Llywodraeth Cymru / Welsh Government

A487 New Dyfi Bridge

Environmental Statement – Volume 1: Chapter 9 Nature Conservation

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9 Nature Conservation (Ecology)

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) assesses the likely effects of the proposed Scheme on ecological resources within the study area and surrounding vicinity.

9.1.2 This chapter documents survey work undertaken in relation to habitats and species, the value of receptors identified and the predicted effects arising from the construction and operation of the proposed Scheme. The chapter also documents measures to mitigate for these effects. Enhancement measures, where deemed necessary in relation to Welsh Government Policies, which go beyond mitigating effects are also identified. The residual effects following the inclusion of these measures are then assessed.

9.1.3 The ecological surveys of the study area were undertaken between July 2015 and June 2016 to inform this chapter.

9.2 Legislation, Policy Context and Guidance

Legislation

9.2.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This is described in the following sections.

Conservation of Habitats and Species Regulations 2010

9.2.2 The Conservation of Habitats and Species Regulations 2010 (the 'Habitats Regulations') transpose the requirements of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) into law within England and Wales. These regulations provide for the designation and protection of sites of European importance know as European or Natura 2000 Sites.

9.2.3 European Sites comprise:

- Special Areas of Conservation (SACs) designated under the Conservation of Habitats and Species Regulations 2010 (as amended) (known as the Habitats Regulations)[1];

[1] The Habitats Regulations transposes the requirements on Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora in to UK law.

- Special Protection Areas (SPAs) designated under the Wildlife and Countryside Act 1981 (as amended)[2].

9.2.4 The Habitats Regulations require that consideration is given to the implications of plans and projects (developments) on European Sites. Specifically Regulation 61(1) states:

- "A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which:
  a) is likely to have a significant effect on a European site or European marine site (either alone or in combination with other plans or projects); and
  b) is not directly connected with or necessary to the management of that site.
- must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.".

9.2.5 The formal consideration of effects on European Sites is therefore undertaken by the determining authority such as the Highways Authority under the Highways Act 1980 (also known as the Competent Authority).

9.2.6 The Habitats Regulations also convey special protection to a number of species which are listed in Schedule 2 of the Regulations and are referred to as European Protected Species (EPS). Those relevant to the Scheme include:

- All UK resident bat species;
- Common dormouse (*Muscardinus avellanarius*);
- Great crested newt (*Triturus cristatus*);
- Otter (*Lutra lutra*);
- Marsh fritillary butterfly (*Euphydryas aurinia*);
- Killarney fern (*Trichomanes speciosum*).

9.2.7 Regulation 41 makes it an offence to:

- Deliberately capture, injure or kill any wild animal of a EPS;
- Deliberately disturb wild animals of such a species;
- Deliberately take or destroy the eggs of such a species;
- Damage or destroy a breeding site or resting place of such an animal.

[2] The Wildlife and Countryside Act 1981 transposes the requirements of Directive 79/409/EEC on the Conservation of Wilde Birds (Birds Directive) in to UK law. The Birds Directive has been updated through Directive 2009/147/EC on the Conservation of Wild Birds.

9.2.8 Disturbance in the context of the offences above is disturbance which is likely to impair the ability of the animals to survive, to breed or reproduce, to nurture their young, to hibernate, to migrate; or to affect significantly the local distribution of the species.

9.2.9 Licences can be granted by the relevant Statutory Nature Conservation Organisation (SNCO) for developments (sometime referred to as EPS Licences or Derogation Licences) providing the purposes of the licence is for "preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment".

Ramsar Convention 1971

9.2.10 Wetlands of International Importance (Ramsar Sites) declared under the Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 are considered European Sites as a matter of UK and Local Government Policy.

Eels (England and Wales) Regulations 2009

9.2.11 This implements Council Regulation (EC No. 1100/2007) of 18 September 2007 establishing measures for the recovery of the stock of European Eel (*Anguilla anguilla*). The Regulation requires Member States to implement a number of short and long-term measures to achieve a target of ensuring that at least 40% of the potential production of adult Eels return to the sea to spawn on an annual basis.

Wildlife and Countryside Act 1981 (as amended)

9.2.12 A network of nationally designated sites has been established through the designation of Sites of Special Scientific Interest (SSSIs) under the Wildlife and Countryside Act 1981. The protection afforded by the Act means it is an offence to carry out or permit to be carried out any operation listed within the notification without the consent of the Statutory Nature Conservation Organisation (Natural Resources Wales). The protection afforded to SSSIs is used to underpin the designation of areas at a European Level.

9.2.13 The Wildlife and Countryside Act also places obligations on Welsh Ministers and other public bodies with regard to the conserving and enhancing of the features of SSSIs in the exercise of their functions.

9.2.14 The Wildlife and Countryside Act 1981 provides protection to both EPSs and other species including wild birds, water voles and reptiles.

9.2.15 All wild birds, their nests and eggs are protected, with some rare species afforded extra protection from disturbance during the breeding season (these species are listed in Schedule 1 of the Act). It is illegal to take any wild bird or damage or destroy the nests and eggs of breeding birds. There are certain exceptions to this in respect of wildfowl, game birds and certain species that may cause damage.

9.2.16 Water vole (*Arvicola amphibius*) receive protection under the Wildlife and Countryside Act 1981 which prohibits the killing, injuring or taking by any method.

9.2.17 All native reptile species in the UK are subject to partial protection from intentional or reckless killing or injury only.

9.2.18 The Act also includes provisions for the control of invasive non-native species (INNS). Under these provisions it is an offence to:

- release or allow to escape into the wild any animal which is not ordinarily resident or a regular visitor to Great Britain, or is included in Schedule 9 of the Act;
- plant or otherwise cause to grow in the wild any plant which is included in Schedule 9 of the Act.

9.2.19 People undertaking works in proximity to invasive non-native plant species should take all reasonable steps and exercise all due diligence to avoid committing an offence.

National Park and Access to the Countryside Act 1949 (as amended)

9.2.20 Local Nature Reserves can be given protection against damaging operations through powers within the National Parks and Access to the Countryside Act 1949. However, this protection is usually conveyed through inclusion of protection within local planning policy relating to these sites and other non-statutory sites such as Sites of Importance for Nature Conservation.

The Protection of Badgers Act 1992

9.2.21 Badger (*Meles meles*) and their setts are protected under the Protection of Badgers Act 1992 which makes it an offence to kill, injure or take a badger, or interfere with a sett.

Hedgerow Regulations 1997

9.2.22 The Hedgerow Regulations 1997 set out a framework for the protection of hedgerows against removal where they are deemed to be important either due to their age, ecological or archaeological features. Approval is required from the local authority prior to the removal of hedgerows. Local authorities can

enforce the retention of Important Hedgerows through the issuing of Retention Notices.

The Environment (Wales) Act 2016

9.2.23 The Environment (Wales) Act 2016 places the duties on public bodies in Wales to conserve and enhance biodiversity in the exercise of their functions. This duty includes consideration of the resilience of ecosystems in terms of their diversity, connectivity, adaptability, scale and condition, The Act also reinforces the duties in relation to the lists of species and habitats of importance and duties to conserve and enhance those species and habitats. Within this Chapter these are referred to as Section 7 Habitats and Species, although revised listed have not been published to date.

Wild Mammals (Protection) Act 1996

9.2.24 This act operates in parallel with the legislation listed above conferring specific protection on rare or threatened mammal species by protecting all wild mammals from any action intended to cause unnecessary suffering.

Policy Context

9.2.25 The Wales Transport Strategy (Welsh Government, 2008) sets out a number of Environmental Outcomes relating to sustainable travel, greenhouse gas emissions, noise and water pollutions, climate change, heritage and biodiversity. The aim of the biodiversity outcome is to “improve the impact of transport on biodiversity”, specifically by ensuring that biodiversity is protected or enhanced through the development of transport measures, and that mitigation and enhancement measures are included where significant negative effects are predicted. The effects of existing roads on biodiversity is also considered through the implementation of the Trunk Road Estate Biodiversity Action Plan (Welsh Government, 2003).

9.2.26 Neither of the relevant planning authorities, Powys County Council or the Snowdonia National Park Authority, include the New Pont-ar-Ddyfi Scheme within their current planning policy documents.

9.2.27 Planning Policy Wales (Welsh Government, 2016) sets the national policies in relation to development control through the Town and Country Planning Act 1990. This is supported by a series of Technical Advice Notes, of particular relevance is Technical Advice Note 5 (Welsh Government, 2009) which sets out the consideration of nature conservation in the determination of planning applications.

United Kingdom Biodiversity Action Plan (UK BAP)

9.2.28 In 1992 the UK signed the Convention on Biological Diversity at the Rio Convention pledging the UK to develop national strategies for the conservation and sustainable use of biological diversity. The UK Government subsequently produced Biodiversity: The UK Action Plan in 1994 which described the biological resources of the UK as a whole and in turn led to the production of Biodiversity Action Plans for individual habitats and species.

9.2.29 Biodiversity policy within the UK has been revised through the publication of the UK Post-2010 Biodiversity Framework (Joint Nature Conservation Committee (JNCC), 2012) which covers the period from 2011 to 2020. A total of 65 Priority Habitats and 1150 Priority Species have been identified as the most in need of protection.

Trunk Road Estate Biodiversity Action Plan (TREBAP)

9.2.30 The National Assembly for Wales, as Highway Authority for Wales, has direct responsibility for the maintenance, improvement and development of the trunk road and motorway network for Wales. Under the Environment (Wales) Act 2016, the National Assembly for Wales has a duty to have a regard for the conservation of biodiversity in its work. The Welsh Government Transport Directorate is already incorporating biodiversity into its work, and the Trunk Road Estate Biodiversity Action Plan (TREBAP) is to contribute to this ongoing process.

9.2.31 There are 11 Habitat Action Plans and seventeen Species Action Plans within the TREBAP. There are also two Generic Action Plans covering Ecological Surveys and Education & Awareness.

Wales Action Plan for Pollinators (2013)

9.2.32 The Action Plan for Pollinators in Wales recognises that: ‘Pollinators are an essential component of our environment. Honey bees and wild pollinators including bumblebees, solitary bees, parasitic wasps, hoverflies, butterflies and moths and some beetles are important pollinators in Wales, for crops such as fruit and oil seed rape, clovers and other nitrogen fixing plants that are important to improving the productivity of pasture systems for livestock grazing, and wild flowers.’

9.2.33 The Welsh Government has worked with industry and stakeholders to look in more detail at the evidence and issues around pollinators and their conservation in Wales. Following consultation, an 'Action Plan for Pollinators in Wales' was

launched setting the strategic vision, outcomes and areas for action to halt and reverse pollinator decline in Wales. This plan aims to reduce and reverse the decline in wild and managed pollinator populations, which includes bees, some wasps, butterflies, moths and hoverflies, some beetles and flies. A pollinator task force comprising of key stakeholders is now active and a draft implementation plan is in place.

Powys Local Biodiversity Action Plan

9.2.34 The Powys Local Biodiversity Action Plan (PLBAP, 2002) was published by the Powys Biodiversity Partnership. It includes seventeen Habitat Action Plans and 28 Species Action Plans relating to the protection of biodiversity within the county.

Snowdonia Biodiversity Action Plan

9.2.35 The Snowdonia Biodiversity Action Plan (SNPAP, Unknown) includes Action Plans for 48 species and 37 terrestrial habitats.

Relevant Guidance

9.2.36 The main overarching guidance for the assessment of the environmental impacts of road schemes is contained within Volume 11 of the Design Manual for Road and Bridges (DMRB). Specific guidance in relation to the assessment and reporting of impacts on ecological receptors is provided within Section 3, Part 4 (HA, 1993). The assessment of the implications of road schemes on European Designated Sites is set out within Section 4, Part 1 (HA, 2009).

9.2.37 Species specific guidance, including survey methodology and mitigation measures (environmental design) are mainly contained within DMRB Volume 10 or through Interim Advice Notes. The species specific guidance from DMRB and other sources used within this chapter includes:

- HA 59/92 Mitigating Against Effects on Badgers;
- HA 80/99 Nature Conservation Advice in Relation to Bats;
- HA 81/99 Nature Conservation Advice in Relation to Otters;
- HA 97/01 Nature Conservation Advice in Relation to Dormice;
- HA 98/01 Nature Conservation Advice in Relation to Amphibians;
- HA 116/05 Nature Conservation Advice in Relation to Reptiles and Roads; and
- The Bat Conservation Trust Good Practice Survey Guidelines (Collins, 2016).

9.3 Study Area

9.3.1 The study area for ecological field surveys included all land within 500m of the centre line of the proposed scheme as shown on Figure 9.1 in Volume 2, and includes compounds, laydown areas or other areas of ancillary works where these are known[3]. Various search buffers have been used within the desk study as set out in Section 9.4 below.

9.4 Methodology

Identification of Baseline

9.4.1 The baseline ecological information for the Scheme has been collated through a combination of a desk study, botanical surveys and species specific surveys. The methodology for establishing baseline conditions is set out in the following sections.

9.4.2 Surveys have been overseen and co-ordinated by Pete Wells (MCIEEM, CEnv) who has over 15 years' experience as a professional ecologist. Survey work has been undertaken by a number of qualified professional ecologists employed by Ove Arup & Partners Ltd along with employees of various sub-consultancies. Sub-consultants used are set out in the methodology sections below. Unless stated otherwise, surveys have been undertaken by Ove Arup & Partners Ltd staff.

9.4.3 All surveys were undertaken by surveyors assessed by Ove Arup & Partners Ltd as being competent in terms of their knowledge and experience to lead surveys for that particular species or habitat group. In some cases assistants were used who may not have been classed as competent under the Chartered Institution of Ecology and Environmental Management (CIEEM) competency framework, however on these occasions the second person was solely present to ensure compliance with Health and Safety procedures and was not undertaking the survey.

Desk study

9.4.4 An ecological desk study for the Scheme was undertaken in August 2015. A biodiversity information request was submitted to the Biological Information Service (BIS), and also the North Wales Environmental Information Service (Cofnod) as the Scheme falls on the boundary of the areas covered by these two organisations. The Multi-Agency Geographic Information for the Countryside (MAGIC) website and the Countryside Council for

[3] Some additional areas for compounds and storage may be identified during the Detailed Design Stage.

Wales Protected Sites and Landscapes Map[4] were reviewed for information on internationally and nationally designated sites of nature conservation importance. Information was also sought from the LANDMAP website in terms of the landscape habitats present.

9.4.5 In accordance with the relevant guidance, the ecology desk study area for the Scheme extends 5km for internationally designated sites (except for SACs designated for bat species where a 30km buffer was used in accordance with HD44/09), 2km for nationally designated SSSIs and 1km for locally designated non-statutory Sites of Importance for Nature Conservation (SINCs).

9.4.6 For legally protected species the desk study area extends for 5km around the centre line of the scheme and 1km for other species of conservation concern using the records supplied by BIS and Cofnod.

9.4.7 Fisheries information has been received from Natural Resources Wales.

Extended Phase 1 Habitat Survey

9.4.8 An Extended Phase 1 Habitat Survey has been undertaken in accordance with the guidance set out in Guidelines for Baseline Ecological Assessment (Institutute of Ecological Assessment, 1995). This survey was undertaken in July 2015 with additional verification surveys undertaken in January 2016. Areas covered in January have been rechecked during other surveys in May and June 2016 to ensure no species were missed.

9.4.9 Phase 1 habitat survey (JNCC, 2010) is a standard technique for rapidly obtaining baseline ecological information over a large area of land. It is primarily a mapping technique and uses a standard set of habitat definitions for classifying areas of land on the basis of the vegetation present. The extended survey also provided an assessment of the potential for those habitats present to support legally protected species and species of principal importance for the conservation of biological diversity (known as Section 7 Species).

9.4.10 Incidental records of flora and fauna were also made during the survey, in the form of Target Notes shown on Figures 9.4 and 9.5 in Volume 2.

9.4.11 Where features such as mammal paths were identified during the extended Phase 1 habitat survey, trail cameras were installed to determine the species present and frequency of use. Deployment and retrieval dates for the cameras are shown in

[4] Please note that this information has now been transposed to the Natural Resources Wales website following the amalgamation of the Countryside Council for Wales, the Environment Agency Wales and Forestry Commission Wales in 2013.

Table 9.1 below. Cameras were checked regularly whilst deployed.

Table 9.1 Dates of deployment and retrieval of trail cameras

Location description	Deployment date	Retrieval date
North river bank at proposed crossing	29 July 2015	23 September 2015
North river bank at proposed crossing	29 July 2015	23 September 2015
Alongside cycle path north of Millennium Cycle Bridge	12 February 2016	9 March 2016
A487 near entrance to Fridd Farm	17 February 2016	9 March 2016
Hole in river bank near confluence with Afon Dulas	9 March 2016	4 May 2016
Over hanging tree roots downstream of retaining wall	9 March 2016	4 May 2016

National Vegetation Classification (NVC)

9.4.12 An NVC survey was undertaken in August 2015 which included a 100m buffer around the extent of the scheme shown in the Tender design, giving a corridor 200m wide. The objective of the survey was to map and describe the plant communities within the survey area in terms of the NVC communities published by the Joint Nature Conservation Committee (JNCC) (Rodwell , Various (1991 - 2000)).

9.4.13 The survey was undertaken by an experienced botanist (Peter Sturgess), which involved a walk-through method, supplemented by the use of quadrat sampling. A plant species list was compiled for each vegetation type, and the broad characteristics of the habitat described. Each stand of vegetation was then examined in greater detail to describe it in terms of the plant communities present.

Arboricultural Survey

9.4.14 A pre-development tree survey in accordance with British Standard BS5837:2012 Trees in Relation to Design, Demolition and Construction was undertaken in January 2016 to provide a tree constraints plan. The survey involved the recording and an assessment of the condition of trees. Measurements taken during the survey were used to plot canopy spread and the likely extent of roots (Root Protection Area) for all trees recorded on the topographic survey data.

Hedgerows

9.4.15 All hedgerows within the study area were assessed to determine their ecological 'importance' with respect of Part II of Schedule 1 of the Hedgerow Regulations 1997. Hedgerow surveys were undertaken in July 2015. Preliminary assessments of additional hedgerows (identified through amendments to the study area) were made in January 2016 and refined during April 2016.

Bryophytes

9.4.16 A survey for bryophytes (mosses and liverworts) was undertaken in January 2016 by an experienced bryologist (Des Callaghan of Bryophyte Surveys Ltd). The survey aimed to:

- Compile an inventory of the bryophyte species present within the areas to be affected by the scheme; and
- Accurately document the locations of any species of conservation concern, including *Fissidens polyphyllus*, by GPS, mapping and photography.

9.4.17 *Fissidens polyphyllus* is a bryophyte of conservation concern which was identified during the previous DMRB Stage 2 work undertaken by Powys County Council (Powys County Council, 2002).

9.4.18 A further survey was undertaken in April 2016 to map the locations and extent of curl-leaved forklet-moss (*Dicranella crispa*) a rare species recorded during the initial survey.

Invasive species

9.4.19 As part of the Phase 1 habitat survey the locations of invasive plant species included on Part II of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) were mapped during July 2015 with subsequent checks in 2016 as described above for the Phase 1 habitat surveys.

Amphibians

9.4.20 All ponds and ditches within the study area were assessed through a Habitat Suitability Index (HSI) to assess their potential to support great crested newts (*Triturus cristatus*) in accordance with published guidance (ARGUK, 2010). The HSI assessments were undertaken during July 2015 and May 2016.

9.4.21 All ponds and ditches suitable for amphibians were subject to presence/absence surveys for amphibians including all species of newts, frog and toad following comments received in response to the Scoping Report. These surveys were undertaken following the methodology for great crested newt presence/absence surveys (EN, 2001).

Bat roost surveys

9.4.22 During the Extended Phase 1 Habitat Survey undertaken in 2015 and updated in January 2016, an initial assessment was made of the potential for trees and buildings within the study area to support bat roosts. This bat assessment was undertaken in accordance with the guidance set out in the Bat Conservation Trust Good Practice Guidelines (BCT, 2012)[5].

9.4.23 Trees within the study area were assessed for the presence of natural holes, woodpecker holes, cracks and splits, loose bark and cavities. The presence of such features were considered in determining the potential for bat roosts to be present and assigning trees to four categories of potential: 1* - High, 1 – Medium, 2 – Low, and 3 – Negligible, as recommended by the BCT Guidelines (BCT, 2012) (Collins, 2016).

9.4.24 Buildings within the study area to the north of the Scheme were also assessed for their potential to support bat roosts based on the presence of potential roost access points. Buildings were also categorised as high, medium or low potential in accordance with the guidelines.

9.4.25 Following the initial assessment of trees, an aerial inspection was carried out on 12 trees which had potential roost features identified from the ground. This inspection was undertaken by Adam Young a licensed bat ecologist and tree climber using a video scope during August 2016.

Bat Transect Surveys

9.4.26 Walked transect surveys were undertaken to record bat activity and behaviour within the study area. Two surveyors undertook each transect using a combination of Batbox Duet, Batlogger and EM3 bat detectors with paired GPS receivers.

9.4.27 Transect survey work was undertaken once per month from July to October 2015, and from April to June 2016, in line with the BCT Guidance (BCT, 2012) (Collins, 2016). The indicative transect route is shown on Figure 9.3 in Volume 2.

9.4.28 Each transect commenced at the time of sunset and continued for at least two hours targeting areas of potential foraging and commuting habitat. Listening points were built into the survey design during the surveys undertaken in 2016 at three locations. The duration spent at each listening point was ten minutes, to increase the chance of detecting quieter species and to provide quantification of levels of activity at particular habitat features.

[5] Please note that BCT have produced a new version of the Good Practice Guidelines since the surveys were undertaken. These will be reviewed and any changes taken in to account during the roost surveys to be undertaken in 2016.

9.4.29 Tablet computers were used to record the locations of bats during the transects along with the paired recordings from the detectors and GPS locations. Wherever possible the direction of flight, species and behaviour (i.e. whether bats were commuting, foraging or social calling), was recorded.

9.4.30 The dates of the surveys and weather conditions completed to date are shown in Table 9.2 below.

Table 9.2 Bat Transect Survey Dates and Weather Conditions

Date	Temperature (°C)	Wind speed (Bft)	Wind direction	Conditions	Notes
29/07/15	18	1	SE	Dry	
18/08/15	16	1	NE	Dry	
23/09/15	15	2	NE	Drizzle	Light drizzle during 2nd hour of survey
19/10/15	13	1	NE	Showery	Rained for approximately 20mins during 2nd hour of survey
14/04/16	10	1	W	Dry	
03/05/16	11	1	SW	Dry	
07/06/16	13	2	SE	Dry	

9.4.31 Species identification was undertaken following the transects using a combination of different software packages designed for analysing and identifying bat calls, primarily Kaleidoscope Pro and BatExplorer software.

9.4.32 Bat registrations from the detectors have been correlated with the track recorded by the GPS receiver and are plotted on Figures (Figures 9.16 to 9.22) within Volume 2. The registrations have been aggregated to provide one point per minute where continuous activity was recorded. Points are labelled with the time of the registration. A heat map showing the relative density of bat registrations across all of the transect surveys has also been produced to identify important foraging areas.

Static Bat Activity Monitoring

9.4.33 In addition to the walked transects, static bat detectors were used to record bat activity over a five-night period each month from July to October 2015 and from April to June 2016.

9.4.34 Three locations were selected on site in line with the Good Practice Survey Guidelines. The locations were chosen on the tree lined north bank of the Afon Dyfi and on two of the hedgerows which will be interrupted by the scheme as shown on Figure 9.3 in Volume 2.

Data Collection

9.4.35 Wildlife Acoustic Song Meter 2 Ultrasonic Bat Detectors (SM2+ BAT) with SMX-U1 microphones were used to record bat activity for five consecutive nights each month. The detectors were set up with the settings shown in Table 9.3 below to record between 18:00 and 07:00 each night.

Table 9.3 SM2+ BAT Settings used during data collection

Parameter	Setting
2.5V Microphone Bias	Off
Low noise filter	1kHz
Microphone pre-amp gain	12dB
Sample rate	354800
Monitoring schedule	Daily from 18:00
Monitoring duration	13hrs

9.4.36 The microphones used with the detectors during the course of the surveys were regularly checked and calibrated using a Wildlife Acoustics Calibration Unit to ensure that they were functioning properly. Microphones that were found not to have shown a significant response to the output of the calibration unit were replaced.

Data Processing and Analysis

9.4.37 The detectors recorded bat activity in Wildlife Acoustics Compression files (.wac). These were downloaded from the detectors and processed using Kaleidoscope Pro Software to produce audio files (.wav) and zero crossing files. The processing also included the automatic identification of bat species based on the classifiers developed by Wildlife Acoustics (Bats of Europe 3.0.0 or 3.1.3).

9.4.38 The files produced by the processing were then reviewed to ensure correct identification of species and to identify where possible the bat species for any calls which could not be recognised by the software. All calls identified as being either common pipistrelle (*Pipistrellus pipistrellus*) or soprano pipistrelle (*P. pygmaeus*) were not reviewed except where high levels of insect noise had been recorded leading to uncertainty over the accuracy of identification. All other calls were checked by Pete Wells (a bat specialist with over 25 years of experience in bat work and a holder of a Natural Resources Wales licence).

9.4.39 The number of files (sound clips) recorded by the detectors each night was taken as a proxy value to the number of bat passes. This was then used to calculate a Bat Activity Index (BAI) for each species at each location during each session. The BAI was calculated on the first five nights recorded each month. In some cases the detector also recorded data on the sixth and sevenths

nights. These additional nights have been excluded from the BAI as it could not be certain that the detector had recorded data for the entire night. However, where rarer or more notable species were recorded on these additional nights, they have been included to ensure their representation within the data in terms of species diversity.

9.4.40 The average BAIs for all species (sum of individual BAIs) at each location has been calculated both for the entire surveys season and over the period from May to September.

9.4.41 The time of recording of the first bat of each species, each night, and time of last recording were also compared to sunset and sunrise times obtained using Anasun software to infer the potential proximity of roost sites.

Dormice

9.4.42 A habitat suitability assessment was undertaken to assess the need for a full dormouse survey in light of comments received during Environmental Liaison Group meetings and consultation with Natural Resources Wales. This assessment was carried out by an experienced ecologist and dormouse survey licence holder, and entailed the consideration of habitats present in terms of species composition and connectivity. Searches for characteristically chewed hazel nuts were also undertaken where fruiting hazel was found to be present during the Extended Phase 1 Habitat Survey.

9.4.43 As described in the results section of this chapter the hedgerows within the floodplain are defunct in their nature with many gaps. To the north of the river the hedgerows along the existing A487 at the northern tie-in are regularly managed by local landowners, which is likely to restrict the availability of food plants for dormice.

9.4.44 While it is acknowledged that records are present to the north of the study area, there are no recent records within the immediate search area used for the desk study, the results of which are set out below.

9.4.45 On the basis of this habitat assessment and review of records, and using professional judgement, it was not considered necessary to undertake species specific surveys for dormice.

Otter

9.4.46 The Afon Dyfi and its tributaries within 500m of the proposed Scheme were searched by experienced ecologists for signs of activity and potential resting places which could be used by otter. The survey was undertaken in accordance with authoritative sources (Chanin, 2003; Crawford, 2003; Strachan & Jefferies, 1996). Details of the waterbodies were recorded using standard forms to record their characteristics and any signs of otters which

may be found. Where signs were found, the GPS co-ordinates of the location was recorded.

9.4.47 Where potential holts were identified within the study area, trail cameras were installed to confirm usage and determine the level of activity to inform licensing requirements. Cameras were installed on the 9th March 2016 at the locations shown on Figure 9.30 in Volume 2.

Water vole

9.4.48 The Afon Dyfi and its tributaries within 500m of the proposed alignment were searched by experienced ecologists for field signs of water voles. These surveys were undertaken in July/August 2015 and during April 2016. The survey method for water voles was undertaken in accordance with best practice survey guidelines in the Water Vole Conservation Handbook (Strachan, Moorhouse, & Gelling, 2011) with the methodology reviewed following the publication of the Water Vole Mitigation Handbook (Dean, Strachan, Gow, & Andrews, 2016). The majority of waterbodies within the initial survey area were surveyed on two occasions in line with the recommendations of the Mitigation Handbook.

9.4.49 Details of the waterbodies were recorded using standard forms to record their characteristics and any signs of water voles which were found. Where signs were found, the GPS co-ordinates of the location were recorded.

Badger

9.4.50 The badger survey was undertaken in July 2015, with additional visits in January 2016 once vegetation had died back and in March 2016 following changes to the scheme design, for the whole of the study area. Surveys included a search for characteristic field signs (faeces, setts, paths, scratching posts, snuffle holes, day nests, hair traces, footprints and latrines). Surveys were undertaken by an experienced ecologist. Where setts were identified these were classified in terms of their type and level of activity in reference to available guidance (Harris, Cresswell, & Jefferies, 1989).

9.4.51 No further detailed badger surveys, such as sett monitoring or bait-marking studies, are considered necessary or proposed.

Wintering birds

9.4.52 Wintering bird surveys were undertaken primarily to determine if the Greenland white-fronted geese (*Anser albifrons flavirostris*) from the Dyfi Estuary /Aber Dyfi SPA use fields within the study area.

9.4.53 The survey followed a methodology of monthly field counts within an enlarged study area, which were undertaken twice each month to coincide with the tidal conditions within the estuary to the west. During each monthly visit, one count was made during the period from low water to mid-tide and the other between mid-tide to high water.

Breeding birds

9.4.54 The survey methods were derived from current best practice as described in Bird Census Techniques (Bibby, Burgess, Hill, & Mustoe, 2000) and Bird Monitoring Methods (Gilbert, Gibbons, & Evans, 1998), and conform to the recommendations of the Royal Society for the Protection of Birds (RSPB), British Trust for Ornithology (BTO) and the Joint Nature Conservation Committee (JNCC). Surveys consist of walking a pre-defined transect route in all accessible habitat types, as described within the Breeding Bird Survey methodology contained within the above references.

9.4.55 All breeding bird surveys were carried out by teams of two surveyors, with at least one experienced in undertaking ornithological survey work. The transect was walked at a slow pace, pausing briefly at intervals to listen for song and to scan for birds flying overhead or taking flight from the surrounding area.

9.4.56 All birds seen and heard were mapped in accordance with the BTO standard activity recording codes.

9.4.57 Survey results were captured using tablet devices in order to improve data collection efficiency, and included details of weather data, species present, numbers of individuals and their behaviour.

9.4.58 The transect was surveyed on three occasions between April and June 2016, each visit at least three weeks apart. The transect route was walked in the morning, between dawn and 10am, when levels of avian activity (particularly singing) are likely to be at their highest. On one of the three visits the route was walked in the opposite direction to the previous visit, to balance any temporal variation in behaviour levels.

9.4.59 Birds were considered to be breeding where they were recorded if any of the following applied:

- Birds heard singing within areas of habitat suitable for that species to breed in;
- Birds exhibiting territorial behaviour e.g. displaying or prolonged agitation;
- Birds seen carrying food, nest material or the faecal sacs of young; or
- Nests, eggs and/or young found to be present.

9.4.60 Where breeding signs were recorded, it was assumed that a 'breeding pair' were present and this term is used from this point forward within this chapter.

Aquatic and Terrestrial Invertebrates

9.4.61 Invertebrate surveys were undertaken by experienced entomologists from David Clements Ecology on 10-11 September 2015, 26-27 May 2016 and 21-22 July 2016.

9.4.62 Invertebrates were sampled on each occasion using several different techniques including pitfall trapping, light-trapping, pan-trapping, sweep-netting, beating and hand-searching in terrestrial habitat. Dipping, kick-sampling and hand-searching were used in aquatic habitat taking in to account the historic records of the minutest diving beetle (*Bidessus minutissimus*).

9.4.63 For practical purposes the collecting and identification of the larger invertebrate orders generally targeted particular families, sub-orders or species-groups. These included:

- Hymenoptera – Aculeata and larger Symphyta;
- Diptera – Tipuloisea, larger Brachycera, Syrphidae, Sciomyzidae, Conopidae, Ulidiidae, Platyomatidae, Tephritidae and Micropezidae;
- Hemiptera – chiefly Heteroptera;
- Coleoptera – Carabididae, Chrysomelidae, Cantharidae, Coccinellidae. All aquatic families sampled; and
- Arachnida – Aranea and Opiliones.

9.4.64 Incidental records of other groups (i.e. grasshoppers, butterflies, dragonflies) were recorded as and when they were encountered on site.

9.4.65 The survey methodology followed the published guidelines (English Nature, 2005; Natural England, 2007), as well as more specific published literature for particular invertebrate groups. The surveys followed the Code of Conduct for Collecting Insects and Other Invertebrates (Invertebrate Link, 2002) and involved subsequent laboratory analysis of collected samples.

9.4.66 The rarity of invertebrate species are assessed by reference to published and unpublished sources including the relevant national Red Data Books (RDBs), National Reviews and distribution atlases etc. The priority lists of the UK Biodiversity Action Plan (JNCC, 2012) were also consulted.

9.4.67 The survey locations for the invertebrate survey are described in Table 9.4 and are shown on Figure 9.1 in Volume 2.

Table 9.4 Descriptions of invertebrate survey locations

Location	Description	Survey methods
D1	A short section of roadside ditch contained in a concrete channel, fed by run-off from the road. Small, dense stands of mixed emergent vegetation.	Sweeping
M1	Species-poor grassland enclosure cut for silage. Dominated by a few common agricultural grasses, with few forbs. Small area of damp ground in field corner with rushes and other wetland species.	Sweeping, pit-fall traps, pan traps.
H1	Moderate tall and dense hedge, faces regularly trimmed. Standing on a small hedgebank with a small seasonal ditch at the foot. Large badger latrine present.	Beating, sweeping
H2	Tall, more intermittent mixed hedge standing on a small hedgebank with a seasonal ditch at the foot. Small seasonal ponds at northern end with wetland vegetation.	Beating, sweeping
G1	Species-poor grassland enclosure grazed mainly by sheep. Dominated by a few common agricultural grass species, with few forbs.	Sweeping
H3	Moderately tall, rather intermittent hedge, faces regularly trimmed. Standing on small hedgebank with a small season ditch at the foot	Beating, sweeping
G2	Species-poor grassland enclosure mainly grazed by cattle, subject to periodic inundation. Dominated by a few common agricultural grass species, but with forbs and rush areas. Rather irregularly grazed, so some areas of taller sward present mainly soft rush. Also some small areas of more-or-less permanent marsh containing shallow water in ruts, poached by cattle.	Sweeping, pit-fall traps, pan traps, dipping in open water ruts.
H4	Intermittent linear scrub, mixed broadleaves.	Beating, sweeping
G3	Riverside grassland subject to periodic inundation. Species-poor but with some more diverse damper areas	Sweeping
S1	Medium size shingle bank, with finer gravels to east. Almost bare of vegetation except for some scattered ruderals. Subject to frequent scouring, but with some very small sheltered patches with emergent vegetation (mainly grasses).	Sweeping, pitfall traps, hand-searching under stones and debris
S3	Large silty shingle bank, mainly finer gravels. Almost bare of vegetation except for some scattered ruderals. Some larger stones and timber debris. Low silty cliffs behind.	Sweeping, pitfall traps, hand-searching under stones and debris
W1	Mainly inaccessible secondary woodland, damp and shaded. Few ground flora species. Extends up steep embankment to	Sweeping

Location	Description	Survey methods
	north. Some marginal emergent vegetation at foot.	
G4	Patchy tall grassland on shingle and sandy gravels, with taller ruderals and some scrub. Probably periodically inundated but not severely scoured. Moderately species-rich, with frequent forbs. Small sheltered area to west with tall emergent marginal vegetation.	Sweeping, pan-traps
G5	Small enclosure of moderately species-rich neutral grassland with frequent common forbs. Mown in late summer for hay, but probably not every year.	Sweeping
H5	Mixed intermittent hedge along interface of G5 with secondary woodland on steep bank below (W1).	Beating, sweeping, light-trap
S2	Large are of open shingle and cobbles subject to frequent inundation and scouring. Patchy, taller vegetation at rear, moderately species-rich with frequent forbs. Some scattered scrub and taller ruderals, particularly at rear.	Sweeping, pitfall traps
A1	Shallow, fast-flowing riffles over cobbles and shingles. Almost no vegetation except for some patchy algae. Subject to frequent scouring.	Kick-samples, dipping
A2	Deeper, moderately fast-flowing water over cobbles and shingles. Almost no vegetation except for some patchy algae. Subject to frequent scouring.	Kick-samples, dipping
A3	Deeper, moderately fast-flowing water over shingles and finer gravels. Almost not vegetation except for some patchy algae.	Kick-samples, dipping
A4	Medium size area of mainly fine gravels and deep silt, with shingles to rear. No vegetation, but with some small timber debris. Subject to frequent scouring.	Dipping

Methodology for Assessment of Impacts

9.4.68 The assessment of impacts from construction and operation has followed the same methodology. As stated above, the methodology followed that set out in the Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016) as these represent the industry standard and provide the information required by the relevant sections of DMRB.

Zone of impact for ecological features

9.4.69 All plant and animal species, habitats and integrated plant and animal communities that occur within the ‘zone of impact’ of the Scheme are defined as potential ‘ecological receptors’. The zone of impact for ecological features varies, depending on the nature and behaviour of the receptors, and also the type of impact that

may affect them. In this Chapter, the assessment of individual receptors is considered for the whole of the site plus the distances listed in Table 9.5 below.

Table 9.5 Maximum Zone of Impact from Scheme Boundary for Ecological Features

Ecological feature	Maximum zone of impact from the site boundary
Internationally designated sites, e.g. Special Areas of Conservation (SACs)	10km (30km for sites designated for bats)
Nationally designated sites, including Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs)	2km
Locally designated sites - Local Nature Reserves (LNRs) and Site of Importance for Nature Conservation (SINCs)	1km
Fauna including amphibians, reptiles, mammals, birds and invertebrates.	2km (5km for bat species)

9.4.70 The maximum zone of impact for international and national sites was established at 10km due to potential hydrological impacts with the exception of effects on mobile bat populations where a 30km zones has been used. For locally designated non-statutory sites, 1km was chosen as a maximum zone of impact given the non-statutory nature of their designation and the fact that these sites are designated for their habitat value rather than species which could be impacted upon over larger area e.g. bats. Regarding fauna, it is largely the behaviour of species, including movement in the landscape combined with the nature of the development, which determines the 2km maximum zone of impact with the exception of bats.

Determining value

9.4.71 The CIEEM guidelines recommend that the value of ecological receptors or features is determined based on a geographic frame of reference. For this assessment the following geographic frame of reference is used:

- International;
- National (i.e. UK);
- Regional (i.e. Mid Wales);
- County;
- Local (i.e. within circa 5km); and
- Less than Local (i.e. within the context of the site and immediate vicinity).

Valuing habitat and species

9.4.72 In accordance with the CIEEM guidelines, in assigning a level of value to each habitat or species considered in the assessment, it is necessary to consider its distribution and status, including a consideration of trends based on available historic records. Rarity (including inclusion of lists of species of conservation importance, such as Red Data Lists, Birds of Conservation Concern, Biodiversity Action Plans and Lists of Habitats and Species of Principle Importance for the Conservation of Biodiversity (Section 7 Habitats and Species)) is an important consideration because of its relationship with threat and vulnerability although since some species are inherently rare, it is necessary to consider rarity in the context of status. A habitat or species that is rare or declining should be assigned a greater level of importance than one that is rare but known to have a stable distribution or population.

9.4.73 Reference is also made to the biodiversity action plans listed in Section 9.2 above. The presence of a habitat or species on these lists reflects the fact that it is in a sub-optimal state; however it does not necessarily imply any specific level of importance.

Predicting and characterising ecological impacts

9.4.74 In accordance with CIEEM guidelines, when describing impacts reference is made to the following:

- Magnitude - i.e. the size of an impact in quantitative terms where possible;
- Extent - i.e. the area over which an impact occurs;
- Duration - i.e. the time for which an impact is expected to last;
- Reversibility - i.e. 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 a spontaneous recovery is possible; and
- Timing and frequency - i.e. whether impacts occur during critical life stages or seasons and how often impacts occur.

9.4.75 Both direct and indirect impacts have been considered: direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor, e.g. a pollution event reducing the food source for a species such as otter or water vole.

9.4.76 The following criteria for determining the magnitude of impact has been used and are based upon, or adapted from, those given in the CIEEM guidelines.

- Major negative – The proposal (either on its own or with other proposals) may adversely affect the integrity of the site, 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. This includes large-scale damage or loss of a large proportion of a particular semi-natural habitat type or protected species habitats that are of regional/national importance or listed as key habitats in the UK Biodiversity Action Plan Steering Group Report Loss of Protected Species.
- Moderate negative – The site's integrity will not be adversely affected but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly demonstrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as major negative. This would apply in the case of damage or loss of a small proportion of a particular semi-natural habitat type or protected species habitat that are of regional / national importance or listed as key habitats in the UK Biodiversity Action Plan Steering Group Report.
- Minor negative – Neither of the above apply, but some minor negative impact is evident. (In the case of Natura 2000 sites a further assessment may be necessary if detailed plans are not yet available). This would apply in the case of damage or loss of a proportion of a particular semi-natural habitat type or protected species' habitat that are of district/ county importance or listed as key habitats in Local Biodiversity Action Plans.
- Negligible negative – Very minor loss of or detrimental impact is evident, but below a level which would be considered a Minor negative impact. This would apply in the case of damage or loss of semi-natural vegetation or wildlife habitats but not protected species. Habitats are not locally or regionally important.
- Neutral – No observable impact in either direction. This would apply in the case of damage or minor losses of common types of habitats or common wildlife. Habitats are not locally or regionally important.
- Negligible positive – Impacts which provide a negligible net gain for biodiversity overall.

- Minor Positive – Impacts which provide a slight net gain for biodiversity overall. This would apply in the case of an increase in the population of a species or area of habitat which is not locally or nationally important.
- Moderate Positive – Impact which provide a net gain for biodiversity overall (but which will not positively affect the integrity of the site). This would include a small increase in the proportion of a semi-natural habitat or habitat of a protected species that are locally important or listed as key habitats within the UK Biodiversity Action Plan Steering Group Report.
- Major Positive – Impact which provides a net gain for biodiversity overall in terms of increases in habitat diversity (and which may positively affect the integrity of the site). This would apply in the case of a large-scale increase in a protected species or habitat of a protected species that are locally important or listed as key habitats within the UK Biodiversity Action Plan Steering Group Report.

9.4.77 The integrity of a site is defined within the Welsh planning guidance (TAN 5, Welsh Office, 1996) as: '…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 levels of populations of the species for which it was classified'.

Significance criteria

9.4.78 In accordance with the CIEEM guidelines, a significant impact, in ecological terms, is defined as 'an impact (whether negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area, including cumulative and in-combination impacts'. It is important to note however that in accordance with the CIEEM guidelines, the actual determination of whether an impact is ecologically significant is made irrespective of the value of the receptor in question. In this respect the CIEEM methodology differs from some other approaches to EIA.

9.4.79 The value of a feature that will be significantly affected is used to determine the geographical scale at which the impact is significant, e.g. an ecologically significant impact on a feature of county importance will be considered to represent a significant impact at a county level. This in turn is used to determine the implications in terms of legislation, policy and /or development management.

9.4.80 Any significant impacts remaining after mitigation (the residual impacts), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered

against legislation, policy and development management in determining the scheme.

Mitigation and Enhancement

9.4.81 It is important as part of any environmental impact assessment, wherever possible, to clearly differentiate between mitigation and enhancement. These terms are used in this assessment as follows:

- Mitigation is used to refer to measures to avoid, reduce or remedy a specific negative impact in situ; and
- Enhancement is used to refer to measures that would result in positive ecological impacts but which do not relate to specific significant negative impacts or where measures are required to ensure legal compliance.

9.5 Consultation

9.5.1 The A487(T) New Pont-ar-Ddyfi Scoping report was submitted to members of the Environmental Liaison Group (ELG), statutory authorities and the employer's agent for comment on 4 September 2015. Comments received on the scoping report have been addressed where appropriate.

9.5.2 Key statutory environmental stakeholders in terms of ecology include:

- Natural Resources Wales;
- Powys County Council;
- Gwynedd Council; and
- Snowdonia National Park Authority.

9.5.3 The responses received in relation to the scoping report are provided in Appendix 1.4 in Volume 3 of this Statement. They are also summarised in Table 9.6 below.

Table 9.6 Summary of Scoping Report Consultation Responses

Consultee	Summary of Comments
Natural Resources Wales	Highlighted the presence of beaver on the Afon Dyfi, consideration of fish species and the impacts on European Sites
North Wales Trunk Roads Agency	Requested consideration of all amphibian species and dormice within the ecological surveys, along with consideration of Section 7 species. Highlighted the presence of invasive non-native species.

9.5.4 Four ELG meetings have been held with consultees including Natural Resources Wales and Snowdonia National Park

Authority. During two of these meetings the survey proposals and initial survey results have been discussed. Comments from attendees have been addressed where appropriate.

Limitations and Assumptions

9.5.5 The findings presented in this assessment represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors which affect the presence of plants and animals, such as the time of year, migration patterns and behaviour. Nevertheless, these surveys were conducted at the optimal survey periods and using methodologies which are accepted by NRW and other statutory bodies. The results of the ecological survey allow evaluation of nature conservation value, assessment of the significance of potential impacts that may arise from the Scheme and consideration of appropriate mitigation measures. Every effort has been made to ensure that the findings of the study present as accurate an interpretation as possible of the status of flora and fauna within the study area.

9.5.6 Given the large number of bat passes recorded on the static detectors, Myotis bat calls have been differentiated into two groups; the large Myotis group comprising Natterer's bat (*Myotis nattereri*) and Bechstein's bat (*M. bechsteini*), and the small Myotis group comprising the remaining species. It should be noted that calls within the large Myotis group were checked for potential Bechstein's bat. This aggregation approach is not considered to be a limitation within the study given the similar behaviours and habitat requirements of these species with the exception of Bechstein's bat.

9.5.7 Due to the subjective nature of bat call analysis it is possible that other ecologists may differ in opinion on the identification of calls, however current reference works (Russ, 2012) (Middleton, Froud, & French, 2014) have been used along with BatExplorer software which also includes species identification functions.

9.5.8 There is also the potential that some calls may have been overlooked principally due to the fact that the automatic species identification systems cannot identify multiply species within the same sound clip. However, with the exception of files identified as common or soprano pipistrelle by the software, all other files have been checked and all species recorded within those files included within the results set out in this report.

9.5.9 During the December 2015 and January 2016 wintering bird surveys some sections of survey area could not be surveyed due to flooding where the Afon Dyfi had burst its banks. This only affected the mid to high tide count.

9.5.10 For the purpose of this assessment it has been assumed that common reptiles (grass snake (*Natrix natrix*) and common lizard (*Zootoca vivpara*)) and regularly occurring Section 7 mammal species (hedgehog (*Erinaceus europaeus*), polecat (*Mustela putorius*) and brown hare (*Lepus europaeus*)) are present within the Study Area. No specific surveys for these surveys have been proposed.

9.6 Baseline Environment

Desk Study

Statutory Designated Sites

9.6.1 The Dyfi Estuary / Aber Dyfi SPA includes the Estuary, adjoining saltmarsh, marshy grassland and improved grassland. The site is of importance as a traditional wintering area for Greenland white-fronted goose, representing at least 1% of the wintering population in the UK. This site is located approximately 4.6km south west of the existing Pont-ar-Ddyfi in a straight line as shown on Figure 9.2 in Volume 2.

9.6.2 Cors Fochno and Dyfi Ramsar site comprises the Dyfi Estuary, calcareous dune systems and raised mire. The closest extent of the Ramsar site is 4.6km from the proposed Scheme. The flora and invertebrate fauna are of national importance, and the site also designated for overwintering Greenland white-fronted goose and is a key site in Wales for breeding waders. It also contains nationally important and Red Data Book lower plant species, dune slack and shingle bryophyte assemblages, dune fungal assemblages and a mire bryophyte assemblage.

9.6.3 The nearest SAC designated for bat species is the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionydd Oakwoods and Bat Sites SAC, which is located approximately 15km from the proposed Scheme.

9.6.4 The Dyfi SSSI is designated for its geological and biological features. The site has important populations of invertebrate species and has a wide range of breeding and wintering birds; the site is used by a nationally significant population of approximately 5000 over-wintering wigeon (*Anas penelope*), and a flock of approximately 140 Greenland white-fronted geese use the site as the only regular wintering population in Wales. This site is located approximately 4.6km south west of the existing Pont-ar-Ddyfi in a straight line as shown on Figure 9.2 in Volume 2.

9.6.5 There are no other SSSIs within the search area.

Non-Statutory Designated Sites

9.6.6 There are no non-statutory nature conservation sites (Sites of Importance for Nature Conservation) within 2km of the proposed scheme. However it is noted that the Snowdonia National Park Authority do not have a system of Non-Statutory Designated Sites, but consider the park area as a whole should be treated as such a site.

9.6.7 The Study Area is located within the Dyfi Biosphere Reserve. Biosphere Reserves have been set up by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) to promote solutions for reconciling the conservation of biodiversity with sustainable use of the area.

9.6.8 There are a number of ancient woodland sites within 2km of the scheme boundary (as shown on Figure 9.3 in Volume 2), comprising of Ancient Semi-Natural Woodland, Plantation on Ancient Woodland Sites, Plantation on Ancient Woodland Sites (PAWS) Restoration Priority Areas, Restored Ancient Woodland Sites and Ancient Woodland sites of Unknown Category. Sites in close proximity to the Scheme include areas of plantation, semi natural and unknown category ancient woodlands, and PAWS Priority Areas; approximately 200m north on the other side of the Afon Dyfi in Foel-y-Ffridd, 660m north in Coed-y-Ffridd, 650m west within Coed-y-Penryn and approximately 200m from the southern boundary of the Scheme near Fron-y-gog.

Species Records

9.6.9 The following species records have been provided by Cofnod, the north Wales environmental records centre. For the purposes of this section “historic records” are those predating the year 2000.

European Protected Species

Bats

9.6.10 Bat species recorded in the area include brown long-eared bat (*Plecotus auritus*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), noctule bat (*Nyctalus noctula*), Daubenton’s bat (*Myotis daubentonii*), Brandt’s bat (*Myotis brandtii*), whiskered bat (*Myotis mystacinus*), greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat (*Rhinolophus hipposideros*).

9.6.11 There are numerous records of bat roosts within 5km of the proposed scheme:

- Historic records[6] of bat roosts of unspecified species within the immediate vicinity of the scheme at Pont-ar-Ddyfi and 831m north near Ffridd Gate;
- Historic record of a brown long-eared bat roost approximately 1.9km to the north of the scheme SH739035 (NRW record) and a number of historic records between 1.9 - 4.2km from site at Gelligen Fawr, Pantperthog, Plas Llwyngwern and Garthgwynion, Glaspwll;
- A number of brown long eared bat and pipistrelle roosts have been recorded approximately 2.5km from site at Pantperthog;
- Record of an unspecified bat roost 2.3km from site at Pantperthog and records of roosts 4.3km north east at Ger y Llan, Llanwin;
- Records of a potential lesser horseshoe bat roost 2.7km and 2.9km from site at Pennal;
- Historic and more recent records of pipistrelle roosts 1.3-1.5km from site at Pantperthog and Gelligen Fach;
- Historic records of a Brandt's bat roost 4.2km south west of the scheme at Garthgwynion, Glaspwll; and
- A known bat roost located 2.5km from the scheme, where lesser horseshoe bat, greater horseshoe bat and brown long-eared bats have been counted.

9.6.12 There are records of brown long eared bat activity approximately 1.4-1.9km from site at Pant Lludw and Gelligen Fawr. There are recent records of noctules foraging approximately 1.4km from site along the A487 and at 3.6km south east at Coed Ty Gwyn. There are a number of records of Daubenton's bat activity along the Afon Dulais 1.4km south east of the site, and 4.5km north east at Llanwrin, and an historic record of whiskered bat 3.8km from site near Pennal. There are records of greater and lesser horseshoe bats at Plas Llwyngwern. There are further records of lesser horseshoe bats near Pantperthog and the Ceinws Slate Mine.

9.6.13 There are further historic and more recent records of lesser horseshoe bat, brown long eared bat, whiskered bat and pipistrelle species in the wider 5km search area.

9.6.14 As part of the consideration of the implications of the Scheme on European Sites the search area was increased for lesser horseshoe bat roosts. The following roosts were identified:

- Hibernation roosts near Pennal 3.1km and 4.1km to the west;

[6] For the purpose of this chapter "Historic Records" are those predating the year 2000.

- A maternity and associated summer roost near Plas Llwyngwern and the Centre for Alternative Technology (as described above) 2.5km to the north;
- A number of hibernation roosts centred around Ceinws between 3.3km and 6km to the north; and
- A roost near Minffordd 9.5km to the north.

9.6.15 The roost near Minffordd is approximately 4.5km from the southernmost roost included within the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionydd Oakwoods and Bat Sites SAC.

Otter

9.6.16 There are numerous records of otter along the Afon Dyfi within the immediate vicinity of the Scheme and along the Afon Dulas, Pantperthog, including sightings and field signs records. There are records of field signs 394m west and 834m north of the scheme on the Afon Dyfi. There are two records of road casualties 1.6km north of the scheme on the A487, a record 1.9km south of the site and numerous records of field signs, holts and lay ups 2.5 - 2.8km north near Pantperthog and south along the Aber Dyfi. There are numerous records of road casualties and field signs within the wider 5km search area, along the Afon Pennal, the Afon Crewi and at Coed Ty Gwyn.

Dormouse

9.6.17 There are historic records of dormouse 551m from the Scheme at Foel y Ffridd, 1.1km south west of the scheme in Machynlleth, approximately 1.4km north near Pantperthog and 1.4km from site at Coed y Ffridd and Gellygen Fach. There are further historic records 2.9km south near Glaspwll and Glanmeryn, and more recent records of field signs north near the Centre for Alternative Technology, 2.4-2.7km north near Pantperthog, Morben Isaf and 3.4km south east at Coed Ty Gwyn. There are numerous historic records between 3-5km north and west of the scheme near Pantperthog, Coed Esgair Foel - Eirin, and Pennal, and more recent records approximately 3.1km north of the site in the same area.

9.6.18 Surveys undertaken for the Llanwrin to Dolgellau Gas Pipeline recorded the presence of dormice in 2010 approximately 2.3km north of the northern extent of the Scheme.

Great Crested Newt

9.6.19 There are five historic records of great crested newt in various garden ponds on the Newlands Estate, Machynlleth, within 1km of the scheme.

Marsh Fritillary

9.6.20 There are two historic records of marsh fritillary (*Euphydryas aurinia*) 5km south east of the site at Ceniarth.

Flora

9.6.21 There is one historic record of Killarney fern (*Trichomanes speciosum*) at Gelli-goch, Machynlleth, approximately 2.2km south west of the scheme.

UK Protected Species

Badger

9.6.22 Badgers have been recorded within the immediate vicinity of the scheme along the A487 near the Pont-ar-Ddyfi, with records of sightings 500m south near Mynydd Griffiths. There are records of setts and field signs north of the scheme at Pantperthog and within woodland at Nant Esgair-gwenyn. There are numerous records of field signs approximately 1.5km north of the scheme near Coed Esgair, and a disused sett recorded 1.7km north in Coed Esgair woodlands. There are a number of records of used and disused setts approximately 1.8km north of the site in the same area of woodland at Coed Esgair. Road casualties have been recorded 1.8km west of Pont-ar-Ddyfi, and there are records approximately 2km north near Pentperthog and Glan Dulas-mawr. There are records of field signs and an active sett 2.5km south west of the site along the A493. There are further records of road casualties and field signs in the wider 5km search area.

Reptiles

9.6.23 Slow worm (*Anguis fragilis*) have been recorded approximately 550m from the scheme at Machynlleth Station. There are records north east of the site near the Centre for Alternative Ecology, 1.8 - 2.1km north of the scheme near Glan Dulas-mawr and approximately 4.3 and 4.9km north near Ceinws.

9.6.24 There is an historic record of grass snake (*Natrix natrix*) 150m south of the scheme at Machynlleth railway station, and a more recent record 3km north of the site at Ceinws. There is an historic record 4.1km from site at Pennal, and a more recent record 4.4km north east of the site at Ceinws.

9.6.25 Common lizard (*Zootoca vivipara*) have been recorded 890m north east of the site at Ffridd Gate, Machynlleth, with a historic record approximately 600m south at Pen Yr Allt. There are also records 4km north at Dyfi Forest, Pantperthog and 4.4km north at Ceinws and Cwm Cadian.

9.6.26 Adder (*Viperus berus*) have been recorded 4.6km south west of the scheme at Pennal.

Amphibians

9.6.27 There is one historical record of smooth newt (*Lissotriton vulgaris*) in a garden pond at Maesy Garth, Machynlleth and more recently approximately 1.9km north east of the site.

9.6.28 There are recent records of multiple adult palmate newts (*Lissotriton helveticus*) north of the scheme near Pantperthog and Llwyn-gwern farm, and one historical record 3.5km north-east of the scheme.

9.6.29 There are four historic records of common frog (*Rana temporaria*), one of which 860m south east of the site, and 19 recent records within 5km of the search area.

9.6.30 There are 14 recent records and two further historical record for common toad (*Bufo bufo*), with records 2.9-5km from the scheme.

Other Nationally Protected Species

9.6.31 There is one historic record from 1959 of pine marten (*Martes martes*) approximately 4.4km north of the scheme at Ceinws forest.

9.6.32 There are no records of white-clawed crayfish (*Austropotamobius pallipes*) or water vole within the 5km search area.

Schedule 1 Bird Species

9.6.33 Kingfisher (*Alcedo atthis*) have been recorded along the Afon Dulas approximately 550m north of the scheme, at Dolygelynen farm, Glangwynedd, with a recent record of a breeding pair at Morfa Dyfi. There is also a historic record at Maes y Garth.

9.6.34 There are osprey (*Pandion haliaetus*) records (sightings) 735m north-west of the site near Foel-y-Ffridd and this species is known to nest approximately 5.3km to the south west of the Scheme.

9.6.35 There are historic records of goshawk (*Accipiter gentilis*) to the south-west of the scheme at Bwlch-y-Groes. There are more recent records approximately 1.9km south within Coed Llynlleod.

9.6.36 There is a recent record of a breeding pair of barn owl (*Tyto alba*) at Y Ffridd in the immediate vicinity of the scheme. Records include breeding pairs approximately 270m north of the scheme at Glan Dulas Mawr, Glanfechan and at Bwlch and Pwllglas. There are records 1.9km south of the scheme in Coed Llynlloedd

and 2.4km south east of the site near Pebrhosmawr. There are further records 3.9km south west at Derwenlas and 4.5km east near Abercegir.

9.6.37 There are numerous historic red kite (*Milvus milvus*) records within the area, and more recent records north of the scheme at Foel y Ffridd and 2.8km south east at Llyn Glanmerin.

9.6.38 There is one historic record of merlin (*Falco columbarius*) approximately 500m from the scheme at Fron-y-Gog, and two more recent records at Morfa Dyfi.

9.6.39 A little ringed plover (*Charadrius dubius*) territory has been recorded within 2km downstream of the Pont-ar-Ddyfi.

9.6.40 There are two records of hen harrier (*Circus cyaneus*) 1.2km south-west of the scheme.

9.6.41 There is a record of approximately 54 black tailed godwit (*Limosa limosa*) undertaking spring passage 4.7km from site at Morfa Dyfi.

Fish Species

9.6.42 Natural Resources Wales confirmed the Afon Dyfi as being a very important fishery within Wales, with regular visits from international anglers. It is considered to be one of the best sea trout rivers in the UK. Declared rod catches of trout in 2013 and 2014 for the Afon Dyfi accounted for 15% and 14% respectively of the total catch across Wales. The declare catch of 1836 trout in 2015 was the third highest across England and Wales.

9.6.43 Fish sampling data from monitoring undertaken by NRW at a sampling site immediately downstream of the existing Pont-ar-Ddyfi is set out in Table 9.7 below.

Table 9.7 Fish Monitoring Data for Site 71 on the Afon Dyfi

Year	Salmon fry	Salmon par	Trout fry	Trout par	Flounder	Bullhead	Stoneloach	Minnow
2005	12	0	0	0	0	0	10	0
2009	11	1	1	0	1	15	12	2
2010	7	0	0	0	0	12	4	9

9.6.44 NRW also stated that eels (*Anguilla anguilla*) and lamprey species may be present in the river in their response to the Scoping Report. Eel have been recorded on both the Afon Dyfi and Afon Dulas in the vicinity of the Scheme.

Other Notable Species

9.6.45 Numerous other records of notable species including Birds of Conservation Concern and Section 7 Species were also provided. These are documented in the Extended Phase 1 and Desk Study Report provided in Appendix 9.1. Recent records include those for the spider *Arctosa cinerea* and the true fly *Tabanus cordiger* which are both Red Data Book species due to being either Nationally Scarce or Nationally Rare.

9.6.46 Statutory consultees have also highlighted the potential presence of the minutest diving beetle within the Afon Dyfi. This is a Red Data Book and Section 7 species.

Field Surveys

Extended Phase 1 Habitat Survey

9.6.47 A total of 29 habitats were identified within the Study Area and immediate surrounding area. These are shown on Figures 9.4 and 9.5 in Volume 2.

9.6.48 The area to the north-east of the Study Area (north of the Millennium Cycle Bridge over the Afon Dyfi) comprises areas of improved and poor semi-improved grassland, grazed by sheep. Parallel to the A487 is an area of stone outcrops, mapped as basic inland cliff, and bracken (*Pteridium aquilinum*) slopes. There is an area of broad-leaved woodland on the north-western boundary bordering the river containing species such as sycamore (*Acer pseudoplatanus*), ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), oak (*Quercus sp.*), crack willow (*Salix fragilis*) and goat willow (*Salix caprea*). Japanese knotweed (*Fallopia japonica*) and Indian balsam (*Impatiens glandulifera*) are present within the understorey.

9.6.49 The Afon Dyfi intersects the Study Area and is bordered by areas of broad-leaved woodland, scattered scrub, improved and poor-semi-improved grassland and shingle beaches. Japanese knotweed and Indian balsam are widespread along the course, mainly throughout the woodland area on the northern bank.

9.6.50 The area to the south of the Millennium Cycle Bridge and the Afon Dyfi consists of improved and poor semi-improved grassland on the floodplain of the river. This area is subject to heavy grazing and contains areas of marshy grassland and flush within semi-improved and improved fields. Fields within the centre of the Study Area are bordered by fence lines with scattered broad-leaved trees and scattered scrub, and defunct species-rich hedgerows.

9.6.51 The fields on the western boundary of the Study Area are bordered by intact species-rich hedgerows, running along both sides of the A487.

9.6.52 There are a number of ponds and ditches throughout the Study Area, located at field boundaries within hedgerows and fence-lines with trees. There is a canalised roadside ditch running along the A487 on the western site boundary, parallel to a hedgerow.

Potential for Legally Protected Species

9.6.53 The Extended Phase 1 Survey identified areas within the Study Area which have the potential to support a number of legally protected species including:

- Breeding birds;
- Badger;
- Otter;
- Water voles;
- Bat foraging and roosting;
- Dormice;
- Reptiles; and
- Amphibians.

National Vegetation Classification (NVC)

9.6.54 Ten distinct plant communities were identified on site (including transitional communities) with additional habitat features described within Target Notes in the NVC Survey Report including in Appendix 9.2. Plant communities are mapped on Figures 9.6 and 9.7 in Volume 2.

9.6.55 The floodplain to the south-west of the site consists mainly of semi-improved and improved grassland, with intersecting hedgerows. There are areas of mesotrophic grassland (MG1) communities along roadside verges, with a low diversity and limited to common species such as Yorkshire fog (*Holcus lanatus*), nettle (*Urtica dioica*) and false-oat grass (*Arrhenatherum elatius*).

9.6.56 Roadside verges on the north-east of the site support another mesotrophic grassland community (MG5) which is associated with well-drained areas of land. In these areas a high proportion of fine leaved grasses and flowering herbs were found, including common bird's-foot trefoil (*Lotus corniculatus),* red clover (*Trifolium pratense*) and in the less frequently mown area common knapweed (*Centaurea nigra*) was present. A small strip of verge adjacent to a cycle track had a higher diversity of species, this was attributed to planting.

9.6.57 In the south and west of the site the majority of the grazed pasture has a low diversity and is dominated by Yorkshire fog and perennial rye-grass (*Lolium perenne*) (MG6). These fields are damp and have patches of soft rush (*Juncus effusus*).

9.6.58 A small field which lies north-west of the site, between the A487 and the Millennium Cycle Bridge, has a transitional grassland (described as transitional MG6b grassland). This grassland is dominated by fine-leaved grasses and a relatively high proportion of flowering herbs, but is relatively damp with scattered patches of soft rush.

9.6.59 Another strip of this transitional grassland community type was identified on the riverbank to the north-east of the Millennium footbridge. This strip of grassland supports occasional gorse (*Ulex europaeus*), scrub and is dominated by common bent (*Agrostis capillaris*) and Yorkshire fog.

9.6.60 In the south and west of the site the fields appear to be more intensively managed and support only a low diversity of very common plants dominated by perennial rye-grass and Yorkshire fog.

9.6.61 Areas of marshy grassland (MG10 rush pasture communities) generally occurs as patches within the grazed pasture. This community is characterised by dense soft rush, with other frequent species being creeping bent (*Agrostis stolonifera*) and Yorkshire fog. There are also a few patches of shallow standing water supporting floating sweet-grass (*Glyceria fluitans*) which are likely to dry out during dryer periods.

9.6.62 In the north of the study area between the A487 and Y Ffridd Farm there is a grassy slope which supports semi-improved acid grassland. This grassland forms a mosaic with trees and scattered scrub, rocky outcrops, patchy bracken and marshy areas. The grassland is dominated by creeping bent and supports a moderately diverse mix of associated grasses and herbs. On this grassy slope there are also several rock outcrops which support a more open sward with gorse.

9.6.63 There is bracken-dominated vegetation on the slope south of Y Ffridd which appears to be spreading into the acid grassland. Beneath the bracken there is a grass community dominated by common bent and sweet vernal-grass.

9.6.64 In the south of the study area there are several areas of heavily cattle poached ground present in the grazed pasture, mainly in gateways and along tracks.

9.6.65 There are several shingle and silt banks, in and beside the river. In a few places these shingle banks support vegetation. Frequent species include creeping bent, Indian balsam, jointed rush

(*Juncus articulatus*), water pepper (*Persicaria hydropiper*), lesser spearwort (*Ranunculus flammula*) and reed canary grass (*Phalaris arundinacea*).

9.6.66 Along the south bank of the river there is rock armoury with trees and scrub. The vegetation includes alder, ash, grey willow (*Salix cinerea*), rowan (*Sorbus aucuparia*), bramble, gorse and sycamore.

9.6.67 There are several ditches present across the study area. The largest ditch lies east of the A487, with smaller more shaded ditches present beside some of the hedges in the southern part of the study area.

9.6.68 Two small ponds are present to the south east of the study area and are largely shaded, but appear to support permanent standing water and include several aquatic plants.

9.6.69 The majority of the fields within the study area are bordered by hedgerows, mostly dominated by hawthorn (*Crataegus mongyna*) and occasional ash standards. The hedges were assessed as having relatively low botanical diversity.

9.6.70 Several areas of woodlands are present to the north of the site, and of the Afon Dyfi. These were described as being broadleaved woodland, with an area of plantation on the northern riverbank. The dominant species are oak (*Quercus robur*) and ash. During the course of the surveys some areas of plantation woodland on the hillside to the north of the Afon Dyfi were felled.

Arboricultural Survey

9.6.71 One hundred and forty-eight trees and groups of trees were recorded during the survey

9.6.72 A small number of trees have been assessed as being of high or moderate value (six classed as Category A2, 18 as Category B and 19 as Category B2). The locations of these trees and the probably root protection zones are shown on Figures 9.8 to 9.10 in Volume 2. Full details of the trees are provided in Appendix 2.2 in Volume 3.

Hedgerows

9.6.73 A total of 31 hedgerows were recorded during the surveys and subsequently assessed for their importance. The locations of these hedgerows are shown on Figure 9.11 in Volume 2.

9.6.74 The majority of the hedgerows (22) were categorised as being ‘intact managed hedgerows’, with five categorised as being ‘intact unmanaged hedgerows’, one as a ‘managed gappy

hedgerow', two as 'unmanaged gappy hedgerows' and one as a 'treeline'.

9.6.75 Five of the hedgerows are considered to be important in terms of the Hedgerow Regulations 1997 due to containing more than seven woody species, or having associated hedgerow features such as banks and ditches. It is also noted that hedgerows are a Section 7 Habitat. Full details of the hedges are provided in Appendix 9.1 in Volume 3.

Bryophytes

9.6.76 A total of 109 mosses and liverworts were recorded within the survey area. Two of these, curl-leaved forklet moss (*Dicranella crispa*) and the moss *Weissia rutilans*, are of conservation concern, the remainder being of no significant interest. The locations of these species within the study area are shown on Figure 9.12 in Volume 2. Curl-leaved forklet moss was recorded mainly on the southern bank of the Afon Dyfi on sections of vertical eroding bank immediately upstream and downstream of the existing Pont-ar-Ddyfi. Further colonies were also recorded on the north bank upstream of the Millennium Footbridge near the confluence with the Afon Dulas.

9.6.77 Curl-leaved forklet moss is rare colonist of bare ground in a variety of open habitats. It appears to have undergone a significant decline in Britain and in recent years has been recorded very rarely (Blockeel, Bosanquet, Hill, & Preston, 2014). It has been recorded in Wales only twice, in 1911 at Morfa Dyffryn (Merionethshire) and in 2009 at Tylcau Hill (Radnorshire), and is included on the Welsh Red List as 'Endangered' (Bosanquet & Dines, 2011). Morfa Dyffryn has been surveyed many times by competent bryologists since 1911 and this species has not been re-recorded, suggesting it has become extinct.

9.6.78 *Weissia rutilans* is a nationally scarce species initially recorded in one location, the first record for Montgomeryshire.

9.6.79 A full list of bryophytes recorded is included in the Bryophyte Survey Report in Appendix 9.3 in Volume 3.

Invasive Species

9.6.80 Japanese knotweed and Indian balsam were found throughout the Study Area; along the Afon Dyfi banks, within woodland areas to the north of the river and within hedgerows and treelines in the western and north-eastern areas of the Study Area. Rhododendron (*Rhododendron ponticum*) has also been identified to the north of the existing Pont-ar-Ddyfi.

9.6.81 New Zealand pygmy weed (*Crassula hemlseii*) was also recorded in two waterbodies during the National Vegetation Classification survey.

9.6.82 The locations of invasive plants are shown on the Phase 1 Habitat Survey Maps on Figures 9.4 and 9.5 in Volume 2, with further details Target Notes in Appendix 9.1 and 9.2 in Volume 3.

Amphibians

9.6.83 Thirty-one waterbodies within the Study Area were assessed and subject to a Habitat Suitability Index Assessment (HSI) for the potential to support great crested newt. Following comments from statutory consultees during consultation, presence/absence surveys were undertaken on 15 waterbodies which represented those still present and holding water in spring 2016 and capable of supporting breeding amphibians. The location of waterbodies along with the results of the HSI and presence/absence surveys are shown on Figure 9.13 in Volume 2.

9.6.84 During the survey, no great crested newts were recorded. A small number of adult palmate newts, adult common frogs and common toads were found, as well as frog and toad spawn and tadpoles.

9.6.85 Common frogs were found in six of the waterbodies surveyed, common toads in three waterbodies and palmate newts in just one (waterbody 19, which held all three species of amphibians recorded during the survey).

9.6.86 Many of the remaining waterbodies rapidly dried during spring 2016. Only two other waterbodies, 3 and 38, still contained water at the end of the survey period (beginning of June). Both of these waterbodies had poor habitat suitability for great crested newt, were heavily disturbed by cattle and contained high densities of sticklebacks with little aquatic vegetation.

9.6.87 Further details are included within Appendix 9.4 in Volume 3.

Bat Roost Surveys

9.6.88 Of the trees identified and assessed as having moderate or high potential to contain bat roosts during the Extended Phase 1 Habitat Survey, the 12 trees located within 60m of the Scheme were subject to aerial inspections. All the trees which had an aerial inspection were tagged for future identification and the tag numbers are used to refer to these trees. Two of the trees (trees 31883 and 31887) contained evidence of previous roosting by bats in the form of smudging and smoothing of the internal surface of potential roost features. These are therefore considered within the assessment in Section 9.6 as being bat

roosts although no droppings were found within these trees. Tree 31883, an ash, contains several large cavities within the trunk extending up to 500mm. Two of these have smoothing of the interior surfaces suggesting that bats have used this cavity. The size of the cavity is such that it is possible that this tree could support a maternity colony of tree dwelling bats.

9.6.89 Tree 31887 is also an ash tree, which has a canker leading a to 75mm deep cavity with multiple crevices. This smaller cavity is less likely to support a maternity roost of bats.

Of the remaining trees, one was considered to be of moderate to high potential, four of moderate potential and five of low potential. The location of these trees is shown on Figure 9.14 in Volume 2.

9.6.90 Further details are provided within the Bat Survey Report in Appendix 9.5 in Volume 3.

Bat Activity Surveys

Transect Surveys

9.6.91 The locations of bats recorded during the transect surveys are shown on Figures 9.15 – 21 in Volume 2. Detailed lists of bat call registrations are provided in the Bat Survey Report in Appendix 9.5 in Volume 3.

9.6.92 Four individual bat species and one cryptic species group were recorded during the transect surveys. These included common and soprano pipistrelle, noctule, Daubenton's bat and whiskered/Brandt's bat[7]. Soprano and common pipistrelle were the most frequently recorded species during the transects with Daubenton's bat also frequently recorded along the Afon Dyfi. Noctule were occasionally recorded on the northern bank of the river and over the central part of the flood plan. The majority of bat activity is concentrated along the river corridor and mature hedgerows (as shown on Figures 9.4 and 9.5 in Volume 2) within the Study Area.

9.6.93 Of note was the first registration of a bat during the July transect which was of a common pipistrelle approximately 8 minutes prior to the time of sunset. The bat was recorded on the A487 just to the south of the existing Pont-ar-Ddyfi, suggesting that a roost could be present within the local vicinity.

[7] Whiskered, Brandt's and Alcathoe (*Myotis alcathoe*) bats are a group of cryptic species which are difficult to distinguish in the field and cannot be separated from echolocation calls. To date Alcathoe bat has not been recorded in Wales (Dietz & Kiefer, 2016).

Static Bat Activity Monitoring

9.6.94 Nine individual species of bat have been recorded on the static bat detectors to date along with the small Myotis group. Bat activity was recorded at all three locations in July and August 2015 (Figures 9.23 and 9.24 in Volume 2). No activity was recorded at Location 2 during September 2015 (Figure 9.25 in Volume 2), although other sounds not from bats were recorded suggesting that the detector had not failed. No bats were recorded during the October 2015 recording session although other sounds were recorded by all three detectors. Wind conditions were relatively high during the October session with gust speeds of 24mph (high force 5) recorded at the Foel Friog Weather Station (Jones, n.d.). Activity was also recorded at all locations in April, May and June 2016 as shown on Figures 9.26 to 9.28 in Volume 2.

9.6.95 The highest level of activity was recorded at Location 1 on the north bank of the river during September 2015. This location also recorded the highest level in July 2015, April 2016 and June 2016, although Location 2 recorded a higher level of activity in August 2015. The highest level of activity recorded in May 2016 was at Location 3.

9.6.96 The levels of bat activity recorded at all three locations are considered to be high or very high, with a maximum average of 1390 bat pass equivalents per night recorded at Location 1 in September (see Graph 9.1).

9.6.97 Common and soprano pipistrelle was the most frequently recorded species on the static detectors, followed by the small Myotis group. The majority of the calls from this group recorded at Location 1 are considered likely to be Daubenton's bat which are known to forage over the river from the Transect surveys.

9.6.98 Other species recorded include occasional passes by noctule bats, and individual passes of serotine, barbastelle, lesser horseshoe and greater horseshoe bats. A single pass of a greater horseshoe bat was recorded on the northern bank of the Afon Dyfi (Location 1) during the August recording session. Lesser horseshoe were recorded on the floodplain at Location 2 in August (one pass over two nights) and at Location 1 on several occasions as show in Tables 9.8 to 9.10 below.

9.6.99 Graph 9.1 Bat Activity Levels Recorded by Static Bat Detectors

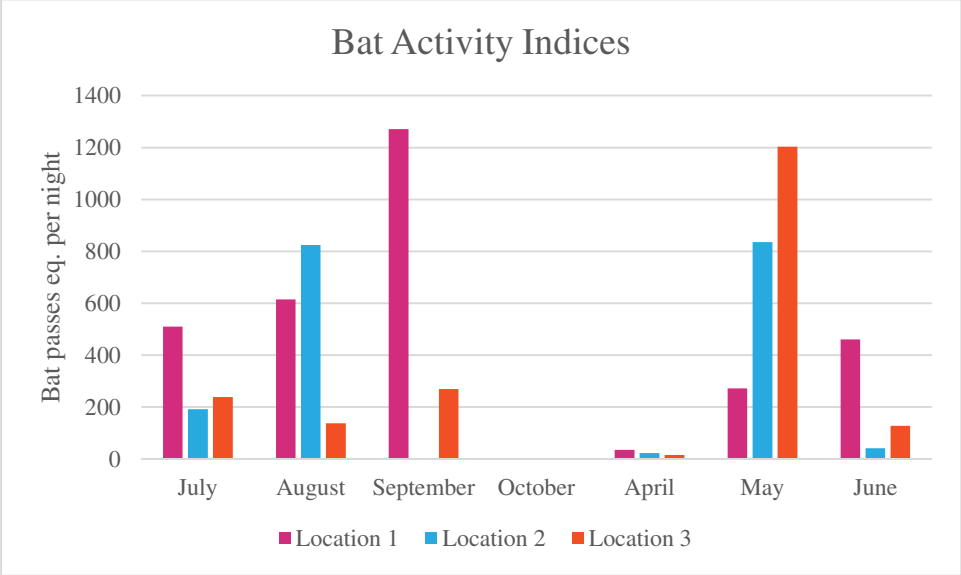

Table 9.8 Bat Activity Indices for each species recorded at Location 1

	Common pipistrelle	Soprano pipistrelle	Nathusius's pipistrelle	Greater horseshoe	Lesser horseshoe	Noctule	Barbastelle	Long-eared bat species	Natterer's bat	Small Myotis group species	Total
July	55	387.6	0	0	0	19.2	0	0	23	25.4	510.2
August	497	83.4	0.2	0.2	0	8.6	0.2	0	0	25.6	615.2
September	79	905.33	0	0	1.33	22	0	0	0.67	263	1271.33
October	0	0	0	0	0	0	0	0	0	0	0
April	5.2	27.8	0	0	0.8	1.2	0	0	0	0	35
May	68	158.6	0.2	0	0	31.2	0.2	0.8	5.4	8	272.4
June	92.8	193.6	0	0	0.8	8.2	0	0	152.2	12.8	460.4

Table 9.9 Bat Activity Indices for each species recorded at Location 2

	Common pipistrelle	Soprano pipistrelle	Lesser horseshoe	Noctule	Serotine	Natterer's bat	Small Myotis group species	Total
July	79.6	98.2	0	9	0.2	0	5	192
August	332.5	440	0.5	12.5	0	0	39.5	825
September	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0
April	12.2	8	0	1.2	0	0	1	22.4
May	183	638.4	0.2	7	0	4.8	2.6	836
June	2	33.2	0	6.2	0	0	0.4	41.8

Table 9.10 Bat Activity Indicies for each species recorded at Location 3

	Common pipistrelle	Soprano pipistrelle	Nathusius's pipistrelle	Noctule	Serotine	Long-eared bat species	Natterer's bat	Small Myotis group species	Total
July	194.4	36.6	0	4.6	0.2	0	0	2.4	238.2
August	18	95.4	0	10.6	0	0	0	13.8	137.8
September	219.67	41	0	6	0	0	0	2.67	269.34
October	0	0	0	0	0	0	0	0	0
April	11.8	3	0	0.4	0	0	0	0.8	16
May	565.8	455.6	0.4	7.6	0.2	0.2	84.6	88.6	1203
June	99.8	20.4	0	4.8	0	0	0.6	2	127.6

Dormouse

9.6.100 Hedgerows within the Study Area provide a range of woody species which provide food sources for dormice. However, the tendency of the floodplain to be inundated means that the majority of the Study Area is unsuitable for hibernation by dormice.

9.6.101 Dormice are known to be present to the north of the Study Area with recent records approximately 2.3km from the northern extent of the scheme, however the management of hedgerows along the existing A487 at the northern extent of the proposed scheme through regular flailing has reduced the opportunity for fruiting hazel and other food sources as shown in Photograph 9.1 below.

Photograph 1 Hedgerows along the existing A487 at the northern tie-in.

9.6.102 Aside from the hedgerows on the existing A487, other areas of potential dormouse habitat are limited to the woodland on the northern bank of the Afon Dyfi and woodlands on the slope to the north at Ffridd farm.

9.6.103 In both these areas the woodland is relatively sparse with little shrub vegetation and poor ground flora, comprising bracken on the hillside slopes and ivy and Japanese knotweed on the river bank. Whilst these areas may provide connectivity for dormice there are not considered likely to provide suitable quality habitat for foraging or nest sites for dormice. However it is noted that the woodland on the river bank to further to the west is of greater quality with a more established shrub layer. If dormice are

present within this area to the west, they could use areas within the footprint of the scheme for dispersal.

9.6.104 In light of their presence to the north of the study area it is considered that dormice have the potential to be present albeit at very low population densities in sub-optimal habitat.

Otter

9.6.105 Twenty-six waterbodies have been assessed for the potential to provide suitable habitat for otter. Two of the waterbodies were assessed as having high suitability, four having medium suitability, eight of having low suitability and 12 waterbodies as having negligible suitability.

9.6.106 The Afon Dyfi and its banks was assessed on site as having high potential habitat for otter. The Afon Dyfi provides good commuting and foraging opportunities for otter, and there are sites suitable for laying up and resting along the northern river bank, within the woodland. A large dog otter was observed in the Afon Dyfi during a survey. No activity was captured on the trail camera placed within the woodland corridor on the northern river bank following the Extended Phase 1 Habitat Survey.

9.6.107 There is a tributary to the east of the site which has high potential to provide foraging, commuting and suitable habitat for laying up and resting. During the survey in January a suitable laying up site was found in the bank in the woodland corridor.

9.6.108 Ditches and ephemeral ponds located on the floodplain to the South of the Afon Dyfi would provide suitable foraging habitat for otters.

9.6.109 A confirmed otter holt was identified approximately 400m upstream of the proposed crossing of the Afon Dyfi on the north bank of the Afon Dyfi near to the confluence of the Afon Dulas (as shown on Figure 9.29 in Volume 2). Camera monitoring of this feature, a hole approximately halfway up the river bank, showed it to be being used by a single adult otter on a regular basis. Potential resting places were also recorded immediately downstream of the retaining wall supporting the existing A487 on the north bank (approximately 60m from the proposed crossing) and on the Afon Dulas. Camera monitoring of the feature near the retaining wall, overhanging tree roots, revealed no use by otters over a period of one month. It is therefore considered unlikely that this is being used as a resting place by otter but it has potential to be used. The feature on the Afon Dulas, undercut bank with tree roots, was not subjected to camera monitoring as it is sufficiently remote from the proposed works that it would not be affected.

9.6.110 Full details of the otter surveys are included within the Riparian Mammal Survey Report in Appendix 9.6 in Volume 3.

Water vole

9.6.111 Twenty-six waterbodies have been assessed for water voles, with four consider to be of medium suitability for water voles, 18 considered to be of low suitability, and two considered to be of negligible suitability.

9.6.112 No water voles or field signs of water voles were recorded during the surveys. It is likely that the repeated flooding of the floodplain over the winter of 2015/16 affected the populations of small mammals within the Study Area and there is the potential for water vole to be present within the Study Area in future years.

Badger

9.6.113 Badger field signs were observed during the survey, which included snuffle holes and possible tracks through field boundaries. Two badger setts were found to the north of the Afon Dyfi, within the area north of the existing A487. These were both considered to be outlier setts with limited signs of activity.

9.6.114 A well-used mammal path was recorded running from the woodland across the existing A487 and the cycle path near the northern abutment of the Millennium Cycle Bridge. The locations of badger setts and field signs are shown on Figure 9.30 in Confidential Appendix 9.7 within Volume 3.

Wintering Birds

9.6.115 No white-fronted geese were recorded within the area surveyed for wintering birds. Small aggregations of birds such as starling (*Sturnus vulgaris*) were recorded using fields within the floodplain. A skein of grey geese were heard flying over the Study Area during the October bat transect but these could not be identified to species level with any certainty.

9.6.116 Whooper swan (*Cygnus cygnus*) was recorded on one occasion in the west of the survey area during the December survey visit.

9.6.117 Small numbers (less than 10) of oystercatcher (*Haematopus ostralegus*) snipe (*Gallinago gallinago*) and curlew (*Numenius arquata*) were recorded in the area to the east of the Millennium Cycle Bridge during the low to mid-tide survey in January.

9.6.118 Full details of the results of the wintering bird surveys are provided in Appendix 9.8 in Volume 3.

Breeding Birds

9.6.119 A total of 51 species were recorded during the three breeding bird surveys across April to June 2016, with an additional five incidental species recorded between March and June 2016.

9.6.120 Cors Fochno and Dyfi Ramsar site is a key site in Wales for breeding waders. Four species of wader were recorded on site; common sandpiper (*Actitis hypoleucos*), oystercatcher (*Haematopus ostralegus*) and little ringed plover (*Charadrius dubius*). A single curlew (*Numenius arquata*) was heard calling from probably off site. Little ringed plover is likely to have bred within the Study Area, and common sandpiper thought possible to have bred within the Study Area.

9.6.121 Six of the species cited on the Dyfi SSSI were recorded, being nuthatch (*Sitta europaea*), sedge warbler (*Acrocephalus schoenobaenus*), reed warbler (*Acrocephalus scirpaceus*), reed bunting (*Emberiza schoeniclus*), curlew and red kite (*Milvus milvus*).

9.6.122 Four species were recorded that are included on Schedule 1 of the Wildlife and Countryside Act 1981, however only little ringer plover are considered to have bred within the site in 2016. Kingfisher (*Alcedo atthis*) have the potential to breed in the steep cut banks of the river but no nests were found during 2016 within the Study Area, and goshawk (*Accipiter gentilis*) and red kite were only recorded flying over the Study Area, although could possibly have bred within the woodlands adjacent to the Study Area or in the local vicinity. A further Schedule 1 species, barn owl, has been recorded breeding locally in desk study records and may forage within the Study Area. No potential barn owl roosting sites were, however, identified within the Study Area.

9.6.123 A total of eight bird species were recorded that are placed on the Red List and 13 species were recorded on the Amber List of the BOCC4 (Eaton, 2015); the remaining 30 species are Green Listed. Six species on the Welsh Red List and 18 species on the Welsh Amber List were recorded (RSPB, 2009); the remaining 27 species are Green Listed. Nine of the species recorded are also included on the S42 list of the NERC Act 2006.

9.6.124 Further details of the birds recorded within Study Area are provided in Appendix 9.9, Volume 3.

Aquatic and Terrestrial Invertebrates

9.6.125 Identification and analysis of invertebrate samples was taken in May 2016. Further sampling work was undertaken in July 2016.

9.6.126 Some 53 invertebrate species have been positively identified from the site to date, with approximately 10 more species to be confirmed at the time of writing.

9.6.127 No protected invertebrate species were recorded on the site.

9.6.128 Five-spot ladybird (*Coccinella quinquepunctata*) was recorded in a small area of grassland growing next to the shingle on the northern river bank. Roy et al (2011) describes this species as rare (Red Data Book 1 Listed) in Britain, with a very local distribution. The 2011 atlas lists only 151 records of this species in Britain, with particular hotspots being the Afon Ystwyth, Afon Rheidol and River Severn in Wales, and the River Spey in Scotland. This species is rarely found more than a few metres away from river shingle in Britain and it is thought to be at the edge of its European range in this country.

9.6.129 Rosy Rustic (*Hydraecia micacea*) Rosy rustic was recorded in the moth trap, which was situated on the northern river bank; this species was also swept from the grassland on this northern bank in the daytime. Rosy rustic is a moth listed as 'Research Only' on the UK BAP, and on the Section 7 list of Species of Principal Importance in Wales. While this moth is currently common and widespread, it is a rapidly declining species that meets UK BAP criteria and could potentially be included as full 'Priority Species' in future.

9.6.130 The majority of fields along the viaduct route had been cut for silage prior to survey, which limited sweeping opportunities, however the field margins, hedgerows and river banks still produced a moderate range of common and ubiquitous invertebrates.

9.6.131 Eleven species of aquatic invertebrate (including larval stages of terrestrial invertebrate species) were identified, none of which is especially rare or interesting although they are all typical of flowing rivers or streams, with many being characteristic of rapid flows and stony substrates. A large number of water beetles were collected, but these were overwhelmingly of *Oreodytes septentrionalis*.

9.6.132 Despite vigorous searching, no evidence of the minutest diving beetle was recorded. Habitats which are potentially suitable for this species are present within the Study Area (i.e. clean, fine silt at the edges of major river estuaries), but the beetle could not be found.

9.6.133 A full list of invertebrates recorded is provided in Appendix 9.10, Volume 3.

Reptiles

9.6.134 No reptiles were found during the 2015 Extended Phase 1 Habitat surveys. The Study Area provides suitable habitat for a number of reptile species including grass snake and common lizard. As documented above it is assumed that grass snake and common lizard are present within the Study Area and that mitigation measures will be incorporated in to the construction methodology. No specific surveys for reptile species are proposed.

Fish Species

9.6.135 Although no specific surveys have been undertaken for fish, a number of ad hoc observations have been made. These include the sightings of trout and flounder during otter surveys and the presence of eels within the ditch alongside the existing A487.

9.7 Potential Construction Effects - Before Mitigation

Statutory Designated Sites

9.7.1 The SPA and SAC designated sites are considered to be of international importance. In reference to UK and Welsh Government Policy the Ramsar Site is also considered to be of international importance and for the purpose of this assessment is regarded as a European Site. An assessment of the Implications on European Sites (AIES) has been prepared for the proposed Scheme to fulfil the requirements of the Habitats Regulations and is provided in the Statement to Inform an Appropriate Assessment which has been produced for the Scheme.

9.7.2 The majority of the features of the European Sites can be scoped out of the assessment as no pathways, such as linking habitats or movement of species, exists to link the potential impacts from the Scheme to the features of the sites. This scoping exercise is summarised in Table 9.11.

Table 9.11: Details of European Site Scoping

European Site		Feature	Pathways	Scoping for further consideration
Dyfi Estuary SPA		Greenland white-fronted goose	Habitat loss/displacement if present in study area Indirect pathway from pollution from construction activities	Y
Cors Fochno and Dyfi Ramsar Site, Cors Fochno SAC		Active raised bogs	No pathway	N
		Degraded raised bogs still capable of natural regeneration	No pathway	N
		Depressions on peat substrates of the Rhynchosporion	No pathway	N
Pen Llŷn a'r Sarnau SAC		Sandbanks slightly covered by sea water all the time	Indirect pathway from pollution from construction activities	Y
		Estuaries	Indirect pathway from pollution from construction activities	Y
		Coastal Lagoons	No pathway	N
		Large inlets and shallow bays	No pathway	N
		Reefs	No pathway	N
		Mudflats and sandflats not covered by sea water at low tide	Indirect pathway from pollution from construction activities	Y
		Salicornia and other annuals colonizing mud and sand	No pathway	N
		Atlantic salt meadows	Indirect pathway from pollution from construction activities	Y
		Submerged and partially submerged sea caves	No pathway	N
		Bottlenose dolphin	No pathway – no records within desk study search area	N
		Otter	Habitat loss/displacement	Y

European Site		Feature	Pathways	Scoping for further consideration
		Grey seal	No pathway – no records within desk study search area	N
Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionydd Oakwoods and Bat Sites SAC		Old sessile oak woods with Ilex and Blechnum in the British Isles	No pathway for effect – sufficient separation distance	N
		Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alno incanae, Salicion albae)	No pathway for effect – sufficient separation distance	N
		Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	No pathway for effect – sufficient separation distance	N
		Northern Atlantic wet heaths with Erica tetralix	No pathway for effect – sufficient separation distance	N
		European dry heaths	No pathway for effect – sufficient separation distance	N
		Tilio-Acerion forests of slopes, screes and ravines	No pathway for effect – sufficient separation distance	N
		Bog woodland	No pathway for effect – sufficient separation distance	N
		Lesser horseshoe bat	Taking a precautionary approach, lesser horseshoe bats from this SAC could move sufficiently to occur within the Scheme area via the network of roosts to the north.	Y

9.7.3 No white-fronted geese have been recorded within the Study Area. It is therefore considered that the proposed Scheme would not affect this species by direct disturbance and displacement from foraging areas.

9.7.4 There is a hydrological pathway through the Afon Dyfi which could convey pollution from construction activities, either surface water run-off or spillages from plant and machinery, to areas within the Dyfi Estuary that are either used by the geese, or are habitat features of the Pen Llŷn a'r Sarnau SAC in their own right. Due to the dilution that could be expected to occur within the river it is considered that these effects would be of low magnitude and reversible. However, in the absence of mitigation the effects from spillages would be considered to be a significant effect.

9.7.5 Otter are known to be present within the vicinity of the proposed Scheme. However, it is likely, based on their territorial behaviour, that only two or three individual otters are present and would be affected by the proposed Scheme. As the Pen Llŷn a'r Sarnau SAC covers a large area from Clarach to the north Lleyn Peninsula coast the effects on the population of otters within the SAC will be of very low magnitude and temporary in nature. This is not considered to be a significant effect on the SAC. Otter as a European Protected Species is also considered separately from the designated site in the sections below.

9.7.6 The effects on the underpinning Dyfi SSSI, considered to be of national value, are considered to be similar to those for the European Sites documented above. Effects on the population of wigeon are considered to be similar to those for white-fronted geese described above. No wigeon have been recorded within the Study Area during the wintering bird surveys to date.

9.7.7 Although lesser horseshoe bats are a mobile species, the core range around maternity sites is 4 - 5km, with movement of up to 11km between summer and winter roosts (Catherine Bickmore Associates, 2003). The lesser horseshoe bats recorded within the footprint of the Scheme are likely to have come from the maternity roost located to the north. This roost along with others further north near Minffordd are likely to be connected to the roosts within the Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionydd Oakwoods and Bat Sites SAC as part of a meta-population within the southern Snowdonia area.

9.7.8 The loss of connectivity along the river bank from vegetation clearance has the potential to affect bat movements within the landscape and therefore could affect the ability of bats to move between roost sites and between roost sites and foraging areas. However, any effect on population size from this is very unlikely to be discernible within the roosts that form components of the

SAC due to the natural fluctuation in numbers. This is therefore considered to be a negligible effect that would not be significant.

Non-Statutory Designated Sites

9.7.9 The construction of the northern junction with the A493 will require earthworks in close proximity to the Ancient Woodland Site to the west of the access to Ffridd Farm. The Ancient Woodland Site is considered to be of local value. The woodland will not be directly affected by the construction work and it is anticipated that the root structure of any trees on the boundary of the woodland would also be avoided. Therefore there is no impact predicted on this resource.

9.7.10 Whilst construction works will take place within the Snowdonia National Park, the majority of these works are either within low diversity grasslands or within the existing road surface. Small areas of riparian woodland (with invasive species present) and more mature woodland will also be affected by the construction of the northern abutment and access to Ffridd Farm. Within the context of the National Park as a whole these impacts are considered to be of very low magnitude and would not be significant.

Habitats

Grasslands

9.7.11 The construction of the proposed Scheme will result in the loss of grassland habitat within the floodplain and on the northern side of the river. Floodplain grazing marsh is a UK BAP habitat and a Section 7 priority habitat. This habitat is considered to be of county importance.

9.7.12 The construction corridor is relatively narrow, however there is likely to be a permanent loss of grassland habitats within the Study Area as vegetation may not recolonize areas beneath the viaduct, particularly at the lower southern end.

9.7.13 Within the context of mid Wales there are relatively large areas of floodplain grazing marsh along the river valleys and coast areas alongside the tidal section of the Dyfi Estuary. The magnitude of this impact is therefore considered to be low and would not be significant.

Woodlands

9.7.14 The woodland areas within the Study Area will largely be unaffected by the proposed Scheme with the exception of the woodland on the northern bank of the Afon Dyfi. The Ancient Woodland Site to the north east of the junction with the A493 will not be affected by the Scheme.

9.7.15 The woodland on the river bank is considered to be of value within the context of the site only due to its poor quality and the abundance of Japanese knotweed within the ground layer. The loss of this section of woodland (including any indirect consequential loss of retained trees such as through wind throw) for the construction of the northern abutment would be a permanent effect of low magnitude that would not be considered to be significant.

Hedges and Treelines

9.7.16 Hedgerows are also a UK BAP and Section 7 priority habitat, although they are an abundant feature within the landscape. They are therefore considered to be of local value. Three hedgerows and tree lines will be intersected by the proposed Scheme resulting in sections being removed. In addition, the drainage proposal for the proposed Scheme is likely to affect hedgerows along the existing A487 on the southern approach to the existing Pont-ar-Ddyfi.

9.7.17 In the absence of mitigation measures the loss of these hedgerows and tree lines (including any indirect consequential loss of retained trees such as through wind throw) are considered to be a permanent impact of low magnitude that would not be significant.

Waterbodies

9.7.18 There are a number of smaller ponds and ditches within the footprint of the proposed scheme in addition to the Afon Dyfi. These small waterbodies are considered to be of local importance, while the Afon Dyfi is considered to be of county importance.

9.7.19 The construction work is likely to affect two field ditches (not constantly containing water), a drainage ditch alongside the existing A487 and one pond within the floodplain which may be permanently lost. No works are required within the Afon Dyfi, although there is the potential for surface water run-off during construction to enter the river and temporarily affect water quality, although it is expected that the dilution that would occur within the river would reduce the scale of any effect.

9.7.20 The effects of the proposed scheme on waterbodies is considered to be of low magnitude and significant in the absence of mitigation.

Invasive Plant Species

9.7.21 There are a number of areas of invasive plant species including areas of Japanese knotweed, Indian balsam and New Zealand pygmy weed, which are likely to be affected by the construction of the Scheme. The release of material contaminated with plant

material or seeds could result in adverse effects on other habitats where material is deposited. This is particularly vulnerable in the area around the Afon Dyfi and the excavation of the northern abutment.

9.7.22 Both Japanese knotweed and Indian balsam are relatively widespread in the local area, present within hedgerows, on the river bank and along the railway embankment. The potential effect of any spread of these species is considered to be of minor scale and would not be significant. However in light of the legal control of these species, mitigation measures will be included to prevent the spread of these species.

9.7.23 The areas and lengths of habitats to be lost are provided in Table 9.12 below.

Table 9.12 Areas and lengths of habitats removed during construction

Existing Features / Habitat Types	Quantity removed
Amenity grass	0
Improved and poor semi-improved grassland	56,000m2
Semi improved neutral grassland	1,632m2
Marshy grassland	691m2
Scrub including scattered scrub	1,516m2
Existing trees	26
Existing hedgerows	624 linear m

Species Populations

Bryophytes

9.7.24 The proposed crossing of the Afon Dyfi is not likely to affect either of the rare bryophytes communities within the Study Area as these are located at least 230m away from the crossing at the closest point.

9.7.25 Given the rarity of these species, they are considered to be of regional value. Curl-leaved feather moss has only been recorded in one other location in Wales.

9.7.26 The Scheme is therefore considered to have a negligible impact on rare bryophytes which would not be significant.

Amphibians

9.7.27 Common frog is known to be present from anecdotal sightings of frog spawn within ephemeral pools within the Study Area. Additionally, common frog and both common toad (*Bufo bufo*) and palmate newt (*Lissotriton helveticus*) were identified during presence/absence surveys. Animals recorded were in a small number of waterbodies and numbers were low. On this basis, the

population of amphibians within the site is considered to be of no more than local value.

9.7.28 The proposed construction work has the potential for killing and injuring of amphibians along with the loss of breeding and terrestrial habitat. A small number of water bodies will need to be drained down to allow for the construction of the southern embankment and the reprofiling of the ditch along the existing A487. This would be considered to be a low magnitude impact and would not be significant.

9.7.29 In order to ensure legislative compliance mitigation measures will be provided as set out in Section 9.8 of this Chapter.

Bats

Bat Roosts

9.7.30 Of the trees identified with bat potential in the vicinity (60m) of the scheme, only one medium potential tree will be directly affected by the construction of the Scheme. Two low potential trees will also be affected and removed during the initial site clearance.

9.7.31 The tree with potential to support a maternity roost of bats (tree 31887) is located approximately 10m from the redline boundary of the Scheme. The works are likely to be approximately 15m from the tree at their closest point where the works will entail the creation of a farm access and gateway. Although the potential presence of a maternity roost is considered to be of county importance, the minor scale disturbance is not considered to be significant.

9.7.32 The other trees which have lower potential to support bats are considered to be of local or less than local value, and the removal of a small number of trees with potential for future use by bats is not considered to be a significant effect.

9.7.33 As all bat species are protected as European Protected Species there is a legislative requirement to include measures for bats and potentially to obtain a licence for works that may destroy roosts or disturb bats within their roosts. These are set out in Section 9.8 of this Chapter.

Bat Foraging and Commuting Routes

9.7.34 The construction of the Scheme will require the clearance of vegetation leading to the severance of hedgerows within the floodplain, and the wooded corridor on the north bank of the Afon Dyfi. These areas have been shown to be used by an assemblage of common bat species and small numbers of rarer and more specialised species. The common and soprano

pipistrelle, and whiskered/Brandt's bat populations are considered to be of local value. Daubenton's bat, Natterer's bat, barbastelle, lesser and greater horseshoe bat populations within the Study Area are considered to be of county value.

9.7.35 The interruption these vegetation corridors may affect the movement of bat species within the study area, especially for the two horseshoe bat species. Night working during construction could also affect the movement of horseshoe bats if task lighting is required. Daubenton's bats foraging over the surface of the river are unlikely to be affected as the river span will be constructed away from the river and lifted in to place.

9.7.36 Although hedgerows will not be replanted beneath the viaduct, field boundaries will be retained through the provision of stock proof fencing that would be in place at the completion of the construction phase.

9.7.37 While the effects of construction are temporary and reversible, they are considered to be of moderate magnitude and significant in terms of the two horseshoe bat species. Effects on other bat species are not considered to be significant as these species are less vulnerable to fragmentation of flight lines and the effects of lighting.

Otter

9.7.38 Otter are widespread throughout Wales and therefore the population resident on the Afon Dyfi, aside from its inclusion as a feature of the Pen Llyn a'r Sarnau SAC, is considered to be of local value.

9.7.39 Although no active holts were confirmed in the vicinity of the proposed crossing there are a number of suitable features which could be used by otters. The closest of these is approximately 60m from the construction areas on the northern river bank. The construction phase is considered likely to result in the disturbance of otters if they are using potential features on the northern river bank. In particular the noise and vibration associated with the piling work for the abutment and piers has the potential to disturb otter using this holt. It is also noted that there are other areas suitable for use as resting places along the northern bank of the river, although no signs of active use by otter were recorded. There is also the potential for otter to become trapped in excavations resulting in injury.

9.7.40 The confirmed holt present near the confluence of the Afon Dyfi and Afon Dulas is approximately 400m from the construction areas and will not be affected.

9.7.41 The potential disturbance of otter is considered to be a low magnitude effect as it is only likely to affect one or two individual

animals. This is considered to be a significant effect in the absence of mitigation measures.

9.7.42 To address this and in order to ensure legislative compliance mitigation measures are outlined later in this chapter.

Dormouse

9.7.43 As noted in earlier sections it is considered that dormice have the potential to be present in the areas of woodland and hedgerows in the northern part of the Scheme, albeit at very low densities and may only be using the hedgerows and riparian woodland for dispersal.

9.7.44 The severing of woodland on the northern river bank and hedgerows alongside the existing A487 has the potential to remove sub-optimal habitat for this species and increase connectivity. It is noted however that these areas do not provide a continuous connection to more suitable habitat to the west due to the presence of a large retaining wall on the north bank of the Afon Dyfi supporting the existing A487.

9.7.45 If dormice are present within these areas the loss of these areas is therefore considered to a minor impact that would not be significant. However as dormice are a European Protected Species reasonable avoidance measures are provided in Section 9.8 to take account of the low potential that this species might be presence.

Badger

9.7.46 No construction works will be required within 30m of the badger setts currently identified. However, the construction activities have the potential to remove areas of foraging habitat and restrict movement of badgers through the study area. In addition, badgers could be trapped in excavations resulting in injury. These are temporary effects which would be reversible. The badger population within the study area is considered to be of local value and in the absence of mitigation a low magnitude effect could be expected during construction. This is considered to be significant in the absence of mitigation.

Wintering birds

9.7.47 The study area is used by small numbers of wintering birds of conservation interest, in particular wading bird species within the field to the east of the proposed river crossing near the confluence of the Afon Dyfi and Afon Dulas. Small numbers of birds were recorded although these were on relatively isolated occasions and were not repeatedly recorded throughout the

survey season. The study area is considered to support populations of wintering waders of local value. The construction of the proposed Scheme has the potential to disturb these birds during the winter months.

9.7.48 This is considered to be a low magnitude effect that is not considered to be significant based on the availability of similar habitats in the local and wider areas.

Breeding Birds

9.7.49 Overall the assemblage of breeding birds recorded is typical of the habitats surveyed within the study area. The habitats supported a range of familiar bird species associated with hedgerows, farmland, scrub and riverine habitat. The site does not support notably high densities of farmland indicator species, such as skylark or linnet.

9.7.50 The river habitat does however support a number of species of conservation concern such as:

- The schedule 1 species little ringed plover and kingfisher;
- The red listed grey wagtail; and
- The amber listed dipper and common sandpiper.

9.7.51 The woodland on the northern side of the river (including the Ancient Woodland Site) whilst not supporting notably high densities of woodland species, was observed to contain notable birds such as goldcrest, song thrush, spotted flycatcher and tawny owl.

9.7.52 The assemblage of birds is considered to be of local value. The exception to this is the single pair of little ringed plover, a rarer breeding species, which is considered to be of Regional value.

9.7.53 The loss of nesting habitat within the footprint of the Scheme and the potential for further displacement of nesting birds from the vicinity of the Scheme is considered to be a low magnitude impact which would not be significant for most species.

9.7.54 Regarding little ringed plover, the pair recorded in 2016 were approximately 150m from the proposed construction areas. This species is known to tolerate some disturbance (del Hoyo, Elliott, & Sargatal, 1996), but nesting locations can change between years and suitable habitat occurs within/close to the construction areas.

9.7.55 Taking a precautionary approach, in the absence of mitigation, such an effect would be of high magnitude and be significant. Given the value of the receptor and legal protection afforded to the species, mitigation is outlined later in this chapter.

9.7.56 Although barn owl are known to breed within the local area, no features suitable to be used as nest site were recorded within the Study Area. The construction of the Scheme is unlikely to result in disturbance to nesting barn owls with the exception of any birds that may be present within buildings at Ffridd Farm (at least 60m from proposed construction works). The potential impact on such birds is considered to be of minor magnitude and would not be significant. However due to the legal protection of Schedule 1 species, mitigation measures are set out in Section 9.8 below.

Invertebrates

Terrestrial Invertebrates

9.7.57 The terrestrial invertebrate assemblage is considered to be of local importance with the exception of the five-spot ladybird and rosy rustic which are considered to be of county importance. The riparian corridor of the Afon Dyfi is considered to be of County importance for invertebrates.

9.7.58 The construction of the northern most pier of the viaduct and the two northern most spans has the potential to affect the population of five-spot ladybird located on the adjacent area of shingle. The potential loss or disruption of the habitat supporting this species is considered to be a moderate magnitude impact which would be significant and therefore mitigation measures are set out in Section 9.8.

9.7.59 The potential loss and disruption of habitats for other invertebrates, including the rosy rustic, is considered to be of low magnitude and not significant due to the relatively small area of high quality habitat that will be lost.

Aquatic Invertebrates

9.7.60 The aquatic invertebrate assemblage identified within the Afon Dyfi is considered to be of local importance, although as noted above the riparian corridor of the Afon Dyfi is considered to be of County importance for invertebrates.

9.7.61 The proposed construction work has the potential to effect water quality and therefore aquatic invertebrate populations, through surface water run-off and pollutant release. In the absence of mitigation measures this would be considered to be a low impact that would be temporary and not significant.

9.7.62 However in line with good practice mitigation measures to protect water quality will be included as set out in Section 9.8.

Fish species

9.7.63 The Afon Dyfi is known to be an important river for fish, in particular salmon and sea trout, within mid Wales and the fish populations are therefore considered to be of county importance.

9.7.64 Both the piers and the abutments of the viaduct will need to be supported on piled foundations. These foundations will be constructed using bored in-situ cast piles. This methodology uses an auger to excavate a column, which is then placed in a steel re-inforcement and backfilled with concrete. This method avoids the need for percussive piling and minimises noise and vibration from the construction activities.

9.7.65 Piling has the potential to affect the movement of fish along the river channel through the propagation of noise and vibration. The closest piles to the river will be the terminal pier and the northern abutment which are approximately 15m and 20m from the edge of the river channel during normal flow conditions. The construction of bored piles is unlikely to give rise to significant noise propagation which can cause damage to fish. However as the piles for the northern most pier and northern abutment will be in close proximity to the river there is the potential for some non-percussive noise to propagate to the Afon Dyfi which could affect the movement of fish along the river. This is predicted to be a minor magnitude impact that would be significant.

9.7.66 Eels were recorded in one waterbody within the site and are likely to be present in other permanent waterbodies across the floodplain. A small number of water bodies will need to be drained down to allow for the construction of the southern embankment and the reprofiling of the ditch along the existing A487. In the absence of mitigation measure this is considered to be a minor impact that would not be significant. However in line with good practice mitigation measures to protect eels and other fish species will be included as set out in Section 9.8.

Section 7 Species (not covered above)

9.7.67 A number of Section 7 species are likely to be present within the study area, although there have been no sightings of species such as brown hare (*Lepus europaeus*) or hedgehog (*Erinaceus europaeus*) which are the most likely to be present. Taking a precautionary approach and assuming presence, the populations of such species are considered to be of local value.

9.7.68 The construction of the Scheme has the potential to affect these species through the loss of habitats and the risk of becoming trapped in excavations. This would be considered to be a low magnitude impact which would not be significant on local

populations, given the abundance of suitable habitat in the local area.

9.8 Potential Operational Effects – Before Mitigation

9.8.1 Once operational, the effects of the proposed scheme would be limited to the effects of air quality changes, water quality changes from road drainage and the effects of vehicle collisions with animals. There is also the potential for amphibians to become trapped within the drainage system or on the road surface.

9.8.2 The air quality changes from the proposed Scheme (as documented in Chapter 6) will be imperceptible in terms of the habitats and species within the study area.

9.8.3 As set out in Chapter 2, the drainage design includes the provision of petrol interceptors and containment valves on the two drainage catchments which outfall directly to the Afon Dyfi. In addition a containment valve is also to be provided for the southernmost drainage catchment which outfalls to a culvert under the railway line. These measures included within the Scheme design are considered sufficient to contain any significant spillages of pollutants on the road surface. Furthermore, if pollutants from road drainage were released in small amounts in to water courses, it is considered likely that there would be sufficient dilution within the Afon Dyfi such that any effect would not be discernible.

9.8.4 There is the potential for bats flying along the trees on the northern river bank to come into close proximity with road vehicles due to the relative height of the retained trees and the carriageway on the new bridge structure. Horseshoe bats (both species but especially lesser horseshoe) are particularly vulnerable to collision with vehicles as they will reduce their height to fly at ground level across open areas (Catherine Bickmore Associates, 2003). Given the high level of bat activity recorded in this location the potential magnitude of this impact is considered to be moderate in the absence of mitigation. This is considered to be a significant impact.

9.8.5 There is the potential for badgers which currently cross the existing A487 near the entrance to Ffridd Farm to come in to contact with vehicles while crossing the re-aligned A497 at the northern junction. In the absence of mitigation this is considered to be a low impact that would be not significant given that traffic volumes are likely to be less than the existing A487. However, as badgers are a legally protected species and given that the potential increased risk of traffic accidents as a result of trying to avoid hitting animals, mitigation measures are proposed below.

9.8.6 Amphibians can become trapped on the road surface or within drainage systems when migrating to and from breeding ponds. In the absence of mitigation there is the potential for this to occur in those parts of the Scheme which are not on the viaduct structure. This is considered to be a moderate scale effect that would be significant.

9.9 Mitigation and Monitoring

Construction Mitigation

9.9.1 The following mitigation principles and measures will be included within the Scheme during the Construction Phase through detailed design and the adherence to a Construction Environmental Management Plan (CEMP):

- Pre-construction surveys will take place to ensure Schedule 1 birds species (notably little ringed plover, kingfisher and barn owl) are not present within the construction area; if found suitable mitigation measures/licences will be undertaken/obtained to allow the works to proceed. Such mitigation measures would include the timing of works to avoid disturbance along with an appropriate buffer around any identified nests;
- Although not currently required if animals utilise new resting places licences may be required for bats, otters, dormice and badgers;
- Pre-construction surveys including surveys of trees for bats, otter surveys and badger surveys;
- Phased vegetation clearance to allow for the presence of amphibians, reptiles and nesting birds and the potential presence of dormice;
- Where possible vegetation clearance will take place outside of the bird breeding season and will be undertaken under the supervision of an ecologist;
- Supervision of the draining down of waterbodies by an ecologist and the careful translocation of fish species (including eels) to agreed receptor waterbodies within the local area;
- If legally protected species are encountered during the clearance of the construction areas, work in that area will cease and relevant licenses obtained prior to the re-commencement of works;
- Creation and maintenance of buffer zones between construction areas and the vegetation at the top of the shingle

bar on the southern bank of the Afon Dyfi to avoid impacts on the five-spot ladybird and its habitat;

- Timing of works to provide farm access to land to the east of the existing A487 to avoid the bat maternity season (May to September);
- Pollution control measures in accordance with industry standards and the Pollution Prevention Guidelines published by the Environment Agency[8];
- In particular measures to control and contain sediment and material arising from excavations and piling operations at the northern abutment, northern most pier and other areas in proximity to waterbodies, will be included within the working method statements that will be developed as part of the agreed CEMP;
- Implementation of an Invasive Species Management Plan, to be agreed with relevant statutory environmental bodies prior to construction, to ensure that legally controlled plant species are not spread outside of the working areas;
- Restrictions on working hours in the proximity Afon Dyfi and northern extent of the Scheme to avoid night working and task lighting;
- Piling activities will be restricted to no more than 12 hours during any 24hr period with regular noise breaks during that period;
- Excavations to be covered or a means of escape provided for animals;
- Re-connection of severed hedgerows with field boundaries (with gates for the access track) beneath the viaduct to maintain bat flight routes;
- Design and arrangement of crane pads and piling mats to retain and protect habitat for the five-spot ladybird;
- During construction measures will be put in place to maintain bat flight lines along the northern river bank during the summer months (April to October). These will comprise cut branches mounted in containers which can be moved during the day to allow construction activities to take place;
- Where possible hedgerows affected by the construction works will be translocated to suitable receptor sites; and
- Supervision by an Ecological Clerk of Works of vegetation clearance, draining of ponds and ditches, and the installation

[8] It is noted that these Guidelines have been withdrawn by the Environment Agency, however they are considered to still be relevant and applicable until such time as new guidance is available.

of any ecological mitigation incorporated within the Scheme design.

Operational Mitigation

9.9.2 The following mitigation principles and measures will be incorporated in to the Scheme design to reduce the scale of effects during the operational phase. These are illustrated on the Environmental Masterplans provided as Figure 8.7 in Volume 2:

- Replanting of vegetation on the northern river bank to maintain connectivity for bat flight lines;
- Mammal fencing in accordance with the specifications in DMRB Volume 10, Section 4, Part 2 (HD59/92) to encourage mammals (primarily badgers) to use the livestock underpass beneath the Scheme on the northern river bank;
- Inclusion of a mammal underpass beneath the re-aligned A497;
- Maintaining continuous water levels within the proposed ditch along the existing A487 to provide replacement standing water habitat; and
- The drainage design in areas not on the viaduct structure will comprise gully pots with a means of escape for amphibians to prevent them being trapped. This is likely to involve the attaching of a textured material to the inside of the gully pot to allow amphibians to climb out. In addition the kerb stones in these area will be of a sloping design such that amphibians are able to climb up the stones and avoid being trapped on the road surface.

9.9.3 Furthermore the habitat planting proposed as part of the landscape design will provide a range of habitats as set out in Table 9.13, which will mitigate for the loss of habitats during construction.

Table 9.13 Habitat areas to be created as part of landscape proposals

Existing Features / Habitat Types	Quantity removed	Proposed landscape planting	Quantity proposed
Amenity grass	0	Amenity grass	1,172 m2
Improved and poor semi-improved grassland	56,000m2	Open grassland	56,000m2
		Grassland with bulbs	834m2
Semi improved neutral grassland	1,632m2	Species rich grassland	11,768m2
Marshy grassland	691m2	Marginal planting to banks & ditches	2,375m2

Existing Features / Habitat Types	Quantity removed	Proposed landscape planting	Quantity proposed
Scrub including scattered scrub	1,516m2	Scrub	194m2
		Scrub with understory woodland seeding	807m2
Existing trees	26	Trees	144 no.
Existing hedgerows	624 linear m	Hedgerow	1,270 linear m

Monitoring Proposals

9.9.4 Monitoring (in addition to the supervision of the works outlined above and the auditing of mitigation measures) will be undertaken during the construction period and for three years post-construction, with any requirement beyond this, subject to agreement with the relevant statutory environmental bodies. The monitoring will include:

- Bat activity monitoring, using static detectors;
- Otter surveys, comprising visual inspections and trail cameras;
- Badger surveys, comprising walkover surveys and trail cameras;
- Monitoring of the gully pots within the sections of the Scheme which are not on the structure; and
- Terrestrial invertebrate surveys in the vicinity of the river crossing.

9.9.5 The results of the monitoring will be reported to NRW and other relevant statutory environmental bodies on an annual basis. In addition the scope of the monitoring, methods and results will be discussed through further engagement with the Environmental Liaison Group during and post construction.

9.10 Construction Effects – With Mitigation

9.10.1 The majority of the impacts predicted from the construction phase are not considered to be significant with the exception of the effects on the following receptors:

- European sites from pollution and sediment run-off;
- Little ringed plover;
- Curl-leaved forklet moss;
- Lesser and greater horseshoe bats;
- Otter;

- Badger;
- Salmonid fish species; and
- The five-spot ladybird.

9.10.2 The measures outlined above are considered sufficient to reduce the scale of impacts from the Scheme to levels which would not be considered significant for all of the receptors identified.

9.11 Operational Effects – With Mitigation

9.11.1 The majority of the impacts predicted from the construction phase are not considered to be significant with the exception of the effects on the following receptors:

- Bat flight lines;
- Badgers; and
- Amphibians.

9.11.2 The mitigation measures outlined above are considered sufficient to reduce the predicted impacts to levels that would not be significant.

9.12 Enhancement Opportunities and Ecosystems Resilience

9.12.1 As described above the creation of wildflower grassland and other vegetation through the proposed landscape planting will provide further habitat enhancement over and above the areas of grassland that will be lost to the Scheme during construction.

9.12.2 The mitigation measures and enhancement measures resulting from the Scheme proposals will ensure ecosystem resilience by maintaining and increasing the extent of grassland, woodland, scrub and hedgerow habitats and connectivity between these habitats. This contributes to the requirements of Section 6 of EWA 2016 and to the UK BAP, Local BAP and TREBAP plans for boundary features and field margins, woodlands and planted native trees and shrubs and bluebells.

9.12.3 The creation of species rich grassland within Scheme will mitigate for the loss of the non-agricultural grassland habitats and increase the proportion of these habitats in the area. These areas will be created in a variety of conditions and with different floral mixes to encourage the establishment of different grassland types, which will provide further ecosystem resilience and biodiversity along the Scheme and within the wider area. This contributes to the requirements of Section 6 of EWA 2016 and to the UK BAP, Local BAP and TREBAP plans for lowland meadows and lowland dry acidic grassland.

9.12.4 This grassland creation works will benefit pollinator populations in the area and thus contribute to the Action Plan for Pollinators. The native woodland, scrub and hedgerow planting will also contribute to the aims of this Action Plan by mitigating for the loss of and providing additional woodland habitats.

9.13 Assessment of Cumulative Effects

9.13.1 There are no other projects within the vicinity of The Scheme which could give rise to cumulative effects in terms of ecological receptors.

9.14 Summary of Effects

9.14.1 The magnitude and significance of effects with and without mitigation are provided in Table 9.14 below.

Table 9.14: Summary of Effects during Construction and Operation

Receptor	Impact without mitigation	Significance without mitigation	Mitigation proposed	Impact with mitigation	Significance with mitigation (Residual)
Dyfi Estuary SPA – Population of geese	Negligible disturbance impact as species not recorded in Study Area	Not Significant	None	Negligible	Not Significant
Dyfi Estuary SPA – supporting habitats	Low magnitude impact from potential pollution/sediment run-off	Significant	Established mitigation measures to control pollution and sediment run-off	Negligible	Not significant
Pen Llyn a'r Sarnau SAC – Habitat features	Low magnitude impact from potential pollution/sediment run-off	Significant	Established mitigation measures to control pollution and sediment run-off	Negligible	Not significant
Pen Llyn a'r Sarnau SAC – otter population	Negligible disturbance impact due to size and extent of SAC designation and number of individual animals affected	Not significant	No night working in vicinity of the Afon Dyfi, means of escape/covering of excavations	Negligible	Not significant
Grassland habitats	Low magnitude impact from habitat loss	Not significant	None	Low magnitude	Not significant
Woodland habitats	Low magnitude impact from habitat loss	Not significant	None	Low magnitude	Not significant
Hedgerows	Low magnitude impact from habitat loss	Not significant	None	Low magnitude	Not significant
Waterbodies	Low impact from potential pollution/sediment run-off	Significant	Established mitigation measures to control	Negligible	Not significant

Receptor	Impact without mitigation	Significance without mitigation	Mitigation proposed	Impact with mitigation	Significance with mitigation (Residual)
			pollution and sediment run-off		
Adjacent habitats	Potential spread of invasive plants	Not significant	Implementation of an agreed Invasive Species Management Plan	Negligible (no impact)	Not significant
Rare/scarce bryophyte species	Negligible as not affected by construction works	Not significant	None	Negligible	Not significant
Amphibians & reptiles	Low impact from mortality and habitat loss	Not significant	Sensitive vegetation clearance, excavations left covered or with means of escape. Inclusion of sloping kerb stones and amphibian friendly gully pots where not on viaduct structure	Negligible	Not significant
Bat populations – Horseshoe species	Moderate impact from severance of flight routes	Significant	Restrictions on night working, re-connection of hedgerows beneath viaduct	Low magnitude	Not significant
Bat populations – other species	Low impact from severance of flight routes	Not significant	Restrictions on night working, re-connection of hedgerows beneath viaduct, planting	Negligible	Not significant

Receptor	Impact without mitigation	Significance without mitigation	Mitigation proposed	Impact with mitigation	Significance with mitigation (Residual)
			around northern abutment		
Otters	Low magnitude impact from disturbance	Significant	Restrictions on night working, excavations left covered or with means of escape	Negligible	Not significant
Water voles	Negligible disturbance impact as species not recorded in Study Area	Not Significant	Sensitive vegetation clearance	Negligible	Not Significant
Badgers	Low magnitude impact from disturbance	Significant	Restrictions on night working, excavations left covered or with means of escape, underpass provided under the A497 with associated mammal fencing around the underpass and northern abutment.	Negligible	Not significant
Wintering birds excluding SPA features	Low magnitude impact from disturbance	Not significant	None	Low magnitude	Not significant
Breeding birds (assemblage)	Low magnitude impact from habitat loss and disturbance	Not significant	Sensitive clearance of vegetation	Negligible	Not significant
Little ringed plover	High magnitude from disturbance	Significant	Pre-construction surveys and sensitive vegetation clearance	Negligible	Not significant

Receptor	Impact without mitigation	Significance without mitigation	Mitigation proposed	Impact with mitigation	Significance with mitigation (Residual)
Terrestrial invertebrates – five-spot ladybird	Moderation impact from disturbance/shading	Significant	Sensitive arrangement of crane pad, potential to translocate animal and/or habitat if required	Low magnitude	Not significant
Terrestrial invertebrates – other species	Low magnitude impact from habitat loss	Not significant	None	Low magnitude	Not significant
Aquatic invertebrates	Low magnitude impact from potential pollution/sediment run-off	Significant	Established mitigation measures to control pollution and sediment run-off	Negligible	Not significant
Fish	Low magnitude impact from potential pollution/sediment run-off	Significant	Established mitigation measures to control pollution and sediment run-off	Negligible	Not significant
S42 species not covered above	Low magnitude impact from habitat loss	Not significant	None	Low magnitude	Not significant
Operation					
Horseshoe bats	Moderation impact from collision with vehicles	Significant	Planting around northern abutment	Low magnitude	Not significant
Badgers	Low impact from collision with vehicles	Not significant	Provision of mammal underpass	Negligible	Not Significant
Amphibians	Moderate impact of mortality from being trapped within the drainage system	Significant	Amphibian friendly drainage design with sloping kerb stones	Negligible	Not significant