Scottish Executive

A82 Rannoch Moor and Glen Coe Bridge Replacements

Bà Bridge NVC Extended Habitat Survey

2006

As of 12 August, Babtie Group became part of the Jacobs group of companies and is now known as Jacobs Babtie

1 Introduction

1.1 General Background

1.1.1 Bà Bridge is located at National Grid Reference NN 309494, spanning River Bà as part of the A82 running approximately south east to north west from Tyndrum to Ballachulish on the way to Glen Coe.

1.1.2 The Scottish Executive (Transport Scotland) is proposing to replace Ba Bridge in Rannoch Moor (Figure 1) as it is beyond economic repair. The bridge over the River Ba is located in a designated Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and neighbours a Special Protection Area (SPA) to the east. The scheme proposal is to replace the existing Ba Bridge, and to strengthen and widen it. The new bridge will be placed on the alignment occupied by the existing Ba Bridge but it will be of a different design. The new bridge will cross the watercourse in three spans using the two existing intermediate piers as central supports. These shall be taken down by approximately 1 m. New reinforced concrete abutments shall be constructed behind the existing masonry abutments to minimise the construction activity adjacent to the watercourse.

1.1.3 During the construction phase, traffic would cross the River Bà via a temporary bridge constructed adjacent to the existing bridge. The online nature of the proposed scheme is likely to minimise many long-term impacts that may occur during the construction phase of the scheme.

1.1.4 The aim of this report is to provide an assessment of the ecological impacts of the proposed scheme on the habitats and species surrounding Bà Bridge. The report includes baseline information, obtained through consultation and field survey, regarding the nature and extent of habitats surrounding Bà Bridge. Following the ecological evaluation of these habitats, potential impacts are characterised and their significance predicted. Appropriate mitigation measures are proposed to alleviate these impacts and the significance of any residual impacts following the implementation of mitigation is predicted.

1.1.5 The study area for this survey comprises all land located within a 100 m radius of the existing Bà Bridge.

1.2 Ecology Background

1.2.1 Scoping was carried out in order to identify the key ecological issues to be addressed in the appraisal. A major part of the scoping included consultations with statutory and non-statutory bodies. The main consultees who responded on nature conservation issues are listed below:

- Scottish Natural Heritage, SNH;
- Scottish Executive;
- The Highland Council;
- Scottish Environment Protection Agency, SEPA;
- National Trust for Scotland; and

- Royal Society for the Protection of Birds, RSPB.

1.2.2 A search was also undertaken to identify any statutory and non-statutory sites designated for nature conservation value within or adjacent to the site. Evaluation of species and habitats was achieved with reference to European and National designations including local and national Biodiversity Action Plans.

1.2.3 Following the recommendations of these consultations an NVC Habitat Survey and a water vole (*Arvicola terrestris*) and otter (*Lutra lutra*) survey were performed. A survey for a freshwater protected invertebrate species was also undertaken and the results are presented in confidential appendix D. Other key species known to be present but not individually surveyed are included in the evaluation and assessment of the appropriate habitat section. Mitigation for these species is also included.

1.3 Legal Status of Habitats

1.3.1 Semi-natural habitats are conferred legal protection through international and national statutes. These recognise the ecological value of the habitats and provide protection or promote policies that guide their conservation.

1.3.2 European Union Directives created a network of protected areas around the European Union of national and international importance. They are called 'Natura 2000' sites. 189 habitats listed in Annex I of the Directive and the 788 species listed in Annex II, are to be protected by means of a network of sites. Special Areas of Conservation (SACs) are designated under The European Union Habitats Directive and Special Protection Areas (SPAs) are designated under The European Union Wild Birds Directive.

1.3.3 Nationally important sites are designated as Sites of Special Scientific Interest (SSSIs) in England, Scotland and Wales and conferred protection under various statutes including the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004.

1.3.4 The Nature Conservation (Scotland) Act 2004 requires Scottish Ministers to publish a list of habitats and species considered to be of principal importance for biodiversity. In addition the Act requires that all public bodies have an obligation to further biodiversity in the course of carrying out all their public duties.

1.4 Legal Status of Species

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

1.4.2 The British water vole population suffered a steady decline throughout the 20th Century owing to habitat destruction and agricultural intensification. This decline has been

rapidly accelerated in recent years, through predation by feral American mink (Mustela vison). Abundant mink can easily wipe out a water vole colony, therefore mink presence will render areas of potentially suitable water vole habitat unsuitable.

1.4.3 The water vole was afforded protection under the Wildlife and Countryside Act 1981 (as amended) when, in 1998, it was added to Schedule 5 in respect of Section 9 only. This legal protection makes it an offence to intentionally damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection, or to disturb water voles while they are using such a place.

1.5 Biodiversity Action Plans

1.5.1 The UK Biodiversity Action Plan (BAP) is the UK government's response to the Convention on Biological Diversity. As part of the UK and other BAPs (including local BAPs), Habitat and Species Action Plans (HAPs and SAPs respectively) have been developed to guide conservation action for the ecological feature concerned. The presence of a HAP or SAP reflects the fact that the habitat concerned is in a sub-optimal state and requires conservation action. It does not imply any specific designation or level of importance, but establishes a framework for the conservation of the habitat and identifies current factors causing loss and decline of that feature. Furthermore, implementation of BAPs, whether at the UK or local level, is perceived as a fundamental requirement for public bodies to meet their obligations under the relevant national legislation.

1.5.2 The UK Biodiversity Action Plan (BAP) (1994) sets out a programme of action to conserve and enhance biological diversity throughout the UK. Local Biodiversity Action Plans (LBAPs) integrate these measures at the local or regional level (see below).

1.5.3 The UK Biodiversity Steering Group publishes individual action plans for 45 priority habitats and some 400 of our most threatened and endangered species. Priority Habitats are those habitats that are particularly important or that are vulnerable to habitat loss and damage and for which conservation action should be targeted.

1.5.4 Both otter and water vole are identified for priority action under the Biodiversity Steering Group (United Kingdom Biodiversity Partnership 2005) and the ensuing national Species Action Plan.

1.5.5 In addition to the national Biodiversity Action Plans a series of local plans have been developed throughout Scotland. The Rannoch Moor area falls within the Argyll and Bute and Perth and Kinross District. The local plans that cover these districts are the LBAP for Argyll and Bute and the Tayside Biodiversity Action Plan. In addition water vole has a SAP under the Argyll and Bute LBAP and is a proposed species for the second tranche of the Tayside BAP.

1.6 Survey Objectives

1.6.1 A National Vegetation Classification (NVC) Habitat Survey and water vole and otter surveys were conducted of the study area to:

- Identify and map the key areas of semi-natural habitat and habitats in use by water vole and otter within the area to be affected by the proposed scheme;
- evaluate the importance of these habitats;
- assess potential impacts upon these habitats following the proposed scheme;
- following these assessments decide which side of the bridge would be more appropriate for a temporary construction; and
- state the residual impacts of the proposed scheme.

1.7 Report Structure

1.7.1 This report provides:

- Background to the survey rationale;
- Methods and results of the NVC Habitat Survey;
- Methods and results of the water vole and otter survey;
- NVC Habitat Map, illustrating the distribution of habitats within the study area. These figures and tables are included at the back of this report;
- An evaluation of the ecological receptors identified during the survey;
- A brief assessment of the likely impacts of the proposed scheme on the ecological receptors identified;
- An outline of proposed mitigation measures for predicted adverse impacts; and
- An assessment of any residual impacts following the implementation of mitigation measures.

2 Survey Methods

2.1 Background to Survey Methods

2.1.1 Individual stands of homogenous vegetation within the study area were identified by the surveyor and assessed by the following method of National Vegetation Classification.

2.1.2 The National Vegetation Classification system (NVC) was commissioned by the old Nature Conservancy Council to provide the first comprehensive and systematic account of the vegetation types of the UK. It covers all natural, semi-natural and major artificial habitats. Where habitat has previously been identified as being of high value or sensitive the NVC is a method widely used for further level of detail than Phase 1 Habitat Surveys provide.

2.1.3 Since its development in the 1980's, the NVC has become the standard method for describing vegetation in Britain, and has been welcomed as providing a standardised language with which the character and value of the vegetation of Britain can be understood. NVC has been accepted as a standard survey method by the nature conservation and countryside organisations, and also by forestry, agriculture and water agencies, local authorities, non-government organisations, commercial and academic sectors

2.1.4 In addition to this detailed botanical survey, the waterways were systematically searched 100m up and downstream of the bridge for water voles and otters.

2.2 Habitat Survey Methods

2.2.1 On the 17th of November 2005, all habitats encountered within 100 m of the existing Bà Bridge were assessed and coded according to the survey methods outlined in Section 2.2 and according to the NVC system (Rodwell 1991). Although this time of year is sub-optimal for conducting vegetation surveys with many species in a state of senescence, identification of the key habitat types and dominant species is still possible by experienced botanists. However, it is likely that early-flowering species and annual species may be underrepresented in surveys undertaken at this time of year. Botanical taxonomic nomenclature follows that of Stace (1997) (except when conflicting with Rodwell, 1991, detailed in Table 8).

2.2.2 The NVC was carried out following the methods outlined in Rodwell (1991). At each NVC location surveyed, 5 quadrats were sampled except where the stand area was very small (< 15 m^2), where 3 quadrats were sampled. A quadrat size of 2 x 2 metres was used as the standard size for the assessment of all habitats, except where the vegetation was linear or too small, where a linear or smaller quadrat size was used (1 x 1 m). Within each quadrat, species abundance was expressed on the Domin scale (Table) which is a variation of the Braun-Blanquet scale (Dahl and Hadac, 1941), a method of describing an area of vegetation. This method provides a quantitative measure of the abundance of plant species recorded in a quadrat. The percentage cover of each species is assessed by eye as a vertical projection on the ground of all the live, aboveground parts of the species in the quadrat.

Table 1 The Domin Scale

% cover	DOMIN value
91-100	10
76-90	9
51-75	8
34-50	7
26-33	6
11-25	5
4-10	4
>4 with many individuals	3
>4 with several individuals	2
>4 with few individuals	1

2.3 Species Survey Methods

2.3.1 On the 17th of November 2005, watercourses were systematically searched for signs of otter (Chanin 2003a). Signs of otters which were searched for included spraints, footprints, lying-up sites, potential holts or couches, and meal remains. Otters are active throughout the year (Chanin 2003b), but the optimum period to carry out surveys is between May and September, when water levels are less variable (Chanin 2003a).

2.3.2 On the 17th of November 2005 watercourses were also systematically searched for signs of water vole (Strachan 1998). Signs of water voles which were searched for included burrows, runs, footprints, feeding stations, latrines, and faeces. The optimum period to carry out surveys is between April and October, when the likelihood of locating breeding territories is highest (Strachan 1998). In the uplands of Scotland, water voles are often found around watercourses which flow through areas of deep peat with marshy floodplains (Raynor 2005).

2.4 Evaluation of Ecological Receptors and Impacts

2.4.1 The project requires the construction of a temporary bridge on one side of the existing bridge. Due to the nature of the project in addition to the evaluation of the individual habitat types found within the study area the habitats were also divided into quadrants.

- quadrant 1, north of the river and west of the bridge
- quadrant 2, south of the river and west of the bridge
- quadrant 3, south of the river and east of the bridge
- quadrant 4, north of the river and east of the bridge

2.4.2 The value of each site with nature conservation interest was determined by reference to any designations and the results of the consultations, literature review and field surveys. The criteria used to evaluate habitat areas of ecological importance were based on those suggested by the IEEM Draft Guidelines for Ecological Impact Assessment (2003). These criteria assign a level of importance to the habitat area based on whether the ecological value is important at a range of geographical scales,

from being important at a local, parish level to being of international importance. The full details of the general evaluation criteria used are included in Table 2.

Table 2 Evaluation of Ecological Receptors

Site Importance	Site Attributes
International	An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area which meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified; A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; Any regularly occurring population of an internationally important species, which is threatened or rare in the UK. i.e. a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP; A regularly occurring, nationally significant population/number of any internationally important species.
National	A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified; A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see local BAP); A regularly occurring, regionally or county significant population/number of nationally important species; A feature identified as of critical importance in the UK BAP.
Regional	Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur; Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole; Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile; Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation; A regularly occurring, locally significant number of a regionally important species. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county.
Authority Area (e.g. County or District)	Sites that are recognised by local authorities (e.g. SWI and IWC); County/District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR) selected on County/District ecological criteria (County/District sites where they exist, will often have been identified in local plans) A viable area of habitat identified in County/District BAP or in the relevant Natural Area profile; Any regularly occurring, locally significant population of a species which is listed in a County/District BAP on account of its regional rarity or localisation; A regularly occurring, locally significant population of a County/District important species (particularly during a critical phase of its life cycle); Sites/features that are scarce within the County/District or which appreciably enrich the County/ District habitat resource; A diverse and/or ecologically valuable hedgerow network; Semi-natural ancient woodland greater than 0.25 ha.
Local	Areas of habitat considered to appreciably enrich the habitat resource within the local context (survey area, parish or neighbourhood, e.g. species-rich hedgerows, ponds etc). Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution of such habitats within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25 ha.

Site Importance	Site Attributes
Less than Local	Sites that retain habitats that are of limited ecological importance due to their size, species composition or other factors.

2.4.3 For the study area around Bà Bridge, the following evaluation criteria were used to assess the ecological importance of habitat areas:

- **International** – of European importance
- **National** – of UK or Scottish importance
- **Regional Authority**– of Strathclyde or Tayside Region Importance
- **Local Authority** – of importance in Argyll and Bute District and Perth and Kinross District
- **Local/District** – of importance in Rannoch Moor area
- **Local/Parish** – of immediate local area importance only

2.4.4 The assessment of the impacts of the proposed works has considered both the magnitude of the impacts and the sensitivity of the ecological receptors. The sensitivity of a feature was determined with reference to its level of ecological importance although other elements have been taken into account where appropriate.

2.4.5 The magnitude of an impact has been assessed for each element of the development. A definition of the magnitude of impacts is presented in Table 3, which is adapted from guidelines suggested by the IEEM for Ecological Impact Assessment. Impacts are assessed as being either negative or positive, and on a scale ranging from Major Negative through to Major Positive.

Table 3 Magnitude of Impacts on an Ecological Receptor

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

2.4.6 The significance of the predicted impacts is assessed by considering the evaluation of the importance of the ecological receptor to be affected with the assessment of the magnitude of the impact itself. The significance of impacts has been determined

according to the system illustrated in Table 4. Impact significance greater than or equal to moderate would require mitigation to be undertaken to ameliorate the impact significance to acceptable levels. Impacts can be beneficial or adverse, either improving or decreasing the ecological status, health or viability of a species, population or habitat.

Table 4 Significance of Ecological Impacts

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

3 Survey Results

3.1 Survey Area Overview

3.1.1 The results of the NVC Habitat Survey are presented in Figure 1, which maps all habitats within the study area: defined by land within a 100 m radius of the existing bridge. Species composition of NVC quadrats are detailed in Table 7. A summary of the ecological characteristics and general land use of the study area is included below, along with an evaluation of the habitat areas identified during the survey. A species list of all species recorded during the survey is included in Table 8.

3.1.2 The Bà Bridge study area is located within a landscape that is dominated by the River Bà that flows into Loch Bà in a west-east direction. The bridge is between Loch Bà (east of the bridge) and Lochan na Stainge (to the west of the bridge). The A82 passes from Bridge of Orchy through Rannoch Moor and Glen Coe to Fort William. Rannoch Moor is an extensive previously glaciated plateau surrounded by uplands; it represents the most extensive complex of western ombrogenous blanket bog and soligenous/valley mire in Britain. It is of particular importance for its range of northern mire types. The site also contains a range of open water habitats in the form of lochs and lochans. Rannoch Moor is the only remaining British locality for a nationally rare vascular plant species, Rannoch-rush (*Scheuchzeria palustris*), and contains several other nationally and locally rare plant species.

3.2 Designated Sites

3.2.1 Bà Bridge is within Rannoch Moor Special Area of Conservation (SAC), Rannoch Moor is also a Ramsar site, a Site of Special Scientific Interest (SSSI), a National Nature Reserve and a National Scenic Area (NSA). Two water bodies within the SSSI, Loch Bà and Loch Laidon, support part of an internationally important breeding population of black-throated divers. Together with other lochans outside the boundary of Rannoch Moor SSSI they contribute to the Rannoch Lochs Special Protection Area (SPA). River Bà and Loch Bà are also are all in the upper reaches of the Tay river system, and are part of the River Tay SAC. The area is subject to grazing pressure from cattle and deer. The grazing pressure is lower in the wetter areas. There is no management plan for the area; deer stalking and fishing take place on the lochs, without the need for permit on Loch Bà and Lochan na Stainge.

3.2.2 The area has been designated for a variety of reasons. Rannoch Moor was primarily designated as a SAC and Ramsar site due to its large areas of blanket bog (an Annex I Habitat under the European Habitats Directive), which supports a population of the exclusively local Rannoch-rush. Other habitats that are qualifying features of the SAC include transition mires and a range of oligotrophic to mesotrophic and dystrophic lochs. These standing water bodies support vegetation such as least water-lily (*Nuphar pumila*), water lobelia (*Lobelia dortmanna*) and floating bur-reed (*Sparganium angustifolium*).

3.2.3 Habitats that are qualifying but not primary factors in the site designation include the Annex I Habitats: Northern Atlantic wet heath with cross-leaved heath, European dry heath and Depressions on peat substrate of the *Rhynchosporion*.

3.2.4 Black-throated divers breed on the network of lochs and are a qualifying feature for the SSSI and the Rannoch Lochs SPA. Annex II Species that are qualifying factors for SAC designation are otters and fresh water pearl mussels that utilise the rivers (and lochs for otters). Surveying, evaluation and mitigation for the protected freshwater aquatic invertebrates is being given individual consideration and is presented in a separate document.

3.3 Evaluation of Key Habitats

3.3.1 The study area was predominantly comprised of wet heath habitat. This habitat is extremely variable, its composition depending upon the topography of the local area. Detailed descriptions of the nature of this and other habitats are presented in the following sections and are mapped on Figure 1. Species composition is detailed in NVC Table 8. A detailed appraisal of the ecological value of the key habitats identified during the survey is included below, the evaluation based on the information in Table 2.

3.3.2 The whole of the study area around Bà Bridge comprises semi-natural habitats that are of considerable ecological value, with the whole site lying within the Rannoch Moor SAC and SSSI. These designations recognise the importance of the Rannoch Moor area at an international and national level. Although the study area surveyed represents a small proportion of the whole of the Rannoch Moor area, it is important that the evaluation of the ecological receptors in the study area considers the integral importance of the habitats as well as their value in the wider context of the whole SAC.

Open and Running Water Habitats

3.3.3 Loch Bà and Lochan na Stainge are to the east and west of the bridge respectively. The River Bà flows into Loch Bà and meanders with Lochan na Stainge. The open water bodies are oligotrophic to mesotrophic and contain high quality habitat with vegetation typical of nutrient-poor conditions such as water lobelia, bulbous rush (*Juncus bulbosa*) and least water-lily. Rivers and burns and standing open water are Tayside LBAP habitats as are freshwater lochs and flowing waters under the Argyll and Bute LBAP.

3.3.4 All waters host important populations of salmonids upon which the life cycle of the protected freshwater invertebrate species depends. The protected freshwater invertebrate occupy the river bed and their evaluation and impact prediction is dealt with in an additional document. Atlantic salmon is listed in Annexes II and V of the European Union Habitats Directive as a species of importance to the UK. Atlantic salmon (*Salmo salar*) are protected under the Salmon and Freshwater Fisheries Act 1975, supplemented by the Salmon Act 1986 and have a species plan under the UK BAP and under the Argyll and Bute LBAP. Blackmount Estate allows fishing on these waters without permits. The waters are heavily utilised by a variety of birds for breeding and roosting. A pair of Annex I Species (and Argyll and Bute LBAP species) black-throated divers *(Gavia arctica)* attempt to nest by the loch most years but often fail due

to disturbance by people fishing (RSPB, consultation response). In addition, otter, although largely coastal in this area, are known to use the loch and river areas. Around 200 of the bigger lochs in Scotland were last classified by SEPA in 2000. Loch Bà was monitored and it was designated as class 1 (excellent) – 'lochs not significantly altered by human activity'. The two water bodies are qualifying factors in the SSSI designation of Rannoch Moor and impact upon the River Tay SAC and Rannoch Loch SPA. Therefore these water bodies and the River Bà are evaluated as being of **International** importance.

Semi-improved acid grassland verges along the A82

3.3.5 Along the roadside embankments and on either side of the lay-by located to the north of the existing bridge, there are areas of grassland habitat, limited to a few metres in width. These are generally species-poor and are considered to be oligotrophic to mesotrophic in nutrient status due to their species composition and sward condition. The verges support semi-improved acid grassland and most closely resemble NVC community: **U2 *Deschampsia flexuosa*** grassland. It comprised abundant to frequent common bent (*Agrostis capillaris*) and wavy hair-grass (*Deschampsia flexuosa*) with occasional viviparous fescue (*Festuca vivipara*), purple moor-grass (*Molinia Caerulea*), mat grass (Nardus Stricta), and soft rush (Juncus effuses). Ribwort plantain (*Plantago lanceolata*) was frequent, while tormentil (Potentilla erecta), heath bed-straw (*Galium saxatile*), dog violet (*Viola canina*) and barren strawberry (*Fragaria vesca*) were occasional. This habitat regularly forms a mosaic with wet heath in the drier soils within the area. These grasslands are degraded due to grazing and pollution from vehicles due to their proximity to the road. They do however offer valuable habitat for invertebrates and small mammals and are therefore evaluated as being of **Local** importance.

Wet Heath Habitats

3.3.6 Wet heath is the dominant habitat throughout the study area surrounding the bridge. The area is characteristic of the NVC community: **M15 *Scirpus cespitosus – Erica tetralix* wet heath with a typical sub-community**. North Atlantic wet heath with Cross-leaved heath (*Erica tetralix*) is a protected habitat under Annex I of the European Habitat Directive. Under this Directive, the designation of areas of wet heath as Special Areas of Conservation is required. Upland heath is also a priority habitat under the Tayside LBAP. In general, the M15 community is characterised by a wide variation in associated species and in the pattern of species distribution and dominance. In the study area, purple moor grass was the most consistent species in this community type but it shares dominance with heather (*Calluna vulgaris*) in the drier areas and deer grass (*Scirpus cespitosus***)** in the wetter areas. Cross-leaved heath is a community constant with occasional crowberry (*Empetrum nigra*) and Bilberry (*Vaccinium myrtillus*). Bearberry (*Vaccinium vitis-idea*) was also occasionally found in the drier areas of the site. Common species in the study area include tormentil and heath bedstraw, with bog asphodel (*Narthecium ossifragum*) and common cotton-grass (*Eriophorum angustifolium*) typical of wetter stands. Wet heath has a range of species very similar to that of blanket bog, but bryophytes are less dominant in this vegetation type than ericoids. *Sphagnum* mosses are present in the study area, particularly red bog-moss (*Sphagnum capillifolium*) and occasional blunt-leaved bog moss (*Sphagnum*

palustre); woolly back moss (*Racomitrium lanuginosum*) is also abundant in slightly drier areas. There is some movement of mildly base-rich water through the peat resulting in the appearance of sedge species such as carnation sedge (*Carex panicea*). Bog-myrtle (*Myrica gale*) is a species that favours flushing and is abundant throughout the area. The quality of this habitat varies throughout the site as it has suffered from grazing pressure, primarily from deer and has undergone periodic burning. Due to the degradation of these habitats, they are assessed as being of **Regional** ecological importance. Areas of good quality wet heath are evaluated as being of **National** importance. Further evaluation of the study area is completed on an area by areas basis in the subsequent sections.

Bog Habitats

3.3.7 Although the area is predominantly wet heath, there is a small patch of bog that has affinities with two communities and is considered to be a transition between NVC community:**M19 *Calluna vulgaris- Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community** and **M20 *Eriophorum vaginatum* blanket and raised mire species poor sub community** (Figure 1). Blanket bog is a protected habitat under Annex I of the European Habitat Directive and is a national Biodiversity Priority Habitat in the UK BAP. It is a primary qualifying habitat for Rannoch Moor SAC. **M20 blanket mire** comprises species poor ombrogenous bog vegetation dominated by Hare's tail cotton-grass (*Eriophorum vaginatum***)**, the tussocks of which form a closed canopy 10-30 cm high. The dominance of hare's tail cotton-grass and absence of cloudberry (*Rubus chamaemorus*) is characteristic of **M20 species poor communities**. However, common cotton-grass, purple moor-grass, and ericoid sub-shrubs were occasional and red bog-moss and papillose bog-moss (*Sphagnum papillosum*) were frequent. Broom fork-moss (*Dicranum scoparium*) was rare. This community is characteristic of ombrogenous peats on bogs where management has greatly affected the vegetation; grazing by deer and past burning have degraded this community which is at present midway between **M19** and **M20**. This community has been seen to revert to the vegetation characteristic of the less degrade blanket bog community **M19 blanket mire** within 25 years of enclosure. Although degraded this community has the potential for recovery therefore this habitat is evaluated as being of **Regional** importance.

3.3.8 Another bog habitat present is that of NVC community: **M3 *Eriophorum angustifolium* bog pools**, (no sub-communities) grid references for the larger of these are presented in the subsequent sections evaluating each area. Swards of common cotton-grass are dominant here and other vascular species and *Sphagnum* spp. are only locally frequent. The stands of cotton-grass were dense and approximately 40 cm in height. The *Sphagnum* spp. papillose bog-moss and feathery bog-moss (*Sphagnum cuspidatum*) were the only other frequently occurring species with occasional deer grass and bog pond-weed (*Potamogeton polygonifolius*) also present.

3.3.9 This community is typically found as small stands on barer exposures of acid raw peat soils in depressions, erosion channels or shallow peat cuttings on a wide range of mire types. Here it was found in natural hollows and in areas of erosion. The community is particularly associated with the eroded blanket mire in the north-west of Britain, and is a common feature in tracts of **M19** and **M20** communities. This community may represent a seral stage in the redevelopment of active mire vegetation following disruption. As a

potential pioneer stage in a priority habitat this is evaluated as being of **Regional** importance.

3.3.10 Along the edge of the river on both sides there is a 2 to 3 m strip of NVC community: **M25 *Molinia Caerulea – Potentilla erecta* mire, with the *Erica tetralix* sub-community**; this habitat is dominated by purple moor-grass with occasional wavy hair-grass, its dominance an indication of high grazing pressure. The associated flora is poor, and was restricted to occasional tormentil, devil's-bit scabious (*Succisa pratensis*), barren strawberry and heath rush (Juncus squarrosus). Ericoid sub-shrubs were occasional, particularly heather and cross-leaved heath. Bog myrtle was also extensively spread throughout the area. This mire is a community typical of moist, but well aerated, acid to neutral peats and peaty mineral soils in the wet and cool western lowlands of Britain. It occurs over gently-sloping ground, marking out seepage zones and flushed margins of sluggish streams, water-tracks and topogenous mires, but also extends onto the fringes of ombrogenous mires. Although both climate and soils influence the composition of the vegetation, treatments such as burning, grazing and drainage are likely to be largely responsible for the development of this community over ground that would naturally carry some other kind of mire or wet heath vegetation. Grazing pressure by deer would seem to be the driving factor behind the development of this community at Rannoch Moor. Although this community is of poor species diversity there is potential for this habitat to recover. It is evaluated as being of **Regional** importance.

Woodland Habitats

3.3.11 There are two small areas of woodland within the study area in addition to scattered downy bitch and grey willow (both in quadrant 3, south of the river and east of the bridge). The NVC community: **W4 Betula pubescens – *Molinia caerulea* woodland with the *Sphagnum* sub-community** is a small area on the land to the south of the river and east of the bridge surrounded by Loch Bà (approximately 15m^2 at NN 31000 49505). These woodlands are typical of moist, moderately acidic, though not necessarily highly oligotrophic, peaty soils. It is characteristic of thin or drying ombrogenous peats which are isolated from the influence of base-rich or eutrophic ground waters. Downy birch is the most dominant woody species and they formed an open canopy of well-spaced individuals. There were no other tree species. The ground flora was dominated by purple moor-grass with frequent blunt-leaved bog moss. Heather and cross-leaved heath were occasional as was bog myrtle, which was frequent throughout the area. This area is valuable to bird species that nest in trees. This area although small is therefore evaluated as being of **Local** importance.

3.3.12 There was a small willow carr (approximately 5m^2) beneath the bridge dominated by grey willow which had greatest affinity with the NVC community: **W1 *Salix cinerea – Galium palustre*** woodland (there are no sub-communities). The ground flora here is more species-rich than the **W4** woodland with neutral grassland species and ground flora with some typical woodland characteristics. This is typically a community of wet mineral soils on the margins of standing or slow-moving water and in moist hollows, mainly in the lowlands. It often occurs as a narrow fringe or as scattered fragments around ponds and lakes as in this case. The canopy is dominated by older, slightly moribund trees covered in fruticose lichens of the genera *Ramalina* and *Usnea*. The

ground layer comprised a diverse range of grasses, rough meadow-grass (*Poa trivialis*), cock's-foot (*Dactylis glomerata*), tufted hair-grass (*Deschampsia cespitosus*), common bent and brown bent (*Agrostis canina*) were frequent with wavy hair-grass and purple moor-grass becoming increasingly dominant on the edges and outwith the willow carr area. The herb layer comprised frequent meadow and creeping buttercup (*Ranunculus acris* and *R. repens*, respectively), black knapweed (*Centaurea nigra*), ribwort plantain, common mouse-ear (*Cerastium fontanum*) and red clover (*Trifolium pratense*). The presence of buttercup and clover species (more common in improved and arable grassland) may indicate disturbance from the original bridge building. Wood anemone (*Anemone nemoralis*) and sweet cicely (*Myrrhis odorata*) was rare. The moss layer contained the woodland mosses swan's-neck thyme-moss (*Mnium hornum*), glittering wood-moss (*Hylocomium splendens*) and common tamarisk-moss (*Thuidium tamariscinum*). Springy turf-moss (*Rhytidiadelphus squarrosus*), an acid grassland indicator, was also present. This area although small is evaluated as being of **Local** importance.

3.4 Evaluation of Key Species

3.4.1 Although no signs of otters were found during this survey it is not possible to determine that the otter population is of no ecological importance, a survey undertaken by Jacobs Babtie in October 2004 recorded a couch 25 m downstream from the bridge with fresh spraint upstream and concluded that otter are passing under the bridge. Due to their international legislation otters are species of **International** importance. There were no water voles found on the main banks of the River Bà although the previous year burrows were found further up stream on some smaller tributaries these are species of **National** importance.

3.5 Evaluation of Habitats by Area

Quadrant 1, Wet Heath Habitat North of River Bà and West of the A82

3.5.1 The area is undulating land with bog pools in the depressions and inundations from the river and Loch na Stainge. The inundations and pools are filled with papillose bog-moss and common cotton-grass. Red bog-moss is the dominant moss throughout the site with frequent blunt leaved bog-moss and papillose bog-moss. Woolly bog moss is frequent in the drier, heather dominated areas. There is a large bog pool (5m in diameter at NN 30786 49524) filled with common cotton grass and deer grass. By the river banks there are grey willow and a few scattered downy birch. There are areas with denser and older stands of heather than others. There is grazing pressure by deer and droppings were in evidence throughout the site. There is an earth bank (2.5 m high by 6 ms across NN 30842 49527) upon which the greater drainage has lead to a thicker stand of heather with bilberry. The verges on the embankment slopes were characteristic of acid grassland. This area is a mosaic of wet heath, mire and bog pool communities. There has been degradation due to grazing but the area may recover. This area is evaluated as being of **Regional** importance.

Quadrant 2, Wet Heath Habitat South of River Bà and West of the A82

3.5.2 The vegetation on the south of the river is similar to that on the north with frequent bog pools and inundations. One of these inundations is approximately 2 m width (at NN 30917 49418) and filled with papillose bog moss and common cotton-grass. There is an earth bank approximately 2 m high and 4 m wide (at NN 30902 49402) dominated by heather, grazing pressure has resulted in areas of bare earth and an increase in frequency of heath rush. This area is evaluated as being of **Regional** importance.

Quadrant 3, Wet Heath Habitat South of River Bà and East of the A82

3.5.3 This area of habitat is a projection bordered on three sides by Loch Ba. There are two small areas of woodland, a small willow carr by the verge under the bridge (approximately 5 m^2) and stand of downy birch (approximately 15m^2 at NN 31000 49505). The bank side area of the river and loch consisted of rank grassland dominated by purple moor grass and categorised as purple moor-grass mire. In the middle of the area the habitat changes into blanket bog dominated by hare's tail-cotton grass tussocks. There is a raised banked area to the south of the quadrant where the soil is drier and a denser stand of ling dominated wet heath habitat has developed. Cross-leaved heath and bearberry is frequent in this area with occasional billberry and crowberry. This is the area of the loch where black-throated divers have attempted to nest. This factor in addition to the priority habitat of blanket bog (although degraded) and the presence of two small stands of trees determines the evaluation of this habitat as being of **National** importance.

Quadrant 4, Wet Heath Habitat North of River Bà and East of the A82

3.5.4 There is a 0.5 m wide drainage channel running north-south parallel to the road. The area is wet heath dominated by heather, with crowberry and cross-leaved heath. There is a patch of vegetation dominated by deer grass, similar in size to the hare's tail cotton-grass area on the opposite side of the river. Bog asphodel is frequent throughout these areas as is woolly back-moss and red bog-moss. Grazing pressure appears to be lower in this area and this has resulted in denser stands of heather. As a fine example of wet heath this area has been evaluated as being of **National** importance.

3.6 Recommendation of Area for Temporary Bridge Construction

3.6.1 In view of the evaluation of the banks west of the current bridge as being of **Regional** importance and those on the east side of the bridge being of **National** importance, it is proposed that the temporary bridge be situated on the west side. One of the criteria also being that the construction would be further away from the black throated divers breeding sites. However, reference to the appraisal for protected freshwater aquatic invertebrates must be in accordance with this appraisal for the evaluation to be confirmed.

4 Impact Assessment

4.1 Introduction

4.1.1 The range of ecological impacts on the receptors associated with a development scheme is dependent on the individual characteristics of each development. In general, impacts can be referred to as direct impacts, where the proposal, either during a construction or operational phase, results in a direct change to the status of an ecological receptor. For example, habitat loss due to land-take, or loss of animals due to road mortality can be referred to as direct impacts. In addition, indirect effects of developments relate to secondary effects of the proposal. For example, fragmentation of habitat units can cause effects on local populations.

4.1.2 Generic impacts associated with road developments have been identified in the Design Manual for Roads and Bridges and include:

- Temporary habitat loss through construction;
- Small permanent habitat loss through land-take;
- Severance or fragmentation of existing habitat areas;
- Mortality of animals on roads;
- Hydrological disruption;
- Pollution via road drainage, run-off and spray from road traffic;
- Physical obstruction caused by road constructions and bridges;
- Visual and light pollution caused by road lighting;
- Air pollution;
- Disturbance during construction.

4.1.3 A summary of the generic impacts that are predicted to occur regarding the proposed scheme (detailed in Section 1) as a whole are summarised in Table 5. Specific impacts as they relate to the ecological habitats identified along the route of the proposed scheme are discussed in the following sections and summarised in Table 6.

Table 5 Summary of Generic Impacts of the Proposed Scheme on Habitats near Bà Bridge

Generic Impact	Effects in the Bà Bridge study area
Direct Habitat Loss	The proposed works involve the replacement of the existing bridge with a bridge at the same location. The permanent loss of habitats associated with the proposed scheme is likely to be minimal in terms of scale and significance and be restricted to the areas adjacent to the existing carriageway. Construction of the temporary bridge and roadway would result in the temporary loss of habitat along this route. In addition, a small area of habitat (approx 5 m^2) would be lost on the west bank of the river where a support pillar would be required.
Severance or fragmentation of existing habitat areas	No additional severance or fragmentation of existing habitat areas is predicted as a result of the proposed scheme, due to the online design of the replacement bridge.
Physical obstruction caused by road constructions and bridges	No physical obstruction of existing habitat areas is predicted as a result of the proposed scheme, due to the online design of the replacement bridge.
Hydrological disruption	Wetland habitats, including mires, blanket bog and wet heaths are susceptible to impacts from developments that affect the hydrological regimes of those habitats. Temporary impacts may result from the construction of a temporary roadway across existing semi-natural habitats to the north of the existing A92.
Pollution via road drainage, run-	Pollution during the operational phase of the replacement bridge is likely to be

Generic Impact	Effects in the Bà Bridge study area
off and spray	similar to existing levels. During construction, however, run-off of construction materials onto semi-natural habitats may result in adverse impacts to these habitats.
Visual and light pollution	No visual and light pollution impacts on existing habitat areas is predicted as a result of the proposed scheme, due to the online design of the replacement bridge.
Air pollution	Air pollution is not predicted to be increased during the operation of the replacement bridge. During the construction phase, however, particulate deposition of material arising form construction materials may result in limited impacts close to the construction site.
Disturbance during construction	Disturbance to habitats in the proposed road corridor and in adjacent habitat areas is likely during construction and due to the presence of temporary site compounds.

4.2 Assessment of Potential Ecological Impacts on Key Habitats

Open and Running waters

4.2.1 There is a possibility of Loch Bà, Lochan na Stainge and River Bà being indirectly affected by the construction due to siltation, spray and runoff. Silt causes permanent damage to fish, invertebrates, insects and plants and build up may cause flooding. Water containing silt should never be pumped or allowed to flow directly into a river, stream or surface water drain. Concrete and cement are very alkaline and corrosive and runoff can have a highly polluting impact on watercourses. A lay-by off the A82 passes close to the western tip of the loch and north of the bridge, use of this lay-by for the site compound is under consideration. Such usage as a site compound or for storage of construction material could potentially result in pollution impacts from run-off and road drainage if material were to be deposited close to the loch side. Disturbance to breeding bird species during construction may prevent successful breeding.

Semi-improved acid grassland verges along the A82

4.2.2 Part of the verges will be lost due to construction of the temporary bridge. This is a **Medium Negative** impact upon a **Local** value receptor, significance of the impact is therefore **Minor**. The lower end of the embankments may avoid major habitat loss but suffer disturbance due to construction, and increased pollution as a result of construction activity, drainage and run-off. This is a **Low Negative** impact upon a receptor of **Local** value, the significance of the impact is therefore assessed as being **Minor**.

Wet Heath Habitats

4.2.3 Only a small permanent habitat loss is proposed for the replacement bridge through a small increase in hard standings this is considered to be a **Low Negative** effect upon a **Regional** to **National** value receptor resulting in an impact of **Minor** to **Moderate** significance. However, construction of the temporary bridge may result in a more substantial temporary habitat loss in an environment where recovery is slow. Additionally, the habitat may suffer from physical disturbance due to construction and increased pollution as a result of spray and run-off. Furthermore, the riverside areas of wet heath may be subject to pollution events that affect the river, including hydrological

disruption and water-borne particulate pollution. This is a **Medium Negative** impact upon a **Regional** to **Nationally** valuable habitat. Therefore, the overall significance of the impacts of the proposed scheme are assessed as being **Moderate** to **Major**.

Mire and Blanket Bog Habitats

4.2.4 Mire habitats are widely distributed through the study, along the river edge, in undulations among the wet heath and one localised patch in quadrant 4. Areas of habitat outwith the construction footprint will not directly be affected by the proposed development although again could suffer from disturbance due to construction, and increased pollution as a result of construction activity, drainage, spray, particulate deposition and run-off. Additionally, as before, the riverside areas of mire may be subject to pollution events that affect the river, including hydrological disruption and water-borne particulate pollution. Although these mire and bog habitats are ombrotrophic, generally relying on atmospheric precipitation rather than surface drainage, they would be potentially affected by pollution events during construction. Therefore, the overall impacts of the proposed scheme are assessed as being of **Medium Negative** magnitude upon receptors of **Regional** importance. The significance of the impact is therefore evaluated as being of **Moderate** significance.

Woodland Habitats

4.2.5 If the construction of the temporary bridge was to take place on the eastern side of the present bridge the willow carr woodland may be lost. This is a **Medium Negative** impact upon a receptor of **Local** value resulting in an impact of **Minor** significance. If the proposed temporary bridge is constructed on the west side of the bridge there would be a **Neutral** impact upon the willow carr and a **Low Negative** impact upon the scattered willow and birch due to pollution during construction from particulate deposition and spray. This would result in an impact of **Minor** significance.

4.3 Assessment of Potential Ecological Impacts on Key Species

4.3.1 Otters may be disturbed indirectly during construction and directly through pollution incidences. These impacts would be **High Negative** on an **Internationally** important receptor and therefore of **Major** significance. If water vole were present in the area similarly they may suffer a **High Negative** impact on a **Nationally** important receptor and therefore also of **Major** significance.

5 Mitigation and Residual Impacts

5.1 Generic mitigation

5.1.1 Mitigation is an integral part of the design and planning of a scheme. It is important to note that the proposed scheme is a result of an iterative design process and some mitigation measures have been incorporated into its development. For example, the online alignment of the proposed upgrading incorporates mitigation measures to avoid adverse impacts associated with large-scale loss of semi-natural habitats.

5.1.2 Within the context of Ecological Impact Assessment, mitigation is one of a hierarchy of measures that are undertaken to prevent or reduce adverse impacts:

- **Avoidance**: measures taken to avoid or prevent adverse impacts, e.g. scheme layout; timing of site works.
- **Mitigation**: measures taken to reduce adverse impacts, e.g.: retaining walls; pollution interceptors.
- **Offsetting**: measures taken to offset significant adverse impacts, i.e. those that cannot be entirely avoided or reduced to the point that they become insignificant: for example, habitat creation or off-site enhancement.

5.1.3 In section 4.1.2 above, generic impacts associated with road construction were assessed (Table 5), with a summary of those impacts likely to occur throughout the whole study section identified in Table 6.

5.1.4 The following measures should be implemented in order to avoid or mitigate these generic impacts throughout the route corridor during construction and operation of the upgraded motorway.

5.1.5 **Direct Habitat Loss**. The online construction of the replacement bridge would result in only very limited permanent loss of semi-natural habitats. Some temporary loss of habitats would also arise form the construction of the temporary bridge to the north of the construction site. Neither of these impacts are considered to result in significant adverse impacts. However, additional damage to adjacent habitats should be minimised during construction by adopting best practice construction procedures that limit movements of heavy machinery and restrict access to adjacent areas. In areas where semi-natural habitats are located adjacent to the construction site, measures should be taken to ensure that damage or loss of habitats are minimised. Where practical, habitats lost due to bridge widening, or the construction of the temporary bridge, should be restored, using translocated turves, removed prior to construction and stored on site.

5.1.6 **Severance or fragmentation of existing habitat areas**. The proposed scheme is unlikely to result in severance of fragmentation impacts and no further mitigation measures are required.

5.1.7 **Pollution: air, run-off and spray.** Pollution impacts may potentially occur during the construction phase of the proposed bridge replacements, with habitats associated with

the water bodies, including low-lying areas associated with the water bodies such as mire, being particularly vulnerable. Measures to minimise such pollution impacts should be implemented into the design and construction of the scheme. For example measures aimed at intercepting run-off pollution, such as filter drains, soak-aways, infiltration trenches and oil separators should be implemented to reduce run-off. It is also essential to ensure that the use of wet concrete and cement in or close to any watercourse is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment. The use of quick setting mixes may be appropriate. During the construction phase, SEPA pollution prevention guidelines (particularly PPG 5) should be strictly adhered to.

5.1.8 **Visual and light pollution.** The proposed scheme is unlikely to result in impacts from increased visual and light pollution and no further mitigation measures are required.

5.1.9 **Disturbance during construction**. If any habitat clearance is required for the proposed scheme, it should be undertaken outside the bird breeding season. All trees and scrub removal should be undertaken under the guidance of an onsite ecologist. Construction should be done outwith the period May to July, inclusive, to minimise disturbance to breeding birds on the loch and lochan. Work near to or affecting watercourses will not be performed between October 15th and May 15th to avoid potential damage to redds and alevins.

5.1.10 Demarcation of areas where water vole or otter activity is recorded within 50 m of any construction activities during the construction period. Areas will be marked off to prevent disturbance to the riparian zone (to 3 m from bank for water vole and to 5 m from bank for otter) during the construction period.

5.2 Mitigation of impacts to Key Habitats

5.2.1 In section 4 above, it was shown that of the key habitats identified within the study areas, impacts of **Moderate** to **Major** significance could potentially occur in four habitats: wet heath habitats to the west of the current bridge (quadrants 1 and 2), and blanket bog (quadrant 3) mire habitats (riparian zones in all quadrants), and the water bodies (all quadrants). In the case of wet heath and mire habitat, the most vulnerable areas are located along the River Bà valley floor, both up and downstream of the construction site, where the habitats would be affected by potential pollution events into the river. Although not present on this surveying occasion, otter are known to use the loch and river and mitigation for their presence during construction must be considered. This equally applies to potential water vole populations.

5.2.2 Small temporary direct habitat loss will be mitigated for by excising and storing of whole turves to be replaced following temporary bridge dismantling. Reinstatement of verges and other structures will be carried out as soon as possible after the completion of construction to maximise the likelihood and speed of regeneration of vegetation. Permanent habitat loss is so small (<5 m^2) as to be deemed insignificant.

5.2.3 Damage to adjacent habitat through construction will be limited by fencing off and avoiding the most sensitive areas and adequate preparation of the areas through which traffic is expected (e.g. the laying of suitable geotextile membranes).

5.2.4 Pollution events should be avoided and reduced in intensity by the strict implementation of SEPA pollution prevention guidelines. Particular efforts should be made to prevent construction materials from entering the river system, and to prevent run-off from the temporary bridge into the river system.

5.2.5 Potential impacts on habitats in Loch Bà may occur if the lay-by adjacent to its western shore is used for storage of construction materials, or as a site compound during the construction phase. Best practice methods will again be followed during the use of this area to ensure storage of materials is off ground level and appropriately covered.

5.2.6 In the unlikely event of a pollution incident occurring resulting in damage to fish stocks, mitigation measures will be employed in accordance with guidance from SEPA to reinstate the habitat and restock with fish if required. Prior to construction it will be necessary to develop a Risk Management Strategy, in agreement with SNH and SEPA, to cover all preventative measures and contingency plans for any such events

5.2.7 Pre-construction otter and water vole surveys of watercourses that may be affected during construction will be performed to confirm use by these species and ensure that construction mitigation measures are appropriately targeted. The surveys will be completed at an appropriate time of year (April to September). The banks will be fenced off in areas of otter (5m from bank) and water vole (3m from bank) activity.

5.2.8 Construction shall not take place during the bird breeding season (May to July inclusive).

5.2.9 Construction shall not take place during October 15th and May 15th to avoid damage or disturbance to redds or alevins.

5.2.10 It is proposed that the eastern side of the bridge is not used for temporary bridge construction. Therefore habitat loss of the willow carr will be avoided.

5.3 Residual Impacts

5.3.1 Following the implementation of the mitigation measures proposed in 5.1 above and 5.2 above, it is predicted that pre-mitigation adverse impacts would be avoided or reduced in significance in most habitat areas in the study area. In areas where habitats were subject to impacts of medium negative magnitude prior to mitigation, adoption of the proposed mitigation measures would result in the significance of the impacts being reduced from moderate to neutral or negligible levels of significance. The summary of the impacts on all habitat areas identified for the proposed scheme is shown in Table 6.

Table 6 Summary of Impacts, and post-mitigation Residual Impacts on Habitat Areas

Habitat Area	Ecological Importance	Impact Magnitude	Significance of Impact	Significance of post-mitigation Residual Impact
Loch Ba, Lochan na Stainge and River Ba	International	High Negative	Major	Negligible
Semi-improved acid grassland verges along A82	Local	Low Negative and Medium Negative	Minor	Negligible
Wet Heath Habitats West of the bridge	Regional	Medium Negative	Moderate	Negligible
Wet Heath Habitats East of the bridge	National	Neutral	Neutral	Neutral
Mire and Blanket Bog Habitats	Regional	Medium Negative	Moderate	Negligible
Willow carr to the east of the bridge	Local	Neutral	Neutral	Neutral
Scattered trees	Local	Low Negative	Minor	Negligible

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Table 7 NVC Record Cards Presenting Species Composition

NVC FIELD SURVEY RECORD CARD **Jacobs Babtie Ltd**		**Other notes:** **M25 *Molinia caerulea* - *Potentilla erecta* mire, *Erica tetralix* sub-community. Found throughout the site along the river banks.**
Site name: Bà Bridge	**Project code:**	
Location: Riparian	**Grid ref of site: all along river bank**	
Date: 17/11/05	**Surveyor name: Martina Girvan**	
Stand area: 2 m wide along riparian zones	**Sample area: 2 x 2 m**	
Layers: mean height **110 cm 30 cm 3 cm mm**		
Layers: cover **100 % 30 % 60 % %**		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Molinia caerulea	10	10	10	10	10	(5-10)	V
Potentilla erecta	4	4	4	4	5	(4-5)	V
Deschampsia flexuosa	4		4		4	(3-4)	III
Myrica gale	4	8		5		(4-8)	III
Nardus stricta		4	4	4		(3-4)	III
Calluna vulgaris	4		4			(2-4)	II
Dicranum scoparium			4		4	(2-4)	II
Narthecium ossifragum		4		4		(2-4)	II
Hypnum jutlandicum				4	7	(2-7)	II
Eriophorum vaginatum		4				(1-4)	I
Fragaria vesca			4			(1-4)	I
Polytrichum formosum					5	(1-5)	I
Scirpus cespitosus	4					(1-4)	I
Sphagnum capillifolium	8					(1-8)	I
Sphagnum papillosum	5					(1-5)	I
Vaccinium myrtillus			4			(1-4)	I

NVC FIELD SURVEY RECORD CARD Jacobs Babtie Ltd		Other notes: M3 *Eriophorum angustifolium* bog pool communities, no sub community. Found on the west side of the bridge in inlets, depressions and inundations.
Site name: Bà Bridge	Project code:	
Location: bog pools and inundations	Grid ref of site: area around NN 30786 49524	
Date: 17/11/05	Surveyor name: Martina Girvan	
Stand area: 2 m in diameter inundations and pools.	Sample area: 2 x 2 m	
Layers: mean height 30 cm 3 cm cm mm		
Layers: cover 100 % 30 % 60 % %		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Eriophorum angustifolium	9	8	8			(8-9)	III
Sphagnum papillosum	5	5	5			(5)	III
Sphagnum cuspidatum		6	6			(6)	II
Scirpus cespitosus		5				(5)	I
Potamogeton polygonifolius	5					(5)	I

NVC FIELD SURVEY RECORD CARD Jacobs Babtie Ltd		Other notes: **M15 *Scirpus cespitosus (syn. Trichophorum cespitosus)* - *Erica tetralix* wet heath, *Erica tetralix* sub-community.** **This habitat is that found west of the bridge and north of the river (quadrant 1).**
Site name: Bà Bridge	**Project code:**	
Location: see notes	**Grid ref of site: NN 30809 49528**	
Date: 17/11/05	**Surveyor name: Martina Girvan**	
Stand area: 25 x 25 m	**Sample area: 2 x 2 m**	
Layers: mean height **110 cm 30 cm 3 cm mm**		
Layers: cover **100 % 30 % 60 % %**		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Calluna vulgaris	6	6	9	9	5	(5-9)	V
Molinia caerulea	7	5	5	5	9	(5-9)	V
Erica Tetralix	5	5	5	6	5	(5-6)	V
Scirpus cespitosus	7	9	4	7		(4-9)	IV
Sphagnum capillifolium		5	7	7	5	(5-7)	IV
Pleurozium schreberi			7	5	5	(5-7)	III
Cladonia portentosa		5	5	6		(5-6)	III
Hypnum jutlandicum	5	8	8			(5-8)	III
Vaccinium myrtillus			4	5	7	(4-7)	III
Racomitrium laguginosum	4	5	7			(4-7)	III
Myrica gale	4			4	5	(4-5)	III
Narthecium ossifragum	5	5				(5-5)	II
Eriophorum angustifolium	7	4				(4-7)	II
Vaccinium vitis idea				5	5	(5-5)	II
Cladonia uncialis			4		4	(4-4)	II
Sphagnum palustre		5				(5-5)	I
Hylocomium splendens					5	(5-5)	I
Potentilla erecta			4			(4-4)	I
Juncus squarrossus	4					(4-4)	I

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Dicranum scoparium				4		(4-4)	I
Fragaria vesca	4					(4-4)	I

NVC FIELD SURVEY RECORD CARD **Jacobs Babtie Ltd**		**Other notes:** **M15 *Scirpus cespitosus- Erica tetralix* wet heath, *Erica tetralix* sub-community.** **This habitat is that found west of the bridge and south of the river (quadrant 2).**
Site name: Bà Bridge	**Project code:**	
Location: see notes	**Grid ref of site: NN 30888 49389**	
Date: 17/11/05	**Surveyor name: Martina Girvan**	
Stand area: 25 x 25 m	**Sample area: 2 x 2 m**	
Layers: mean height **110 cm 30 cm 3 cm mm**		
Layers: cover **100 % 30 % 60 % %**		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Scirpus cespitosus	9	9	9	6	8	(6-9)	V
Calluna vulgaris	5	7	6	8	5	(5-8)	V
Erica Tetralix	5	5	5	7	5	(5-7)	V
Narthecium ossifragum	7	5	5	4	5	(4-7)	V
Molinia caerulea	5	5	4	5	5	(4-5)	V
Sphagnum capillifolium	5	4	5	5	4	(4-5)	V
Eriophorum angustifolium	4	5	5	4		(4-5)	IV
Myrica gale	5			5	7	(5-7)	III
Racomitrium laguginosum			5	4	5	(4-5)	III
Carex bigelowii				4	5	(4-5)	II
Cladonia portentosa				4		(4-4)	I

NVC FIELD SURVEY RECORD CARD Jacobs Babtie Ltd		Other notes: W4 *Betula pubescens- Molinia caerulea* woodland, *Sphagnum* sub-community. This habitat is that found west of the bridge and south of the river (quadrant 3).
Site name: Bà Bridge	Project code:	
Location: see notes	Grid ref of site: NN 31000 49505	
Date: 17/11/05	Surveyor name: Martina Girvan	
Stand area: 15 x 15 m	Sample area: 2 x 2 m ground flora, one 15 x 15 value for canopy	
Layers: mean height 3-4 m 100 cm 3 cm mm		
Layers: cover 60 % 100 % 60 % %		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Molinia caerulea	9	9	8			(8-9)	III
Betula pubescens	8	8	8			(8)	III
Sphagnum capillifolium	6	7	7			(6-7)	III
Myrica gale	6	4	5			(4-6)	III
Calluna vulgaris	4	4	5			(4-5)	III
Erica Tetralix	4		4			(4)	II
Eriophorum angustifolium	4		3			(3-4)	II

NVC FIELD SURVEY RECORD CARD Jacobs Babtie Ltd		Other notes: W1 *Salix cinerea – Galium palustre* woodland, no sub-communities. This habitat is that found west of the bridge and south of the river (quadrant 3, adjacent to the road).
Site name: Bà Bridge	Project code:	
Location: see notes	Grid ref of site: NN 30961 49465	
Date: 17/11/05	Surveyor name: Martina Girvan	
Stand area: 5 x 5 m	Sample area: 2 x 2 m	
Layers: mean height 2-3 m 30 cm 3 cm mm		
Layers: cover 70 % 100 % 60 % %		

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Deschampsia flexuosa	5	6	6			(5-6)	III
Salix cinerea	5	6	6			(5-6)	III
Potentilla erecta	4		5			(4-5)	II
Agrostis cappilaris	5		5			(5)	II
Centaurea nigra	4	4				(4)	II
Galium saxatile		5	5			(5)	II
Rhytidiadelphus loreus		4	5			(4-5)	II
Deschampsia cespitosus	5		4			(4-5)	II
Hypochaeris radica	5	3				(3-5)	II
Thuidium tamariscinum		5	5			(5)	II
Hylocomium splendens		5	5			(5)	II
Ranunculus repens		4	5			(4-5)	II
Cerastium fontanum	4	5	5			(4-5)	II
Festuca vivipera	5	4				(4-5)	II
Plantago lanceolata	4	4				(4)	II
Molinia caerulea	6					(6)	I
Poa trivialis	4					(4)	I
Ranunculus acris		4				(4)	I
Polytrichum commune			4			(4)	I

	QUADRAT DOMIN VALUE						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Holcus lanatus		5				(5)	I
Myrrhis odorata	4					(4)	I
Anemone nemorosa			3			(3)	I
Dactylis golmerata	4	5				(4)	I
Trifolium pratense	4					(4)	I

NVC FIELD SURVEY RECORD CARD **Jacobs Babtie Ltd**		**Other notes:** **M19 Calluna vulgaris-*Eriophorum vaginatum blanket mire*/M20 *Eriophorum vaginatum mire*, (*Erica tetralix* sub-community/species poor sub-community respectively).** **This habitat is that found east of the bridge and south of the river (quadrant 3). It is a small area of bog that has been degraded due to burning and grazing.**
Site name: Bà Bridge	**Project code:**	
Location: see notes	**Grid ref of site: NN 30888 49389**	
Date: 17/11/05	**Surveyor name: Martina Girvan**	
Stand area: 25 x 25 m	**Sample area: 2 x 2 m**	
Layers: mean height **110 cm 30 cm 3 cm mm**		
Layers: cover **100 % 30 % 60 % %**		

M19/M20 blanket mire	**QUADRAT DOMIN VALUE**						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Eriophorum vaginatum	8	9	8	5	8	(5-9)	V
Molinia caerulea	5	5	5	6	5	(5-6)	V
Calluna vulgaris	4	5	5	5	5	(4-5)	V
Eriophorum angustifolium		4	4	5	4	(4-5)	V
Myrica gale	8	7	7	8		(7-8)	IV
Narthecium ossifragum	4	4	5		5	(4-5)	IV
Sphagnum capillifolium		5	8	8	7	(5-8)	IV
Erica Tetralix		6	5	5	5	(5-6)	IV
Potentilla erecta	3	4	4			(3-4)	III
Sphagnum papillosum		8	5			(5-8)	II
Nardus stricta	4					(4-4)	I
Scirpus cespitosus				5		(5-5)	I
Polytrichum commune		5				(5-5)	I
Dicranum scoparium		5				(5-5)	I
Juncus conglomeratus	4					(4-4)	I

NVC FIELD SURVEY RECORD CARD **Jacobs Babtie Ltd**		**Other notes:** **U2 *Deschampsia flexuosa* grassland, no sub-communities.** **This habitat is that found along the verges of the A 82**
Site name: Bà Bridge	**Project code:**	
Location: see notes	**Grid ref of site: NN 30855 49500**	
Date: 17/11/05	**Surveyor name: Martina Girvan**	
Stand area: 1.5 x 5 m strips on either side of the road	**Sample area: 2 x 1 m**	
Layers: mean height **2-3 m 30 cm 3 cm mm**		
Layers: cover **70 % 100 % 60 % %**		

U2 acid grassland	**QUADRAT DOMIN VALUE**						
Species Name	**1**	**2**	**3**	**4**	**5**	**Range**	**Frequency**
Deschampsia flexuosa	5	6	5			(5-6)	III
Molinia caerulea	5	5	5			(5)	III
Agrostis cappilaris	4	4	4			(4)	III
Nardus stricta	4	5	5			(4-5)	III
Ranunculus repens	5	5				(5)	II
Festuca vivipera	4	5				(4-5)	II
Fragaria vesca	4		5			(4-5)	II
Hypochaeris radica		4	4			(4)	II
Festuca rubra	4		4			(4)	II
Galium saxatile		4	4			(4)	II
Potentilla erecta	4		4			(4)	II
Plantago lanceolata	4		4			(4)	II
Peltigera canina	3		3			(3)	II
Viola canina	3		4			(3-4)	II
Cerastium fontanum	5					(5)	I
Agrostis canina			5			(5)	I
Succisa pratensis		4				(4)	I
Polytrichum formosum	4					(4)	I
Rhytidiadelphus loreus		4				(4)	I

Table 8 List of species identified during the survey

Latin Name	English Name
Agrostis canina	Velvet bent
Agrostis capillaris	Common bent
Alchemilla alpina	Alpine lady's-mantle
Anemone nemoralis	Wood anemone
Betula pubescens	Downy birch
Calluna vulgaris	Heather
Carex bigelowii	Stiff sedge
Carex panicea	Carnation sedge
Centaurea nigra	Black knapweed
Cerastium fontanum	Common mouse-ear
Cladonia portentosa.	A Reindeer lichen
Cladonia uncialis.	A Reindeer lichen
Deschampsia flexuosa	Wavy hair grass
Deschampsia caespitosa	Tufted hair-grass
Dicranum scoparium	Broom fork-moss
Empetrum nigrum	Crowberry
Erica tetralix	Cross-leaved heath
Eriophorum angustilfolium	Common cotton-grass
Eriophorum vaginatum	Hare's-tail cotton-grass
Festuca rubra	Hard fescue
Festuca vivipara	Viviparous fescue
Galium saxatilis	Heath bedstraw
Fragaria vesca	Barren strawberry
Hylocomium splendens	Glittering wood-moss
Hypnum jutlandicum	Heath plait-moss
Hypochaeris radica	Smooth cat's-ear
Juncus conglomeratus	Compact rush
Juncus squarrosus	Heath rush
Juncus effusus	Soft rush
Lobelia dortmanna	Water lobelia
Mnium hornum	Swan's-neck thyme

Latin Name	English Name
	moss
Molinia caerulaea	Purple moor-grass
Myrrhis odorata	Sweet cicely
Myrica gale	Bog myrtle
Nardus stricta	Mat grass
Narthecium ossifragum	Bog Asphodel
Nuphar pumila	Least water-lily
Peltigera canina	Dog lichen
Planyago lanceolata	Ribwort plantain
Polytrichum commune	Common haircap-moss
Polytrichum formosum	Bank haircap-moss
Poa trivialis	Rough meadow-grass
Potamogeton polygonifolius	Bog pondweed
Potentilla erecta	Tormentil
Racomitrium lanuginosum	Woolly back moss
Ranunculus acris	Meadow buttercup
Ranunculus repens	Creeping buttercup
Rhytidiadelphus squarrosus	Springy turf moss
Salix cinerea.	Grey willow
Scirpus cespitosus	Deer grass
Sphagnum cappillifolium	Red bog-moss
Sphagnum palustre	Blunt-leaved bog-moss
Sphagnum papillosum	Papillose bog-moss
Scheuchzeria palustris	Rannoch-rush
Succisa pratensis	Devil's-bit scabious
Thuidium tamariscinum	Common tamarisk-moss
Vaccinium vitis idea	Bearberry
Vacciunium myrtillus	*Billberry*