10 Nature Conservation

10.1 Scope of the Assessment

10.1.1 This chapter presents the assessment of the Proposed Scheme in terms of ecology and nature conservation, following the guidelines presented in DMRB Volume 11, Section 3, Part 4. A DMRB Stage 2 assessment has been previously been carried out for ecology as part of the consideration of route options (Mouchel Fairhurst JV, 2008). The current assessment combines a review of this data and more up-to-date existing information in order to undertake a comprehensive assessment of potential ecological issues relating to the scheme.

Study Area

10.1.2 An area of 1km surrounding the proposed bypass route was identified for consideration in the desk study. However this was extended to 10km for the identification of sites of European importance. Bespoke survey areas for each species are discussed in the Technical Appendices (see below).

Scheme Assessment

10.1.3 The assessment has the overall objective of identifying the nature conservation factors associated with the Proposed Scheme and the significance of effects upon them.

10.1.4 The assessment allows the identification of any ecological constraints associated with the scheme and allows mitigation to be put in place to protect and maintain the ecological integrity of the survey area.

10.1.5 The assessment has two main parts – the collation of baseline information (via a detailed desktop assessment and a walkover survey followed by targeted species specific surveys) and the impact assessment process itself.

10.1.6 The survey suite comprised a Phase 1 Habitat Survey (focussed on an update of previous Phase 1 survey work undertaken as part of the DMRB Stage 2 Environmental Assessment (Mouchel, 2008), National Vegetation Classification (NVC) survey, otter, badger, breeding birds and bats. A full suite of aquatic surveys, including River Habitat Survey (RHS), freshwater benthic invertebrates, aquatic macrophytes and fish fauna, was also undertaken.

10.1.7 Methods and results of all ecological surveys are presented in separate Appendices:

- Phase 1 Habitat survey – Appendix 10.1 / Figure 10.1
- National Vegetation Classification - Appendix 10.1 / Figure 10.2
- Protected Mammals - Appendix 10.2 / Figures 10.3
- Bat *spp.* - Appendix 10.3 / Figure 10.4
- Aquatic Ecology - Appendix 10.4 / Figure 10.5

10.2 Legislative, Regulatory and Planning Context

10.2.1 Legislation operating at a range of geographic extents applies to the Proposed Scheme, from that aiming to protect sites and species at a European scale to protection on a local scale. Such legislation is often amended over time, and references to Acts and Regulations made below refer to the most up to date text in current UK statute.

10.2.2 The following legislation, policies and guidance have been taken into consideration during the assessment:

- Ayrshire Local Biodiversity Action Plan (LBAP);
- North Ayrshire Council Environmental Policy 2012;
- Water Framework Directive 2000;
- Water Environment & Water Services Act 2003;
- Salmon and Freshwater Fisheries Act 1975;
- Birds Directive 2009/147/ EEC;
- Habitats Directive 92/43/ EEC;
- Conservation (Natural Habitats, & c.) Regulations 1994;
- Protection of Badgers Act 1992;
- Wildlife and Countryside Act 1981;
- Wildlife and Natural Environment Act 2011 and
- Nature Conservation (Scotland) Act 2004.

10.2.3 The paragraphs below summarise the key legislation, policies and guidance that are relevant to the assessment of the Proposed Scheme.

10.2.4 Sites (within the “Natura 2000” network) and species (“European Protected Species” or EPS) highlighted as requiring conservation by all EU member states are protected in the UK by the Conservation (Natural Habitats etc) Regulations 1994. Natura 2000 is the centrepiece of EU nature & biodiversity policy. It is an EU-wide network of nature protection areas established under the 1992 Habitats Directive. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It is comprised of Special Areas of Conservation (SACs) designated by Member States under the Habitats Directive, and also incorporates Special Protection Areas (SPAs) which they designate under the 1979 Birds Directive.

10.2.5 EPS are protected from deliberate or reckless capture, injury or death, disturbance, and destruction of their places of rest, shelter or breeding sites (see specific Appendices for further information relating to protection of EPS). These species are also protected in a similar way by the Wildlife and Countryside Act 1981 (WCA), with further provision in Scotland made under the Nature Conservation (Scotland) Act 2004. The WCA further protects all wild birds and their nests and all UK reptile species, as well as areas designated as Sites of Special Scientific Interest (SSSIs) and schedule 5 species as listed under the under the Wildlife and Countryside Act (1981).

10.2.6 In addition to the species and habitats protected under wildlife legislation, many more are included on lists of UK Biodiversity Action Plan (BAP) priority species and habitats (established as a material consideration in the planning process by the Nature Conservation (Scotland) Act 2004) as well as being classified as features of principal conservation importance. Local versions of these national action plans exist in the form of Local BAPs (LBAPs). BAP designation places a responsibility on the planning system and the UK government to work to achieve conservation goals through the decision making process. These designations are therefore material considerations in the planning process.

10.2.7 Local and national (Scottish) planning policy also contains provisions for nature conservation. The Scottish Biodiversity Strategy, published in 2004, places responsibilities on planning authorities regarding the protection of habitats and species.

10.2.8 Legislation related to each of the surveys is discussed in the specific Technical Appendix.

10.3 Methods of Assessment

Desk Study

10.3.1 A detailed desktop study was undertaken to identify any statutory, non-statutory or designated/classified sites within the study area. The following web-based sources were utilised for this:

- E-maps website (www.emapsite.com);
- Scottish Environment Protection Agency (SEPA) website (www.sepa.org.uk) – for classified/designated waterbodies under the Water Framework Directive (2000/60/EC) (WFD) and Freshwater Fisheries Directive (2006/44/EC) (FFD);
- Scottish Natural Heritage (SNH) Sitelink website (http://gateway.snh.gov.uk/sitelink/) – for location of any European, national and localised statutorily protected species or habitats; and
- National Biodiversity Network (NBN) (www.nbn.org.uk) – for localised species records, and focused on legally protected and ecologically significant species. Mouchel have written permission from the dataset providers to publish the data for the purposes of this report. Mouchel Fairhurst JV (MFJV) would like to credit Scottish Natural Heritage, the Bat Conservation Trust and the Scottish Wildlife Trust for permission to use data published on the NBN. The datasets and data recorders are acknowledged within each Technical Appendix. All interpretation of the data has been undertaken by MFJV alone.

10.3.2 Previously collected survey data obtained by consultants Amec (as presented in the Stage 2 environmental assessment (MFJV, 2008)) was also reviewed and used to inform the assessment.

10.3.3 In order to obtain baseline information and to provide any comments on the Proposed Scheme consultations were undertaken with the following statutory and non-statutory consultees with nature conservation interests:

- Scottish Natural Heritage
- Scottish Environment Protection Agency

- Ayrshire Rivers Trust
- Scottish Wildlife Trust
- Scottish Ornithologists Society
- Ayrshire Bat Group
- Scottish Badgers

10.3.4 Reference is made to those responses where applicable within the text below.

10.3.5 The Ayrshire Rivers Trust was commissioned to undertake electrofishing surveys on the River Garnock and Caaf Water. A report of the results was produced which incorporated historical data from the watercourses dating back to 2003. This work is discussed in Appendix 10.4 and in section 10.4 of this report.

Field Study

10.3.6 The methodologies used in the field study are summarised in Table 10.1, and are described in greater detail in the corresponding Technical Appendix.

10.3.7 Following the desk study, analysis of previous surveys and completion of an initial walk-over survey, specialist surveys were planned and undertaken for species of nature conservation importance likely to use habitats within the development site that may be directly or indirectly impacted by the Proposed Scheme.

10.3.8 Scottish Natural Heritage (SNH) was consulted with regard to the surveys proposed. The scope of surveys is set out in Table 10.1 and this was agreed with SNH.

Table 10.1 Field Survey Methodologies

Survey	Date undertaken	Methods used
Terrestrial Habitats		
Phase 1 habitat survey (Figure 10.1)	September 2007 (DMRB Stage 2) May 2012 (update survey)	Standard Phase 1 habitat survey methods (JNCC, 2010). The methodology was agreed with Scottish Natural Heritage (SNH) with regard to survey requirements and it was concluded that an update of the 2007 Phase 1 survey would be required.
National Vegetation Classification (NVC) Survey of Blairland Bing Wildlife Site / SINC (Appendix 10.1)	August 2012	Quadrat sampling to assess the abundance and frequency of plant species present within defined sampling areas. Use of quadrat data to assign vegetation types within sampling areas to published NVC communities (Rodwell et al. 1991a, 1991b, 1992, 1995 & 2000) and mapping the extent of the described communities.

Survey	Date undertaken	Methods used
Watercourses and Waterbodies		
Otter *Lutra lutra* (Appendix 10.2)	June - September 2012	Search for field signs (spraint, prints etc) and breeding/resting sites (holts, couches etc) (Chanin 2003). Habitat quality in terms of otter breeding potential was assessed according to the criteria described by Liles (2003).
Water Vole *Arvicola amphibius* (Appendix 10.2)	June - September 2012	Search for field signs (feeding remains, paw prints etc) and breeding/resting sites (burrows). Strachan and Moorhouse 2006.
Aquatic Flora (Appendix 10.4)	July 2012	Collation of species lists for aquatic habitats within the study area and evaluation using the LeafPacs system. Haslam *et al*., (1987)
Benthic Invertebrate Fauna (Appendix 10.4)	July 2012	Kick sampling within watercourses in the study area and identification of benthic invertebrate fauna to family level. Evaluation using the Biological Monitoring Working Party (BMWP) / Average Score Per Taxon (ASPT) system and RICTS. British Standard (BS EN 27828:1994).
Fish (Appendix 10.4)	October 2012	Electrofishing surveys to determine age class, composition and abundance of fish fauna (inc. lamprey sp.) present within watercourses in the study area. British Standard guidance (BS EN 14011:2003).
Terrestrial Fauna		
Bat *Spp*. (Appendix 10.3)	July – October 2012	Transect walks and placement of static bat detectors (Anabats) to determine bat activity along woodland edges and around water bodies within the study area. BCT (2012).
Badger *Meles meles* (Appendix 10.2)	June – September 2012	Search for field signs (setts, prints, paths, push-throughs, feeding signs (snuffle holes and dung pits. Harris *et al* (1989).
Breeding Birds	June – September 2012	Although full breeding bird surveys were not undertaken, incidental observations were recorded during other surveys. The Scottish Ornithological Society was consulted. It had been agreed with Scottish Natural Heritage (SNH) that there was no need for a full breeding bird survey.

Determining Biodiversity Value

10.3.9 Various characteristics can be used to identify important biodiversity features (sites, habitats and species) that are likely to represent potentially significant constraints to a project. These include:

- Rarity at various geographical scales;
- Threat status and vulnerability at various geographical scales;
- Diversity and/or it's synergistic associations;
- Population size; and
- Location in relation to it's known geographical distribution and range at various geographical scales.

10.3.10 The Institute of Ecology and Environmental Management (IEEM) (2006) provides further information on how the relative value and importance of a receptor can be determined and states that its *biodiversity value* should be measured against published selection criteria where available. This guidance was used alongside the Ratcliffe criteria and guidance in DMRB to assess the biodiversity value of an ecological receptor as described below.

10.3.11 It is also useful to distinguish between the biodiversity value of a receptor and its legal *status*. Features of *high biodiversity* value may not necessarily attract *legal protection*. For example, a viable area of ancient woodland is likely to be considered of high biodiversity value even if it does not receive any formal statutory designations.

10.3.12 In the evaluation of biodiversity value reference is also made to UK and Local BAPs, inclusion on national or county Red Data Books, and to conservation status (such as nationally notable/scarce, etc.). However, the inclusion within a BAP reflects the fact that the population of the species/habitat concerned is in a sub-optimal state (and hence that conservation action is required) and does not necessarily imply any specific level of value. Despite this, priority BAP species may represent a significant ecological constraint if their presence triggers *planning guidance implications*.

10.3.13 In accordance with IEEM (2006), and following the Ratcliffe criteria (1977), Table 10.2 identifies the criteria used to provide a biodiversity, or potential biodiversity, value for each ecological feature or receptor.

Table 10.2 Criteria for Determination of Biodiversity Value of an Ecological Receptor

Value	Criteria
International (European)	**Habitats** An internationally designated site or candidate site, i.e. Special Areas of Conservation (SAC) or candidate SAC (cSAC), or an area that would meet the published selection criteria for designation. A viable area of habitat that is essential to maintain the viability of a population or habitat in the wider area.
	Species Any regularly occurring population of internationally important species, threatened or rare in the UK, i.e. a UK Red Data Book species, UK BAP or of uncertain conservation status or of global conservation status. A regularly occurring, nationally significant population/number of an internationally important species.

Value	Criteria
National (Scotland)	**Habitats** A nationally designated site, i.e. Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR), or a discrete area that would meet the published selection criteria for national designation (e.g. SSSI selection criteria). A viable area of key habitat important in maintaining the viability of a population or habitat in the wider area.
	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 of threatened or rare conservation status in the region or county. A species identified as of critical importance in the UK BAP.
Regional (Ayrshire)	**Habitats** Sites that exceed the County-level designation but fall short of national designation criteria. Viable areas of habitat that is considered to be important in maintaining the viability of a population or habitat in the wider area.
	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 BAP. 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.
County (North Ayrshire)	**Habitats** Sites recognised by local authorities, e.g. Sites of Interest for Nature Conservation (SINCs) or Local Nature Reserves (LNRs). A small area of habitat that is considered to be important in maintaining wider viability of a population or habitat.
	Species Any regularly occurring, locally significant population of a species listed in a Local BAP because of county rarity or localisation. A regularly occurring locally significant population of a County important species. Sites supporting populations of regionally important species that are not threatened or rare in the region or county and not integral to maintaining those populations.
District (Kilwinning)	**Habitats** Sites recognised by local authorities, e.g. District Wildlife Sites (DWS). Areas of habitat that enrich the local resource for species and are important to maintaining local viability of a population.
	Species Any regularly occurring, locally significant population of a species listed in a Local BAP due to district rarity or localisation. A regularly occurring, locally significant population of a District important species. Sites/features scarce in the District or which appreciably enrich the District habitat resource.
Local (Dalry)	**Habitats** Areas of habitat that enrich the local habitat resource or have been identified for designation at this level, i.e. Local Wildlife Site (LWS). Sites that retain other elements of semi-natural vegetation that, due to their size, quality or distribution, are not considered for above classifications.

Value	Criteria
	Species Populations/assemblages of species that appreciably enrich the biodiversity resource within the local context. Site 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 Value)	Sites that retain habitats and/or species of limited ecological importance due to their size, composition or other factors.

Evaluation of Predicted Impacts

10.3.14 Each of the identified sites, habitat types, mosaics/communities and associated species/populations has been attributed a value reflecting their geographic significance as shown in Table 10.2.

10.3.15 Impacts related to loss, fragmentation or degradation of habitats, death or disturbance of animals and potential changes in species range have been defined and described taking into account:

- Magnitude - the size of an impact in quantitative terms where possible;
- Extent - the area over which an impact may occur;
- Duration - the time for which an impact is expected to last;
- Reversibility - a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it; a temporary impact is one from which short-term recovery is possible; and
- Timing and frequency - whether impacts are constant ongoing, separated but recurrent or single events and whether they occur during critical seasons or lifestages of habitats and fauna.

10.3.16 Impacts have been defined as significant if they affect the integrity of designated sites and ecosystems and/or the conservation status of habitats and species.

10.3.17 The level at which impacts upon integrity or conservation status are important is defined by the geographic scale at which each receptor is valued. For example an impact upon the integrity of a site of value at a national scale would be of significance at a national scale. In some cases an effect on the integrity or conservation status of the receptor may not occur, but more localised impacts may still be significant at smaller geographic scales. Any legal implications are also described along with policy implications appropriate to the scale of the impact.

10.3.18 Each impact is also given one of four confidence ratings reflecting the likelihood that the impact would occur. The confidence ratings applied are:

- certain/near certain – probability estimated at 95% chance or higher;
- probable – probability estimated above 50% but below 95%;

- unlikely – probability estimated above 5% but below 50%; and
- extremely unlikely – probability estimated at less than 5%.

10.4 Baseline Conditions

Designated Sites

10.4.1 No statutory protected sites are located within the footprint of the Proposed Scheme, although several are found in the wider study area. Table 10.3 below indicates sites designated for their ecological importance, their features for designation and their biodiversity value.

Table 10.3 Designated Habitat Receptors and their Biodiversity Value

Site	Site / Designation	Reasons for Designation	Biodiversity Value
Bankhead Moss	Special Area of Conservation (SAC) and a Site of Special scientific Interest (SSSI)	Bogs (Wetland); active raised bog.	International
Cockinhead Moss	SAC & SSSI	Bogs (Wetland); active raised bog and degraded raised bog	International
Dykeneuk Moss	SAC & SSSI	Bogs (Wetland) active raised bog and degraded raised bog	International
Ashgrove Loch	SSSI	Fen, marsh and swamp (Wetland); open water transition fen. Standing open water and canals; mesotrophic loch.	National
Bogside Flats	SSSI	Littoral sediment (coast); saltmarsh and littoral sediment (marine); mudflats.	National

10.4.2 The closest Natura 2000 sites are Bankhead Moss SAC, Cockinhead Moss SAC and Dykeneuk Moss SAC (all of which are also designated as a Site of Special Scientific Interest (SSSI)). These sites are approximately 4km east, 7km east and 5km east-south-east respectively. None of these sites would be directly impacted by the Project, and no effect pathways which could transfer impacts to them have been identified, and thus they have been scoped out of this study and would not be considered further. Natura 2000 sites at greater distances have not been considered as no pathways exist that could transfer impacts to them.

10.4.3 Bogside Flats SSSI (designated for littoral sediment (coast); saltmarsh and littoral sediment (marine); mudflats) is located approximately 12km to the south of the Project at the estuary of the River Garnock so a defined effect pathway is present.

10.4.4 A locally designated site, Blairland Bing and River Garnock Wildlife Site / Site of Importance for Nature Conservation (SINC), is located between the River Garnock and

the Glasgow to Ayr railway line, to the east of the existing A737, south of Dalry. The location of this site is shown on Figure 9.3a.

Water Framework Directive Classification / Freshwater Fisheries Directive Designation

10.4.5 The two largest watercourses in the survey area are the River Garnock and the Caaf Water. Both watercourses receive classification under the WFD but the River Garnock is the only watercourse within the survey area to be designated under the FFD (as a salmonid watercourse).

10.4.6 There are several unclassified watercourses in the immediate survey area. These are mostly ephemeral field drains (Figure 10.5), and the Coalheughglen Burn toward the eastern end of the scheme.

Flora & Habitats

Extended Phase 1 Habitat Survey

10.4.7 Table 10.4 shows the habitat receptors within the survey area and their respective biodiversity values.

Table 10.4 Habitat Receptors and Biodiversity Values

Receptor	Biodiversity Value
Habitats	
Broad-Leaved Semi-Natural Woodland	Local
Coniferous Plantation	Local
Mixed Plantation Woodland	Local
Scrub	Local
Improved Grassland	Local
Marshy Grassland	Local
Arable Farmland	Less than local
Hedgerows	Local
River Garnock	District
Caaf Water	District
Unnamed watercourses	Less than local
Aquatic Flora	Less than local

10.4.8 Through consultation with SNH it was agreed that an update of extended Phase 1 Habitat survey that was undertaken in September 2007 (as part of the DMRB Stage 2 assessment for the Dalry Bypass scheme) should be carried out. The 2012 survey, therefore, covered the study area up to a distance of 500m from the centreline and around either end of the Proposed Scheme and extending from Hillend to Highfield. The results of the Phase 1 survey are shown in Figure 10.1.

10.4.9 There was no significant change in the habitat since the 2007 Phase 1 habitat survey; the majority of habitat present along the proposed route consists of improved

grassland, of negligible biodiversity value. Blair Estate (to the south east of the proposed route) contains ancient woodland. This however, is outwith the field survey area.

10.4.10 The bypass route does, however, bisect several hedgerows, one of which was recorded during the Phase 1 as species-rich and is therefore identified as not only a UK BAP Priority Habitat, but also within the Ayrshire LBAP, which identifies ancient and/ or species-rich hedgerows as priority habitats. Other hedgerows recorded during the Phase 1 were recorded to be species-poor, and therefore not recognised as UKBAP priority habitats. These hedgerows are however still recognised for their importance as habitat features within the Farmland birds Species Action Plan (SAP) of the Ayrshire LBAP. Field observations also highlighted their importance as foraging routes for bats.

Broad-Leaved woodland (semi-natural and plantation)

10.4.11 This is the most common woodland habitat type within the ecological survey area. Mature semi-natural broad-leaved woodland is present to the south east of the survey area, around Blair Estate and Crow Grove. A thin strip of mature semi-natural broad-leaved woodland is also present along both banks of the River Garnock on the southern edge of the scheme, south of the Blairland Bing and River Garnock Wildlife Site. Semi-natural broad-leaved woodland also predominates within the riparian habitat along the eastern bank of the River Garnock, which is adjacent to the Blairland Bing and River Garnock wildlife site. A thin corridor of mature broad-leaved plantation borders a short stretch either side of the A737 road towards the north of the scheme alignment in the vicinity of Coalheughglen.

10.4.12 Given the species present, the majority of this habitat within the study area is assessed as being of value within the local area only.

Coniferous Plantation

10.4.13 Coniferous Plantation is only located toward the southeast of the survey area; a small dense stand of young Sitka spruce plantation is located towards the south east of the scheme alignment.

10.4.14 The coniferous plantation within the survey area is assessed as being of value within the local area only.

Mixed Plantation Woodland

10.4.15 A thin strip of mature mixed plantation woodland is present to the north east area of the scheme alignment, south of Highfield and continuous with Barjocks Plantation. A second thin strip of mature mixed plantation is present towards the south east section of the scheme, south east of Blairland.

10.4.16 The mixed plantation within the survey area is assessed as being of value within the local area only.

Scrub

10.4.17 Scattered and occasionally dense scrub composed mainly of gorse *and broom* with some hawthorn is present within the survey area.

10.4.18 At the northern end of the scheme the remains of two disused lime quarries have become overgrown. Another feature to the south, likely to be the remains of a lime kiln is also densely vegetated with gorse, broom and hawthorn scrub.

10.4.19 Towards the centre of the survey area, just north of a Blairland Housing Estate on the outskirts of Dalry, is an area of marshy ground and scattered scrub on a slope down to the River Garnock. The vegetation is dominated by gorse, hawthorn and bramble scrub. Towards the south of the survey area, the railway sidings and verges represent an extended area dominated by tall ruderal species and scrub.

10.4.20 Given the relatively low species diversity and limited extent, the scrub habitat is assessed as being of value within the local area only.

Improved Grassland

10.4.21 Agricultural land is the most dominant habitat type within the ecological survey area. Of the agricultural habitats present, the most prevalent is improved grassland, present throughout the survey area. Less common were semi-improved grassland and arable land, restricted to the southern end of the survey area. Boundary features throughout the ecological survey area were predominately hedges with fences and walls also common.

10.4.22 Given its relatively low species diversity and the abundance of similar habitats in the wider area; the improved grassland habitat within the survey area is assessed as being of value within the local area only.

Marshy Grassland

10.4.23 Marsh and more commonly marshy grassland are scattered but not extensive throughout the survey area. At the northern extent of the Proposed Scheme an area of marsh and marshy grassland surrounds the entrance to a disused quarry. An area of marsh, continuous with an area of marshy grassland is present in a low lying patch of ground at the bottom of an improved grassland field towards the centre of the survey area. The marsh borders a drainage ditch.

10.4.24 An extended area of marsh and marshy grassland is present between the railway line and the River Garnock towards the southern extent of the survey area. The marshy area is continuous with an area of marshy woodland. An area of marshy grassland is present within a low lying field at the southern extent of the scheme, to the east of the A737. Other less extensive areas of marshy grassland are present within the agricultural grasslands throughout the survey area.

10.4.25 This habitat is considered to be of value within the local area only.

Arable

10.4.26 The survey identified several fields toward the southern end of the survey route to the east of the River Garnock.

10.4.27 Given its low botanical diversity and highly artificial nature, this habitat is assessed as being of value of less than local.

Hedgerows

10.4.28 Hedgerows are present throughout the route; hedges are the most common boundary feature within the survey area, including several intact species-rich hedges. However, the majority of hedgerows in the survey area species-poor consisting predominantly of hawthorn.

10.4.29 The hedgerows are assessed as being of value of within the local area only.

Watercourse Classification

10.4.30 The River Garnock receives classification under the WFD and designation under the FFD. The stretch of the River Garnock at the site of the Proposed Scheme (Caaf Water to tidal limit) receives classification as a medium, lowland calcareous watercourse. As the River Garnock has been identified as significantly modified and of bad ecological status, and a Salmonid Water it is considered to be of intrinsic biodiversity value at no more than the District scale.

10.4.31 The Caaf Water receives classification under the WFD but is not designated under the FFD. The Caaf Water receives classification as a small, lowland calcareous watercourse. As the River Garnock has been identified as significantly modified and of poor ecological potential, it is considered to be of intrinsic biodiversity value at no more than the District scale.

10.4.32 The Coalheughglen Burn is an unclassified watercourse in the immediate survey area. In addition to this, there are ephemeral watercourses that run along hedgerows (identified in Figure 10.5). These watercourses are of limited ecological value but would act as vector carrying sediment to classified watercourses (River Garnock).

10.4.33 The unclassified watercourses constitute a priority habitat in the UK BAP and a broad habitat type in the Local BAP. However, due to their low ecological value the unclassified watercourses are considered to be of intrinsic biodiversity value at no more than the Local scale.

Aquatic Flora

10.4.34 The aquatic flora within the watercourses in the field survey area was sparse and only consisted of mosses and some filamentous algae. A single record of river grimmia *Schistidium rivulare* was found in the River Garnock, giving the River Garnock a WFD Status of ‘Good’. No aquatic macrohpytes were found in the Caaf Water or Coalheughglen Burn.

10.4.35 While the aquatic flora composition of the watercourses in the survey area is considered to be Good to Moderate status under the WFD, the species identified are common nationally and locally, are not identified in any BAP or identified as being of

conservation concern and are therefore of intrinsic biodiversity value at less than local scale only.

National Vegetation Classification (NVC) Survey

10.4.36 A National Vegetation Classification (NVC) survey of the Blairland Bing and River Garnock Wildlife Site / SINC was previously undertaken in 2008, to provide additional information regarding the nature of vegetation communities present within the Wildlife Site / SINC. As the previous survey was carried out more than four years ago, an updated NVC survey was carried out using the same NVC survey techniques and noting any changes which have occurred in the intervening four year period. This survey was undertaken on the 16th August 2012, and is discussed in the NVC Technical Appendix. A map of NVC communities recorded is provided as Figure 10.2.

10.4.37 The 2012 NVC survey identified two woodland communities, four wetland/marshy grassland communities, three dry grassland communities and unclassified areas of scrub within the survey area.

10.4.38 The majority of woodland habitat present at the site is W6 *Alnus glutinosa-Urtica dioica* woodland. This NVC type is accommodated within the broader UK BAP definition of wet woodland. Despite the woodland containing a high non-native species component it is still recognisable as a UK BAP Priority Habitat and as such is one of the more valuable habitats present at Blairland Bing.

10.4.39 The W21 *Crataegus monogyna-Hedera helix* scrub vegetation, present along field margins and in localised patches is not intrinsically a UK BAP Priority Habitat but where this vegetation type forms hedgerows it can be classed as a UK BAP Priority Habitat where the hedgerow contains at least 80% of at least one UK native species, which would be the case with hawthorn dominated W21 vegetation.

10.4.40 The two most valuable wetland areas are the expanse of S12 *Typha latifolia* swamp, between the wet woodland and the eastern bank of the River Garnock and the M23 *Juncus effusus / acutiflorus-Galium palustre* rush-pasture at the northern end of the site. Both of these vegetation communities would be classed as Priority Habitats, with the S12 *Typha latifolia* swamp belonging to the broader UK BAP classification of lowland fen and the M23 *Juncus effusus / acutiflorus-Galium palustre* rush-pasture being included within the purple moor-grass and rush pastures habitat classification.

10.4.41 The wetland area directly to the south of the SINC, consisting of S5 *Glyceria maxima* swamp and marshy grassland would also be accommodated within the Priority Habitats described above but this area is smaller and habitats are more fragmented than the larger wetland areas and so would be classed as less valuable.

10.4.42 None of the grassland vegetation types present at the survey site is included within UK BAP Priority Habitat. Overall the grasslands within the survey site are of low biodiversity value, with the large MG7 *Lolium perenne* leys and related grassland type fields being of negligible ecological interest due to the lack of structural or plant species diversity present.

Schedule 9 Species

10.4.43 The Wildlife & Countryside Act 1981 (as amended) Schedule 9 invasive plant species Japanese knotweed *Fallopia japonica* was found to be present towards the north-west

of the SINC, along the eastern bank of the River Garnock and directly adjacent to a recently built industrial building towards the north-eastern corner of the Blairland Bing Wildlife Site.

10.4.44 No other species currently listed on the Scottish Schedule 9 list were found to be present within the SINC or the land immediately to the south.

Fauna

Protected Mammals

10.4.45 Several walk-over surveys were undertaken between 24th July and 12th October, 2012. Due to complexities in arranging land access and adverse weather conditions affecting water levels, it was necessary to stagger the surveys over this extended period to allow all areas to be fully accessed and surveyed. Protected mammal receptors recorded within the survey area that their biodiversity values are shown in Table 10.5.

Table 10.5 Fauna Receptors and their Biodiversity Values

Receptor	Biodiversity Value
Species	
Bat spp	County
Badger	Less than local
Otter	Regional
Water Vole	NA – absent from the survey area
Red Squirrel	NA – absent from the survey area
Fish fauna	County
Benthic Invertebrates	Local
Breeding Birds	Local
Amber Listed birds – sand martin & kingfisher	Regional

Badger

10.4.46 Surveys were carried out in late July 2012 by experienced ecologists in accordance with methods identified by Harris *et al*. (1989). Ideally such surveys would be conducted prior to significant growth of vegetation which can visually obscure setts and field signs. Although the surveys were not undertaken at the optimal time of year, badger activity was nevertheless reliably detected and appropriately recorded.

10.4.47 The field survey area for badger was walked and systematically searched for the presence of setts and other signs of badger activity, including: spoil piles, dung pits and latrines, bedding material, paths, footprints, hairs and feeding signs (holes in the ground, scrapes in the soil and excavated woody material).

10.4.48 As badgers are subject to persecution, the location of badger field signs is shown in a confidential annex to this chapter which is available upon request to the authors. A description of the badger survey findings is provided below.

10.4.49 Evidence of badger activity appears to be more abundant in the DMRB Stage 2 survey (undertaken 8th-9th Nov 2007 and repeated on 18th-19th March 2008) when compared to the current surveys for the now Proposed Scheme carried out between July and October 2012. However, field surveys indicated a number of changes within the study area which appear to have influenced badger activity.

10.4.50 The woodland at Blairland Bing wildlife site showed historical signs of badger activity, as recorded in 2007-08, however these excavations had been abandoned when investigated during the most recent surveys, and showed no recent signs of activity. The woodland has a network of small tracks and paths, enlarged by human use, and shows signs of fly tipping and use of motorbikes on many of the tracks. Some of the tracks are in extremely close proximity to previous badger excavations. The absence of recent badger activity in the woodland, when considered in conjunction with the apparent increase in human disturbance would indicate a degradation of habitat quality in the Blairland Bing woodland for this species.

10.4.51 Due to refinements in the scheme design since 2008 and development of the now Proposed Scheme, survey effort could also be refined to better reflect the development footprint. As a result, survey effort was more focussed within areas identified as being likely to be directly affected by the proposed works. Consequently, the eastern edges of the Blair Estate where badger signs were previously recorded were considered to be outwith the area likely to be affected by the Scheme, and were not investigated further during recent surveys. The presence of extensive areas of suitable badger habitat, and historical field signs are however important indicators that this species is likely to be present within this part of the study area.

10.4.52 Elsewhere within the study area, historical survey records indicated badger presence on the farmland around Highfield to the north of the study area. Due to livestock restrictions at the time of survey, fields within the study area on the south of the A737 at Highfield could not be surveyed, although observations from adjacent areas indicated habitat to be largely unsuitable due to livestock presence and lack of sufficient suitable cover. More suitable habitat was however noted to be present around and within an abandoned quarry to the northern and of the scheme. Due to lack of safe access, closer investigation of the quarry was not possible.

10.4.53 Recent field signs recorded along a field margin on the northern (opposite) side of the A737 indicate that this species is present within close proximity of the northern end of the study area. These recent field signs were found during the current surveys; to the north of the A737 at the north eastern end of the Proposed Scheme. A recently excavated dung-pit with several snuffle holes, excavations and push-through's indicates higher levels of badger activity than elsewhere within the study area. Mammal field signs observed (push-through / shelter) are present throughout the scheme but are either disused (outlier sett at Blairland Bing) or cannot be confirmed as badger (the push – through's may also be created or used by deer or fox).

10.4.54 Due to their conservation status and their widespread distribution both nationally and locally, the presence of badgers is considered to be of intrinsic biodiversity value at a less than local scale only. However, badgers legal protection applies irrespective of their local conservation status.

Otter

10.4.55 All notable waterbodies within the field survey area were subject to walkover surveys in which they were systematically searched for the presence of resting sites and signs of otter activity, including: footprints; slides; feeding remains; and spraints. As otter are territorial, they spraint mark particular features along the watercourse, such as large boulders or bridge structures, which can be used to indicate their presence. In addition to this, the potential for breeding sites was assessed.

10.4.56 The otter surveys were undertaken in accordance with methods identified by Chanin (2003).

10.4.57 Otter evidence recorded during the survey is shown on Figure 10.3.

10.4.58 Due to spate conditions on the River Garnock in July 2012, initial survey efforts were impaired, exacerbated by the inaccessibility of the banks within the study area due to vegetation growth and vertical inclines. Later surveys permitted the channel to be investigated along extensive stretches; however some areas remained inaccessible to close examination. These areas were surveyed closely with binoculars, paying close attention to any areas of exposed bank or prominent sprainting features. The western bank was thoroughly searched for field signs, however easy accessibility and associated human disturbance, combined with a lack of suitable cover greatly reduces the habitat suitability for otter. Much of the eastern bank within the study area was not readily accessible due to the treacherous terrain; however this side of the Garnock was much more densely vegetated, with several areas which also appeared inaccessible to humans and therefore providing more suitable otter habitat. These areas were examined closely from the western bank using binoculars, and channel features investigated more closely where access was possible.

10.4.59 No field signs of this species were found on the River Garnock or the Coalheughglen Burn within the study area during current surveys. A fresh spraint was however found under the A737 road bridge over the Caaf Water, approximately 500m upstream from its confluence with the Garnock. Approximately a further 500m upstream (under the road bridge of the B714) otter field signs were recorded in greater density with numerous fresh prints and spraint recorded. Evidence of such activity would indicate that this location is used as a temporary lay-up.

10.4.60 Previous surveys carried out in 2008 found several otter field signs on both the Garnock and the Caaf water, and around their confluence which suggests movement of this species between the two watercourses. Recent field signs from surveys support this assessment, and it can be considered that this species is highly likely to be present within the study area on the Garnock itself, and is confirmed to be using the Caaf Water. Field signs suggest there is movement of this species between suitable habitat upstream at Lynn Bridge and the Garnock itself, which undoubtedly provides an important feeding resource. This appears to be in spite of the stretch of poor habitat between Lynn Bridge and the Caaf Water's confluence with the Garnock, which is heavily disturbed by livestock and humans, and lacks any suitable cover.

10.4.61 Anecdotal evidence provided by a local resident during the current surveys indicated that a holt was found downstream on the River Garnock toward the Dalgarven House Hotel; approximately 3 km downstream of the current survey area.

10.4.62 The results of current and recent surveys indicate that otter are present within the study area and using the main watercourses present. No evidence of breeding of this species was found within the study area in the current or recent surveys.

10.4.63 In accordance with IEEM (2006), and following the Ratcliffe criteria (1977), the study area can be considered to be a site which is maintaining a population of this species that are not threatened or rare in the region or county. Consequently, the presence of otter is therefore considered to be of intrinsic biodiversity value at no more than the Regional scale.

Water Vole

10.4.64 The water vole survey was undertaken on 24th-27th July by experienced ecologists and in accordance with the methods outlined in the Water Vole Conservation Handbook (Strachan and Moorhouse, 2006).

10.4.65 All waterbodies within the field survey area that have potential to support water voles were subject to field survey and the banks were systematically searched for field signs to indicate a presence or likely absence of the species. The field signs looked for included feeding stations, footprints, latrines, lawns, runs and burrows.

10.4.66 Sub-optimal habitat was found on the Coalheughglen burn (Figure 10.3) but due to the culverted watercourse limiting connectivity it is highly unlikely that water vole use the burn. No field signs were recorded anywhere in the survey area. Consequently, the species is considered to be absent from the field survey area. As such, no further consideration would be given to water vole.

Red Squirrel

10.4.67 Areas of coniferous woodland within the field survey area that have potential to support red squirrel were subject to field survey and were systematically searched for field signs to indicate a presence or likely absence of the species. These included sightings, feeding signs and dreys.

10.4.68 Areas of suitable habitat were surveyed on the 24th-27th July by experienced ecologists using aspects of the methodology described by Gurnell *et al* (2001).

10.4.69 Small areas of suitable habitat were found (Figure 10.3) for red squirrel. However, connectivity with other suitable habitat is limited. No field signs were found throughout the survey area. NBN database records from 2005 show that red squirrel are present within 1km of the study area. However, given the age of the records and no observations made during the current surveys, the species is considered likely to be absent from the field survey area. As such, no further consideration is given to red squirrel.

Deer

10.4.70 Although no deer surveys were undertaken, they are known to be present within the study area. Records provided by Amey (currently responsible for trunk road maintenance in North Ayrshire) indicate that several recent Road Traffic Accidents have involved deer.

10.4.71 Field signs of deer, including prints and scrapes, were recorded during the current surveys and two female roe deer were flushed from the fields at the Highfield end of the study area in September 2012. These animals were recorded close to the site of a

previous RTA involving deer, which suggest this end of the study area may include one or more locations where deer may potentially cross the proposed road alignment.

Conclusions

10.4.72 It can be concluded that otter are present within the southern end of the study area, both on the River Garnock and the Caaf Water. Current surveys supported by previous survey effort and local anecdotal evidence indicate otter are moving between the two watercourses for foraging purposes, transiting the degraded riparian habitat along the Caaf Water's lowest reaches to the Garnock, which undoubtedly offers valuable fishing opportunities for this species. No holts or couches were found, although the density of field signs under the Lynn Bridge on the Caaf Water may constitute a temporary lie-up.

10.4.73 Field signs confirming recent badger activity were limited to the northern extent of the scheme, where various excavations, a dung-pit and push-throughs found north of the current A737. Previous surveys have reported a large sett in Blair Estates to the South of the Proposed Scheme, but this lays outwith the 500m boundary specified by the DMRB and was therefore outwith the scope of the most recent surveys.

10.4.74 Since no field signs recorded and little suitable habitat present, water vole and red squirrel are considered to be absent from the study area.

Bats

Walkover Survey

10.4.75 A detailed walkover survey of the site was carried out and included any structures and areas of woodland across the site. In general terms, records indicate that the site is used mainly for commuting and feeding. The open farmland offers feeding and commuting potential for bats; the hedgerows crossing the proposed route offer potential for commuting and feeding bats. The presence of livestock indicates feeding potential; i.e. insects associated with livestock. In addition areas of marshy grassland identified by the presence of *Juncus* spp. (located to the west of Stoopshill farm) also offer feeding potential to bats.

10.4.76 No potential roost sites were identified along the proposed route. The woodland of Blair Estates (Crow Grove) approximately 300m from the proposed works was deemed suitable for bat roosts and feeding. This is reflected in the results obtained from the NBN, previous Stage 2 survey and results in the current study.

10.4.77 Mature trees at the location of the proposed roundabout to the south of Highfield (Habitat 3 on Figure 10.4) were identified as having low roosting potential. An underpass on the railway line located to the north of the proposed crossing point (Habitat 2 on Figure 10.4) was identified as having medium potential for roosting bats. There are a group of four dead trees (Habitat 1 shown on Figure 10.4) which have been identified as having medium to high bat roosting potential. Trees on the railway line embankments where the viaduct crossing is proposed were identified as having potential for feeding and commuting bats.

Dusk Transect

10.4.78 A single dusk transect was walked across the survey area; undertaken by two experienced ecologists using a single Anabat SD1 bat detector. Details of the methodology used can be seen in the guidance discussed by Mitchell-Jones & McLeish (2004) and in the Bat Survey Good Practice Guidelines (BCT, 2012).

10.4.79 The transect survey was undertaken from 30 minutes prior to sunset until 2 hours after sunset (details of sunrise and sunset times were collected from http://www.sunrisesunsetmap.com). During the survey, notes were taken and a national grid reference (NGR) noted when calls were recorded. This allowed species activity to be mapped across the transect. The dusk transect survey took place on the 16th August 2012. The route of the dusk transect is shown in Figure 10.4.

10.4.80 In summary, soprano pipistrelle *Pipistrellus pygmaeus* and common pipistrelle *P. pipistrellus* bats were recorded during the dusk transect along the hedgerows in the survey area. More bats were recorded toward the Blair Estate (southern side) of the transect; this could possibly be due to the abundant feeding to be had on the edge of the woodland. Most records were recorded to the western end of the survey area. However, this could be due to the onset of rain during the survey rather than bat activity being more prolific in the western end of the survey area. The raw data from the transect is shown in Table 2-3 in Appendix 10.3.

Static Surveys

10.4.81 In accordance with the guidance (Mitchell-Jones & McLeish, 2004) and BCT (2012), three static surveys were undertaken over the months of August, September and October 2012. These surveys were undertaken using two Anabat SD1 bat detectors (automated recording equipment). The locations of the static Anabat surveys are shown in Figure 10.4

10.4.82 Areas thought to support bat activity were identified and Anabats were used to record bat activity over a period of three nights (the Anabats were set to record as follows: dusk (30 minutes before sunset until 2 hours after sunset) and dawn (2 hours prior to sunrise until 30 minutes following sunrise). Sunset and sunrise times for the survey dates were obtained from http://www.sunrisesunsetmap.com. The locations and dates of the static Anabat surveys are shown in Table 1-1 in Appendix 10.3.

10.4.83 Full results from the static surveys are shown on Appendix 10.3.

Stoopshill (NS 30427 48895)

10.4.84 Soprano pipistrelle and common pipistrelle are by far the most common species to be recorded at this location, with Soprano being recorded more frequently that common pipistrelle. A single pass made by a noctule spp was recorded at Stoopshill Farm. When weather conditions are optimal, significant bat activity was recorded (up to 1200 calls in a single night). In general, the first bats do not appear until approximately 30 minutes after sunset. As pipistrelle and noctule species are early emerging species, this would suggest that there are no roosts in close proximity to the Proposed Scheme. When bats are active through the night (activity was suppressed due to poor weather), activity is recorded up until / several minutes after sunrise.

Railway Line (NS 29767 48295 / NS 29812 48265)

10.4.85 Although bat activity was lower at the railway line than at Stoopshill Farm, activity patterns recorded at both sites was similar. Soprano pipistrelles and common pipistrelles most common, with soprano pipistrelles being recorded significantly more often that common pipistrelle. Two Noctule spp. calls were made on a single evening, suggesting that the species is present but uses the route infrequently. Given the timings of the earliest and latest calls recorded at the railway line, it is unlikely that an

active roost is located within close proximity to the proposed route. Similar to Stoopshill, results were affected by weather with poor weather suppressing bat activity.

Highfield (NS 30852 50010)

10.4.86 Bat activity recorded was very low at this location. Given bat activity at other locations within the survey area, it is considered likely that bat activity at Highfield is generally higher than recorded during the current studies. Although recorded at low levels, bat activity showed similar traits to those recorded at Stoopshill and the railway line in that bats were first recorded around 30 minutes after sunset with latest calls recorded approximately an hour prior to sunrise. Similar to the other two sites, soprano pipistrelle dominates over common pipistrelle. No noctule spp. were recorded at Highfield.

Conclusions

10.4.87 Previous surveys and current surveys show that bat activity is present throughout the survey area. However, due to the nature of the survey area, the habitat present is used for feeding and commuting (mainly tree-lines and hedgerows). With limited roosting potential in the area (lack of suitable structures/ trees) and no bat roosts identified, all activity observed was related to foraging and commuting.

10.4.88 The presence of bats is considered to be of intrinsic biodiversity value at no more than the County scale.

Aquatic Survey

10.4.89 Several walk-over surveys were undertaken between 24th July and 12th October, 2012. Due to complexities in arranging land access and adverse weather conditions affecting water levels, it was necessary to stagger the surveys over this extended period to allow all areas to be fully accessed and surveyed.

River Habitat Survey

10.4.90 River Habitat Surveys (RHS) were completed for the watercourses in the survey area that demonstrated geomorphological diversity; the River Garnock and Caaf Water. The reaches surveyed are indicated on Figure 10.5. The results obtained from the RHS surveys were utilised to calculate the Habitat Quality Assessment (HQA) and Habitat Modification Score (HMS). From this, the corresponding Habitat Modification Class (HMC) is derived. Both watercourses were deemed to be significantly modified.

Watercourse Classification

10.4.91 Watercourse classification is discussed with the Phase 1 habitats in paragraphs 10.4.29 to 10.4.32. The River Garnock and Caaf Water are valued at no more than the District scale while unclassified watercourses within the survey area are valued a no more than the Local scale.

Aquatic Plants

10.4.92 As discussed in section 10.4.34 and 10.4.35, aquatic flora within the watercourses in the field survey area was sparse; a single record of river grimmia *Schistidium rivulare* was found in the River Garnock. No aquatic macrohpytes were found in the Caaf Water or Coalheughglen Burn.

10.4.93 The species identified are common nationally and locally, are not identified in any BAP or identified as being of conservation concern and are therefore of intrinsic biodiversity value at less than local scale only.

Benthic Invertebrates

10.4.94 Benthic Invertebrates were collected from four points throughout the survey area, as indicated on Figure 10.5. The samples were sorted, identified and assessed using the River Invertebrate Classification Tool (RICTS) to allow the calculation of Environmental Quality Ratios (EQR) to be calculated for NTaxa (species diversity) and ASPT (pollution sensitivity). This permitted classification of the species communities under the WFD. For a full explanation, please see section 1.3.3 in the Aquatic Ecology Technical Appendix.

10.4.95 Three sampling points were on the River Garnock (one at the confluence with the Caaf Water). For species diversity (under the WFD), EQR NTaxa ranged from *Bad* to *Moderate*, with EQR ASPT recorded as *High* at all three survey locations. Although diversity was relatively low, the species found have a low tolerance to pollution and demand high water quality to survive. The sample collected on the Coalheughglen Burn was analysed similarly. EQR NTaxa was rated as *Bad* while EQR ASPT was calculated as *Good* suggesting the populations of the Coalheughglen Burn are not diverse but are slightly more tolerant to pollution than those communities surveyed in the River Garnock.

10.4.96 As none of the species identified within the field survey area are legally protected, identified on the UK or Local BAP or listed as being of conservation importance, the benthic invertebrate composition for the watercourses has an intrinsic biodiversity value at no more than the Local scale.

Fish

10.4.97 Assessment of the composition, abundance and age class of fish using electrofishing techniques was undertaken by the Ayrshire Rivers Trust (ART). Electrofishing surveys (see Appendix 10.5) were undertaken at a total of three sites; two sites on the River Garnock and one site on the Caaf Water. The location of these is shown on Figure 10.5.

10.4.98 The results from surveys where fish densities were classified according to the Scottish Fisheries Co-ordination Centre (SFCC) Scottish national classification scheme (Godfrey, 2005). This was then compared to previous surveys undertaken either at the same location or from a similar location within the watercourse.

10.4.99 In general terms, numbers of trout (both 0+ (salmonid species less that 1 year old – referred to as fry) and 1++ (salmonid species at least 1 year old – referred to as parr)) in the River Garnock and Caaf Water are very low with the classification ranging from *Poor* to *Absent* on the Caaf Water and *Very Poor* to *Absent* on the River Garnock. Historical data shows similar results to the current surveys.

10.4.100 The population of salmon fry (0+) are classified as *Excellent* under the SFCC classification scheme. It should also be noted that between the historical surveys and the current survey on the Caaf Water, it would appear that the salmon fry population is improving (*Moderate* in 2003, *Good* in 2006 and *Excellent* in 2012). However, site variability (latest surveys undertaken at a similar not identical site to previous surveys) may be a factor on the results. Classification records for salmon in the Garnock have

been recorded from *Excellent* to *Very Poor* under the SFCC classification scheme highlighting how variable recruitment success can be. It should be noted that the latest surveys records salmon populations between C (*Moderate*) and E (V*ery poor*).

10.4.101 Both the Caaf Water and River Garnock are both classified under the WFD with the River Garnock designated under the FFD. Given the range of values achieved under the SFCC classifications, salmonid populations are considered to have an intrinsic biodiversity value at no more than the County scale.

Conclusions

10.4.102 The aquatic surveys provide results typically associated with developed watercourses; significantly modified, low aquatic macrophyte populations and a benthic invertebrate population containing species which are tolerant to higher levels of pollution (*Gammaridae, Haliplidae, Oligachaeta* and *Sphaeriidae*).

10.4.103 Fish fauna surveys highlight the Caaf Water as being a strong salmon nursery area (fry numbers classified as *Excellent* under the SFCC classification system. Salmon populations at the other sites are not so strong (Moderate to Very Poor). Numbers of trout recorded during the current surveys (and historically) are very low (SFCC; *Poor* to *Absent*).

10.4.104 However, the River Garnock is classified under the WFD and designated under the FFD. Consequently, measures would be taken to protect the watercourse and receiving watercourses.

Breeding Birds

10.4.105 As discussed and agreed with SNH (Table 10-1), full breeding bird surveys were not deemed necessary as part of the assessment.

10.4.106 The southern end of the study area (where the Proposed Scheme crosses the River Garnock) offers the most habitat potential for breeding birds, with extensive wooded areas within Blairland Bing Wildlife Site and numerous mature trees and areas of dense scrub along the railway line and the river itself. These areas are likely to support an assemblage of common and woodland species, while the riparian habitat offers potential for species such as kingfisher *Alcedo atthis*, dipper *Cinclus cinclus* and grey heron *Ardea cineria*. Many common species typical of these habitats were seen and heard during other surveys, including common buzzard *Buteo buteo*, great tit *Parus major*, blue tit *Cyanistes caeruleus*, chaffinch *Fringilla coelebs*, wren *Troglodytes troglodytes*, blackbird *Turdus merula*, song thrush *Turdus philomelos*, chiffchaff *Phyloscopus collybita*, goldfinch *Carduelis carduelis* and grey heron.

10.4.107 The Scottish Ornithological Society provided a written response in August 2012 to the request for further information on bird species within the study area. It their response they stated that they did not possess detailed records for the study area, and that overall the Proposed Scheme did not cause them serious concern. However, the SOC response highlighted the presence of kingfisher on the river Garnock, a species listed under Schedule 1 of the WCA 1981, and an Amber list Species of Conservation Concern.

10.4.108 Although suitable kingfisher nesting habitat was noted along the banks of the Garnock, no kingfisher were observed during the current surveys. The Scottish Ornithological Society also advised of the presence of sand martins *Riparia riparia*, another Amber list

species. Incidental observations in May 2012 noted the presence of sand martin using the banks of the River Garnock close to the proposed crossing point on the river. Later surveys in this area could not confirm the presence of this species or any burrows, although spate conditions in July would have rendered any burrows temporarily uninhabitable. Both species have been recorded by SOC members as nesting within the study area in recent years on both the River Garnock and the Caaf Water.

10.4.109 The Scottish Ornithological Society also made reference to dipper present on adjacent stretches of the River Garnock. Individuals of this species were observed during the current studies.

10.4.110 The habitat in the central and northern parts of the route is generally of less value to breeding birds than the southern end, since the predominant habitat type is open field with improved grassland. There are, however, numerous hedgerows and some small field margins which offer limited nesting habitat for common and farmland species, as do the small numbers of mature broadleaf trees also present. These trees are mainly found towards the northern end of the study area at Highfield, where there area also limited areas of scrub. The areas of woodland adjacent to the study area offer nesting and foraging potential for common, farmland and woodland species. The farm buildings at Stoopshill also offer potential nesting opportunities for various species including owls. Incidental observations of species noted during other surveys included, common buzzard, great tit, chaffinch, wren, blackbird, song thrush, goldfinch and sparrowhawk *Accipiter nisus*.

10.4.111 The Stage 2 environmental assessment (MFJV, 2008) recorded a heronry to the south west of Highfield, located in woods adjacent to the existing A737 at NS 303 498. There was also a large rookery recorded in this area at NS 305 500. It had been noted that the rookery had become disused mid-season, possibly as a result of illegal persecution. No evidence of either the heronry or the rookery were observed during the current surveys. Given that the current surveys started early July during the breeding bird season, it is unlikely that either of these locations is currently being used. As such, no further consideration would be given to these sites.

10.4.112 In accordance with IEEM (2006), and following the Ratcliffe criteria (1977), the common species assemblage likely to be found using the range of habitats within the study area can be considered to be populations/ assemblages of species that appreciably enrich the biodiversity resource within the local context. Consequently, their presence is therefore considered to be of intrinsic biodiversity value at no more than the Local scale.

10.4.113 In contrast, the presence of sand martin and kingfisher on the River Garnock and Caaf water, both of which are Amber listed as species of unfavourable conservation status in Europe, are of greater intrinsic biodiversity value. Additionally, kingfisher are a Schedule 1 species listed under the WCA 1981. The presence of kingfisher and dipper are therefore considered to be of intrinsic biodiversity value at no more than the Regional scale.

10.5 Predicted Impacts

10.5.1 The predicted impacts are provided in a tabulated format below; a general approach is initially discussed followed by a more habitat and species specific appraisal.

10.5.2 Table 10.6 shows potential impacts upon the ecological receptors present in the survey area prior to any specific mitigation. The impact magnitude and significance of effect are then determined in Table 10.7.

Table 10.6 General Potential Impacts of the Scheme Prior to Mitigation

Impact	Phase	Description and Potential Effects	Ecological receptors
Direct loss and fragmentation of significant ecological receptors	Construction	Within the scheme habitats such as, wetland, woodland, grassland and scrub and offsite (such as storage compounds and access routes). Fragmentation of habitats bisected by the route.	- UKBAP habitats - On-site habitats - Protected species - UKBAP species
Degradation of significant ecological receptors	Construction	This could affect ecological receptors through: 1) Habitat degradation may, unintentionally, result from the construction activities including: - Compaction and disturbance through movement of vehicles; - Storage of materials; and - Spillage of contaminants (including concrete, fuels, oils and lubricants).	- UKBAP habitats - On-site habitats
		2) Exposure of the topsoil and subsoil may increase the amount of sediment run-off into watercourses. There may also be a higher risk of contaminant release into watercourses due to the presence of heavy vehicles and machinery disturbing the topsoil. Particularly sensitive areas include those in the vicinity of rivers and other watercourses. All of the areas of interest bisected or immediately adjacent to the works could be vulnerable.	- On-site habitats
		3) Increased airborne pollution during construction Enhanced concentrations of airborne pollution, i.e. dust from construction works may degrade the surrounding areas of important habitat such as the semi-natural ancient woodlands.	- Statutory protected sites within 5km of the route - Non-statutory protected sites adjacent to the route - UKBAP habitats - On-site habitats

Impact	Phase	Description and Potential Effects	Ecological receptors
Degradation of significant ecological receptors (contd.)	Operation	4) Increased airborne pollution during operation Enhanced concentrations of airborne pollution from increased traffic volumes may degrade the surrounding areas of important habitat.*	- Statutory protected sites within 5km of the route - Non-statutory protected sites adjacent to the route - UKBAP habitats - On-site habitats
		(5) Increased waterborne pollution during operation Enhanced concentrations of waterborne pollution from increased traffic volumes may degrade the surrounding areas of important habitat.*	- Statutory protected sites within 5km of the route - Non-statutory protected sites adjacent to the route - UKBAP habitats - On-site habitats

* Given the distance that each of the designated sites are located from the area of the proposed works and the lack of key source to receptor pathways, it is not considered that the Proposed Scheme would have an impact on any of the designated sites.

10.5.3 Table 10.7 below describes the predicted impacts upon the ecological receptors present within the survey area, the magnitude of the impact and its significance of effect prior to any mitigation.

Table 10.7 Specific Potential Impacts of the Scheme Prior to Mitigation

Receptor	Impact Characterisation	Impact Magnitude / Significance (prior to mitigation)
Designated Sites	Airborne and waterborne pollution as a result of construction and operation of the Proposed Scheme.	A minor negative impact at the International scale is ***extremely unlikely.***
Plant Communities	The majority of vegetation along the scheme corridor consists of intrinsically low value improved grassland. There is likely to be direct loss of some areas of UK BAP Priority Habitat vegetation, including hedgerows comprised of predominantly native species and marshy grassland / swamp vegetation to the south of Blairland Bing. The wetland area to the south of Blairland Bing, however, is very small and fragmented, with more valuable wetland areas further north, within the Wildlife Site, which would not be affected by direct habitat loss.	A minor negative impact at the Local scale (direct loss of UK BAP Priority Habitat vegetation) is ***near certain.***
Broad-Leaved woodland (semi-natural and plantation)	Clearance of woodland along either side of the railway line to facilitate construction of the viaduct.	A minor negative impact at the Local scale is ***near certain.***
Coniferous Plantation	Would not be affected by the proposed works.	***Neutral***
Mixed Plantation Woodland	Would not be affected by the proposed works	***Neutral***
Scrub	Scrub located between the railway line and the River Garnock is likely to be removed to facilitate construction of the viaduct.	A minor negative impact at the Local scale is ***near certain.***
Improved Grassland	This is the dominant habitat within the survey area. The proposed route of the works would pass through Improved Grassland.	A minor negative impact at the Local scale (direct loss of UK BAP Priority Habitat vegetation) is ***near certain.***
Marshy Grassland	An area of marshy grassland to the southwest of Stoopshill farm (near the centre of the survey area) as well as the area lying between the railway line and the River Garnock would be affected by the proposed works.	A minor negative impact at the Local scale (direct loss of UK BAP Priority Habitat vegetation) is ***near certain.***
Arable	Would not be affected by the proposed works.	***Neutral***
Hedgerows	Hedgerows crossing the proposed route would be severed.	A minor negative impact at the Local scale (direct loss of UK BAP Priority Habitat vegetation) is ***near certain.***

Receptor	Impact Characterisation	Impact Magnitude / Significance (prior to mitigation)
Japanese knotweed	The only stands of Japanese knotweed recorded during the 2012 NVC surveys were located to the north of Blairland Bing Local Wildlife Site, outside the proposed works areas. As such it is unlikely that this species would be disturbed and spread as a result of construction or clearance activities.	***Neutral***
Watercourses	Construction Pollution could result from the proposed work which could result in a reduction in the classification of watercourses under the WFD.	Construction A major negative impact at the District level is ***unlikely.*** Such an impact, if it occurred, would be potentially in breach of law. Works potentially impacting upon watercourses is strictly controlled through The Water Environment (Controlled Activities) (Scotland) Regulations 2011.
	Operation Road pollution could result from road traffic accidents / tanker spills / lorry spills which could result in a reduction in the classification of watercourses under the WFD.	Operation A major negative impact at the District level is ***unlikely.***
Otter	Construction Otter are present throughout the area surveyed. There is suitable habitat along the River Garnock and the Caaf Water. Therefore, although there would be no loss off suitable otter habitat there is potential for temporary disturbance of otter and otter commuting routes, including potential disturbance whilst breeding due to the works and pollution risk. There is no evidence of otter on other watercourses where culverting is required.	Construction A minor negative impact at the Regional level is ***probable*.** Such an impact, if it occurred, would be potentially in breach of law, as otter are a European Protected Species (EPS) and are fully protected through inclusion in Schedule II of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).
	Construction There is the potential for works to result in temporary severance of otter habitat.	Construction A minor negative impact at the Regional level is ***unlikely.***
	Operation There is a risk of otter road casualties once the proposed road is in operation.	Operation A moderate negative impact at the Regional level is ***extremely unlikely.***

Receptor	Impact Characterisation	Impact Magnitude / Significance (prior to mitigation)
	Operation Road pollution could result from road traffic accidents / tanker spills / lorry spills, which could impact the watercourses and food availability for otter.	Operation A moderate negative impact at the Regional level is ***unlikely.***
Badger	Construction During construction there is potential for animals to be killed or injured.	Construction A moderate negative impact at the Local level County level is ***unlikely.*** Such an impact, if it occurred, would be potentially in breach of law, as badger receive protection through the Protection of Badgers Act 1992 (as amended).
	Operation Although there would be no severance of habitat considered suitable for badger breeding, there is potential for permanent and temporary loss of suitable foraging habitat. This is likely to represent a relatively minor effect as extensive suitable habitat is available within the survey area and also on adjacent land.	Operation A minor negative impact at the Local level County level is ***unlikely.***
	Operation Risk of badger road casualties once the Proposed Scheme is in operation.	A minor negative impact at the Local level County level is ***unlikely.***
Deer	Construction Deer observed feeding within the survey area. As such, noise, movement and lighting associated with the construction of the proposed development would result in disturbance.	Construction A minor negative impact at the Local Level is ***unlikely.***
	Operation Deer were observed feeding within the survey area. As such, noise and movement of traffic using the bypass would result in disturbance.	Operation A minor negative impact at the Local Level is ***unlikely.***
	Operation Potential for increased deer road mortality (following completion of scheme) due to increased vehicular movements.	Operation A minor negative impact at the Local Level is ***unlikely.***

Receptor	Impact Characterisation	Impact Magnitude / Significance (prior to mitigation)
Bats	Construction Temporary severance of a major commuting route would occur at the railway line to facilitate construction of the viaduct.	Construction A significant negative impact at the County level is ***probable***.
	Construction There is potential that artificial lighting during nights works (if required) could disturb or prevent bats using regular commuting routes or foraging areas. This could potentially sever habitats for bats.	Construction A moderate negative impact at the County level is ***probable***.
	Construction Potential for severance of habitat used by commuting bats.	Construction A minor negative impact at the County level is ***probable***.
	Operation Continued severance of bat commuting routes, i.e. no mitigation.	Operation A significant negative impact at the County level is ***near certain.***
Red Squirrel	Not thought to be within the study area.	No effect
Water Vole	Not thought to be within the study area.	No effect
Fish	Construction Sedimentation and pollution resulting from the proposed works. Sedimentation could impact upon suitable spawning habitat reducing recruitment and potentially having an adverse effect on the salmonid population of the River Garnock. In addition to having an adverse effect on the classification under the WFD (see below), heavy impact upon the watercourse could effect the designation of the River Garnock as a salmonid watercourse under the FFD. A reduction in water quality could impact upon all fish species.	Construction A major negative impact at the County level is ***possible.*** Such an impact, if it occurred, would be potentially in breach of law. Atlantic salmon, brown trout and freshwater fish receive protection through the Salmon and Freshwater Fisheries Act 1975.
	Operation Road pollution could result from road traffic accidents / tanker spills / lorry spills, which could result in a reduction in the classification of watercourses under the WFD.	Operation A major negative impact at the County level is ***unlikely.***

Receptor	Impact Characterisation	Impact Magnitude / Significance (prior to mitigation)
Aquatic Invertebrates	Construction Sedimentation and pollution resulting from the proposed works. This could potentially alter benthic invertebrate populations as a result of degraded water quality.	Construction A major negative impact at the County level is ***unlikely.*** Works potentially impacting upon watercourses is strictly controlled through The Water Environment (Controlled Activities) (Scotland) Regulations 2011.
	Operation Sedimentation and pollution of watercourses in the survey area could cause a reduction in the quality of the watercourses under the WFD.	Operation A minor negative impact at the County level is ***unlikely.***
Breeding Birds	Construction Loss of nesting habitat due to construction of the scheme. This is likely to represent a relatively minor effect as breeding bird habitat is widespread and less disturbed nesting habitat is available on adjacent land.	Construction A moderate negative impact is ***probable.*** It is an offence to disturb active nests during the breeding birds season (March – July inclusive).
	Operation Landscaping (aesthetic purposes) of the local area would provide nesting and foraging habitat for local bird assemblages.	Operation A moderate positive impact is ***probable.***

10.6 Mitigation

10.6.1 Table 10.8 below describes the mitigation recommended to alleviate the above predicted impacts upon the ecological receptors as a result of the Proposed Scheme.

Table 10.8 Ecological Mitigation

Ecological Receptor	Mitigation
Plant Communities	The minor negative impact on plant communities within the scheme corridor is primarily due to direct habitat loss of vegetation which are defined as UK BAP and Ayrshire LBAP Priority Habitat types. Those habitat types that are likely to suffer direct habitat loss include hedgerows, lowland fen and purple moor-grass and rush pasture. The design of the road would therefore incorporate measures to compensate for areas of lost UK BAP Priority Habitat. Where hedgerows are removed, similar linear lengths of new hedgerow would be planted adjacent, or as near as possible to the new road to restore any links potentially severed in these habitat corridors, and create new linkages with existing habitat. This would require the creation of hedgerows along the verges of the new road and additional planting to restore degraded sections of existing hedgerows. Where planting is used, appropriate species of local genetic provenance would be used where practicable. A landscaping strategy is illustrated in Figures 9.36a to 9.36e and shows indicative locations for new hedgerow planting. The loss of the small area of marshy grassland (approx. 0.19 ha) would be offset by the creation of new SuDS (sustainable drainage system) features along the route of the new road. These would be suitably planted where appropriate to create new areas of habitat and enhance the biodiversity of the surrounding local area. A combination of conservation grassland and a grass and wildflower mix, with some wet woodland planting would be implemented. Typical species would include: Common Knapweed, Meadow Cranesbill, Greater Bird's-foot trefoil, Jointed rush, Water mint, Yellow Flag Iris, Ribwort Plantain, Meadow Buttercup, and Chewings Fescue and Smooth-Stalked Meadow Grass. This mix reflects some of the riparian / aquatic species recorded during the 2012 NVC survey. In the long term, any loss of mature trees which may result during the construction phase would be mitigated by planting new native trees to enhance existing areas of woodland and ultimately to create new woodland areas. Where road safety and visibility considerations do not require the use of amenity turf on road verges, wildflower seed mixes would be planted on verges to create species-rich grassland habitat. The above mitigation and enhancement would be subject to a monitoring strategy as part of the contractors standard landscape maintenance requirements.
Otter	Field evidence suggests that an EPS license would not be required to carry out the works. Pre-construction surveys would be undertaken immediately prior to the construction of the scheme to assess whether there are any changes in the otter activity in the study area. An appropriately qualified ecological clerk of works (ECoW) would be appointed during the construction phase to oversee any intrusive works taking place within close proximity of the River Garnock, with a watching brief to identify and highlight any new field signs which may subsequently be detected and to develop an appropriate course of action if new evidence identified. Plant, equipment and exposed ground excavations left unattended / uncovered overnight can result in animals becoming trapped and/or injured. Therefore, any open trenches during operations would be covered at the end of each day or mammal ramps would be positioned in such a way that trapped mammals

Ecological Receptor	Mitigation
	can escape. Habitat loss and clearance for construction would be limited to the minimum area necessary for works, and site compounds would be located sensitively in relation to potential otter habitat, namely watercourses and associated riparian habitat. In order to minimise disturbance to otter night-time works would be avoided within 50m of the River Garnock where possible. All construction debris would be removed from site once the works are completed, and any disturbed areas would be reinstated to their original condition or enhanced. Site storage compounds containing chemicals, oils and fuels would be appropriately bunded and carefully sited away from watercourses. In addition, all waste would be appropriately managed. Where the temporary loss or degradation of potential otter habitat is unavoidable, it would be restored to its original quality or enhanced following completion of works. Any planting required during habitat restoration and enhancement would use native species of local genetic provenance where practicable, or encourage natural re-colonisation using soft engineering methods such as willow spilling and coir matting to provide bank stability. Emergent vegetation would be encouraged and existing tree root systems would be retained where practicable. If a holt, couch or sprainted lay-up is found during the construction phase, an immediate halt would be brought to works and ecological advice sought. A licence would be required to proceed with works 250m of a natal holt or 30m of other holts, couches or lay-ups. <u>Recommendation</u> The use of otter tunnels and associated otter proof fencing adjacent to the Coalheughglen Burn (or a mammal ledges integral to culverts) to allow otter to pass safely under the newly constructed roads at Highfield is recommended. As no adverse impact on any otter commuting routes is predicted in this area (no evidence of otter using the watercourse), mitigation is not required. The provision of tunnels is therefore a method of enhancement. The preferred option is to provide separate tunnels for otter passage, although mammal ledges within culverts can be used. Tunnels/ledges and fencing would be designed and constructed in line with current specifications and standards (refer to DMRB Volume 10).
Badgers	Pre-construction surveys would be undertaken immediately prior to the construction of the scheme to assess whether there are any changes in the badger activity in the study area. Plant, equipment and exposed ground excavations left unattended / uncovered overnight can result in animals becoming trapped and/or injured. Therefore, any open trenches during operations would be covered at the end of each day or mammal ramps would be positioned in such a way that trapped mammals can escape. Habitat loss and clearance for construction would be limited to the minimum area necessary for works and site compounds would be sited sensitively in relation to badger habitat, namely woodland, scrub and dense cover. Where temporary loss or degradation of farmland (generally improved grassland used for grazing cattle) that provides suitable habitat for badger (foraging) during construction is unavoidable, an agricultural seed mix would be applied to reinstate grazing land.

Ecological Receptor	Mitigation
	All construction debris would be removed from site once the works are completed, and any disturbed areas reinstated to their original condition or enhanced. If a badger sett or recent excavations are found during construction, work would cease immediately and ecological advice sought. There are time restrictions and licence requirements for works within proximity to badger setts.
Deer	Plant, equipment and exposed ground excavations left unattended / uncovered overnight can result in animals becoming trapped and/or injured. Therefore, any open trenches during operations would be covered at the end of each day or mammal ramps would be positioned in such a way that trapped mammals can escape. Warning signs would be erected on the new road advising drivers of the presence of deer in the local area and a potential increased possibility of RTA's involving deer.
Bats	No bat roosts were identified along the proposed route of the scheme. However, it has been noted that as part of the current works, some trees (with limited roost potential for bat roosts) may be felled. If trees are to be removed, surveys would be undertaken prior to removal (using endoscopic equipment if trees are deemed to have bat-roost potential). The Proposed Scheme is likely to have an adverse impact in terms of permanently disturbing some feeding / commuting routes whilst only temporarily disturbing others. Recent surveys combined with the current surveys have shown that bats use the hedgerows throughout the survey area as commuting and foraging routes; in the correct environmental conditions they are heavily used. Where the new viaduct (road-bridge) would pass over the existing treeline along the railway line at the south of the site, removal of a number of mature trees is likely to be necessary to permit access for heavy plant. This loss of trees may affect the use of this habitat corridor which is used as a bat commuting and foraging route. The loss of mature trees would be minimised wherever practicable. There are other suitable foraging and commuting routes present in the survey area which would be used as alternate foraging / commuting routes during the construction period and bats may still use the River Garnock corridor. During the construction phase artificial trees or other eco-location focal points (for example spoil filled bags) placed at regular intervals along the route where trees are removed) would be used to provide a temporary 'bridge' across the de-vegetated area to encourage its continued use by bats. Reinstatement of the area once construction is complete would provide a vegetated corridor and provide the opportunity for use as a bat foraging / commuting route. Reinstatement would also maintain the adjacent scrub with additional tree planting with the intention of linking any breaks in the canopy and under-canopy. Such mitigation would increase feeding opportunities for bats as well as increasing foraging and nesting opportunities for breeding birds. Continued use of the route would be further encouraged by incorporation of bat bricks (appropriate to the species recorded) into the viaduct (road bridge) structure in this area to provide roosting habitat. Where installation of road furniture and lighting of the viaduct is required directly above the habitat corridor below, lighting would be positioned

Ecological Receptor	Mitigation
	sensitively to avoid light pollution of this corridor. This may discourage some bat species from crossing the road and the risk of reduce mortality. Habitat creation would be used to mitigate breaks in habitat corridors: ▪ Creation of 'hop-overs' to encourage continued use of habitat corridors where they would be severed by the proposed works. These would link to remaining hedgerows and newly planted hedges to create new habitat corridors. Artificial 'trees' would be used initially to maintain commuting corridors and would later be planted with suitable native species. The locations of proposed hop-overs are shown on Figures 9.36a to 9.36e. ▪ At some locations for the proposed hop-over's, new planting is restricted to a single side of the proposed road as either existing features are present on the other side or the new road embankment is at a height such as to allow a continuous commuting corridor. ▪ The creation of areas of species-rich grassland would also attract insects providing foraging opportunities for bats. Monitoring (bat surveys) of commuting routes (railway line and proposed hop-over's) during and after the construction of the scheme would allow the effectiveness of the mitigation measures to be quantified. Surveys would be undertaken by qualified ecologists and with the use of automatic bat detectors (anabats) placed at select locations during the months of April and September inclusive (i.e. when bats are active) throughout the construction period. Data would be collected on a monthly basis and compared to initial survey data and between subsequent data sets to monitor efficiency of the proposed mitigation. During scheme operation, automatic bat detectors would be placed at the same locations for one week every 6 months in the first 5 years post-construction.
Red squirrel	Not thought to be within the study area.
Breeding birds	Breeding and nesting birds are protected through the breeding season (April to July inclusive). As such, works requiring vegetation clearance and tree felling/lopping would be undertaken outwith the breeding season where possible. If this is not possible, an ECoW would be employed to supervise construction when it involves clearance of vegetation or removal of a structure (such as a hedge) that may be used by breeding birds. If an active nest is observed during construction, work would cease immediately and advice sought from the ECoW. Habitat creation: ▪ As part of the planting scheme, large-seeded hedgerow species of local genetic provenance such as hawthorn, blackthorn and rowan would be planted to provide feeding opportunities and increase the value of the habitat to breeding birds. Where species poor-hedges are present, this planting would also increase their general biodiversity value.
Aquatic Environment	In planning and carrying out any work in or near an appropriate watercourse or water body, precautions must be taken to ensure their complete protection against pollution, silting and erosion. All works would be undertaken in compliance with best working practices including SEPA Pollution Prevention Guidelines: General Guide to the Prevention of Pollution (PPG 1); Works and Maintenance in or Near Water (PPG 5); Working at Construction and Demolition Sites (PPG 6); and Pollution Incident Response Planning (PPG

Ecological Receptor	Mitigation
	21). Good construction working practices would be adopted, in accordance with the following SEPA guidelines, to mange pollution risks to the water environment: ▪ SEPA's Good Practice Guides (WAT-SG-23, WAT-SG-25, WAT-SG-26, WAT-SG-28, WAT-SG-29), ▪ WAT-SG-31: SEPA Special Requirements for Civil Engineering Contracts for the Prevention of Pollution Engineering in the Water Environment, and ▪ WAT-SG-32: SEPA Guidance on the Special Requirements for Civil Engineering Contracts Engineering in the Water Environment. All appropriate watercourses and water bodies likely to be affected by works are to be identified in the detailed construction planning stage and added to the relevant plans and the CEMP. Agreement to be sought with SEPA on pollution and siltation prevention measures, strategy and emergency procedures for all construction stages. This would include the protection of watercourses and water bodies by planning all drainage including the run-off from access tracks and watercourse crossings. Any increase in the suspended solids entering the system can have significant consequences on fish fauna in the main-stem channels. It is essential that any sediment resulting from the proposed works would be strictly controlled to avoid any detrimental impact upon the ecology of the receiving watercourses. Water quality monitoring would be undertaken throughout the works; use of in-stream sediment monitors / periodic benthic invertebrate sampling throughout the works (baseline level of benthic invertebrates to compare future samples against). In addition to the PPG's discussed above, the following measures are recommended to ensure that sedimentation resulting from the proposed works is kept to a minimum: ▪ Compliance with all environmental mitigation and any SEPA / SNH agreements to be covered by the Environment team/site contractor. ▪ Design and construction methodology for the works would take account of the nature of the watercourses within the study area and their importance for sensitive aquatic flora and fauna. ▪ Sediment control barriers erected parallel to the banks of the River Garnock (e.g. straw bales and/ or silt fencing). These would intercept any runoff of silty water, and would be correctly maintained to minimise sediment entering the river. Periodic checking and cleaning or replacement of silt barriers would be undertaken to ensure continued functionality and works would not be undertaken during replacement. Similarly, straw bales would be fixed in place and regularly replaced, particularly when signs of deterioration in integrity are evident. ▪ CAR Licensing would be obtained as appropriate.
Japanese knotweed	Given the location of the Japanese knotweed recorded, it is unlikely to require removal. However, if removal is deemed necessary, the contractor would consult with SEPA in regard to its removal. It is an offence to release this into the wild, or not disposed of in the correct manner. It is a controlled waste in the terms of Section 34 of the Environmental Protection Act 1990. Invasive Species can be controlled or disposed of on site (burned or by burying under at least 5m of soil to avoid re-infestation). However, if plant material or soil polluted with this species is sent for disposal elsewhere it must

Ecological Receptor	Mitigation
	be accompanied by appropriate Waste Transfer documentation and disposed of in a licensed, lined landfill site. Landfill sites, and hauliers, would need advance warning of several days to deal with this hazard.

10.7 Residual Effects

10.7.1 Table 10.9 below indicates the residual effects upon ecological receptors once the mitigation described in Table 10.8 above has been implemented. No significant effects are predicted in terms of nature conservation.

Table 10.9 Residual Effects

Ecological Receptor	Ecological Impact	Residual Effect
Plant Communities	Loss of habitat	Not significant
Otter	Disturbance to otter	Unlikely
Badgers	Damage or destruction of badger setts (that may not have been recorded during the current surveys) Injury (fatal or otherwise to individuals) Loss of foraging habitat	Unlikely
Deer	Disturbance during and post construction. Potential for increased deer road mortality due to increased vehicular movements.	Still a risk of road casualties.
Bats	Potential for severance of habitat used by commuting bats. This is likely to have a minor effect on bats as the habitats are unlikely to be completely severed. Disturbance and or prevention of bats using regular commuting routes or foraging areas.	Limited risk that bats do not use the hop-over planting (BCT, 2007) and commuting routes become severed.
Red squirrel	Not thought to be within the study area.	N/A
Breeding birds	Loss of nesting / feeding habitat Disturbance during nesting season	None
Fish	Sedimentation: Loss of spawning habitat Chemical pollution: -Potential impact upon Salmonid designation of the River Garnock under the FFD. Reduction in water quality: -Loss / death of fish.	None

Ecological Receptor	Ecological Impact	Residual Effect
Aquatic Invertebrates	Sedimentation and pollution; potentially alter benthic invertebrate populations as a result of degraded water quality; Could cause a reduction in the quality of the watercourses under the WFD.	None
Japanese knotweed	Unlikely to be removed or disturbed.	Neutral