct, damage or destroy otter holts or couches.

1.2.7 The otter is also listed on Appendix 1 of the Convention on International Trade of Endangered Species (CITES), Appendix II of the Bern Convention and Annexes II and IV of the EC Habitats Directive (92/43/EEC). The European sub-species is listed as 'globally threatened' on the IUCN/World Conservation Monitoring Centre Red Data List.

1.2.8 The otter has a UK Species Action Plan (UK SAP), the targets of which are:

- to maintain and expand existing otter populations; and
- by 2010 restore breeding otter to all catchments and coastal areas where they have been recorded since 1960.

2 Approach and Methods

2.1 Consultation

2.1.1 The following were approached for their comments with regard to otters:

- Scottish Natural Heritage (SNH);
- Scottish Environmental Protection Agency (SEPA);
- Dee District Salmon Fisheries Board;
- Scottish Wildlife Trust;
- North East Scotland Biodiversity Records Centre (NESBREC);
- Centre for Ecology and Hydrology; and
- Professor Hans Kruuk (otter specialist).

2.1.2 The National Otter Survey of Scotland 1991 - 1994 (Green and Green) was also used as a reference.

2.2 Survey Methods

Field Survey

2.2.1 The survey area was defined with regard to specified standards (DMRB Volume 10 2001) and was agreed with SNH. The survey boundary extended 500m either side of the centreline of the proposed scheme alignment. Along major watercourses, it was extended up to 1km either side of the centreline of the proposed scheme. This was necessary to take into account alternative road and junction options, to confirm the status of the otter population using the feature and to confirm presence where signs were not recorded within the 500m study area. The survey boundary was extended up to 2km either side of the proposed scheme at the River Dee and Crynoch Burn since otter are one of the candidate species for which the SAC is designated.

2.2.2 Otter surveys were undertaken in 2004 on Loirston Loch, Loirston Burn, Greenhowe Pond, the Burn of Ardoe, Shanna Burn, parts of the River Dee and Borrowstone Burn under scheme proposals which have since been superseded. Repeat surveys and initial surveys of the remaining water features in the Southern Leg were undertaken between March and August 2006 under the current proposed scheme. The assessment of Kepplehill Burn and Bucks Burn are not considered to have changed and these burns will not be discussed further in this report. Their assessment is included in Northern Leg Otter Report A10.6. The assessment of Borrowstone Burn has changed as a result of resurvey and this watercourse is discussed below.

2.2.3 A single survey was undertaken at Hare Moss and the Moss of Auchlea on November 10, 2006 to identify whether these habitats are likely to support breeding otters. Further surveys were undertaken in November 2006 and January 2007 at Crynoch Burn and the River Dee. An additional survey of the Dee was carried out in March 2007 to inform the Appropriate Assessment (required under the EC Habitats Directive) for the activities related to the scheme that may affect the River Dee SAC (Jacobs, 2007). The need for additional monitoring and assessment for the Appropriate Assessment were discussed and agreed with SNH. The results and discussion of the monitoring are included in the Appropriate Assessment report and have been included here only where directly applicable to the impact assessment of the proposed scheme.

2.2.4 As otters avoid disturbance and are largely nocturnal, surveys usually have to be carried out by searching for otter field signs. In the present study, all waterbodies including lochs, burns, rivers, field drains and ditches were surveyed for signs indicative of the presence of otters, including:

- otter spraint;
- footprints;
- actual, possible or potential resting sites. These include underground holts (e.g. beneath the roots of bankside trees) or above ground couches (e.g. in reedbeds);
- slides or other well-used access points to watercourses (though additional evidence would be required to positively confirm their use by otters);
- feeding remains, e.g. fish carcasses (though additional evidence would be required to positively confirm these as evidence of otter presence); and/or
- sightings, including otter Road Traffic Accidents (RTAs) and evidence supplied by landowners and watercourse users.

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

2.2.6 In the present survey, it was not necessary to undertake spot checks of any watercourses up to 5km from the watercourses within the study area (as recommended by the DMRB) as otters were present in all of the main watercourses surveyed and field drains frequently do not extend far beyond the survey boundary.

Habitat Evaluation

2.2.7 In addition to the otter surveys, data relating to the quality of identified water features was researched so that a general assessment could be made as to the suitability of the habitat for otters. This involved a review of the Freshwater Ecology Report (see Appendix 25.9) to obtain data on water quality classifications, riparian habitat and fish populations. The Average Score Per Taxon (ASPT score) referred below relates to the SEPA river health category.

2.2.8 Factors that are likely to influence the survival of local otters are judged to be of the greatest importance when considering habitat value. As otter populations may be limited by prey abundance, areas possessing or allowing access to optimal foraging habitat are judged to be of key importance. Areas possessing sub-optimal foraging habitat but have other habitat qualities (e.g. low levels of disturbance and dense riparian cover) are of lesser importance, as they are less likely to be vital to local otter survival (Kruuk et al., 1993). Details of how values of importance to the local otter population were derived are given below:

- very high value – a locally unique key resource, vital for maintenance of existing otter population.
- high value - optimal foraging habitat owing to locally abundant prey items coupled with low disturbance and suitable riparian habitat for cover and lying-up sites, i.e. holts and couches.
- medium value - despite abundant prey items, location is considered sub-optimal due to either moderate disturbance levels or poor riparian habitat for cover and/or lying-up-sites.
- low value - location offers marginal food resources and/or poor habitat/cover and/or suffers from substantial disturbance.

2.3 Evaluation of Nature Conservation Value

2.3.1 The value of the local otter population 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 (SSSI). Sites and features were classified according to the general criteria identified in Table 1, which is a general guide for all habitats and species.

Table 1 – Evaluation of Ecological Receptor

Ecological Importance	Attributes of Ecological Receptor
International (European)	Habitats An internationally designated site or candidate site i.e. Special Protection Area (SPA), provisional SPA (pSPA), Special Areas of Conservation (SAC), candidate SAC (cSAC), Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site or an area which meets the published selection criteria for such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat that 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 i.e. Site of Special Scientific Interest (SSSI), Areas of Special Scientific Interest (ASSI), National Nature Reserve (NNR), Marine Nature Reserve, or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines). A viable area of a priority habitat identified in the UK Biodiversity Action Plan (UK BAP), or of smaller areas of such habitat that 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 that is threatened or rare in the region or county (see local BAP). A feature identified as of critical importance in the UK BAP.

Ecological Importance	Attributes of Ecological Receptor
Regional (North East Scotland)	Habitats Sites that exceed the county-level designations but fall short of SSSI selection criteria. Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat that 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). A viable area of habitat identified in County/District BAP or in the relevant SNH Natural Heritage Future area profile. A diverse and/or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25 ha. Any river classified as Good A2 or Fair B and likely to support coarse fishery. Any river with a Habitat Modification Score indicating that it is Significantly Modified or above. Species Any regularly occurring, locally significant population of a species that 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 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 0.25ha. Any river classified as Fair B or Poor C and unlikely to support coarse fishery. Rivers 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.

2.4 Impact Assessment

2.4.1 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 was determined with reference to its level of importance although other elements have been taken into account where appropriate. Methods of impact prediction used indirect 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.

Magnitude of Impact

2.4.2 The magnitude of an impact has been assessed for each element of the development. A definition of the magnitude impacts is presented in Table 2 and includes positive impact criteria in accordance with IEEM guidance (IEEM, 2002). The magnitude of each impact was assessed independently of value or statutory status.

Table 2 – Impact Magnitude

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.
Medium Negative	The change is not likely to permanently, adversely affect the integrity of an ecological receptor, but the effect 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 species assemblage or populations but not affect the 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. Impacts are unlikely to result in changes to the species assemblage or populations, but core species more vulnerable to future impacts
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

2.4.3 The significance of an impact was determined according to the matrix of importance and magnitude as illustrated in Table 3.

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
County	Moderate	Moderate	Minor	Negligible	Minor	Moderate
Local	Minor	Minor	Minor	Negligible	Minor	Minor
Less than Local	Minor	Negligible	Negligible	Negligible	Negligible	Negligible

2.4.4 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. In general, an adverse impact significance greater than or equal to Moderate would require specific mitigation to be undertaken to ameliorate the impact significance to acceptable levels.

2.5 Limitations to Assessment

2.5.1 Otter field signs can be found at any time of the year. However due to the variable nature of wildlife and the limitations of survey methods, it is possible that not all field signs will have been recorded. Dense in-channel vegetation prevented access to some parts of water features which could have led to signs being missed.

2.5.2 Small parts of Bellenden Burn have not been surveyed for otters as the burn flows through private gardens where the landowner was not known. However, the majority of the burn has been surveyed and it is considered unlikely that otters are using the burn due to high disturbance from humans.

2.5.3 Weather conditions during the survey period were moderate and no otter surveys were undertaken during or within two weeks of spate conditions.

3 Baseline

3.1 Consultation Information

3.1.1 In response to otter population decline, a number of national population surveys were carried out in 1977-79, 1984-86 and 1991-94. In the final survey, 88% of sites surveyed in Scotland proved positive, representing a rise of 15% over the results from the first survey (Green and Green, 1997). Otter are now believed to be present in every river catchment in Scotland (Grogan et al., 2001). The fourth otter survey of Scotland is currently underway and is due for completion in 2006.

3.1.2 The National Otter Survey of Scotland 1991-94 (Green and Green, 1994) identified a significant increase in the number of sites showing positive signs of otter in the Grampian region with 91% of sites surveyed testing positive. The majority of negative sites were along isolated coastal fringes.

3.1.3 The National Biodiversity Network revealed records of the presence of otter in five of the six main 10km grid squares in the study area.

3.1.4 The Centre for Ecology and Hydrology (CEH) in Banchory however provided two records of otter RTA in the survey area, dating from 1995 to 2001 (see Figures 25.7a and 25.7d):

- A90 road at NJ 936010; and
- B9077 road at NJ 858 001.

3.1.5 SNH provided the following information of otter sightings:

- 25 June 2006, an otter was observed swimming upstream towards the River Dee crossing at NJ 861004; and
- 26 June, an otter was observed swimming across the River Dee to the northwest bank near Badger Island at NJ 864008.

3.1.6 Most of the consultees possessed no records of otter in the Southern Leg study area, although a number of landowners and local residents provided comments about the otter in the area.

3.2 Survey Results

3.2.1 There are a number of water features within the survey area where no signs of otters were recorded. These were assessed as being of particularly low value to otters in terms of the habitat they provide and their suitability for otters. These water features have not been included in the baseline report or impact assessment, except where they form part of an integrated drainage network or part of the main drainage channel. The water features which fall into this category are:

- Jameston Ditch;
- Tributary of Findon Burn;
- Heathfield Burn;
- Cowford Pond;
- Barnhill Burn;
- Whitestone Burn;
- Kingcausie Pond;
- Albyn Burn;
- Culter House Ditch;
- Tributary of Milltimber Burn; and
- Kingshill Burn Pond.

3.2.2 Of the burns and water features recorded, 11 water features were surveyed as part of the Freshwater Ecology Impact Assessment (see Appendix 25.9). Data pertaining to the quality of water and the availability of suitable prey items, which has been included in Table 4 to Table 9, has been obtained from review of the freshwater ecology assessment.

3.2.3 Where there is potential for impacts on otter populations, e.g. major watercourses, the survey area was extended up to 1km either side of the proposed scheme, and up to 2km for SAC designated sites of the River Dee and Crynoch Burn. The purpose of this was to take into account alternative road and junction options and establish the status of otters in the area. The survey results include the results of surveys that were undertaken under previous proposal schemes for the AWPR. The data for these were collected by Jacobs surveyors in 2004 and 2006.

3.2.4 Otter lying up sites and potential lying up sites are numbered from south to north across the Southern Leg study area according to whether they are couches, potential couches, holts or potential holts. These are referred to hereafter in the report by their status and their letter (e.g. potential couch C2; couch C5; potential holt H2, holt H1). All lying up sites in the Southern Leg are shown on Figures 25.7a-h, with actual lying up sites shown in red with their reference number and potential lying up sites shown in black with their reference number.

3.2.5 Where the current proposal overlaps with areas surveyed under previous proposed schemes, surveys have been repeated to monitor the status of otter in these watercourses.

Section SL1

3.2.6 Of the six named watercourses in Section SL1, Loirston Burn and tributary, Greenhowe Quarry Pond and the Burn of Ardoe have been assessed in this report. The results are shown in Table 4.

3.2.7 Otter signs were recorded around Loirston Burn and Loirston Loch and an otter RTA casualty was found on the A90, which confirms that otter use terrestrial routes in the area. No signs were found

in the tributary of Loirston Burn to the west of the A90 despite relatively low levels of disturbance and abundant potential lying up sites in Duffs Hill plantation conifer woodland.

3.2.8 The pond size and relative isolation from other otter habitat at Greenhowe Pond is considered to deem it generally unsuitable for otter, although it has some potential as a seasonal foraging resource. The Burn of Ardoe at Haremoss and associated ditches are considered to provide excellent seasonal foraging habitat and ideal secluded lying up habitat for breeding otter. This habitat includes fallen trees, scrub and long herbaceous vegetation, although none of the signs recorded were located within the study area. The Burn of Ardoe maintains good connectivity between Hare Moss and the River Dee, which is a core area of otter activity to the north. Spraints, footprints, feeding signs, a potential holt and an otter RTA casualty have been recorded adjacent to the burn north of the study area indicating its importance to otter commuting to the south from the River Dee. Relatively fresh, as well as older spraints, were recorded in Hare Moss in November 2006 indicating its use by otters. The water quality at Loirston Burn has been assessed as being Low, while water quality in the the Burn of Ardoe was assessed as being Good.

Table 4 – Waterbodies and Habitat Features of Use to Otter in Section SL1

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/Absent	Holt/Couch	Observations
Loirston Burn and tributary	NO 922 998	LOW – MEDIUM Mainly surrounded by farmland, the stream flows adjacent to manufacturing yard and crossed by A90 and A956. Loirston Loch is in a public park area immediately adjacent to the A956.	Long grass and gorse provides good cover along the burn. Duffs Hill Wood provides good shelter. Around the southern and western shores of Loirston Loch willow carr scrub and emergent vegetation provide good cover and potential lying-up sites.	Burn likely to support salmonids. Scottish Environment Protection Agency (SEPA) reports that salmonids are present in Loirston Loch. ASPT score suggests that the water quality is impoverished.	PRESENT	None evident	The tributary is narrow (<1m wide). Loirston Burn is wider and flows into Loirston Loch. Otter spraint found at the entrances of culverts where Loirston Burn flows under the existing A956 and A90(T) roads. An adult dog otter RTA was recorded on the A90(T) at NJ 933005 on 21/10/2004 (pers.obs. Jonathan Guarnaccio). Several spraints were recorded around the south west shores of Loirston Loch, which supports a reliable source of fish prey, where the burn flows into the loch.
Greenhowe Pond	NJ 926 001	LOW Undisturbed area away from roads and footpaths. Several houses nearby.	Good surrounding cover in form of gorse and bracken. Located at edge of conifer plantation.	Pond unlikely to support fish.	No signs evident	None evident	Pond is very small and isolated and offers little potential for foraging.
Burn of Ardoe	NO 908 991	VERY LOW - LOW Farmland and woodland, undisturbed heathland and scrub at Hare Moss. Recent excavation work at Heathfield Burn is likely to have caused some disturbance.	Majority of burn fringed by trees giving good cover. Upstream of Townhead Cottages the burn flows through improved/semi improved grassland with poor cover. Hare Moss provides excellent cover among immature trees and heathland suitable for breeding.	ASPT score suggests water quality is good. Pools and riffles provide good fish habitat, as do adjacent ponds. Burn supports salmonids, eel and brook lamprey.	PRESENT	One potential holt recorded at: NJ 898006 (outwith survey area)	A potential holt, marked with a single spraint was recorded under overhanging tree roots along the burn to the north of the road while adjacent fishponds were marked with spraint and a trout carcass eaten by an otter was recorded. Female sub-adult otter RTA recorded on B9077 at NJ 894019 on 03/07/2004 (pers.obs. Jonathan Guarnaccio). Burn provides connectivity between River Dee and Hare Moss which, in conjunction with Heathfield Burn, Jameston Ditch and Bishopston Ditch, provides excellent cover among immature trees and heath, and a seasonal foraging resource although recent excavation work has reduced the suitability of the westernmost drains for otter. Six spraints were recorded at Hare Moss during repeat surveys in November 2006 confirming the regular use of the Moss by otters. Potential for lying up was noted under fallen trees, in disused rabbit holes and in tall grass and scrub.

Section SL2

3.2.9 Of the six named water features in Section SL2, three have been assessed separately (Shanna Burn, Cowford Burn, Burnhead Burn) while Swellhead Burn is included with the assessment for Burnhead Burn. The results are shown in Table 5 and Figures 25.7b-c. Although Shanna Burn has been assessed as part of this section, most of the burn lies outwith the study area as it is considered likely that any otter using the burn will explore the woodland area adjacent to Cowford Burn. Cowford Pond has dried up and is not included in the discussion in this assessment further.

3.2.10 Cowford Burn is considered to be a potential commuting route between the upper reaches of the Burn of Ardoe and Shanna Burn. Both of these watercourses are centres of otter activity on the basis of the presence of otter signs in their downstream reaches. Although the northern most reaches of Cowford Burn are subject to moderate disturbance levels from the road and cattle, woodland, scrub and tall herbaceous vegetation at Greenloaning Wood is considered to provide ideal undisturbed habitat. This habitat is suitable for lying up, for breeding and seasonal foraging to otter using Shanna Burn and Cowford Burn. Burnhead Burn is considered to extend the foraging habitat resource upstream of Crynoch Burn and the River Dee SAC, which is an area of core otter activity, via Blaikiewell Burn. Although Burnhead Burn (with Swellhead Burn) offers little in the way of shelter, aside from a potential couch (C11), otter tracks alongside the burn indicate that otters use it. The quality of the water in the three burns has been assessed as being good.

Table 5 – Waterbodies and Habitat Features of Use to Otter in Section SL2

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/ Absent	Holt/Couch	Observations
Cowford Burn	NO 892 990	VERY LOW - MEDIUM Burn immediately adjacent to busy road and poached by cattle in northern reaches. Upstream burn flows through area of carr woodland and scrub with very low disturbance levels.	Little cover where burn flows through pasture land in downstream reaches. Excellent lying up habitat and shelter provided in Greenloaning Wood.	ASPT score suggests water quality is good.	No signs evident	Potential couch recorded at: NO 892 991 (C12)	Narrow (<1m wide), slow-flowing burn and field drain upstream of the Burn of Ardoe. The burn flows through an area of dense carr woodland at Greenloaning Wood with a well developed ground layer ideal for lying up and potential for breeding otter and includes potential couch under a tree root. No signs identified along the burn although otter with main territories along the Burn of Ardoe and Shanna Burn may explore along the burn and in the woodland. Cowford pond, which would previously have provided a seasonal source of amphibian prey, has dried up and been reverted to pasture.
Shanna Burn	NJ 891012 – NO 893998	LOW – MEDIUM: Farmland and woodland along most of stream but part of burn flows through residential gardens and adjacent to road.	Good cover in upper section of burn from scrub and immature woodland in Greenloaning Wood and trees in Shanna Burn Wood. Rhododendron bushes and dead wood in wooded sections provide potential lying-up sites. Lower sections moderately open with occasional woodland cover.	ASPT score indicates water quality is Good. Pools and riffles provide good fish habitat. Burn supports salmonids and eel.	PRESENT	One potential holt recorded at: NJ 891011 (outwith survey area)	Shanna Burn is a relatively wide (2m) tributary of the River Dee opening up woodland areas to otter with territories on the river. Several sprainting sites located although no signs found upstream of pond in Shanna Burn Wood. Potential holt found in tree root cavity in wooded section.
Burnhead Burn	NO 870 986	LOW – MEDIUM Burn flows largely through arable/pasture farmland. Farm track, minor roads and horse/sheep trails run alongside and over burn.	Low cover in upstream reaches south of farm access track culvert. Tall herbaceous banks and occasional bushes with little cover outwith channel. Narrow strip of young woodland and scrub adjacent to burn near confluence with Blaikiewell Burn with overhanging banks, boulders and gorse and broom scrub.	ASPT score suggests water quality is good. Burn channelised in places. Salmonids are unlikely but trout are likely to be present.	PRESENT	Potential couch recorded at: NO 875 981 (C11)	Burnhead Burn is a tributary of Blaikiewell Burn and the River Dee SAC. Whitestone and Barnhill Burns flow into the burn although these are predominantly dry. Burn around 2m wide in downstream reaches where excellent lying up cover exists. Five old spraints recorded along the downstream reaches of the burn that is likely to support small prey items and a foraging resource away from Crynoch Burn. A number of adult otter prints recorded along the burn further upstream near the confluence of Swellhead Burn alongside a minor road indicating otter explore along the burn network. A potential couch was recorded in a hole in the wall next to the road.

Section SL3

3.2.11 Of the 11 named watercourses in study area, six have been assessed separately (Blaikiewell Burn, Kingcausie Burn, Crynoch Burn, Mill Bank Burn, Glenburnie and ponds, and the River Dee). Burnhead Burn has been assessed under Section SL2. The otter activity results for Section SL3 are shown in Table 6 and Figures 25.7c–d. A number of field drains have been included in the assessment for Crynoch Burn.

3.2.12 Crynoch Burn provides ideal habitat for otter including a mosaic of pools and riffles. Suitable undisturbed lying up habitat including three holts (H1, H2, H3), two couches (C6, C7) and a number of prints and abundant spraints as well as lying up potential all along the burn were observed. It is likely that otter with main territories along the burn also hunt and seek refuge along tributary burns within the study area including Blaikiewell Burn, Glenburnie and Glenburnie ponds where spraints have been recorded. The Burn of Monquich and Red Moss of Netherley SAC extend the lying up and foraging resource of Crynoch Burn. The presence of breeding otter, as evidenced by footprints thought to belong to a bitch and cub, and sightings of otter by surveyors and local landowners confirm that otter use the burn regularly. The burn is likely to be an important commuting route between the River Dee and resources to the south, including Blaikiewell Burn and Burnhead Burn as indicated by signs all along these watercourses.

3.2.13 A steep cliff between Crynoch and Kingcausie Burns may be the reason why no signs were recorded along the smaller burn. A sighting of an otter crossing overland toward the burn from Crynoch Burn would suggest that the burn is occasionally used as a foraging resource, and may be exploited during times when Crynoch Burn is in spate or for shelter. Two potential holts (H2, H3) and a potential couch (C14) were recorded in the vicinity of Kingcausie Burn. Similarly, Millbank Burn is considered to be of value to otter when the River Dee floods, as indicated by old spraint, although no lying up sites were recorded.

3.2.14 The River Dee is considered to be an important resource for otter. It provides optimal habitat for foraging and lying up along its banks away from the most disturbed areas on the north bank east of the bridge (Holts H4 and H5, couches C8 – C12, potential couches C16 – C24), and acts as an important commuting route east west up the River Dee valley. The river connects resources including tributary burns and feeding pools, and resting sites including the three couches within and many more outwith the study area. The abundance of signs and regular sightings of otter, and the designation of the river as a SAC notified for otter reflect its importance. Otter using this stretch of the River Dee are likely to explore Culter, Milltimber and Crynoch Burns and range extensively up and downstream. This includes the in-channel islands where potential holts were identified, although it is not known how many otter territories overlap in this area.

3.2.15 The field drains that feed into Milltimber Burn are considered to provide an important foraging resource during times of spate on the River Dee when otter are forced to investigate suitable places to lie up and food resources including seasonal prey items away from turbulent water. The water quality in Milltimber Burn has been assessed as being Fair. The presence of prints and spraints alongside the main burn suggest that otter may use the burn as a route by which to commute north to Milltimber.

3.2.16 The water quality of watercourses within this section has been assessed as being from Fair (Kingcausie Burn and Milltimber Burn) to Excellent (Blaikiewell Burn, Crynoch Burn). The River Dee has Good water quality.

Table 6 – Waterbodies and Habitat Features of Use to Otter in Section SL3

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/ Absent	Holt/Couch	Observations
Blaikiewell Burn	NO 868 987	LOW - MEDIUM Class C road runs adjacent to the burn along most of its length, pasture farming.	Poor - moderate cover upstream of Kingcausie in grassland and scrub. Excellent cover in estate from broadleaved/mixed woodland.	Pools and riffles present. ASPT score suggests water quality is Excellent. Salmon unlikely but trout likely to be present.	PRESENT	Potential couch recorded at: NO 871987 (C13)	Blaikiewell Burn is a tributary of Crynoch Burn and the SAC. Channel is 1-2m wide and dominated by grasses and reeds with some immature conifer trees that provide little cover for otter. Surrounding land is largely farmed, although the burn passes through woodland near the confluence with Crynoch Burn and at Cleanhill Wood, where tree roots and low disturbance levels offer suitable lying up opportunities away from the burn. Four otter spraints were identified along the length of the burn in the woodland near to the confluence with Crynoch Burn and under the road bridges. A fresh print was also recorded adjacent to a potential couch under a wall near the Blaikiewell Animal Sanctuary farm access road.
Kingcausie Burn	NO 864996 – 863997	VERY LOW – LOW Burn flows through private estate with some access tracks and livestock. Flows predominantly through dense undisturbed woodland	Very dense cover from rhododendron in places with opportunities for lying up in broadleaved/mixed woodland	Water very shallow in places; burn up to 1m wide and channelised in a number of places. ASPT score suggests water quality is Fair. Salmon unlikely but trout likely to be present.	None evident	Potential holt recorded at: NO 870 994 (H2) NO 863 996 (H3) Potential couch recorded at: NO 864 995 (C14)	Kingcausie Burn is a narrow, heavily realigned burn with few natural features but which is a tributary of Crynoch Burn where a steep cliff separates the two burns. The burn is subject to very low levels of disturbance and there is abundant cover all along its length in woodland and rhododendron scrub suitable for lying up, including potential holts and couches in rabbit holes and under tree roots and boulders. No signs recorded along the burn but tenant at Eastland House has seen otter crossing from Crynoch Burn towards Kingcausie Burn over the fields (March 2006) suggesting that they may occasionally use the burn for shelter.
Crynoch Burn	NO 860 999	LOW – MEDIUM Medium disturbance from dog walkers, playing field and Storybook Glen visitors (seasonal) and forestry operations in downstream reaches. Low disturbance due to farmland in upper	Variable cover – broadleaf and mixed woodland and occasional bracken and bramble scrub and rhododendron in lower reaches. Boulders and felled trees also provide some shelter	Salmonid river, SEPA water quality category Excellent. Ponds in Storybook Glen likely to support amphibian and fish prey.	PRESENT	Holt recorded at: NO 865 975 (H1) NO 866 977 (H2) NJ 85767 00268 (H3) Couch recorded at: NO 866 975 (C6) NJ 857 002 (C7) Potential couch	The downstream reaches of Crynoch Burn are part of the River Dee SAC. The burn is fed through Red Moss of Netherley SAC via Cairnie Burn and the Burn of Monquich. Burn 3 – 5m wide with frequent pools and riffles providing good habitat for fish and other prey items. Steep sided rocky gorge to south of B9077 South Deeside Road is unsuitable for resting. A holt marked with spraint was identified in a cavity near the confluence with the River Dee (H3). Boulders provide cavities with potential lying up sites including one exposed couch in Kingcausie with three spraints inside (C7). Two holts were recorded north of Greens of Crynoch in a hole in the riverbank,

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/ Absent	Holt/Couch	Observations
		reaches. Crossed by Class C road and B9077.				recorded at: NO 861 991 (C15)	in gorse and in a pile of rocks and rubbish marked with fresh spraint. Another couch was recorded in gorse near the holts (C6). Lying up potential was recorded immediately south of the road at Eastland (C15) and otter spraints were found along the burn and around the ponds with the highest spraint density near Greens of Crynoch. Otter spraints were found along the burn and around the ponds with the highest spraint density near Greens of Crynoch. Footprints including those possibly belonging to a bitch and cub were recorded between the B9077 road and the River Dee. Recent incidental observations of otter on the burn were reported by local residents to surveyors. An adult otter was sighted making its way upstream at Eastland Bridge in July 2006 (pers. obs. Rob Parkin, Jacobs). An otter RTA was recorded by the Centre for Ecology and Hydrology (CEH) on the B9077 where the road crosses Crynoch Burn suggesting that otter use terrestrial routes alongside the burn as well as the channel itself. Stranog Burn, Greens of Crynoch Burn, Wedderhill Burn, Craigentath Burn and Craigentath Ditch are tributaries of Crynoch Burn, which extend the foraging and lying up resource of Crynoch Burn, including potential good habitat for natal holts.
Mill Bank Burn	NJ 856 001	MEDIUM Burn passes through caravan park with moderate levels of human activity including dog walkers	Dense scrub and shrub undergrowth and mature broadleaved plantation woodland with many lying up opportunities under fallen trees, boulder piles and in rabbit holes.	n/a	PRESENT	None evident	Slow-flowing burn and marshy area strategically situated close to the River Dee SAC and Crynoch Burn, to which Mill Bank Burn is a tributary. Numerous suitable holes and cavities exist within the woodland suitable for use as temporary resting places by otter. A single dried spraint identified on a tree root indicates infrequent use by otter – it is likely that otter will investigate this burn during times of flood on the Dee and Crynoch Burn.
Glenburnie and Glenburnie Ponds	NO 860 994	MEDIUM Ponds and burn within children's theme park with public access during	Dense mature broadleaved woodland and undergrowth	n/a	PRESENT	None evident	Ponds and burn strategically located adjacent to Crynoch Burn and the River Dee SAC. Two old spraints recorded under two bridges along Glenburnie indicating otter hunt up the burn.

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/ Absent	Holt/Couch	Observations
		daylight hours					
River Dee	NJ 860 004	VERY LOW – MEDIUM Occasional disturbance from anglers and dogs (no public path exists), sheep around pasture land. Greater disturbance from dog walkers using public footpath along the north bank and houses near meander loop. Very low: in-channel Badger island immediately to the east of the survey area provides sanctuary for otter.	South Bank: Woodland in the easternmost reaches provides some cover, alder and scrub around the confluence of Crynoch Burn, low cover further upstream with open gardens, moderate cover from grass, reeds, bracken and brambles set back from the bank will provide substantial cover in summer. North Bank: Flat floodplain with little cover east of the existing Dee Crossing at Peterculter. West of the bridge much scrub and long grass between the path and river. In-channel island numerous mature trees, dead wood and flood debris provide good lying up sites.	ASPT score suggests water quality is Good. Pools, riffles, backwaters and coarse substrate provide good fish habitat and nursery areas for salmonids. River supports salmonids, eel, lamprey, stickleback, minnow and freshwater pearl mussel.	PRESENT	Holt: NJ 842 004 (H4) NJ 8607500382 (H5) NJ 869 010 (outwith Study area) Potential holt: NJ 852 005 (H4) Couch: NJ 85882 00346 (C8) NJ 851 005 (C9) NJ 860 003 (C10) NJ 861 004 (C11) NJ 859 003 (C12) Potential couch: NJ 857 003 (C16) NJ 855 005 (C17) NJ 863 006 (C18) NJ 863 007 (C19) NJ 847 005 (C20) NJ 846 006 (C21) NJ 845 005 (C22) NJ 843 003 (C23)	The main river is approximately 30m wide and fast flowing at this section. Signs of otter are abundant along the length of the river up and downstream of the study area. Fresh and dry spraints were found, including under the existing road bridge at Peterculter, as well as sign heaps, fish remains, prints, runs and slides along the banks and at the waters edge. These observations indicate regular use by otter. The presence of juvenile prints on the south bank of the River in January 2007 indicate that otters breed and raise their young along this stretch of the river. Along the south bank, five couches were recorded including an area of flattened grass adjacent to a spraint site and run near the existing bridge (C8), a timber and dead woodpile with fresh spraint inside and runs leading to the water's edge (C11). Dry spraint inside a cavity near the edge of the woodland in Kingcausie (C10), a couch marked with spraint and fish remains (C9) and a small hollow in the sandy bank (C12) were also found. Two holts were recorded outwith the study area: on the north bank, a chamber holt with a slide and signs of use, and near Badger Island in a hole in the bank between broom and alder, both with spraints nearby. A holt was recorded within the woodland close to the proposed scheme where a well-used network of hovers and tunnels connected to the recorded couches and marked with abundant prints. Spraint were recorded under the wood rush (H5). Many potential resting sites were identified along the riverbanks such as cavities in the bank in woodland at Kingcausie; under gorse and scrub on the north bank and under the bank or behind trees near the westernmost boundaries of the survey area. Landowners on the south bank and river bank users have observed otter regularly along the river banks (pers. comm.). Surveyors observed an adult female otter swimming up the River Dee and using the ledge under Milltimber Bridge on four separate occasions in June 2006 and January 2007 (pers. obs. Claire Hopkins, Kate Finlinson, Mark Jackson, Jacobs).

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/ Absent	Holt/Couch	Observations
Milltimber Burn and tributaries	NJ 856 009	MEDIUM High intensity arable and pasture farming and excavation works in the area. Water littered and polluted. Class C road and busy B979 road from the River Dee Crossing to Milltimber. Burn likely to be affected by urban and farm drainage.	Little cover available in most ditches. Occasional gorse and broom.	ASPT score suggests water quality is fair.	PRESENT	None evident	Network of narrow (<1m) drainage channels with slow-non-existent flow and shallow banks offering little/no opportunities for lying up aside from rabbit burrows. Two recent spraints that were identified on a tussock along a field boundary next to a ditch and five adult-sized prints evident alongside Milltimber Burn. Single spraint at top of a levee leading from Milltimber Burn marks a track to the drainage ditch system.

Section SL4

3.2.17 Of the six named water features in this section, three have been assessed (Bellenden Burn, Beans Burn and Beanshill Ponds). The results are shown in Table 7 and Figures 25.7d-e.

3.2.18 No signs of otter were recorded alongside Bellenden Burn, which is subject to heavy disturbance from dogs and walkers in Milltimber Wood and where the burn flows through a residential area. An area of Milltimber Wood, that lays outwith the main area, has been felled and provides numerous opportunities for secluded lying up. However, the burn is considered to be relatively isolated from probable commuting routes and other watercourses of value to otter.

3.2.19 No field signs were recorded alongside Beans Burn and the suitability for lying up is considered low. It is likely that otter with main territories along Murtle Burn and Upper Beans Hill Burn and Beanshill Ponds may explore along the burn, which may provide a seasonal foraging resource.

3.2.20 Beanshill Ponds represent a reliable source of fish prey strategically located along to a probable commuting route, which includes Upper Beanshill Burn and Murtle Den Burn. Secluded lying up habitat is also provided adjacent to the ponds (potential couch C25). In general, this section is poorly represented by water features and therefore by signs of otter in the central sections.

3.2.21 No signs of otter were recorded along Albyn Burn, Culter House Ditch or the Tributary of Milltimber Burn.

3.2.22 Culter House Burn, which lies outwith the study area in this section, has not been surveyed for otter. It should be noted that this burn forms part of the River Dee SAC and is therefore considered likely to provide another important otter commuting route connecting the River Dee to burns and water features north of the River Dee.

Table 7 – Waterbodies and Habitat Features of Use to Otter in Section SL4

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/Absent	Holt/Couch	Observations
Bellenden Burn	NJ 851 018	MEDIUM – HIGH Burn flows through woodland used frequently by dog walkers, and also through residential area and pasture farmland	Moderate – good cover from fallen trees and in woodland, shelter next to wall where burn flows through farmland	ASPT score for this burn indicates that the burn is of Good biological status.	No signs evident	None evident	Burn very narrow, despite good cover within woodland and in nearby felled woodland. Burn is highly disturbed by local woodland users and residents. Burn isolated from other water features, and culverts leading south toward Milltimber Burn have been gated preventing access.
Beans Burn	NJ 849 030	LOW – MEDIUM Burn flows through pasture farmland	Little cover available – open pasture with occasional gorse	n/a	No signs evident	None evident	Burn around 0.5m wide and slow flowing with no cover beyond channel that is retained on one side. Burn flows into Murtle Den Burn that is used by otters.
Beanshill Ponds	NJ 857 036	LOW - MEDIUM Ponds are located in conifer plantation woodland with mown grass and no public access	Moderate cover available in reeds around the ponds and in Gairnhill plantation woodland	Ponds stocked with trout and support other prey items	PRESENT	Potential couch recorded at: NJ 857 038 (C25)	Four man-made ponds drained by narrow ditches. Ponds surrounded by narrow strip of reeds and grasses suitable for temporary lying up. Mature conifer plantation woodland exists nearby. Two spraints recorded on rocks around the northeastern pond and the landowner observed a large otter in 2002 (pers. comm. local resident).

Section SL5

3.2.23 Of the named water features in this section, five have been assessed (Upper Beanshill Burn, Ord Burn, Silver Burn, Gairn Burn and the Moss of Auchlea). The results are shown in Table 8 and Figures 25.7e – 25.7g.

3.2.24 Upper Beanshill Burn flows through sheltered plantation woodland where there are abundant lying up opportunities including a potential couch under tree roots and fallen trees in a deforested area (C25). Disturbance during felling is likely to affect otter movements through the woodland. A commuting route exists between the Ord and Silver Burn catchment to the west and Beanshill Ponds and Murtle Burn to the east but is short lived and infrequent.

3.2.25 Ord and Silver Burns are closely interlinked in this section and there are abundant signs of otter including recent observations by local residents. The presence of a holt (H6) near the edge of the study area on the banks of Ord Burn and spraints along the burns indicate their regular use by otter and it is likely that otter cross between catchment areas in this section. In addition, Silver Burn and Gairn Burn provide connectivity with areas of excellent and secluded lying up habitat suitable for breeding otters at Auchlea Moss, where otter spraint was recorded, and Rotten O'Gairn District Wildlife Sites. The water quality in Silver Burn has been assessed as being Excellent and in Gairn Burn as Fair.

Table 8 – Waterbodies and Habitat Features of Use to Otter in Section SL5

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/Absent	Holt/Couch	Observations
Upper Beanshill Burn	NJ 852 042	LOW - MEDIUM Burn flows through plantation conifer forest with infrequent forestry operations	Gairnhill Wood (mature conifer plantation with some broadleaved/mixed) provides dense cover and lying up opportunities under tree roots and fallen trees and in gorse and bramble scrub.	n/a	PRESENT	Potential couch recorded at: NJ 850 039 (C26)	Narrow (<1m), slow-flowing and acidic water and ditch system flowing through Gairnhill Wood. Abundant fresh and older otter spraint along the burn south of the road and along field drains leading through Gairnhill Wood toward Beanshill Ponds despite recent disturbance from forestry operations. A potential holt was recorded in the wood with fresh spraint nearby under tree roots.
Ord Burn	NJ 847 040	LOW Burn surrounded by farmland managed for horses/livestock.	Cover largely limited to the immediate channel with low juncus and marshy grassland along most of the burn and occasional gorse, broom, bramble, scrub and piles of boulders.	Burn likely to support fish populations. Frogspawn recorded adjacent to burn.	PRESENT	Holt recorded at: NJ 840 040 (H6)	Source of Ord Burn is within study area where it exists as a series of slow-flowing drainage ditches 1.5 – 2m wide with steep grassy banks and occasional scrub. All areas of marshy grassland provide ideal conditions for amphibian prey. The burn drains to Culter Burn (Part of the Dee SAC) and Silver Dart reservoir. Adult print recorded near confluence with Silver Burn and 11 fresh and old spraints recorded along the burn. One holt (H6) was recorded in a burrow along the burn with recently used sign heap and prints outside. Many opportunities for lying up exist in rabbit holes and gorse scrub along the channel.
Silver Burn	NJ 848 039	LOW Burn surrounded by farmland managed for horses/livestock. Burn passes through Rotten O'Gairn DWS.	Cover largely limited to the immediate channel with low juncus and marshy grassland along most of the burn and occasional gorse, broom, bramble, scrub and piles of boulders. Burn flows through small woodland near Silver Burn House.	Burn likely to support fish populations. ASPT score suggests water quality is excellent. Salmon are unlikely, but trout are possible.	PRESENT	None evident	Silver Burn is a narrow, deep burn channelised in places and 0.5-2m wide in the lower reaches and connected to a network of deep field drains and ditches and a number of man-made ponds around East Brotherfield. The burn is an upper tributary of Ord Burn. Only one spraint recorded north of the road although good lying up opportunities exist in juncus and marshy grassland and gorse scrub, rabbit warrens and a pile of boulders. This section of the burn connects Moss of Auchlea with Ord Burn. Spraints of varying ages found along the burn and around ponds at East Brotherfield, which provides source of amphibian prey. Reports were received of incidental observations

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/Absent	Holt/Couch	Observations
							by local landowners in March 2005 of otter playing near East Brotherfield Farm. Other landowners in the study area also reported sightings of otters.
Gairn Burn	NJ 850 044	LOW - MEDIUM Burn flows through pasture farmland and Rotten O'Gairn DWS and under busy country road	Moderate cover north of the road in bramble and tall herbaceous scrub. Cover limited to channel and adjacent grassland and scrub south of road	ASPT score suggests water quality is Fair - Good. Burn is unlikely to support salmon, but likely to support trout. .	PRESENT	None evident	Short burn draining Rotten O'Gairn DWS and Kingshill Wood and providing connecting habitat between Upper Beanshill Burn and Ord Burn/Silver Burn. Old spraint recorded under the culvert under the road, which is large enough to accommodate otter. Incidental sighting of otters south of the road at East Silver Burn by local landowner (pers. comm. local resident).
Moss of Auchlea	NJ 850 053	VERY LOW Moss is a DWS with no public access. Occasional visits by local residents; surrounded by organic arable/pasture farmland.	Moderate – dense cover from birch and willow scrub and rushes. Occasional fallen trees, piles of debris and root systems provide numerous secluded lying up opportunities.	n/a	PRESENT	None evident	Drainage ditch system in area of wet woodland ideal for natal holts. Two spraints were recorded in the moss adjacent to drainage ditches which indicates that otters use the ditches to enter the moss. The source of Silver Burn, which drains the moss and is a tributary of the RIver Dee, is in Auchlea Moss providing connectivity between the Moss and holt and foraging grounds at Silver/Ord Burns south of the road. SNH pers. comm. Otter may breed in the moss.

Section SL6

3.2.26 Westholme Burn, Borrowstone Burn and Fairley Home Farm Pond in this section have been assessed. The results are shown in Table 7 and Figures 25.7g and 25.7h.

3.2.27 A couch (C12) and otter spraints were recorded along Borrowstone Burn, which, although it is now dry, represents a commuting route between Brodiach Burn and Borrowstone Pond. The pond is likely to provide suitable prey items and extends the resource provided by Brodiach Burn, which ultimately connects to Ord Burn and the River Dee SAC. A couch under a culvert and marked with spraint was recorded at a field boundary and two other similar structures provide potential for lying up (C27, C28).

3.2.28 Westholme Burn is also a tributary of Brodiach Burn but provides limited foraging potential due to its exposed and relatively disturbed nature. Some lying up opportunities exist under buildings, however signs were not present and the burn unlikely to be used frequently as a foraging or commuting resource by otter.

3.2.29 Fairley Home Farm Pond is a small, isolated feature which has some potential as a seasonal foraging resource and as a “stop gap” between Borrowstone Burn and Bucks Burn, although it is unlikely to be used regularly by otters. Limited lying up potential was recorded in gaps between boulders.

Table 9 – Waterbodies and Habitat Features of Use to Otter in Section SL6

Water Feature	Grid Ref	Disturbance	Cover	Water Quality	Otter Present/Absent	Holt/Couch	Observations
Westholme Burn	NJ 852 064	LOW – MEDIUM Pasture farmland managed for horses. Burn is cleared periodically, minor road crosses burn	Low cover limited to the channel and immediate surroundings (riparian herbaceous vegetation and grasses). Woodpiles, boulder piles and man-made structures offer some lying up potential. Occasional gorse scrub downstream.	n/a	No signs evident	None evident	Westholme Burn is a small tributary of Brodiach Burn, which is polluted and straightened. The burn is narrow (<0.5m), shallow and has been modified in the past although bank voles provide a potential prey resource. Some limited lying up opportunities exist along the burn in gorse, under sheds and in farm debris, but no field signs were found within the study area.
Borrowstone Burn and pond	NJ 857 081	LOW Surrounded by arable farmland	Little cover away from the pond where burn channel crosses fields. Moderate cover including emergent vegetation, conifer woodland and tall grass and herbaceous vegetation near the pond.	Pond represents seasonal foraging resource	PRESENT	Couch recorded at: NJ 855 080 (C12) Potential couch recorded at: NJ 855 078 (C26) NJ 855 079 (C27)	Borrowstone Pond has good potential for foraging as a seasonal resource for amphibians, and good cover and low disturbance levels nearby. Although Borrowstone Burn has dried up it represents a commuting route from Brodiach Burn to the pond. A recently used couch was identified in a brick culvert marked by many spraints on an earth mound. A potential couch was recorded in another culvert nearby.
Fairley Home Farm Pond	NJ 859 077	LOW Surrounded by arable and pasture farmland and local woodland	The pond is located within a small mature beech and Scots Pine plantation woodland with poorly developed scrub layer. A pile of large boulders on one side of the pond and old car offers some potential for lying up.	Pond represents potential seasonal foraging resource	No signs evident.	None evident	Fairley Home Farm Pond is a small pond fed by a minor burn and with potential as a seasonal foraging resource. The pond is relatively isolated from other features in the area, but may represent a stop gap between Borrowstone Pond and Bucks Burn.

4 Evaluation of Habitat Areas

4.1 Introduction

4.1.1 Each watercourse identified in the results section has been evaluated in terms of its value and importance to otters on the basis of interpretation of field signs, following the criteria outlined in Table 1.

4.1.2 Smaller drainage ditches, ponds and water features that are not described individually are considered in isolation to be of low value and less than local importance to otter. This is due to their size, the quality of the resource they provide, the high levels of disturbance to which they are subjected and/or the absence of signs of otter.

Section SL1

4.1.3 The evaluation of watercourses for their importance for otters in Section SL1 is summarised in Table 8.

4.1.4 Despite possessing good riparian cover from dense gorse, Loirston Burn and its tributaries suffer from low to moderate disturbance levels owing to their proximity to a manufacturing yard and the A90 and A996 and should therefore be considered of Medium value to otters. The burn is unlikely to support substantial fish populations and gave a low ASPT scores (see Appendix 25.9: Freshwater Ecology). However, Loirston Burn and its tributaries provide a commuting route between land to the west of the A90 (T) road including Loirston Loch, which provide good potential lying up sites in emergent vegetation and scrub, and support populations of salmonids as well as other prey items such as birds, small mammals and amphibians. The discovery of an otter RTA on the A90 (T) at Charleston Junction (pers.obs. Jonathan Guarnaccio, Jacobs, 2004) (see Figure 25.7a) would imply that otters are also using terrestrial short-cut routes to move between Loirston Loch and west of the A90. Loirston Burn is considered to be of county importance to otters.

4.1.5 Greenhowe Pond is likely to provide seasonal foraging opportunities (i.e. amphibians) while the undisturbed woodland and dense bracken that surround the pond offer good cover. However, the pond is very small, does not support fish and is isolated from other watercourses. Greenhowe Pond is therefore assessed as being of low value and of local importance to otters.

4.1.6 The Burn of Ardoe is judged to be of High value to otters as it supports healthy fish populations owing to in-channel features (see Appendix 25.9: Freshwater Ecology) and Excellent water quality, and provides a commuting route between the River Dee and an undisturbed area of trees, heath, scrub and immature woodland adjacent to the burn, and in Hare Moss which also has potential as a breeding site. Several fishing ponds lie immediately adjacent to the burn, providing an additional source of food in the form of fish and amphibians. Signs including fish remains and sprainting sites have been recorded along the burn and a potential holt was identified. The burn is likely to be an important refuge when the River Dee is in spate. The population of otters using the Burn of Ardoe is considered to be of regional importance.

Table 10 – Evaluation of Features for Otters in Section SL1

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Loirston Burn	Medium	Commuting and potential lying up	County	Loirston Burn and tributaries support a population of an internationally important species not threatened or rare in the region and the burn is not integral to maintaining this population but provides a potential crossing point under the A90 (T).
Greenhowe Quarry Pond	Low	Potential foraging, potential lying up	Local	The pond enriches the habitat resource within the local context by providing a potential refuge and foraging resource in an area otherwise sparse in alternative resources.
Burn of Ardoe	High	Foraging, commuting, potential lying up	Regional	The Burn of Ardoe, in conjunction with Hare Moss and the surrounding drainage network, maintains a population of this internationally important species that is not threatened or rare in the region.

Section SL2

4.1.7 Cowford Burn represents a habitat resource considered to be of medium value as it provides access to an area of undisturbed woodland habitat ideal for lying up and potential breeding. The burn represents a potential commuting route between the upper reaches of Shanna Burn and the Burn of Ardoe, which have high value to otters including potential holts and abundant field signs. However, there are moderate disturbance levels along the burn from poaching by cattle and the road, which runs alongside and reduce its suitability as a commuting route. Cowford Burn should therefore be considered to have county importance to otters.

4.1.8 Shanna Burn possesses many of the features considered to be of high value to otters using the Burn of Ardoe. In addition, Shanna Burn flows through Shanna Burn Wood which could be used by breeding female otters as it offers undisturbed cover in the form of rhododendron bushes and dead wood while also providing a link with the River Dee. Shanna Burn is considered to be of regional importance to otters.

4.1.9 Burnhead Burn is likely to extend the resource provided by Blaikiewell Burn and Crynoch Burn and abundant signs of otters in the downstream reaches of the burn indicate frequent use by individuals, representing a potential commuting route into the agricultural area between Clochandighter and Crynoch Burn. The presence of potential hiding places behind boulders and in vegetation either side of the burn and the lack of alternative resources upstream mean that the burn should be considered as a resource of Medium value and county importance to otters.

Table 11 − Evaluation of Features for Otters in Section SL2

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Cowford Burn	Medium	Potential foraging, lying up and commuting	County	Cowford Burn is likely to support a population of an internationally important species not threatened or rare in the region. The burn is not integral to maintaining this population but maintains a potential commuting route between Shanna Burn and the Burn of Ardoe and provides potential lying up habitat.
Shanna Burn	High	Commuting, foraging and lying-up. Potential breeding.	Regional	One potential holt site was recorded and the burn provides a commuting corridor to southern areas such as Greenloaning Wood. Burn maintains a population of internationally important species that is not threatened or rare in the region.
Burnhead Burn	Medium	Foraging, potential lying up	County	Burnhead Burn supports a population of an internationally important species not threatened or rare in the region, and the burn is not integral to maintaining this population

Section SL3

4.1.10 Blaikiewell Burn is a tributary of Crynoch Burn, which is extensively used by otters, connecting Crynoch Burn with resources in Burnhead Burn and field drains beyond. Moderate cover in the downstream reaches and a number of opportunities for lying up exist behind boulders and scrub as well as in Kingcausie Burn. Fish are present in the burn, which has Excellent water quality (see Appendix 25.9). This extends the habitat and prey resource provided by Crynoch Burn. Despite a number of spraints being identified, no resting places were confirmed here or along the adjacent Burnhead Burn. Blaikiewell and Burnhead Burns are therefore considered to be of medium value and county importance to otters.

4.1.11 Kingcausie Burn is a shallow but sheltered and largely undisturbed burn, which opens up the burn to a range of lying up opportunities. Although there is a steep cliff at the confluence of the burn with Crynoch Burn, otters have been observed using terrestrial routes to access resources in the estate. It is likely that Kingcausie Burn provides some foraging and lying up opportunities used during times of spate in the SAC. Despite the absence of otter signs along the burn, it is considered to be of medium value and county importance to otters.

4.1.12 Glenburnie and ponds are ideally situated in an area of very low disturbance and optimal habitat, including mature broadleaved woodland which provides abundant cover and lying up opportunities adjacent to the SAC designated Crynoch Burn and within 100m of the River Dee. Glenburnie and ponds may be considered as being contiguous with the Crynoch Burn and with the River Dee both in terms of the otters, which hunt and hide there, and in terms of the quality of the resource it provides. The evidence of otters around the ponds indicates their value to otters. However, considered separately from the SAC, the ponds are considered to be of high value and county importance to otters.

4.1.13 Crynoch Burn lies within the boundaries of the River Dee SAC, which is designated for the presence of Atlantic Salmon *Salmo salar*, Freshwater Pearl Mussel *Margaritifera margaritifera* and otter. Crynoch Burn has been identified as a core area of otter activity with two holts, one couch and two potential holts recorded along its length including where the burn passes through the study area. The habitats along the burn include optimal foraging habitat and secluded suitable lying up habitat, as well as continuity between the River Dee, Blaikiewell Burn, Burnhead Drains and the Burn of Monquich where signs of otters have also been found. In addition, footprints thought to belong to a bitch and cub were recorded in the lower reaches of the burn indicating its possible status as a breeding or natal range. Otters appear to use all sections of the burn surveyed despite moderate disturbance from forestry activities at Durris Forest. For these reasons, Crynoch Burn is considered to be of very high value and international importance to otters.

4.1.14 Mill Bank Burn is considered to be an extension of the resource provided by the River Dee and Crynoch Burn and is commutable from these during times of flood. The burn supports a number of lying up opportunities and provides access to a different foraging resource considered to be of Medium value to otters. Moderate levels of disturbance and infrequent use by otters give the burn county importance.

4.1.15 The River Dee is an internationally designated Special Area of Conservation (SAC) designated under the Habitats Directive for the presence of internationally important populations of Atlantic Salmon *Salmo salar*, Freshwater Pearl Mussel *Margaritifera margaritifera* and otter. The river constitutes a core area of otter activity, which includes Crynoch Burn. Within the study area, four couches, three potential couches and a holt were recorded in scrub and riparian woodland along the banks of the River Dee within the study area and additional lying up sites have been recorded further upstream and downstream on undisturbed mid-channel islands and overhanging banks which provide ideal cover for otters. The river supports large populations of salmonids and eels, which represent a year-round important food source to otters. It is likely that the bitch and cub identified on Crynoch Burn use the River Dee, reflecting its importance as a natal resource. The section of the River Dee in the survey area represents part of an important migration corridor enabling otters to disperse between foraging grounds and resting places up and down stream, increases the genetic variation of the otter population and connects tributaries which in turn provide refuge during spate conditions. The River Dee is therefore considered to be a unique resource of very high value and international importance to otters.

4.1.16 Milltimber Burn flows into the River Dee therefore representing a commuting route to the north and opening up the drain system and standing pools as a refuge during times of flood. The field drains are, however a resource of low value to otters as they are unlikely to support fish and suffer from high levels of disturbance from human activities, offering little or no cover suitable for resting. Milltimber Burn is subject to moderate disturbance levels and together the burn and field drains should be considered as being of medium value supporting an otter population of county importance.

Table 12 – Evaluation of Features for Otters in Section SL3

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Blaikiewell Burn	Medium	Foraging, Commuting, potential lying up	County	Blaikiewell Burn supports a population of an internationally important species not threatened or rare in the region, and close to Crynoch Burn and the River Dee SAC. The burn is not integral to maintaining this population
Kingcausie Burn	Medium	Potential foraging and lying up	County	Kingcausie Burn supports a population of an internationally important species not threatened or rare in the region, and close to Crynoch Burn and the River Dee SAC. The burn is not integral to maintaining this population
Glenburnie and Ponds	Medium	Foraging, potential lying up	County	Glenburnie and Ponds support a population of an internationally important species not threatened or rare in the region and the ponds are not integral to maintaining this population given their proximity to Crynoch Burn and the River Dee.
Crynoch Burn	Very High	Foraging, Commuting, Lying up, breeding	International	Crynoch Burn is part of the River Dee SAC, which is internationally designated for Atlantic Salmon, freshwater pearl mussel and otters. Crynoch Burn maintains a regularly occurring, nationally significant population of an internationally important species including breeding otters and a unique resource, including foraging and lying up opportunities.
Mill Bank Burn	Medium	Foraging, potential lying up	County	Mill Bank Burn supports a population of an internationally important species not threatened or rare in the region and the burn is not integral to maintaining this population but extends the habitat resource due to proximity to Crynoch Burn and the River Dee.
River Dee	Very High	Foraging, Commuting, Lying up, breeding	International	The River Dee is an internationally designated SAC designated for Atlantic Salmon, freshwater pearl mussel and otters. The River Dee maintains a regularly occurring, nationally significant population of an internationally important species including breeding otters and represents a unique resource including migration route and foraging resource contiguous with Crynoch Burn. The River Dee is vital to the maintenance of this species.
Milltimber Burn	Medium	Foraging, Commuting, potential lying up	County	Milltimber Burn supports a population of an internationally important species not threatened or rare in the region and the burn is not integral to maintaining this population but extends the habitat resource of the River Dee, appreciably enriching the county habitat resource.

Section SL4

4.1.17 Bellenden Burn offers some ideal lying up habitat under fallen trees and roots and piles of brash in the felled section of Milltimber Wood, and some potential for foraging along the burn itself. However, the high levels of disturbance from local residents and the inaccessibility of the area from other water features in the area mean that it is unlikely to be of above local value to otters.

4.1.18 Offering little in the way of cover and foraging resources due to its size, Beans Burn is considered to have low value to otters. Although it is likely to be used periodically by otters with a home range on Murtle Den Burn, Upper Beanshill Burn and Beanshill Ponds, the burn is considered to be of only local value to otters.

4.1.19 Beanshill Ponds represent a reliable source of fish and small mammal and bird prey strategically placed along a probable commuting route connecting the top of the Silver Burn and Ord Burn catchment with the top of Murtle Den Burn. The abundance of suitable lying up opportunities nearby and the undisturbed nature of the ponds represent a habitat of medium value to otters and county importance to otters.

Table 13 − Evaluation of Features for Otters in Section SL4

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Bellenden Burn	Medium	Potential foraging and lying up	Local	Bellenden Burn enriches the habitat resource within the local context by providing an area of potential foraging and lying up habitat in an area sparse in alternative resources.
Beans Burn	Low	Potential foraging	Local	Beans Burn enriches the habitat resource within the local context by extending the resource provided by Murtle Den Burn and Upper Beanshill Burn.
Beanshill Ponds	Medium	Foraging, potential lying up	County	Beanshill Ponds support a population of an internationally important species not threatened or rare in the region and the ponds are not integral to maintaining this population but provide a strategically important foraging resource along a probable commuting route, appreciably enriching the county habitat resource.

Section SL5

4.1.20 Upper Beanshill Burn flows through some sheltered habitat including an area of felled conifer woodland and dense conifer plantation providing cover in the form of tree roots, stumps and upturned root plates although occasional high disturbance levels during forestry operations, absence of fish prey and disruptions to the water and drainage system are likely to have adverse impacts on the behaviour of otters using the burn. However, the burn is seen to be an important commuting route between the Silver Burn, Gairn Burn and Ord Burn catchment to the west and abundant prey resources to the east including ponds at Beanshill and Murtle Den Burn, and a potential holt provides a strategic resting place en route. The burn is considered to have medium habitat value but support a small population of otters of county importance.

4.1.21 Silver Burn is recognised as an important feature within this section connecting areas of habitat including Auchlea Moss and Ord Burn and providing a reliable source of amphibian and small mammal prey in the burn and adjacent ditches and ponds. The burn is unlikely to support substantial fish populations (see Appendix 25.9). At least two otters have been observed in the area, which is close to a holt on Ord Burn and forms contiguous habitat with it. In addition, an abundance of lying up opportunities and relatively low disturbance levels make the burn high value to a population of otters of regional importance.

4.1.22 Ord Burn, contiguous with Silver Burn and connecting foraging resources downstream (Silver Dam and ultimately the River Dee) with that upstream (Auchlea Moss, Gairn Burn, Upper Beanshill Burn and ponds) make it an important dispersal route along which abundant signs of otters and evidence of lying up (holt at East Brotherfield) exist. Low disturbance levels contribute toward the high habitat value and the burn is considered to maintain a regionally important otter population.

4.1.23 Gairn Burn is contiguous with Ord Burn and Silver Burn and provides connectivity between the drainage network around Silver Burn and Upper Beanshill Burn and Murtle Den Burn. Again, otter signs were identified along the burn in a culvert, which allows access to shelter north of the road. However, the burn is unlikely to support substantial fish populations (see Appendix 25.9: Freshwater Ecology) and is therefore assessed as being of medium value to otters and the otter population using it of county importance.

4.1.24 The Moss of Auchlea is unlikely to support fish due to the shallow nature of the connecting Silver Burn, but is likely to provide alternative foraging resources including small mammals and undisturbed cover suitable for lying up in the form of immature broadleaved woodland and scrub with some dead wood and occasional upturned root plates. This habitat is scarce in the immediate surroundings and may represent a potential breeding location, and is therefore considered to be of high value to otters. The moss has been assessed as being of county importance due to the

presence of otter signs, its connectivity to Silver Burn, and due to its suitability as a lying up resource.

Table 14 − Evaluation of Features for Otters in Section SL5

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Upper Beanshill Burn	Medium	Commuting, potential lying up	County	Upper Beanshill Burn supports a population of this internationally important species as a commuting route between areas of lower disturbance and higher foraging habitat value. The burn is not considered integral to maintaining these populations, which are not threatened or rare in the region.
Silver Burn	High	Commuting, Foraging, potential lying up	Regional	Silver Burn, in conjunction with Ord Burn and surrounding drainage network, maintain a population of this internationally important species that is not threatened or rare in the region.
Ord Burn	High	Commuting, Foraging, Lying up	Regional	Ord Burn, in conjunction with Silver Burn and the surrounding drainage network maintain a population of this internationally important species.
Gairn Burn	Medium	Foraging, potential lying up	County	Gairn Burn supports a population of this internationally important species that is not threatened or rare in the region and is not considered integral to maintaining the population.
Moss of Auchlea	High	Potential foraging and lying up	County	Moss of Auchlea supports a population of this internationally important species that is not threatened or rare in the region and is not considered integral to maintaining the population. The moss is considered to enhance the lying up resource of Silver and Ord Burns by providing a secluded location suitable for breeding otters. Designated DWS.

Section SL6

4.1.25 Westholme Burn is considered unsuitable to support fish in the upstream reaches due to relatively high levels of disturbance from agricultural activities, polluted runoff from the A944 and Five Mile Garage. This reduces the suitability of this burn for otters, although some cover is available within and nearby the channel. Otters commuting and hunting along Brodiach Burn may occasionally explore this burn, but it is not considered to enrich the habitat resource above local level.

4.1.26 Borrowstone Pond is considered suitable to support seasonal prey items and the presence of a couch marked with spraint indicate that the burn draining the pond is used as a lying up site and commuting route from Brodiach Burn to the west. Good alternative potential lying up habitat in the form of a culvert, tall herbaceous vegetation and mixed woodland exist nearby. The pond is therefore considered to be of medium value to otters. As pond habitats are scarce in the locality, it is considered to enrich the habitat resource at the county level as the size of the pond makes it unlikely to support a regionally important population of otters.

4.1.27 Fairley Home Farm Pond is considered likely to support seasonal prey items such as amphibians, although its relative isolation from other water features makes it unlikely to be used regularly by otters. Despite low disturbance levels and the availability of some limited potential lying up habitat, the pond is considered unlikely to enrich the habitat resource at higher than local level.

Table 15 – Evaluation of Features for Otters in Section SL6

Water Feature	Habitat Value	Use by Otters	Evaluation	Reason for Valuation
Westholme Burn	Low	Potential foraging and lying up	Local	Westholme Burn appreciably enriches the habitat resource within the local context extending the cover and foraging resource provided by Bodiach Burn.
Borrowstone Burn and pond	Medium	Lying up, foraging, commuting	County	Borrowstone Burn and Pond support a population of an internationally important species and represent a commuting route from Brodiach Burn and a scarce foraging opportunity in the area. The burn is not considered integral to maintaining the population, which is not threatened or rare in the region.
Fairley Home Farm Pond	Low	Potential lying up and foraging	Local	Fairley Home Farm Pond appreciably enriches the habitat resource within the local context by extending the cover and foraging resource provided by Borrowstone Burn and pond and Brodiach Burn.

4.2 Evaluation Summary

4.2.1 Aberdeen is known to be an important area for otters supporting internationally important populations of otters in the Dee and Don catchments. The identification of otter signs, their resting places and otters themselves along many of the watercourses within the study area reflect this assessment.

4.2.2 The River Dee and Crynoch Burn are assessed as being of the highest value to otters, being internationally designated as Special Areas of Conservation specifically for their presence. High value habitat and extensive otter signs including lying up sites along the Burn of Ardoe, Shanna Burn, Ord Burn and Silver Burn reflect their importance to regionally important groups of otters. Smaller burns and drainage ditches and terrestrial features are considered to have strategic importance as landmarks connecting the River Dee and Don catchments, linking different parts of otter territories and making enabling access to foraging resources and shelter away from the main water features, including secluded areas suitable for natal holts.

5 Potential Impacts

5.1 Introduction

5.1.1 The following assessment addresses the potential impacts on badger populations associated with the construction and operational phases of the proposed scheme (both short and long-term), without mitigation. Following guidance from the DMRB (Highways Agency, 2001), potential impacts would be likely to include: direct mortality, habitat loss, habitat fragmentation and isolation, disturbance and pollution and other indirect impacts.

5.1.2 It should be noted that the impacts associated with the operational phase of the scheme are considered to be permanent Temporary impacts, which are only apparent while the road is being built, are discussed in association with the construction phase. In this way, burn realignments, habitat loss due to land take and other aspects of the scheme are considered to be permanent, and therefore operational impacts. In addition, it is important to recognise that the potential impacts outlined below frequently interact (i.e. habitat loss during construction could potentially result in disturbance and habitat fragmentation) and the resulting combination of impacts may, through synergistic effects, significantly increase the overall adverse impact of the proposed scheme (Iuell et al 2003).

5.1.3 The impact assessment is based on the evaluation of the otter population in the study area as being of national importance.

5.2 General

Direct Mortality

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

5.2.2 The principle cause of direct mortality resulting from operation of the proposed scheme is likely to be through otter being struck by vehicles as they attempt to cross the new road. Otter are highly susceptible to being killed on existing roads with 60% of all recorded deaths in the UK being attributed to road accidents (Woodroffe, 2001). Trunk and A-roads account for 57% of these RTAs, although they comprise only 13% of the road network (Philcox et al*.,* 1999). The majority of road casualties (over 50%) occur within 100m of a watercourse (Highways Agency, 1999). This frequently occurs during high water levels. In periods of flooding, otter are reluctant or unable to swim under a bridge or through a culvert due to strong currents and high flows, this being exacerbated where there is no ledge above the high water level for otter to walk along. Where otter do attempt to swim under the road during strong currents, they are liable to drown, especially in culverts that have become blocked at one end or where there is a lack of air space. RTAs may be increased where drainage ditches and burns run alongside the road, as otter can be attracted onto the carriageway (Grogan et al., 2001).

5.2.3 Direct mortality as a result of the operational phase of the proposed scheme could adversely affect otter where the proposed scheme crosses and/or comes in close proximity to watercourses that are utilised by otter. It is possible that dispersing juveniles and females could be killed either through being struck by vehicles or drowning as they attempt to swim under the road during high water levels. Females and juveniles in particular are vital in maintaining the population and their death would result in the loss of otter on some streams, which over time would lead to changes in the regional distribution of otter. Considering that it is also illegal to kill an otter, direct mortality of otter represents a main impact.

Habitat Loss

5.2.4 Loss of habitat would occur from the siting of works compounds, and storage of materials. Such impacts are associated with the construction phase of the proposed scheme due to their temporary nature. Further loss of habitat would occur during the excavation of cuttings, the construction of embankments and access roads, and the building of bridges and culverts where the road crosses watercourses. Construction is also likely to require the diversion and realignment of watercourses, as well as the destruction of features that may be in the vicinity of these wetland areas. Adverse impacts are predicted, especially where large areas of land adjacent to watercourses would be taken up by the presence of compounds and where junctions and bridges are proposed.

5.2.5 The total amount of landtake required in order to construct the Southern Leg of the proposed scheme is estimated at approximately 2.77km^2 / 277ha. Table 16 shows the estimated total pre-construction and post-construction areas of Phase 1 Habitats present within the proposed land-take. The post-construction figures take account of both anticipated habitat loss to construction and habitat created or changed as a result of mitigation.

5.2.6 However, although this habitat loss occurs during the construction phase of the proposed scheme, it is regarded as an operational impact, as the habitat loss would be permanent. The otter is a secretive mammal and as such, holts and couches are very important. Each individual is familiar with its home range knowing each site where shelter is available. The loss of holts and other lying-

up sites would therefore place more stress on the animal, requiring it to travel further in order to find suitable cover. This would create conflict between otter particularly where they exist at high (otter) population densities (e.g. in Aberdeen) or put them at risk to other hazards such as RTAs (Highways Agency, 1999). Furthermore, the intentional or reckless obstruction, damaging or destruction of holts or couches would constitute an offence under UK and European legislation.

Table 16 – Phase 1 Habitat Areas Pre and Post Construction

Phase 1 Habitat Description	Phase 1 Habitat Categories within scheme land-take	
	Pre-construction (ha)	Post-construction (ha)
Woodland mixed plantation	2.43	27.86
Woodland broadleaved plantation (Including standard trees)	2.78	7.43
Woodland broadleaved semi-natural	2.90	1.25
Woodland coniferous plantation	15.41	8.59
Scattered scrub	3.55	6.78
Dense continuous scrub	3.58	7.73
Riparian woodland	0	3.03
Acid grassland semi-improved	4.84	3.40
Acid grassland unimproved	0.09	0.06
Amenity grassland	0.01	0.01
Improved grassland	122.66	66.29
Marshy grassland	4.66	3.63
Neutral grassland semi-improved	3.59	1.85
Neutral grassland unimproved	1.57	0.79
Poor semi-improved grassland	23.45	12.77
Disturbed amenity grassland	0.08	0.06
Arable	43.92	18.70*
Built up areas (buildings)	2.51	3.03
Open water	0.36	0.57
Parkland mixed	3.22	4.35
Fen	0.39	0.60
Heath - acid grassland dry mosaic	0.08	0.13
Recently felled coniferous	0.34	0.58
Wet bog	0.52	0.63
Bare ground	1.58	1.80
Herb and fern tall ruderal	0.18	0.36
Total	244.70	182.29

**Figure assumes all potential return to agriculture is achieved.*

Habitat Fragmentation and Isolation

5.2.7 Construction of the road would necessitate the provision of construction compounds, storage facilities and access roads. These may prevent otter from moving freely within and between existing areas of habitat, particularly where they are situated in the vicinity of watercourses. The construction of culverts on some watercourses may act as a barrier to migratory fish movements, thus reducing salmonid populations (see Appendix A25.9) and rendering upper reaches of these

burns of limited use to foraging otter, with potential impacts on their suitability to otter and the availability and distribution of fish prey.

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

5.2.9 In the long-term, the effects of fragmentation and isolation are likely to be exacerbated with culvert lengths. The longer and narrower culverts, such as those in excess of 100m long (e.g. North Cookney main culvert) pose the greatest potential for fragmentation impact to otter populations. Otters are known to use culverts longer than 100m in length, although these are generally more than 5m wide which results in slower flow rates (Jim Green, pers.comm.). Research has shown that otters are less inclined to swim through structures with greater tunnel effects (which can be calculated by height between span and water x width of span/length of span) or when flows are greater, thus highlighting the importance of large structures which present otters with the option of swimming or walking alongside the watercourse (Grogan et al., 2001). There is potential for some otters to be reluctant to use narrow culverts, particularly where they are in excess of 50m long.

Disturbance

5.2.10 Otter are likely to suffer increased disturbance during both construction and operation of the new road. Construction of the road is likely to create physical disturbance that would affect the activities of otter. Noise from machinery and vehicles, light for night working, the possible obstruction of holts and otter pathways and the presence of humans would all have adverse impacts. Consideration would need to be given so as to avoid the inappropriate siting of construction compounds and/or storage sites during the construction phase, which would exacerbate such impacts e.g. if they were placed close to a lying-up site. In the absence of the appropriate licence, it would be an offence if construction works were to obstruct access to a holt, disturb an otter in a holt or damage/destroy a holt or couch. Otter may attempt to avoid any periodic disturbance, which would act as a barrier to their usual activities and deter them from using these lying-up sites, resulting in the effective loss of these sites. This would cause otter to use different routes that would bring them into conflict with other otter or they would use a route that involves crossing other roads, and they would therefore risk being killed. Otter would also be prompted to forage further away if foraging habitat is reduced.

5.2.11 During the operational phase otter would suffer disturbance from traffic noise as well as from road lighting. Otter would become accustomed to these impacts over time (for instance, they commonly use the River Don in Aberdeen itself, e.g. at Bridge of Balgownie). However, otter would abandon any holts or couches in the immediate vicinity of the proposed scheme. It must also be taken into consideration that it is an offence to disturb an otter in its resting place.

Pollution and Other Indirect Impacts

5.2.12 Pollution of watercourses and water features in the area would result in serious long-term damage to the productivity and diversity of nearby habitats, this having an adverse impact on both otter and their food supply. The construction of bridges and culverts as part of the proposed scheme may cause restrictions in river and stream channels, which would cause scouring and flooding, cumulating in sediment deposition downstream and a reduction in aquatic invertebrate numbers (Grogan et al., 2001). This would have an adverse impact on fish populations, which in turn would

affect otter prey availability. The damage or destruction of salmonid redds is also possible during construction and this would have equally damaging repercussions on the otter population (refer to Appendix A25.9).

5.2.13 There is also potential for accidental spillages e.g. from oil and diesel drums. As well as reducing the amount of available prey immediately, a particularly severe spillage would lead to a bio-accumulation of contaminants in prey species. High levels of pollutants would therefore accumulate in otter resulting in mortality. Being large carnivores, otter are particularly vulnerable to changes in food availability at all levels of the food chain. A pollution event would be particularly serious if it were to occur on one of the larger rivers such as the River Dee, which has large fish populations. Otter use of land and burns in the vicinity of the river was high during the surveys. Pollutants such as oil and diesel can also affect thermo-regulation qualities of an otter's coat and cause mortality (Kruuk, 1995; Grogan et al., 2001).

5.2.14 Pollution from roads can be particularly detrimental during occurrences of storm water runoff or accidental spillage. Runoff from the operational road would contain compounds used in the manufacture of cars including zinc, cadmium and copper. Compounds such as PCBs would also be present and these have the potential to seriously affect reproduction of otter (Kruuk, 1995). There is also the possibility of spillages occurring during the operational phase and these would have impacts similar to those mentioned above.

5.3 Specific Impacts

Section SL1

Construction

5.3.1 Construction of the scheme, particularly the A90 junction works and side road improvements, may result in direct mortality and disturbance impacts at Loirston Burn (county importance), and to a lesser extent its tributary which is only used infrequently by otter. This would result in a high negative magnitude and Moderate impact significance on the resident otter population using the burn and Loirston Loch. There would also be a high negative risk of direct mortality and disturbance where the burn crosses the Burn of Ardoe (regional importance) close to its source in Hare Moss, as otter are likely to use the moss for lying up and possibly breeding. The potential impacts are assessed as being of Major significance.

Operation

5.3.2 There would be a risk of direct mortality as a result of collision with vehicles where the proposed scheme crosses the Tributary of Loirston Burn and the Burn of Ardoe south of Hare Moss, severing the uppermost reaches of the burns. This would constitute an impact of high negative magnitude and Moderate (Loirston Burn) to Major (Burn of Ardoe) significance to the resident otter populations.

5.3.3 Habitat loss would constitute an impact of low magnitude and Minor significance at Loirston Burn where potential lying-up habitat would be lost. Habitat loss is anticipated to be of Negligible magnitude and Negligible significance where the Burn of Ardoe borders the southern edge of Hare Moss. None of the potential lying up habitat here would be lost to the scheme.

5.3.4 The potential effects of severance are likely to be minimal in this section as the operational scheme is not expected to result in any additional severance at Charleston junction in comparison to the A90. The upper reaches of Loirston Burn are unlikely to be used regularly by otters. The scheme would pass along the southern boundary of Hare Moss and the Burn of Ardoe and there are few otter resources south of the proposed road. The impacts of severance are therefore predicted to be of negligible magnitude and Negligible significance.

5.3.5 Impacts of low magnitude and Minor significance are predicted at the Burn of Ardoe as a result of disturbance from traffic noise along Hare Moss, particularly if otter were disturbed while breeding.

5.3.6 The risk of deterioration in water quality downstream at the Burn of Ardoe would constitute an impact of high negative magnitude and Major significance if impacts spread downstream to the River Dee and the internationally important population of otters this watercourse supports. The impact of pollution would be predicted to be of medium negative magnitude and Moderate significance at Loirston Burn due to the potential for affecting the quality of the foraging habitat at Loirston Loch downstream.

5.3.7 Greenhowe Pond would be lost to the proposed scheme. While this would be an impact of high negative magnitude, it would only constitute Minor impact significance to the resident otter population due to the infrequent use of the pond.

Section SL2

Construction

5.3.8 The construction of the proposed junction and C5K improvements would result in increased human presence in the area. There would be a risk of direct mortality to otter during construction where the scheme crosses Burnhead Burn (county importance to otters). This would result in direct impacts of high negative magnitude and Moderate significance on the resident otter population, which is likely to include those with a home range along the River Dee and Crynoch Burn.

Operation

5.3.9 Direct mortality during the operational phase of the scheme, due to RTAs or drowning in culverts, would be likely to occur along Burnhead Burn if otter cannot travel safely across the road, which would result in an impact of high negative magnitude and Moderate significance.

5.3.10 Some loss of medium value riparian scrub habitat and associated lying up potential adjacent to Burnhead Burn would occur, resulting in a medium negative/Moderate significant loss of availability of shelter.

5.3.11 The proposed Cleanhill junction would also restrict the movement of otter along Burnhead Burn and reduce the accessibility of upstream resources used by otter that have most of their home range along Blaikiewell Burn, Crynoch Burn and the River Dee. This has been assessed as a severance impact with potentially high negative magnitude and Moderate significance.

5.3.12 Additional operational impacts of high negative magnitude and Moderate significance are predicted for Burnhead Burn, primarily due to the risk of deterioration in water quality from runoff. The burn would be in close proximity to the new junction and the scheme would also cross an upstream tributary of the burn.

5.3.13 Cowford Burn (county importance) and Shanna Burn (regional importance) would be far enough away from the scheme that the impact magnitude negligible and Negligible significance on the otters using these watercourses during construction and operation phases.

Section SL3

Construction

5.3.14 The potential for direct mortality of otters is predicted where the proposed scheme crosses Blaikiewell Burn (county importance), Kingcausie Burn (county importance), the River Dee (international importance) and Milltimber Burn (county importance). These impacts are predicted to be of high negative magnitude and of Moderate (Blaikiewell, Kingcausie and Milltimber Burns) to

Major (River Dee) impact significance on the resident otter population. This is compounded by the fact that all the crossings in this section are likely to affect the same internationally important population of otters. The siting of works access and compounds would likely result in disturbance to otters near lying up sites along these watercourses resulting in impacts as above.

5.3.15 Construction of the proposed scheme would act as a temporary barrier to otter movement up and down the River Dee, which is predicted to result in an impact of high negative magnitude and Major significance, if otters could not travel safely between foraging sites and lying up areas or if territories were divided. Similarly the construction of the buried structure at Blaikiewell Burn would restrict the movement of otters up and downstream, potentially affecting the availability of resources including Crynoch Burn and Burnhead Burn with high negative and Moderate impacts on the local otter population.

Operation

5.3.16 An increased risk of direct mortality due to RTAs or drowning in culverts would be predicted due to the operation of the road where it crosses Kingcausie Burn and the upper reaches of Milltimber Burn. These impacts are anticipated to result in high negative magnitude and Moderate significant impacts on the resident otter population at Kingcausie and Milltimber Burns as per the construction phase. However, the structures that would be constructed over Blaikiewell Burn and the River Dee would permit otters to move freely along the banks, minimising the risk of direct mortality, and would therefore result in impacts of negligible magnitude and Negligible significance.

5.3.17 Loss of medium value riparian scrub woodland along Blaikiewell Burn from bridge construction would result in a low negative/Minor significant impact on otters as the height of the structure should allow sufficient vegetation to underneath in the long term. The loss of riparian habitat is unlikely to affect the availability of lying up sites as these are abundant along the nearby Crynoch Burn. Burn realignment and permanent habitat loss along Kingcausie Burn would involve the destruction or disturbance of potential holt H3, which is situated within 50m of the proposed works resulting in low negative magnitude and Minor significance to otters that use the burn as the changes are unlikely to be substantial in terms of the integrity of the area. Couch C12 and medium value habitat would be destroyed by the construction of the River Dee crossing with medium magnitude and Major significance as this site may provide refuge to more than one otter at different times, although alternative lying up opportunities exist nearby. Habitat loss at Milltimber Burn would constitute a negligible magnitude and Negligible significance due to the low value of the habitat and lack of cover.

5.3.18 The proposed junction would not be predicted to restrict the movement of otter along Blaikiewell Burn as the bridge to be provided would be wide enough to enable otters to move freely under the road resulting in an impact of negligible magnitude and Negligible significance to the resident otter population. Similarly severance would not be predicted to have any adverse impacts on the resident otter population at the River Dee (as per direct mortality above) as the abutments of the proposed Dee crossing would be set back from the river leaving commuting routes and overland routes open with negligible magnitude and Negligible significant impacts. Severance would also result in high negative and Moderate significant impacts to those otters using Kingcausie Burn, but only low negative magnitude with Minor significance at Milltimber Burn, as alternative commuting routes exist in the area.

5.3.19 Further operational impacts are also predicted due to disturbance caused by traffic noise and increased human presence at Cleanhill Junction and within Kingcausie. This disturbance is likely to be of particular concern where lying up sites are located nearby and would be predicted to result in an impact of medium negative magnitude and Moderate significance at Blaikiewell and Kingcausie Burns. The presence of a new crossing at the River Dee is considered unlikely to permanently adversely affect the integrity of the local otter population as the most important areas for lying up, foraging and commuting would be retained. Impacts are predicted to be of negligible magnitude and Negligible significance along the River Dee.

5.3.20 The risk of water quality being affected by spills and other events during operation is likely to have medium-high negative magnitude impacts on the resident otter population at Blaikiewell, Kingcausie and Milltimber burns, compounded by the potential risk of downstream effects on Crynoch Burn and the River Dee SAC. Impacts of Moderate significance are anticipated on these watercourses; impacts on the key otter foraging resource at the River Dee would constitute an impact of high negative magnitude and Major significance.

5.3.21 Glenburnie Burn and ponds (county importance), Crynoch Burn (international importance) and Mill Bank Burn (county importance) are considered to be far enough away from the scheme that impacts on the otters using these watercourses are likely to be negligible magnitude and Negligible significance for construction and operation.

Section SL4

Construction/Operation

5.3.22 As the scheme would cross only minor watercourses, there are no significant crossings that may affect the otter population in this section of the study area. The magnitude and significance of impacts on Bellenden Burn (local importance), Beans Burn (local importance) and Beanshill Ponds (county importance) would be negligible magnitude and Negligible significance.

Section SL5

Construction

5.3.23 A risk of direct mortality during construction would be predicted where the proposed scheme severs a probable otter commuting route between Upper Beanshill Burn (county importance) and Gairn Burn (county importance) with impacts of high negative magnitude and Moderate significance to the resident otter population. Potential couch C26 would be located within 100m of the scheme on Upper Beanshill Burn. Otters may also breed or lie up at the Moss of Auchlea (county importance) and commuting and foraging otters may be exposed to additional disturbance if night works or lighting were used. As resident otter populations are likely to have home ranges that extend along all four burns and the Moss of Auchlea, they may be subjected to high negative magnitude and Moderate significant impacts in these locations. The siting of site compounds and access would result in disturbance if located near the holt (H4) on Ord Burn (regional importance) or if disrupting foraging or commuting otters along Silver Burn (regional importance). These impacts have been assessed as being of low negative magnitude and Minor significance.

Operation

5.3.24 Direct mortality during the operation of the proposed scheme due to RTAs would be predicted at Upper Beanshill Burn where the proposed scheme would sever a commuting route. Direct mortality would also be an impact at Gairn Burn which is already severed by the existing Silverburn Road C127, and where otters are already considered to be at risk from direct mortality. Similar impacts are anticipated at Moss of Auchlea. This would likely result in impacts of high negative magnitude and Moderate significance at these watercourses.

5.3.25 The removal of riparian habitat and scrub at Gairn Burn would result in an impact of medium negative and Moderate significance due to the relative paucity of shelter and secluded lying up sites elsewhere in the immediate vicinity. Minimal loss of medium value conifer plantation woodland at Upper Beanshill Burn would result in a low negative magnitude and Minor significance on the resident otter population as the loss is unlikely to have a permanent effect on the integrity of the habitat to support otters. No significant habitat loss would occur at any of the other watercourses in this section.

5.3.26 The severance of otter movements between catchments (between Upper Beanshill Burn and Gairn Burn) would have a medium - high magnitude and Moderate significance on the resident otter population, as they are likely to cross regularly between resources either side of the scheme. The effects of severance would likely be lower where the scheme cuts between Moss of Auchlea and Kingshill Wood as otter are only likely to explore this section infrequently. This would result in a low negative magnitude and Minor impact significance.

5.3.27 Disturbance due to traffic noise and increased human presence would result in a medium negative magnitude and Moderate significance at the Moss of Auchlea. This is mainly due to the fact that breeding otters may be disturbed as the scheme would be within 50m of the edge of the moss.

5.3.28 Adverse impacts on water quality and the availability of fish resources would likely have downstream effects in both catchments. The potential impacts on Silver Dam to the west via Gairn Burn is assessed as high negative magnitude and Medium significance as the burn would be culverted. Murtle Den and Beanshill Ponds to the east via Upper Beanshill Burn have been assessed as being of medium negative magnitude and Moderate significance to the resident otter population if not mitigated for.

5.3.29 The operational impacts at Silver and Ord Burns are assessed as being of negligible magnitude and Negligible significance as a result of the distance of these burns from the scheme. Potential impacts on water quality during the operation of the scheme are assessed as per Gairn Burn above.

Section SL6

Construction/Operation

5.3.30 Fairley Home Farm Pond (local importance) would be destroyed during construction of the proposed scheme along with potential lying up and foraging habitat. This is anticipated to be an impact of high magnitude and Minor significance as the feature is unlikely to be used regularly by otters and the change would be unlikely to have a permanent effect on the value of the area.

5.3.31 No impacts are predicted at Westholme Burn (local importance) and Borrowstone Burn and Pond (county importance) due to their distance from the scheme.

Table 17 - Table of Specific Impacts

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
Section SL1				
Loirston Burn and Tributary (County)	AWPR Mainline (ch205580), side road (ch340), A90 (ch790), S956 (ch207030)	Construction	Scheme crosses Loirston Burn which is likely to be used regularly by otters commuting and potentially for lying up. Otters may suffer direct mortality and/or disturbance due to construction activities.	High negative/Moderate
		Operation	Increased risk of direct mortality due to RTAs and/or drowning where the scheme crosses the burn.	High negative/Moderate
			Loss of medium value habitat comprising conifer plantation woodland and associated potential lying up habitat where the scheme crosses Greenhowe Woods is unlikely to permanently affect the integrity of the local otter population due to their infrequent use of the watercourses upstream of the A90.	low negative/Minor
			Scheme is unlikely to cause significant barrier to otter movements as the A90 and A956 crossings already exist and due to otters' infrequent use of the tributary upstream of the A90.	Negligible/Negligible
			Risk of deterioration in water quality due to runoff from the scheme is compounded by the multiple burn crossings and potential impacts on Loirston Loch which is a valuable foraging resource to the east of the scheme.	Medium negative/Moderate
Greenhowe Pond (Local)	n/a	Construction and Operation	Pond would be removed during construction with associated foraging and lying up habitat.	High negative/Minor
Burn of Ardoe (Regional)	AWPR Mainline (ch204040)	Construction	Scheme crosses burn near its source in an area used by otters for foraging and potential lying up and breeding. Otters may suffer direct mortality and/or disturbance due to construction activities.	High negative/Major
		Operation	Increased risk of direct mortality due to RTAs where the scheme passes close to the burn.	High negative/Major
			Minimal loss of high value foraging and secluded lying up habitat comprising scrub and moss at the boundary of the habitat possible..	Negligible/Negligible
			Severance of otter movements is likely to have minimal impacts on the local otter population due to lack of resources to the south of the scheme and presence of alternative commuting routes at Heathfield Burn and Bishopston Ditch.	Negligible/Negligible
			Operational scheme is likely to result in some disturbance if otters are lying up, breeding or foraging in the moss, resulting in reduction in suitability for lying up.	Low negative/Minor
			Risk of deterioration in water quality due to runoff from the scheme. This would have potentially serious indirect effects on local otter populations as the River Dee downstream represents a primary prey resource to otters in this area.	High negative/Major

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
Section SL2				
Cowford Burn (County)	n/a	Construction and Operation	Burn is over 100m from the scheme and therefore no potential impacts are predicted.	Negligible/Negligible
Shanna Burn (Regional)	n/a	Construction and Operation	Burn is over 200m from the scheme and therefore no potential impacts are predicted.	Negligible/Negligible
Burnhead Burn (County)	AWPR Mainline (ch200100)	Construction	Otters are likely to forage and potentially lie up along the burn and may therefore suffer direct mortality or disturbance from construction activities, particularly at Cleanhill junction and the C5K overbridge construction.	High negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses the burn.	High negative/Moderate
			Loss of medium value habitat comprising riparian scrub woodland and associated foraging and potential lying up habitat adjacent to Blaikiewell Farm is unlikely to have a significant impact on the overall availability of lying up habitat.	Medium negative/Moderate
			Scheme would sever otter movements between upstream reaches of Burnhead Burn and Crynoch Burn as well as the River Dee to the northwest. These areas represent key foraging areas downstream.	High negative/Moderate
			Risk of deterioration in water quality due to runoff from the scheme. This would have potentially serious indirect effects on local otter populations as the Crynoch Burn and River Dee downstream represent primary prey resources for otters in the area.	High negative/Moderate
Section SL3				
Blaikiewell Burn (County)	AWPR Mainline (ch100150)	Construction	Otters are likely to commute and forage along the burn regularly and may lie up in scrub areas. This may lead to direct mortality or disturbance from construction activities, particularly for junction and bridge construction. Impacts may occur at potential couch C4, which would be within 100m of the scheme.	High negative/Moderate
			Scheme would sever otter movements between upstream tributaries (e.g. Burnhead Burn) as well as Crynoch Burn and the River Dee which represent key foraging areas downstream, if otters could not move freely along banks during construction.	High negative/Moderate
		Operation	Risk of direct mortality as a result of RTA predicted to be low due to the height of the crossing	Negligible/Negligible
			Loss of medium value habitat comprising riparian scrub woodland and associated foraging and potential lying up habitat adjacent to Blaikiewell Farm is unlikely to have a significant impact on the overall availability of lying up habitat.	Low negative/Minor

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
			Habitat Fragmentation would be negligible during operation due to the size of the buried structure and the availability of space either side to enable movement up and down the channel.	Negligible/Negligible
			Increased disturbance and unsuitability of burn for foraging and lying up due to operation of the road.	Medium negative/Moderate
			The length of the bridge may impact on water quality due to lack of light and fish populations may be affected by oxygen sag. There may also be pollution due to runoff from the scheme, if not treated. Such events would have potentially serious indirect effects on local otter populations as the Crynoch Burn and River Dee downstream represent primary prey resources for otters in the area.	High negative/Moderate
Kingcausie Burn (County)	AWPR Mainline (ch 101470)	Construction	Otters are likely to forage along the burn and lie up in woodland area and may suffer direct mortality or disturbance from construction activities, especially during burn realignment.	High negative/Moderate
		Operation	Increased risk of direct mortality through RTAs where the scheme crosses Kingcausie Burn	High negative/Moderate
			A small section of the burn would be realigned with associated loss of pool/riffle structure, woodland lying up habitat and invertebrate/fish prey. Realignment and straightening of burn unlikely to result in permanent effect on the integrity of the burn which is already extensively modified.	Low negative/Minor
			Scheme would sever otter movements overland between the upper reaches of the burn and Crynoch Burn.	High negative/Moderate
			Increased disturbance and unsuitability of burn for foraging and lying up due to operation of the road.	Medium negative/Moderate
			Risk of deterioration in water quality due to runoff from the scheme. The burn is a tributary of Crynoch Burn and the River Dee which support Internationally significant population of otters, therefore increasing the significance of the impact.	Medium negative/Moderate
Glenburnie and ponds (County)	n/a	Construction and Operation	Ponds and burn are over 200m away from the scheme and therefore no potential impacts are predicted.	Negligible/Negligible
Crynoch Burn (International)	n/a	Construction and Operation	No direct impacts on the burn are likely due to the distance of the burn from the scheme. Indirect impacts likely if the construction and operation of the scheme involve deterioration in water quality in tributaries including Kingcausie Burn and Blaikiewell Burn (assessed above)	Negligible/Negligible
Mill Bank Burn (County)	n/a	Construction and Operation	Burn is over 200m away from the scheme and therefore no potential impacts are predicted.	Negligible/Negligible

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
River Dee (International)	AWPR Mainline (ch102000)	Construction	River is used regularly by otters for foraging, commuting and lying up. Couch C12 is directly below the scheme and there are holts within 100m to the east of the scheme. Otters may suffer direct mortality and disturbance as a result of construction activities.	High negative/Major
			Construction of the Dee crossing would cause severance along a key commuting route if the banks and overland routes were not kept open during bridge construction, effectively severing otter movements between tributary burns including Crynoch Burn, and other catchments. The River Dee is the largest watercourse in the study area and a key immigration and emigration route, foraging resource supporting breeding otters.	High negative/Major
		Operation	Risk of direct mortality as a result of RTA predicted to be low due to the height of the crossing	Negligible/Negligible
			Loss of medium* value riparian habitat comprising of low scrub, grassland and pasture.	Medium negative/Major
			Severance along a commuting route would be reduced as otters are likely to cross readily under the bridge structure due to set back piers, with no permanent impacts on the integrity of the otter population.	Negligible/Negligible
			Disturbance to commuting and lying up otters as a result of increased vehicular traffic and the presence of the road is unlikely to reduce the suitability of the River to support and maintain otter populations in the long term, or to increase vulnerability of the local otter population.	Negligible/Negligible
			Risk of deterioration in water quality due to runoff from the scheme if not treated. Such events would have potentially serious indirect effects on local otter populations as the River Dee represents a primary prey resource in this area.	High negative/Major
Milltimber Burn (County)	AWPR Mainline (ch102670)	Construction	Otters are likely to forage along the burn infrequently and may suffer direct mortality or disturbance from construction activities.	High negative/Moderate
		Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn although otters may only use burn infrequently.	High negative/Moderate
			Loss of low value habitat comprising arable/pasture farmland near source of burn.	Negligible/Negligible
			Scheme would sever otter movements between the River Dee and land to the west of the alignment, although alternative commuting routes exist.	Low negative/Minor
			Risk of deterioration in water quality due to runoff from the scheme, if not treated. Although otters are only likely to use Milltimber Burn infrequently, particularly when the Dee is in spate, it flows into the Dee therefore increasing the significant of such an impact.	Medium negative/Moderate

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
Section SL4				
Bellenden Burn (Local)	n/a	Construction and Operation	Minimal disturbance likely due to distance from scheme and lack of resources on the other side.	Negligible/Negligible
Beans Burn (Local)	n/a	Construction and Operation	Minimal disturbance likely due to distance from scheme and lack of resources on the other side.	Negligible/Negligible
Beanshill Ponds (County)	n/a	Construction and Operation	Minimal disturbance likely due to distance from scheme; indirect severance possible as per Upper Beanshill Burn, assessed below	Negligible/Negligible
Section SL5				
Upper Beanshill Burn (County)	n/a	Construction	Scheme crosses the burn at its source and within 100m of potential couch C26 in Gairnhill Wood. Otters are likely to use the burn regularly for commuting and potential lying up and may suffer from direct mortality or disturbance.	High negative/Moderate
		Operation	Increased risk of direct mortality through RTAs where the scheme passes within 50m of the source of the burn and between catchments.	High negative/Moderate
			Loss of medium value habitat comprising plantation conifer woodland and pasture.	Low negative/Minor
			Scheme would sever a otter movement along a commuting route between catchments including Silver/Ord Burns to the west and Beanshill Burn and features to the east.	High negative/Moderate
			Although the scheme would not cross the burn, its proximity to the source of the burn means there would be a risk of deterioration in water quality due to runoff from the scheme. With no mitigation in place, this would have potentially serious indirect effects on the water quality in Beanshill Bonds and Murtle Den downstream which represent a prey resource to otters in the area.	Medium negative/Moderate
Silver Burn (Regional)	n/a	Construction	Potential disturbance during construction if otters using burn.	Low negative/Minor
		Operation	Minimal disturbance due to distance from scheme.	Negligible/Negligible
Ord Burn (Regional)	n/a	Construction	Potential disturbance if site compounds are located near to the holt (H4).	Low negative/Minor
		Operation	Minimal disturbance due to distance from scheme.	Negligible/Negligible
Gairn Burn (County)	Side road (ch163)	Construction	Scheme crosses the burn and also passes within 100m of it. This may result in direct mortality and disturbance from construction activities if otters are lying up or foraging along the burn.	High negative/Moderate

Water Feature	Crossing Point(s)	Phase of Scheme	Impacts	Impact Magnitude/Significance
		Operation	Scheme crosses the burn and passes parallel to and within 100m of it. There would be an increased risk of direct mortality through RTAs as otters are likely to use the burn for foraging regularly.	High negative/Moderate
			Loss of medium value habitat comprising woodland scrub suitable for lying up in area used regularly by otters.	Medium negative/Moderate
			Scheme would sever otter movements between the Moss of Auchlea to the north, Silver/Ord Burns to the south and Upper Beanshill Burn to the east, although Gairn Burn is already culverted under an existing side road.	Medium negative/Moderate
			Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on the water quality in Silver/Ord Burns which represent a key prey resource to otters in the area.	High negative/Moderate
Moss of Auchlea (County)	AWPR Mainline (ch107440)	Construction	Scheme crosses a tributary burn and passes within 100m of the moss. This may result in disturbance from construction activities if otters are lying up, breeding or foraging in the Moss	High negative/Moderate
		Operation	Scheme crosses a tributary burn and passes within 100m of the moss. There is potential for an increased risk of direct mortality through RTAs where the scheme passes between the moss and Kingshill Wood.	High negative/Moderate
			Scheme would sever otter movements between the moss and Kingshill Wood, which otters are likely to cross only infrequently.	Low negative/ Minor
			Scheme passes within 50m of the edge of the moss. This may result in disturbance from construction activities if otters are lying up, breeding or foraging in the moss.	Medium negative/Moderate
			Risk of deterioration in water quality and long-term changes in the suitability of the moss due to runoff from the scheme, if not treated. Potential impacts from changes to the water regime in the moss due to the location of the road between the moss and water source.	Medium negative/Moderate
Section SL6				
Westholme Burn (Local)	n/a	Construction and Operation	Scheme does not cross the burn, which is likely to be used only infrequently by otters and therefore no impacts are predicted	Negligible/Negligible
Borrowstone Burn and pond (County)	n/a	Construction and Operation	Burn and pond are over 200m away from the scheme and therefore no impacts are predicted	Negligible/Negligible
Fairley Home Farm Pond (Local)	AWPR Mainline (ch110100)	Construction and Operation	Pond would be removed during construction with associated foraging and lying up habitat.	High negative/Minor

* refers to the value of habitat at the crossing location, not to the overall value of habitat along the watercourse, as per section 4 and the Freshwater Survey Report in Appendix 25.16.

5.4 Summary

5.4.1 In the absence of appropriate mitigation, construction of the road is likely to result in temporary, localised impacts on otters wherever site compounds and access roads are located near to watercourses. This is of particular concern when otter and their lying up sites are disturbed or the accessibility of foraging and lying up resources is altered.

5.4.2 Most longer-term impacts would be associated with the operation of the proposed scheme. Direct mortality caused by road accidents is the greatest cause of recorded otter mortality in the UK and without mitigation measures in place, comparatively more otter may be killed on roads than at present with impacts on otter at all geographical scales.

5.4.3 Pollution incidents resulting from the proposed scheme (refer to Appendix 25.9: Freshwater Ecology) have the potential to result in changes to the local population, particularly if a serious pollution incident occurred on Crynoch Burn, the River Dee or their tributaries as the River Dee SAC supports the largest otter and fish populations (see Appendix 25.9: Freshwater Ecology).

5.4.4 Disturbance during construction and operation of Cleanhill junction and the River Dee bridge crossing would require the destruction of a couch and would have implications for the availability of lying up opportunities for otter. The road is likely to render a number of couches and holts unsuitable for use due to proximity to the road or by obstructing their access routes.

6 Mitigation

6.1 Introduction

6.1.1 New road schemes and improvements to existing roads that do not take the requirements of otter into account in their design and construction may adversely affect existing populations. The otter's status is still considered vulnerable enough to warrant its inclusion in the *Biodiversity Steering Group Report* (1995) as a target species. This resulted in the Joint Nature Conservation Committee (JNCC) producing *A Framework for Otter Conservation in the UK: 1995-2000* (1996). These documents recognise road casualties as one of the main factors affecting otter populations and that specific work is required to reduce the impacts of road construction and operation (Grogan et al , 2001). There are several main targets in providing mitigation for otter on the UK road network, and they need to be considered in road design, construction and operation:

- minimise disturbance and adverse impacts on otter;
- maintain access for otter to their present habitats;
- allow existing otter populations to expand and colonise new areas; and
- reduce the numbers of RTAs involving otter.

6.1.2 This requires careful planning by designers and constructors, so that important habitats and migration routes are not destroyed and the provision of more sensitive watercourse crossings where otter may be present.

6.1.3 Mitigation measures are primarily based on advice given in the Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Otters (Highways Agency, 1999) and Nature Conservation and Roads: Advice in Relation to Otters (Grogan et al , 2001), and would help the above targets to be achieved in relation to the proposed scheme. In addition, correspondence was undertaken with SNH.

6.1.4 The mitigation measures provided form a hierarchy of measures to be adopted and comprise prevention/avoidance, reduction and offset measures. All of the mitigation measures described in this chapter have been developed in consultation with the appropriate statutory advisory organisation, i.e. SNH and will compliment the Species Management Plan that will be prepared. The Species Management Plan will include details on habitat management and methodologies to promote long-term conservation objectives.

6.2 General

Direct Mortality

Construction

6.2.1 During the construction phase, direct mortality of otter will be avoided through the implementation of the following measures.

6.2.2 Holes/pits will be covered at night or mammal ramps positioned to allow any trapped animals to escape.

6.2.3 Where otter are known to be active, they must be excluded from the dangerous areas on the site by erecting temporary otter proof fencing in such a way that commuting routes are not disrupted. Temporary otter proof fencing will consist of chestnut paling fence with stakes at 25mm gaps or stiff plastic mesh that otter cannot scale. Where temporary fencing is erected, it must be positioned to guide otter to safe routes through the working areas. Safe routes may include underpasses for site access and haul roads, these will have an internal diameter of at least 600mm. The advice of SNH will be sought prior to any such activities and their advice followed. Initially, this advice will be sought in the form of the development of 'ghost licences', which will mirror the contents of the full licence. This approach will enable the development of a method and the full information required to ensure SNH are confident that the approach will fulfil the conservation regulations and maintain the favourable conservation status of the species concerned.

6.2.4 Night working will not be permitted where the proposed scheme comes within 30m of any watercourse to reduce the risk of otter being run over by construction traffic.

Operation

6.2.5 During operation of the scheme, direct mortality of otter will be avoided through the implementation of the mitigation measures described below.

6.2.6 Permanent otter-proof fencing will be erected along both sides of the carriageway (in conjunction with the provision of sufficient safe crossing points) wherever the scheme comes within 150m of a watercourse or where it severs or passes between areas of otter habitat. Otter proof fencing to DMRB standard (Highways Agency 1999) will be combined with badger fencing and underpasses (see Appendix A25.2: Badger) and will be maintained to ensure that otters cannot gain access to the carriageway. Where fencing extends for several hundred metres and there is no stream crossing, underpasses will be installed. The minimum internal diameter of the underpass must be 900mm and be as straight as possible.

6.2.7 Where fencing extends for several hundred metres and there is no watercourse crossing, underpasses will be installed. The minimum internal diameter of the underpass must be 900mm and be as straight as possible. Fencing and underpasses installed as part of the mitigation for badgers, (see Appendix A25.2: Badger) will also benefit otter.

6.2.8 Watercourse crossings will be constructed to enable the safe passage of otter. Where bridges or buried structures are proposed (such as Blaikiewell Burn and the River Dee Crossing), space between the abutments and the watercourse will enable otter to pass safely during high water levels (0.1% AEP (Annual Event Probability) and provision must be made for otters to gain access to the water at such structures. Ledges must also be incorporated in the bridge design.

6.2.9 Where the proposed scheme crosses smaller watercourses, depressed invert box culverts designed to 0.5% AEP will be provided as these do not fill as rapidly as cylindrical culverts and can therefore be used more easily by swimming otters. Culverts will be fitted with dry ledges that are accessible during high water levels (0.01 AEP). These mammal ledges will be made of solid concrete integral with the culvert and will be 500mm wide and be accessible both from the bank and the water by the provision of ramps or groups of large boulders. Ledges will be sited at least 150mm above the appropriate high flood level, allowing 600mm headroom. Where appropriate otter will be guided to the ledge by planting dense scrub on the opposite bank or providing the ledge on the appropriate side of the culvert. Further surveys will be undertaken prior to the construction of these ledges in order to ascertain which bank otter are travelling along.

Habitat Loss

Construction

6.2.10 Temporary habitat loss is likely to result during establishment of construction works compounds, storage sites and access roads. Therefore, these must be sited at least 30m away from any watercourse and avoid areas of woodland, dense scrub and/or wetland to prevent valuable areas of otter habitat being degraded. Where the loss or degradation of valuable habitat is unavoidable, it must be returned to its former quality or better once construction is completed. Improvements may include the planting of trees such as willow, oak and ash along riverbanks while emergent vegetation and dense scrub such as bramble should be encouraged.

6.2.11 In addition to the above, habitat creation for other species groups such as birds and amphibians (see Bird and Amphibian Reports respectively, Appendix 25.4 and the Amphibian section of Chapter 25) will also indirectly provide mitigation for otter, particularly where close to waterbodies. Further details regarding habitat restoration can be found in the Appendix 25.1 (Terrestrial Habitats).

6.2.12 Where over-grazing is a current problem, an opportunity exists during construction to fence off areas of land adjacent to watercourses, encouraging vegetation growth. Where mature trees along riverbanks need to be removed, the root systems should be retained to provide potential holt sites where this is practical in terms of engineering works. Where the proposed scheme would cause damage to river and stream banks these must be protected using large concrete blocks (1000mm diameter approximately) piled together to create attractive cavities for otter (Hans Kruuk, pers. comm.). However, potential lying-up sites must only be created where the safety of otter can be assured by restricting their access to the carriageway.

6.2.13 Realigned sections of watercourses will be reinstated to as near a natural state as possible. Where this is feasible, there may be an opportunity to create new channels with meanders and riparian planting along the inside of bends. In addition to minimising the loss of riparian habitat, this will also encourage otter to pass the proposed scheme safely.

Habitat Fragmentation and Isolation

6.2.14 Works compounds, storage sites and access roads will, where possible, be located away from important areas of otter habitat to prevent severance of commuting routes. Disturbance at these areas will be minimised as above. Access roads must have otter underpasses installed, thus enabling otter to move freely throughout their home range. The construction of bridges and other

structures may also cause obstructions that otter must negotiate. One side of the river or stream being bridged must therefore remain intact for as long as possible to provide safe access.

6.2.15 The operation of the proposed scheme must not prevent otter from moving freely within and between available areas of habitat. This will necessitate the construction of bridges and culverts where the road dissects watercourses, and these must allow the safe passage of otter during spate conditions. Field ditches will be incorporated into pre-earthworks drainage. Where extensive stretches of the road are fenced, dry underpasses will be installed under the road to enable otter to move between habitats. In addition the provision of dry mammal underpasses for badgers may provide additional crossing points (see Appendix A25.2) connecting areas of habitat so that otters may pass safely.

Disturbance

Construction

6.2.16 During construction, site compounds, storage or waste dumping facilities will be located at least 30m away from any holt/couch or watercourse. If holts or couches are likely to be disturbed by any construction activities or if access routes are to be blocked, a Scottish Executive Environment and Rural Affairs Department (SEERAD) licence must be acquired prior to work. An Ecological Clerk of Works will be on site during construction of the scheme. At the River Dee a no-working zone will be established adjacent to the SAC boundary to ensure minimal disturbance and no damage to otter habitat, including the woodland edge.

6.2.17 Contractors will be provided with an overview of otter ecology prior to works commencing. The locations of all holts and couches will be identified to contractors in confidence to ensure that they are not accidentally disturbed during the construction process. Such areas must be fenced with signs to clearly mark that contractors must not enter. Site clearance must be preceded by a thorough survey of the area for holts, couches and otter. Once this has been completed the working area must be fenced to prevent otter returning.

6.2.18 If a holt or couch is discovered during construction, an exclusion zone of 30m must be established and all works suspended. If an occupied breeding site is found, it may lead to the cessation of work for up to 10 weeks until cubs are mobile and able to leave the area.

6.2.19 Night working (one hour after sunset to one hour before sunrise) will not be permitted where the scheme comes within 30m of a holt/couch or watercourse in order to prevent disturbance to otter and their routines.

Operation

6.2.20 Disturbance caused by the operation of the scheme will be partially mitigated for through the planting undertaken to minimise landscape and visual impacts, as described in Chapter 26 (Landscape) and Chapter 27 (Visual). The planting of natural screens along the scheme will reduce noise and light disturbance to otter. Areas of lighting will be restricted to major junctions (Charleston, Cleanhill Junction, the A93 Milltimber Junction and South Kingswells Junctiuons) and levels of lighting will be relatively low where the operational scheme crosses or runs parallel to watercourses thus reducing disturbance to otters. Screening as described in Chapter 26 (Landscape) will reduce the intermittent impacts of lighting on watercourses.

Pollution and Other Indirect Impacts

6.2.21 During construction, 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; and
- PPG6: Working at Construction and Demolition Sites.

6.2.22 Pollution control measures will necessitate the installation of drainage systems to divert runoff into drains, soakaways and detention basins thus avoiding contamination of watercourses. This will benefit otters through the protection of local watercourses from road runoff pollution. Detention basins will be fenced for health and safety purposes which may deter otters from gaining access and becoming trapped. Drainage systems must be grilled to prevent otter entering and becoming trapped.

6.2.23 Chemical and oil storage tanks will be set back at least 10m from any watercourse and secondary containment must be provided to prevent pollution incidents from occurring. Construction vehicles will be prohibited from crossing watercourses used as breeding grounds by salmonid fish and silt traps will be installed. Disturbance to streambeds will be kept to a minimum to prevent erosion and siltation. Further details regarding pollution control during construction and operation are outlined in Chapter 24 (Water Environment) and Appendix 25.9: Freshwater Ecology.

Monitoring

Construction

6.2.24 Otter habitats and lying-up sites are subject to change over time. Further surveys will be conducted immediately prior to the start of construction. This will involve re-surveying all watercourses and waterbodies within 100m of the alignment as well as checking the status of existing holts and couches. If any new otter lying-up sites be found, mitigation will be adjusted as required. The discovery of any holts or couches being used for breeding will necessitate the suspension of all works in that area until the cubs have left the holt/couch.

Operation

6.2.25 Regular maintenance of culverts and dry underpasses to ensure they are clear of blockages will also ensure that these crossings can continue to be used by otter.

6.2.26 Fencing must also be examined regularly to check for damage and corrosion. In this respect, it is important that maintenance of mitigation measures is stipulated in the Term Maintenance Contract to be agreed with the contractor.

6.2.27 Post-construction monitoring will be required on an annual basis over the first five years to check for signs of otter, assess the status of holts and to record any RTAs. This will help gauge how otter are adapting to the new scheme and whether the mitigation measures have been effective in helping to maintain the otter population and preventing RTAs. Based on the results of these surveys, alterations and/or enhancements may be necessary.

Specific Mitigation

6.2.28 The mitigation measures described previously are to be applied as minimum requirements where the construction and operation of the road are likely to result in adverse impacts on the otter population. Further mitigation has been specified where the impact significance is assessed as being of Moderate or above.

6.2.29 Specific mitigation requirements have been summarised in Table 18 and are presented in Figures 26.5a - p.

Table 18 – Table of Specific Mitigation Measures

Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
Section SL1				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation Otter-proof fencing to be fitted at ch207300 – ch206850 and a 300m section north and 150m south of Loirston Burn Culvert along the A90 to be fenced. Fencing to be provided at ch205900 – ch205425 and ch204200 - ch202675 ` Installation of depressed invert culverts with integral mammal ledge at crossing of Loirston Burn and Tributary and the Burn of Ardoe (see Table 19). Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix 25.2 and on Figures 26.5a – d.	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13, including the incorporation of underpasses under site access roads and no site compounds to be located within 50m of the boundary of Hare Moss. Operation Replacement of Greenhowe Pond with new pond and riparian planting (E3). Woodland planting to offset loss of lying up habitat (E4).	Construction Generic Mitigation as prescribed in 6.2.14. Operation Installation of depressed invert culverts with integral mammal ledges at crossings of Loirston Burn and Tributary (see Table 19).	Construction Generic mitigation as prescribed in 6.2.16 - 6.2.19 Operation Generic mitigation as prescribed in 6.2.20 including minimisation of lighting at the A90 junction and no lighting along the carriageway. Tree planting around Charlestown Junction as per Chapter 26 Landscape.	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 - 6.2.23 and in the Freshwater Report in Appendix 25.9.
Section SL2				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation Otter-proof fencing to be fitted at ch202400 – ch202100, ch201500 - ch200825 and ch200600 – ch102250 with the perimeter of Cleanhill Junction fenced. Installation of depressed invert culverts with integral mammal ledge at crossing of Burnhead Burn (see	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13, including the incorporation of underpasses under site access roads Operation Scrub woodland habitat creation adjacent to Cleanhill Junction to minimise disturbance and offset habitat loss along Burnhead	Construction Generic Mitigation as prescribed in 6.2.14. Operation Installation of depressed invert culverts with integral mammal ledges at crossing of Burnhead Burn (see Table 19).	Construction Generic mitigation as prescribed in 6.2.16 - 6.2.19. Operation Generic mitigation as prescribed in 6.2.20 including minimisation of lighting at Cleanhill Junction and no lighting along the carriageway.	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 - 6.2.23 and in the Freshwater Report in Appendix 25.9.

Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
Table 19). Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix 25.2 and on Figures 26.5d – g	Burn(E18).			
Section SL3				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation Otter-proof fencing to be fitted at ch200600 – ch102250 and ch102525 - ch102850 with the perimeter of Cleanhill Junction fenced as per Section SL2 and fencing around the toe of the River Dee bridge embankments. Installation of Bridge at Blaikiewell Burn with 5m riparian woodland strip either side to allow otter to cross; depressed invert culverts with integral mammal ledge at crossing of Kingcausie Burn and Milltimber Burn (see Table 19). Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix 25.2 and on Figures 26.5g - i.	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13, including the incorporation of underpasses under site access roads Operation Existing grassland, wet woodland and fen to be retained along Blaikiewell Burn (E11) Scrub woodland habitat creation adjacent to Cleanhill Junction to minimise disturbance and offset habitat loss along Blaikiewell Burn (E18). Provision of replacement lying up habitat along the River Dee if couches to be destroyed.	Construction Generic Mitigation as prescribed in 6.2.14 including commuting routes under Dee Crossing to be retained throughout construction. Operation Installation of depressed invert culverts with integral mammal ledges at crossing of Burnhead Burn (see Table 19).	Construction Generic mitigation as prescribed in 6.2.16 - 6.2.19 including no compounds within 50m of holts and couches on the Dee and a no-working zone adjacent to the SAC boundary to which there must be no access. Operation Generic mitigation as prescribed in 6.2.20 including minimisation of lighting at Cleanhill Junction and no lighting along the carriageway, including near the River Dee crossing. Mixed woodland and tree planting adjacent to the road at Blaikiewell Burn as per Chapter 26 Landscape and (E12) to screen the burn; standard tree and scrub woodland planting as per Chapter 26 Landscape to screen Kingcausie Burn.	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 - 6.2.23 and in the Freshwater Report in Appendix 25.9.
Section SL4				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13 Operation	Construction Generic Mitigation as prescribed in 6.2.14. Operation	Construction Generic mitigation as prescribed in 6.2.16 - 6.2.19. Operation Generic mitigation as prescribed in 6.2.20.	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 -

Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
Otter-proof fencing to be fitted at ch104975 – ch105650. Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix 25.2 and on Figures 26.5i - l	No specific mitigation required.	No specific mitigation required		6.2.23 and in the Freshwater Report in Appendix 25.9.
Section SL5				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation Otter-proof fencing to be fitted at ch105900 – 106950 and ch107250 – ch107600. Installation of depressed invert culverts with integral mammal ledge at crossing of Gairn Burn and ditches leading from the Moss of Auchlea (see Table 19). Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found in the Badger Report in Appendix 25.2 and on Figures 26.5l - n	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13, including the incorporation of underpasses under site access roads Operation Scrub to be maintained and replace to provide cover for otters at Gairn Burn (E20)	Construction Generic Mitigation as prescribed in 6.2.14. Operation Installation of depressed invert culverts with integral mammal ledges at crossings of Gairn Burn and ditches at the Moss of Auchlea (see Table 19). Scrub planting to facilitate use of underpass at ch106500 to cross the scheme (E19)	Construction & operation Generic mitigation as prescribed in 6.2.16 - 6.2.19 and 6.2.20. Scrub retention and planting as per Chapter 26 Landscape and E20 will screen Gairn Burn and the Moss of Auchlea	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 - 6.2.23 and in the Freshwater Report in Appendix 25.9.
SL6				
Construction Generic mitigation as prescribed in 6.2.1 - 6.2.4. Operation Fencing and underpasses provided for badgers will also serve as mitigation for otters. The extent of badger fencing and locations of badger underpasses can be found	Construction Generic Mitigation as prescribed in 6.2.10 - 6.2.13. Operation Replacement pond will be provided near the existing Fairley Home Farm Pond to the west of the scheme.	Construction Generic Mitigation as prescribed in 6.2.14. Operation No specific mitigation required	Construction Generic mitigation as prescribed in 6.2.16 - 6.2.19. Operation Generic mitigation as prescribed in 6.2.20.	Construction & Operational phases: Generic mitigation as prescribed in 6.2.21 - 6.2.23 and in the Freshwater Report in Appendix 25.9.

Direct Mortality	Habitat Loss	Habitat Fragmentation & Isolation	Disturbance	Pollution and Other Indirect Impacts
in the Badger Report in Appendix 25.2 and on Figures 26.5n – p				

Table 19 – Watercourse Crossing Structures

Water Feature	Chainage/Location	Crossing Type	Length (m)	Width (m)	Height (m)	Additional Information
Section SL1						
Loirston Burn and tributary	A956 (ch207030)	Culvert	45	2.7	1.5	Integral mammal ledge on east bank.
	A90 (ch790)	Culvert	47	2.7	1.5	Integral mammal ledge on south bank.
	Side road (ch340)	Culvert	24	2.7	1.5	Integral mammal ledge on south bank.
	AWPR Mainline (ch205580)	Culvert	34	2.4	1.2	Integral mammal ledge on west bank.
Section SL2						
Burn of Ardoe	AWPR Mainline (ch204040)	Culvert	59	2.4	1.2	Integral mammal ledge on east bank.
Bishopston Ditch	AWPR Mainline (ch203900)	Culvert	55	2.4	1.2	Integral mammal ledge on east bank.
Heathfield Burn	AWPR Mainline (ch203650)	Culvert	46	2.4	1.5	Integral mammal ledge on east bank.
Whitestone Burn	AWPR Mainline (ch200990)	Culvert	51	2.4	1.2	Integral mammal ledge on east bank.
Burnhead Burn	AWPR Mainline (ch200100)	Culvert	65	3	2.1	Integral mammal ledge on west bank.

Water Feature	Chainage/Location	Crossing Type	Length (m)	Width (m)	Height (m)	Additional Information
Section SL3						
Blaikiewell Burn	AWPR Mainline (ch100150)	Buried structure	45	23	12	Buried structure with 5m riparian strip either side of the burn.
Kingcausie Burn	AWPR Mainline (ch101470)	Culvert	47	2.7	1.5	Integral mammal ledge on south bank.
River Dee	AWPR Mainline (ch102000)	3-span viaduct bridge	120	26	5-12	High span bridge with set-back piers. Commuting route to be maintained on both banks.
Milltimber Burn	AWPR Mainline (ch102670)	Culvert	77	2.4	1.5	Integral mammal ledge on north bank.
Section SL4						
No crossings in this section						
Section SL5						
Gairn Burn	Side road (ch163)	Culvert	12	2.4	1.5	Integral mammal ledge on west bank.
Moss of Auchlea	AWPR Mainline (ch107440)	Culvert	75	2.4	1.5	Integral mammal ledge on north bank.
Section SL6						
No crossings in this section						

6.3 Summary

6.3.1 Otters are frequently killed on trunk and A-roads (Philcox et al., 1999 and adequate fencing on both sides of the carriageway is a vital component of mitigation. Evidence from radio-tracking and from studies of the distribution of road casualties shows that otter will use small burns and ditches, including dry watercourses, for feeding and as regular commuting routes (Kruuk et al., 1998; Chanin, 2003). In terms of mitigation, every watercourse in the Southern Leg will have provision for otters to cross so that otter may continue to commute in the river corridor. The provision of appropriately located fencing and underpasses will ensure that otter can cross the scheme safely.

6.3.2 The most important areas of otter habitat would not be affected by the proposed scheme. Where valuable areas are to be lost, the loss of habitat will be compensated for through re-planting and the creation of additional habitat. The provision of ponds as mitigation for other species such as amphibians (see Chapter 25) will also benefit otter.

6.3.3 The loss of otter holts and couches is more difficult to mitigate for and every effort must be made to avoid the destruction of these.

6.3.4 The destruction or disturbance of an otter holt/couch will require a special derogation under the European Habitats Directive. A licence to undertake such works will be obtained from SEERAD, which will include a method statement. Detailed methodologies for holt exclusions and artificial holt design will be outlined in this method statement. Any measures that are needed to protect otter will be in place prior to the start of the construction phase. Similarly, any mitigation required during the construction phase will be installed prior to the commencement of construction. It is essential that all personnel working on site are aware of the mitigation in place and of the obligations. All the mitigation measures discussed in this section must be fully operational before the road scheme is opened to traffic.

7 Residual Impacts

7.1 General

Direct Mortality

7.1.1 With the effective implementation of the mitigation measures described in this report, the construction and operational phases of the scheme are not predicted to compromise the long-term viability of the otter population in the study area. It is acknowledged that it may take time for otters to adjust to the new scheme and use culverts and underpasses, especially those which are greater than 50m long.

7.1.2 Otters would be able to continue their night journeys within the confines of the existing river/waterway corridors they are using, therefore negating the need to cross the carriageway. The provision of badger fencing in conjunction with otter fencing will prevent otters from finding their way onto the carriageway and avert potential RTAs at the highest risk areas. Individual RTAs may occasionally occur where otters are taking terrestrial routes and entering the carriageway via unfenced side roads. However, these are unlikely to affect the viability of the local population. Such local impacts may be balanced overall by reduced traffic flows on existing roads (which lack appropriate structures designed to accommodate otter crossing such as bridges, culverts and fencing), which is predicted to result in a reduction in RTAs on these routes.

Habitat Loss

7.1.3 The proposed scheme would not result in the significant loss of any highly valuable areas of otter habitat as the road passes mainly through agricultural land, which is of minimal value to otters.

Several strips of valuable riparian habitat including at Kingcausie Burn and within the SAC at the River Dee would be temporarily unavailable to otters during construction, while one couch would be lost to the scheme. This may cause temporary stress to otters lying-up along the River Dee, although the limiting of disturbance to areas outwith the no-working zone (see 6.2.16 above) will ensure that minimal disruption is caused to the habits of otters in the long-term.

Habitat Fragmentation and Isolation

7.1.4 In the short-term, the scheme would result in the severance of home ranges especially when taking into account the large sizes of otter ranges. However, it is expected that otters may soon become accustomed to using the crossing structures that have been incorporated into the design of the road and otters will be able to follow their natural behaviour patterns.

7.1.5 In the long-term, the effects of fragmentation and isolation are likely to be exacerbated with culvert lengths. The longer and narrower culverts, pose the greatest potential for fragmentation impact to otter populations. Taking into consideration that most culverts along the Southern Leg would be less than 3m wide, it is likely that some otters may be reluctant to use them, particularly where they are in excess of 50m long.

Disturbance

7.1.6 The completed scheme would increase the overall level of disturbance to otters, as a consequence of the watercourse crossings or where the road would run parallel to watercourses. The implementation of the mitigation described in this report should ensure that disturbance is kept to a minimum during the construction phase, particularly in the vicinity of watercourses (where exclusion zones have been put in place). Lighting is only likely to be an issue close to the three major junctions.

7.1.7 The operational scheme would be in close proximity (approximately 30m) to several lying-up sites, although otters may become accustomed to increased noise levels over time. This would be assisted by the sympathetic design of planting adjacent to the scheme. The provision of artificial holt sites away from the footprint of the scheme will provide otters with alternative lying-up sites should disturbance levels prove to be too high.

7.1.8 The waters and banks all along the River Dee are frequently used by otters, e.g. near Bridge of Balgownie, (Hans Kruuk, pers.comm.), while otters are rapidly re-colonising rivers and streams in towns and cities across the UK (Chanin, 2003; Crawford, 2003). The main residual impacts resulting from disturbance are associated with the construction phase. These impacts are temporary and will be reduced to a minimal level by the mitigation measures proposed, including the imposition of a no-working zone along the River Dee.

Pollution and Other Indirect Impacts

7.1.9 The implementation of the mitigation suggested should ensure that the risk of pollutants reaching any watercourse is negligible and therefore there should be no adverse impact on otters. The installation of culverts and diversion of watercourses is however, likely to destroy aquatic invertebrate habitat and result in scouring and sedimentation to some extent. This may have an adverse impact on fish populations, which could in turn have some negative consequences for otters.

7.2 Specific Residual Impacts

7.2.1 The results of the assessment of residual impacts on the otter population in the Southern Leg study area are presented in Table 20.

Table 20 – Specific Residual Impacts

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
Section SL1					
Loirston Burn and Tributary (County)	Construction	Scheme crosses Loirston Burn which is likely to be used regularly by otters commuting and potentially lying up therefore otters may suffer direct mortality and/or disturbance due to construction activities	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn and reduce the risk of direct mortality.	Negligible/Negligible
	Operation	Increased risk of direct mortality due to RTAs and/or drowning where the scheme crosses the burn	High negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the burn, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing along the scheme will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Loss of medium value habitat comprising conifer plantation woodland and associated potential lying up habitat where the scheme crosses Greenhowe Woods is unlikely to be a major impact due to otters' infrequent use of the watercourses upstream of the A90	Low negative/Minor	Mixed woodland planting in this area will offset loss of existing habitat, although this will take some time to mature. Habitat loss is unlikely to have a residual impact on local otter population due to the infrequent use of the watercourses in the upper reaches.	Negligible/Negligible
		Scheme is unlikely to cause significant barrier to otter movements as the A90 and A956 crossings already exist and due to otters' infrequent use of the tributary upstream of the A90	Negligible/Negligible	No residual impacts due to the provision of crossing points (culverts with integral mammal ledges) which may improve the existing provision for crossing the A90 and side roads and none of the culverts are over 50m long.	Negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme is compounded by the multiple burn crossings and potential impacts on Loirston Loch which is a valuable foraging resource to the east of the scheme	Medium negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
Greenhowe Pond (Local)	Construction and Operation	Pond will be removed during construction with associated foraging and lying up habitat.	High negative/Minor	The pond will be replaced on a 1:1 basis. Otters are only likely to use the new pond infrequently, so there will be no overall loss of potential foraging resources in the operational phase of the scheme.	Negligible/Negligible
Burn of Ardoe (Regional)	Construction	Scheme crosses burn near to its source in an area used by otters for foraging and potential lying up and breeding therefore otters may suffer direct mortality and/or disturbance due to construction activities	High negative/Major	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch (50m of a breeding site) and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the moss and reduce the risk of direct mortality. Otters lying up in the moss may suffer some disturbance although this will be temporary.	Low negative/Minor
	Operation	Increased risk of direct mortality due to RTAs where the scheme passes close to the burn	High negative/Major	Culverts with integral mammal ledges will be constructed where the scheme crosses the watercourse, allowing otters to continue their night journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Minimal loss of high value foraging and secluded lying up habitat comprising scrub and moss possible at the boundary of the habitat	Negligible/Negligible	No residual impacts predicted.	Negligible/Negligible
		Severance of otter movements is likely to have minimal impacts on the local otter population due to lack of resources to the south of the scheme and presence of alternative commuting routes at Heathfield Burn and Bishopston Ditch.	Negligible/Negligible	The installation of culverts at crossing points and the provision of alternative crossing points enhanced by planting will allow otters to move within and between available areas of habitat. However Burn of Ardoe culvert would be 59m long and some otters may be reluctant to use it, although otters are only likely to cross infrequently.	Negligible/Negligible
		Operational scheme is likely to result in some disturbance if otters are lying up, breeding or foraging in the Moss, resulting in reduction in suitability for lying up	Low negative/Minor	Otters are likely to become accustomed to the disturbance, although there may be a residual impact as a result of increased human presence and lack of screening in this area.	Low negative/Minor

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the River Dee downstream represents a primary prey resource to otters in this area.	High negative/Major	Road drainage collection and treatment system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/Negligible
Section SL2					
Cowford Burn (County)	Construction and Operation	Burn is over 100m from the scheme and therefore no significant impacts are predicted	Negligible/Negligible	None predicted due to distance from the scheme.	Negligible/Negligible
Shanna Burn (Regional)	Construction and Operation	Burn is over 200m from the scheme and therefore no significant impacts are predicted	Negligible/Negligible	None predicted due to distance from the scheme.	Negligible/Negligible
Burnhead Burn (County)	Construction	Otters are likely to forage and potentially lie up along the burn and may therefore suffer direct mortality or disturbance from construction activities including Blaikiewell junction and C5K Overbridge construction.	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	Negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses the burn, including forcing otters up towards the U63K Blaikiewell Road.	High negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the burn, allowing otters to continue their night journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Loss of medium value habitat comprising riparian scrub woodland and associated foraging and potential lying up habitat adjacent to Blaikiewell Farm is unlikely to have a significant impact on the overall availability of lying up habitat.	Medium negative/Moderate	Scrub and woodland planting between the burn and the scheme will offset the loss of habitat along the burn.	Negligible/Negligible
		Scheme will sever otter movements between upstream reaches of Burnhead Burn and Crynoch Burn and the River Dee to the north west which represent key foraging areas downstream.	High negative/Moderate	At 65m long, some otters may be reluctant to use Burnhead Burn culvert, although alternative potential commuting routes from Blaikiewell Burn exist.	Low negative/Minor

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the Crynoch Burn and River Dee downstream represent primary prey resources for otters in the area.	High negative/Moderate	Road drainage collection and treatment system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/Negligible
Section SL3					
Blaikiewell Burn (County)	Construction	Otters are likely to commute and forage along the burn regularly and may lie up in scrub areas and may therefore suffer direct mortality or disturbance from construction activities including junction and bridge construction, including at potential couch C4 within 100m of the scheme.	High negative/Moderate	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed or disturbed during construction. Best practice guidelines will be followed during construction including the suspension of night time works within 30m of the watercourse and holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	Negligible/negligible
		Scheme would sever otter movements between upstream tributaries (e.g. Burnhead Burn) as well as Crynoch Burn and the River Dee which represent key foraging areas downstream, if otters could not move freely along banks during construction.	High negative/Moderate	Commuting routes to remain open on both banks during buried structure construction. This will ensure that minimal disturbance is caused to otters using the burn.	Low negative/Minor
	Operation	Risk of direct mortality as a result of RTA predicted to be low due to the height of the crossing	Negligible/Negligible	Construction of a buried structure with adequate clearance on the banks of the burn will ensure otters can pass without having to climb up to the road during high water levels. The installation of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/negligible
		Loss of medium value habitat comprising riparian scrub woodland and associated foraging and potential lying up habitat adjacent to Blaikiewell Farm is unlikely to have a significant impact on the overall availability of lying up habitat.	Low negative/Minor	The construction of a bridge will allow retention of much riparian habitat although this will take some time to regenerate and the section immediately under the buried structure will be irreversibly lost. Existing wet woodland and fen would remain unaffected and best practice guidelines will be adhered	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
				to ensure no overall loss of habitat. Woodland and tree planting adjacent to the structure will mitigate for lost habitat in the long term.	
		Habitat Fragmentation would be negligible during operation due to the size of the buried structure and the availability of space either side to enable movement up and down the channel.	Negligible/Negligible	The construction of a buried structure with space between the burn and walls will allow otters to move freely within and between available areas of habitat.	Negligible/Negligible
		Increased disturbance and unsuitability of burn for foraging and lying up due to operation of the road	Medium negative/Moderate	Planting will act as a screen from the road and otters are likely to become accustomed to the disturbance in the short - long term	Negligible/Negligible
		The length of the bridge may impact on water quality due to lack of light and fish populations may be affected by oxygen sag. There may also be pollution due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the Crynoch Burn and River Dee downstream represent primary prey resources for otters in the area.	High negative/Moderate	Road drainage system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/negligible
Kingcausie Burn (County)	Construction	Otters are likely to forage along the burn and lie up in woodland area and may therefore suffer direct mortality or disturbance from construction activities, especially during burn realignment.	High negative/Moderate	Best practice guidelines and demarcation of the burn within 30m of active otter lying up sites to ensure that otters are not killed or disturbed during construction. Best practice guidelines will be followed during construction including the suspension of night time works within 30m of the watercourse and holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn.	Negligible/negligible
	Operation	Increased risk of direct mortality through RTAs where the scheme crosses Kingcausie Burn	High negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the burn, allowing otters to continue their night journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		A small section of the burn would be realigned with associated loss of pool/riffle structure, woodland lying up habitat including potential holts and invertebrate/fish prey. Realignment and straightening of burn unlikely to result in permanent effect on the integrity of the burn which is already extensively modified.	Low negative/Minor	Loss of invertebrate and fish habitat along the realigned reach of the burn will be minimised through careful design of realignment, while best practice guidelines will be adhered to. As the loss of high value undisturbed woodland habitat is not being mitigated for there will be a residual impact on the availability of shelter, although the burn may only be used infrequently by otter.	Low negative/Minor
		Scheme will sever otter movements overland between the upper reaches of the burn and Crynoch Burn.	High negative/Moderate	The installation of culverts at crossing points will allow otters to move freely within and between available areas of habitat. Alternative overland routes have also been shown to exist.	Negligible/Negligible
		Increased disturbance and unsuitability of burn for foraging and lying up due to operation of the road	Medium negative/Moderate	Tree and scrub planting alongside the road will screen the realigned burn and provide shelter in the long term. Otters are likely to become accustomed to the disturbance and no long-term residual impacts are predicted	Negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. The burn is a tributary of Crynoch Burn and the River Dee which support Internationally significant population of otters, therefore increasing the significance of the impact.	Medium negative/Moderate	Road drainage collection and treatment system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/Negligible
Glenburnie and ponds (County)	Construction and Operation	Ponds and burn are over 200m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible	None due to distance from the scheme.	Negligible/Negligible
Crynoch Burn (International)	Construction and Operation	No direct impacts on the burn are likely due to the distance of the burn from the scheme, but indirect impacts likely if the construction and operation of the scheme involve deterioration in water quality in tributary burns including Kingcausie Burn and Blaikiewell Burn (assessed above)	Negligible/Negligible	No specific mitigation required due to distance from the scheme. Mitigation measures provided for Crynoch Burn's tributaries, including provision of detention basins, will ensure there are no residual impacts on this watercourse	Negligible/Negligible
Mill Bank Burn (County)	Construction and Operation	Burn are over 200m away from the scheme and therefore no significant impacts are predicted.	Negligible/Negligible	None predicted due to distance from the scheme.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
River Dee (International)	Construction	River is used regularly by otters for foraging, commuting and lying up. Couch C12 is directly below the scheme and there are holts within 100m to the east of the scheme. Otters may suffer direct mortality and disturbance as a result of construction activities.	High negative/Major	Best practice guidelines will be followed including demarcation of the river and SAC within 30m of active otter lying up sites (50m of breeding sites) to ensure that otters are not killed during construction; suspension of night time works and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the river and reduce the risk of direct mortality.	Negligible/Negligible
		Construction of the Dee crossing would cause severance along a key commuting route if the banks and overland routes were not kept open during bridge construction, effectively severing otter movements between tributary burns including Crynoch Burn, and other catchments. The River Dee is the largest watercourse in the study area and a key immigration and emigration route, foraging resource supporting breeding otters.	High negative/Major	Commuting routes to remain open on both banks during bridge construction. A no working area will be fenced off within 5m of the water to prevent human encroachment onto otter territories and to retain overland routes along the river bank during work. This and the mitigation above will ensure that minimal disturbance is caused to otters using the river.	Negligible/Negligible
	Operation	Risk of direct mortality as a result of RTA predicted to be low due to the height of the crossing	Negligible/Negligible	Construction of a wide-span bridge with set back piers will allow otters to pass safely between the abutments of the bridge and the riverbank during high water levels. The installation of otter/badger proof fencing will prevent otters from finding their way on to the road	Negligible/Negligible
		Loss of medium* value riparian habitat comprising of low scrub, grassland and pasture.	Medium negative/Major	Bridge structure with set back piers will allow habitat underneath to remain relatively intact. Minimum habitat loss would result as there will be sufficient light under the bridge for some vegetation to grow.	Negligible/Negligible
		Severance along a commuting route would be reduced as otters are likely to cross readily under the bridge structure due to set back piers, with no permanent impacts on the integrity of the otter population.	Negligible/Negligible	The construction of a high span bridge with set back piers will allow otters to move freely within and between available areas of habitat and may provide an alternative site where otters can cross the river.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		Disturbance to commuting and lying up otters as a result of increased vehicular traffic and the presence of the road is unlikely to reduce the suitability of the River to support and maintain otter populations in the long term, or to increase vulnerability of the local otter population.	Negligible/Negligible	Retention of woodland area will provide screening for existing lying up sites, commuting routes and feeding areas in the most valuable areas; otters are likely to become used to the road in time, as they have done at the existing Dee crossing.	Negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on local otter populations as the River Don represents a primary prey resource in this area	High negative/Major	Road drainage collection and treatment system will ensure that road runoff entering the River complies with Environmental Quality Standards.	Negligible/Negligible
Milltimber Burn (County)	Construction	Otters are likely to forage along the burn infrequently and may therefore suffer direct mortality or disturbance from construction activities	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn and reduce the risk of direct mortality.	Negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs and/or drowning where scheme crosses burn although otters may only use burn infrequently	High negative/Moderate	A culvert with an integral mammal ledge will be constructed where the scheme crosses the burn thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway and may deter otters from finding their way onto the existing road.	Negligible/Negligible
		Loss of low value habitat comprising arable/pasture farmland near source of burn	Negligible/Negligible	No residual impact is predicted as existing habitat at the crossing point is of minimal value to otters.	Negligible/Negligible
		Scheme will sever otter movements between the River Dee and land to the west of the alignment although alternative commuting routes exist	Low negative/Minor	At 77m long, some otters may be reluctant to use the culvert to be provided at Milltimber Burn. However, alternative commuting routes exist from the River Dee to Camphill and otters may only cross infrequently.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		Risk of deterioration in water quality due to runoff from the scheme. Although otters are only likely to use Milltimber Burn infrequently, when the Dee is in spate, the burn flows into the Dee therefore increasing the significant of such an impact	Medium negative/Moderate	Use of best practice guidelines in relation to construction works near watercourses will be followed with no residual impacts on the local otter population.	Negligible/Negligible
Section SL4					
Bellenden Burn (Local)	Construction and Operation	Minimal disturbance likely due to distance from scheme and lack of resources on the other side	Negligible/Negligible	No residual impacts predicted due to distance from scheme.	Negligible/Negligible
Beans Burn (Local)	Construction and Operation	Minimal disturbance likely due to distance from scheme and lack of resources on the other side	Negligible/Negligible	No residual impacts predicted due to distance from scheme.	Negligible/Negligible
Beanshill Ponds (County)	Construction and Operation	Minimal disturbance likely due to distance from scheme. Indirect severance possible as per Upper Beanshill Burn, assessed below	Negligible/Negligible	No residual impacts predicted due to distance from scheme	Negligible/Negligible
Section SL5					
Upper Beanshill Burn (County)	Construction	Scheme crosses the burn at its source and within 100m of potential couch C26 in Gairnhill Wood and otters are likely to use the burn regularly for commuting and potential lying up therefore otters may suffer from Direct mortality or disturbance.	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn and reduce the risk of direct mortality.	Negligible/Negligible
	Operation	Increased risk of direct mortality through RTAs where the scheme passes within 50m of the source of the burn and between catchments	High negative/Moderate	Underpass will be constructed near the likely crossing point, thus allowing otters to continue their nightly journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Loss of medium value habitat comprising plantation conifer woodland and pasture	Low negative/Minor	Scrub planting will offset the loss of cover and retain connectivity between habitat areas.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
		Scheme will sever a otter movement along a commuting route between catchments including Silver/Ord Burns to the west and Beanshill Burn and features to the east	High negative/Moderate	Provision of underpass, enhanced by scrub planting and guided by otter/badger fencing will allow otters to pass safely within and between areas of habitat. The location of the underpass offset from the existing crossing point may result in some loss of connectivity, but it is likely that otters will become accustomed to the crossing in the medium-long term.	Low negative/Minor
		Although the scheme would not cross the burn, its proximity to the source of the burn means that, without mitigation, there would be a risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on the water quality in Beanshill Bonds and Murtle Den downstream which represent a prey resource to otters in the area.	Medium negative/Moderate	Road drainage collection and treatment system will ensure that road runoff entering the burn complies with Environmental Quality Standards.	Negligible/Negligible
Silver Burn (Regional)	Construction	Potential disturbance during construction if otters using burn.	Low negative/Minor	Implementation of best practice guidelines in relation to construction works near watercourses will ensure no residual impacts on the local otter population.	Negligible/Negligible
	Operation	Minimal disturbance due to distance from scheme.	Negligible/Negligible	None predicted due to distance from the scheme.	Negligible/Negligible
Ord Burn (Regional)	Construction	Potential disturbance if site compounds are located near to the holt (H4).	Low negative/Minor	Implementation of best practice guidelines in relation to construction works near watercourses will ensure no residual impacts on the local otter population.	Negligible/Negligible
	Operation	Minimal disturbance due to distance from scheme.	Negligible/Negligible	None predicted due to distance from the scheme.	Negligible/Negligible
Gairn Burn (County)	Construction	Scheme crosses the burn and passes within 100m of it and may therefore result in direct mortality and disturbance from construction activities if otters are lying up or foraging along the burn.	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch (50m of a breeding site) and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the burn and reduce the risk of direct mortality.	Negligible/Negligible

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
	Operation	Scheme crosses the burn and passes parallel to and within 100m of it therefore there is an increased risk of direct mortality through RTAs. Otters are likely to use the burn for foraging regularly.	High negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the burn, allowing otters to continue their night journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Loss of medium value habitat comprising woodland scrub suitable for lying up in area used regularly by otters.	Medium negative/Moderate	Maintenance of scrub and replacement to provide cover for otters will allow habitat to remain relatively intact with no long-term impacts on resource availability.	Negligible/Negligible
		Scheme will sever otter movements between the Moss of Auchlea to the north, Silver/Ord Burns to the south and Upper Beanshill Burn to the east, although Gairn Burn is already culverted at the side road.	Medium negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the burn, allowing otters to continue their night journeys within the confines of the burn corridor. The culvert under the side road will be 12m long and located in an area already used by otters so has a high chance of success. Alternative commuting routes between catchments will be provided as per Upper Beanshill Burn above.	Negligible/Negligible
		Risk of deterioration in water quality due to runoff from the scheme. Such events would have potentially serious indirect effects on the water quality in Silver/Ord Burns which represent a key prey resource to otters in the area.	High negative/Moderate	Road drainage collection and treatement system will ensure that road runoff entering the burn complies with Environmental Quality Standards	Negligible/Negligible
Moss of Auchlea (County)	Construction	Scheme crosses a tributary burn and passes within 100m of the Moss and may therefore result in disturbance from construction activities if otters are lying up, breeding or foraging in the Moss	High negative/Moderate	Best practice guidelines will be followed during construction including the suspension of night time works within 30m of a watercourse or holt/couch (50m of a breeding site) and siting works compounds away from valuable areas of habitat. This will ensure that minimal disturbance is caused to otters using the moss and reduce the risk of direct mortality. Otters lying up in the moss may suffer some disturbance although this will be temporary.	Low negative/Minor

Water Feature	Phase of Scheme	Impacts	Impact Magnitude/Significance	Residual Impacts	Residual Impact Magnitude/Significance
	Operation	Scheme crosses a tributary burn and passes within 100m of the Moss therefore there is an increased risk of direct mortality through RTAs where the scheme passes between the Moss and Kingshill Wood	High negative/Moderate	Culverts with integral mammal ledges will be constructed where the scheme crosses the watercourse, allowing otters to continue their night journeys within the confines of the burn corridor. The erection of otter/badger proof fencing will prevent otters finding their way onto the carriageway.	Negligible/Negligible
		Scheme will sever otter movements between the Moss and Kingshill Wood which otters are likely to cross only infrequently	Low negative/Minor	The installation of culverts at crossing points and the provision of alternative crossing points enhanced by planting will allow otters to move safely between available areas of habitat. However, Moss of Auchlea culvert is 75m long and some otters may be reluctant to use it, although other routes exist and otters are only likely to cross infrequently.	Negligible/Negligible
		Scheme passes within 50m of the edge of the Moss and may therefore result in disturbance from construction activities if otters are lying up, breeding or foraging in the Moss	Medium negative/Moderate	Mixed woodland planting will act as a screen from the road and otters are likely to become accustomed to the disturbance in the short - long term	Negligible/Negligible
		Risk of deterioration in water quality and long-term changes in the suitability of the Moss due to runoff from the scheme and changes in the water regime in the moss due to the location of the road between the Moss and water source.	Medium negative/Moderate	Road drainage collection and treatment system will ensure that road runoff entering the burn complies with Environmental Quality Standards	Negligible/Negligible
Section SL6					
Westholme Burn (Local)	Construction and Operation	Scheme does not cross the burn, which is likely to be used only infrequently by otters and therefore no significant impacts are predicted	Negligible/Negligible	Otters are only likely to use the burn on an infrequent basis and no residual impacts are predicted.	Negligible/Negligible
Borrowstone Burn and pond (County)	Construction and Operation	Burn and pond are over 200m away from the scheme and therefore no significant impacts are predicted	Negligible/Negligible	No residual impacts are predicted due to distance from the scheme	Negligible/Negligible
Fairley Home Farm Pond (Local)	Construction and Operation	Pond will be removed during construction with associated foraging and lying up habitat.	High negative/Minor	The pond will be replaced on a 1:1 basis. Otters are only likely to use the new pond infrequently so there will be no overall loss of potential foraging resources in the operational phase of the scheme.	Negligible/Negligible

7.3 Residual Impacts Summary

7.3.1 With the incorporation of mitigation measures detailed in this report, the construction and operation of the AWPR Southern Leg are unlikely to compromise the viability and integrity of the currently healthy otter population. The installation of long and confined culverts, in particular those in excess of 50m long, may sever home ranges and act as barriers to otter movements, resulting Negligible to Minor significant impacts on the local otter population, although some otters may gradually become accustomed to these culverts. There is potential for this to be an issue at Burnhead Burn and at Upper Beanshill Burn where an alternative safe crossing point is to be located away from existing commuting routes. Habitat loss is likely to result in residual impacts in Kingcausie Burn, which would be realigned. Disturbance may be an issue for otters if they are breeding in the Moss of Auchlea.

7.3.2 While a road scheme of this scale is inevitably going to result in some residual impacts on otter populations, as noted previously, there may also be some benefits. One such benefit will be a reduction in local traffic flows and RTAs along the existing road network, which currently has no mitigation measures in place.

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