

# Wylfa Newydd Project Site Preparation and Clearance

## Environmental Statement – Volume 3D Appendices



APPLICATION November 2017

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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-12  
Consultancy Report: Over-wintering and  
Passage Birds Technical Summary  
Report**

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## Wylfa Newydd

Horizon Nuclear Power (Wylfa) Ltd

### Technical Summary Report – Over-wintering Birds

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## Executive Summary

This technical summary report provides a single resource regarding all survey and background data available for over-wintering birds (excluding barn owl) in the study area that comprises the Wylfa Newydd Development Area and the surrounding 500m. Over-wintering bird surveys of the study area have taken place in consecutive years between 2009 and 2015.

Data gathering has included a review of:

- desk/background information;
- walked transect surveys;
- vantage point surveys; and
- incidental sightings.

The study area provides habitats of value to over-wintering birds. The habitats considered to be important for over-wintering birds include grassland (marshy, semi-improved and coastal), woodland/scrub, hedgerows and running water.

A total of 99 bird species were recorded in the study area during the over-wintering bird surveys. This included 62 notable species, i.e. those afforded special protection and/or species of conservation concern.

Fourteen bird species recorded are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

Twenty-three species feature on the Red List and 29 species are on the Amber List of Birds of Conservation Concern (Eaton et al., 2015).

Twenty Species of Principal Importance in Wales (WBP, 2014), listed in accordance with Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006, were recorded along with three Local Biodiversity Action Plan (LBAP) species.

Ten species listed under Annex I of the Directive on the Conservation of Wild Birds 79/409/EEC (the Birds Directive) (European Commission, 2014) were also recorded.

Taking into account the size of the study area and the number of surveys undertaken, the species assemblages recorded are considered typical for the habitats present and, as such, the study area is considered to be of local conservation importance for over-wintering birds.

## 1. Introduction

This report provides a technical summary of the data collected on over-wintering birds within the Wylfa Newydd Development Area, plus a 500m buffer zone around its boundary. This area is referred to in this report as the study area.

### 1.1 Overview

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) comprises the proposed new nuclear power station (the Wylfa Newydd Generating Station), including the reactors, associated plant and ancillary structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities. The Project will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a development consent order.

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Power Station Site. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station and Associated Development.

### 1.2 Proposed Development

The Project includes the Wylfa Newydd Generating Station and Associated Development<sup>1</sup>. The Wylfa Newydd Generating Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and ancillary structures and features. In addition to the reactors, development on the Power Station Site (the indicative area of land and sea within which the majority of the permanent Wylfa Newydd Generating Station buildings, plant and structures would be situated) will include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments will include a Cooling Water System (CWS) and breakwater, and a Marine Off-Loading Facility (MOLF).

### 1.3 Site Description

The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site, the Wylfa NPS<sup>2</sup> Site and the surrounding areas that would be used for the construction and operation of the Wylfa Newydd Generating Station) covers an area of approximately 380ha. It is bounded to the north by the coast and the existing Magnox power station (the Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregele. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

The Wylfa Newydd Development Area includes the headland south of Wylfa Head candidate Wildlife Site. There is one designated site for nature conservation within the Wylfa Newydd Development Area; Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of Conservation (SAC) and SSSI, and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA).

<sup>1</sup> Development needed to support delivery of the Wylfa Newydd Generating Station is referred to as Associated Development. This includes highway improvements along the A5025, park and ride facilities for construction workers, Logistics Centre, Temporary Workers' Accommodation, specialist training facilities, Horizon's Visitor Centre and media briefing facilities.

<sup>2</sup> The site identified on Anglesey by the National Policy Statement for Energy EN-6/NPS EN-6 as potentially suitable for the deployment of a new nuclear power station.

Tre'r Gof is a small basin mire adjacent to the Existing Power Station, west of Cemaes. The area receives mineral-enriched waters from the surrounding boulder clay leading to the development of notable flora. It is the botanical interest that provides the reason for the designation of the site as a SSSI.

Cae Gwyn SSSI is located immediately to the south of the site to the west of Llanfechell. The site comprises two wetland areas separated by an outcrop of rock with heathland vegetation. The southern wetland is confined by a rock basin and is dominated by bogmoss (*Sphagnum* spp.) and a wide variety of common wetland herbs. The northern wetland has a different flora containing denser areas of willow (*Salix* spp.) and common reed (*Phragmites communis*).

## 1.4 Aims and Objectives

The purpose of this technical summary is to provide a single resource regarding all survey and background data available for over-wintering birds to inform and support the Ecological Chapter of the Environmental Impact Assessment (EIA) for development of the Wylfa Newydd Generating Station.

The specific aims of the surveys completed to date were to:

- identify over-wintering birds of conservation concern and inform an evaluation of the assemblage of over-wintering birds using the study area; and
- identify locations considered to be of relative significance for assemblages and populations of over-wintering birds.

Together, these will provide a robust baseline of over-wintering bird data to enable any future impact assessment to be made and mitigation to be designed to limit the impact on over-wintering birds.

## 1.5 Summary of Work

Over-wintering bird surveys in the study area have taken place during four seasons between 2009 and 2015, these are:

- winter 2009/2010 and winter 2010/2011 (Arup, 2012);
- winter 2012/2013 (Arup, 2013);
- winter 2013/2014 (Jacobs, 2014); and
- winter 2014/2015 (Jacobs, 2015).

In addition, a desk study was undertaken which involved obtaining bird records from Cofnod (the North Wales Environmental Information Service) from all areas within 2.5km of the boundary of the Wylfa Newydd Development Area.

## 1.6 Legal Status

Birds are protected by national and international legislation that is summarised below.

### 1.6.1 International Legislation

Many resident, over-wintering and migratory bird populations are protected under European legislation.

- I. The Wild Birds Directive 2009/147/EC (as amended) identifies and classifies SPAs for rare or vulnerable species, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance as listed in Annex I of the Directive.
- II. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, otherwise known as the 'Habitats Directive' was adopted in 1992. The directive is the means by which the European Union meets its obligations under the Bern Convention and highlights a legal obligation to protect over 500 wild plants and over 1000 wild animal species. The directive is implemented in UK legislation through the

Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 (as amended).

- III. The Bonn Convention on Conservation of Migratory Species of Wild Animals 1979 which aims to achieve effective management of migratory species across national or jurisdictional boundaries. This is implemented in UK legislation by the Wildlife and Countryside Act 1981 (as amended).

### **1.6.2 National Legislation**

The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in Great Britain.

All bird species are protected under elements of Section 9 of the Wildlife and Countryside Act 1981 (as amended) which prohibits the following:

- intentionally injuring, killing and taking any wild bird species; or
- intentionally taking, damaging or destroying eggs or nests (that are in use or being built) of any wild bird species.

Some species listed on Schedule 1 of the Act are afforded additional protection which makes it an offence to intentionally or recklessly disturb these birds or their dependent young while they are building a nest or are on, in or near a nest containing eggs or young.

The NERC Act 2006 places a statutory duty on public bodies to take, or promote the taking by others, of steps to further the conservation of the listed habitats and species. In Wales, this is sanctioned by Section 42 which lists habitats and species of principal importance. These are material considerations in the planning process. There are currently 51 bird Species of Principal Importance in Wales Section 42 (WBP, 2014).

## **1.7 Conservation Status**

There are two mechanisms by which the relative conservation status of birds is categorised in the UK. These are the Birds of Conservation Concern classification devised by the Joint Nature Conservation Committee (JNCC) and Biodiversity Action Plans (BAPs). These are discussed below and referenced where relevant to this report.

### **1.7.1 Birds of Conservation Concern (BoCC)**

In 1996, the UK's leading non-governmental bird conservation organisations, headed by the Royal Society for the Protection of Birds (RSPB), reviewed the status of all bird species regularly found in Britain. On the basis of several criteria relating to population status and relative importance to global conservation, each species was placed on one of three lists – Red (highest conservation concern), Amber (medium conservation concern) and Green (lowest conservation concern) (Eaton *et al.*, 2015).

The lists are reviewed every five years and used to inform the BAP process and other conservation policy decisions.

### **1.7.2 UK Post-2010 Biodiversity Framework**

The UK Biodiversity Action Plan (UK BAP), published in 1994, was the UK's response to the commitments of the Rio Convention on Biological Diversity (1992). The plan outlined action for 59 species of birds of conservation importance/concern (JNCC, 2013). This has since been replaced by the UK Post-2010 Biodiversity Framework. This framework covers the period 2011 to 2020 and forms the UK government's response to the new strategic plan of the United Nations Convention on Biodiversity (CBD) published in 2010. The UK BAP partnership therefore no longer operates, with the framework that replaces it promoting a focus on individual countries delivering targets for the protection of biodiversity through their own strategies.

In Wales the strategy adopted has transferred the species and habitats listed under the defunct UK BAP to Habitats and Species of Principal Importance in Wales in accordance with Section 42 of the NERC Act (ref. section 1.6.2). However, many of the tools and resources originally developed under the UK BAP still remain of

use. Background information on UK BAP priority habitats and species form the basis of county level biodiversity protection initiatives such as Local Biodiversity Action Plans (LBAP). Anglesey currently has LBAPs for the following seven bird species:

- barn owl (*Tyto alba*);
- bittern (*Botaurus stellaris*);
- chough (*Pyrrhocorax pyrrhocorax*);
- corncrake (*Crex crex*);
- grey partridge (*Perdix perdix*);
- skylark (*Alauda arvensis*); and
- song thrush (*Turdus philomelos*).

## **1.8 Notable Species**

Reference to “notable” species is made in this report. Notable species are those that are afforded special protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) or are of conservation concern, as listed in section 1.7 above.

## 2. Methodology

Four sources of data have been used to establish the presence of over-wintering bird populations within the study area. The data sources reviewed are summarised in table 2.1.

**Table 2.1: Sources of Data**

Data Gathering	2009/2010 & 2010/2011	2012/2013	2013/2014	2014/2015
Desk/background Information (including Cofnod data)	-	■	-	■
Walked Transect Survey	■	■	■	■
Vantage Point Survey	■	■	-	-
Incidental Sightings	■	-	■	■

### 2.1 Desk Survey

A background data search was requested from Cofnod in order to inform this study. This was requested to include all legally protected and notable species records within 2.5km of the study area. This data was then analysed and mapped. A desk study was also undertaken to identify any nature conservation sites specifically designated for bird species within 2.5km of the study area.

### 2.2 Field Survey

#### 2.2.1 Survey Methodology

The field survey followed the standard survey methodology guidelines as outlined in the Wintering Bird Report 2012-2013 (Arup, 2013), taken from Bibby *et al.* (2000) and Gilbert *et al.* (1998). All surveys were carried out by experienced ecologists or ornithologists, using 10x42 or 8x42 binoculars.

#### 2.2.2 Transect Surveys

Two transects were walked in winters 2009/2010 to 2012/2013. Six transects were surveyed in 2013/2014 and 2014/2015 as land access agreements were expanded in order to effectively survey the study area. The methodology followed that described in Bibby *et al.*, (2000) and Gilbert *et al.* (1998).

Transects were designed to give good views of all fields, hedgerows, scrub, woodland, coastal heath and grassland, waterbodies or watercourses present. All survey visits were carried out between 08:00 and 17:00 and during weather conditions favourable for bird activity. Periods of persistent or heavy rain, high wind or fog were avoided.

Each transect was walked at a constant pace and all species of birds observed within and considered to be using the study area were recorded. Particular attention was paid to the area ahead of the observer to ensure, where possible, that birds were recorded before they were flushed. Surveyors stopped periodically at certain locations to listen for calls and observe any bird behaviour. Larger tracts of open land were also scanned from higher vantage points in order to accurately record numbers of large assemblages of birds such as waders and wildfowl before being flushed. The species, location, number and behaviour of all birds considered to be using the site were recorded. Birds observed flying directly overhead and through the study area i.e. commuting or migrating, were not recorded.

#### 2.2.3 Vantage Point Surveys

Vantage point surveys were carried out in winter 2009/2010 and 2012/2013 (Arup, 2013). Bird flight observations were recorded from four vantage points. These points were selected to provide maximum cover of the proposed development area. Surveys comprised 30-minute fixed point observations from each vantage

point during each survey visit. All species flying over were mapped and the activity recorded. At least four such observation sessions were carried out during each visit, spacing the timing of these observations over the visit. Periods of persistent or heavy rain, high wind or fog were avoided.

#### **2.2.4 Incidental Records**

Incidental records of additional notable bird species observed within different transect survey areas were taken whilst undertaking the over-wintering bird survey if they had not been previously recorded in those locations.

#### **2.2.5 Assessment of value of the bird assemblage within the study area**

The method used for assessment of the value of the assemblage of over-wintering birds that the study area supports was to compare the total number of species to the values produced by Fuller (1980). The values produced by Fuller (1980) determine four levels of species richness according to the following numbers of confirmed species:

- 1) Local = 25-49 species.
- 2) County = 50-69 species.
- 3) Regional = 70-84 species.
- 4) National = 85+ species.

The limitations of this approach are described below

### **2.3 Limitations**

The over-wintering bird survey methodology as given in Bibby et al., (2000) and Gilbert *et al.* (1998) is designed to give estimates of bird density across a landscape by sampling bird communities. It is not intended for mapping accurately the total number of birds or individual territories within a given area. However, the aim of the report is to provide a quantitative summary of over-wintering bird presence and so this is not considered a limitation.

It should be noted that the surveys undertaken did not include the known gull colony on the north side of the Existing Power Station as this was outside the survey area. However, this feature would be taken into account during future assessments.

Access was not granted for certain farms within the study area at the time of some surveys. These areas were surveyed from adjacent areas where possible. The habitats within these farms were also present in the areas surveyed and therefore it is unlikely that additional species not recorded during the survey were present on these farms. Combining the results from all of the years of data has enabled robust conclusions to be drawn.

Survey and sampling methods were not consistent each year preventing accurate direct comparisons between the years from being possible. However, all habitat types in the study area were surveyed at some point and combining the results from multiple years of survey has enabled robust conclusions to be drawn.

## 3. Results

### 3.1 Desk Survey

#### 3.1.1 Designated Sites

The Ynys Feurig, Cemlyn Bay and The Skerries Special Protection Area (SPA) and the constituent Cemlyn Bay SSSI are located within the study area. This sites are designated for its internationally important breeding populations of four species of tern: Arctic tern (*Sterna paradisaea*); common tern (*Sterna hirundo*); roseate tern (*Sterna dougalli*); and Sandwich tern (*Sterna sandvicensis*). These tern species breed at this location and represent between 1.5% and 5% of the populations in Great Britain (JNCC, 2001). The site is not notable for its over-wintering bird assemblages.

Wylfa Head candidate Wildlife Site located within the Wylfa Newydd Development Area is notable for choughs which breed and over-winter on the cliffs and coastal grassland.

#### 3.1.2 Habitats

Land within and surrounding the Wylfa Newydd Development Area is predominantly in agricultural use for grazing by sheep or cattle. The study area is also contained by hedgerows and crossed by a network of roads, rural lanes, watercourses and overhead electricity infrastructure.

The main habitats present within the study area comprise improved grassland with areas of semi-improved grassland and arable fields also present. Smaller parcels and isolated blocks of coniferous plantation woodland, marsh/marshy grassland, coastal grassland and heathland and amenity grassland are also present. Small fragments of dense and scattered scrub are distributed across the study area along with several kilometres of hedgerow, although these are generally species poor and/or defunct. Further habitats found within the study area include running and standing water (including inundated grassland), built-up areas, introduced shrub, stone walls, maritime hard cliff, and crevice and ledge vegetation with potential to support a variety of bird species. Figure 1 (in Figures section at end of this report) shows the locations of all habitats within the study area.

#### 3.1.3 Species Records

Cofnod provided a total of 17,227 records of bird species within 2.5km of the study area between 1975 and 2014. This list was refined to show records between 1994 and 2014 inclusive and notable bird species only; this generated a list of over 15,000 individual records of 175 species plus 10 sub-species. Of these the species known to winter in the UK are shown in figure 2 (see Figures section at end of report) and detailed in appendix A. It should be noted that many of these species have not been regularly recorded in the study area.

In summary, 57 notable over-wintering bird species have been recorded within 2.5km of the study area with species including redwing (*Turdus iliacus*), fieldfare (*Turdus pilaris*) and lapwing (*Vanellus vanellus*).

Ten notable bird species were recorded directly within the Wylfa Newydd Development Area. Over-wintering birds included barn owl, kingfisher (*Alcedo atthis*), red-throated diver (*Gavia stellata*) and yellowhammer (*Emberiza citrinella*). Migrant breeders and summer visitors were not included in this analysis.

## 3.2 Field Survey

### 3.2.1 Transect Results

Transect routes are shown in figure 3. The main habitat types present on and adjacent to the six transects are listed in table 3.1.

Five years of combined transect data recorded a total of 96 different bird species. A total of 60 notable species were recorded during the surveys.

### 3.2.2 Vantage Point Surveys

Figure 4 (see Figures section at the end of this report) shows the location of the vantage point surveys. Vantage point surveys produced a total number of 46 species. Of these, 28 were notable species.

### 3.2.3 Incidental Sightings

A pair of whooper swans (*Cygnus cygnus*) was recorded incidentally on a single occasion on 9 December 2014. These individuals were not thought to be in passage and are not included in the analysis.

### 3.2.4 Results Summary

When combining the results for all field survey methods over all survey periods, a total of 99 bird species were identified within the study area. These are listed in appendix B along with their conservation status.

Fourteen bird species recorded are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). These species are: black redstart (*Phoenicurus ochruros*), black-tailed godwit (*Limosa limosa*), chough, fieldfare, goshawk (*Accipiter gentilis*), greater scaup (*Aythya marila*), greenshank (*Tringa nebularia*), hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*), peregrine (*Falco peregrinus*), pintail (*Anas acuta*), red kite (*Milvus milvus*), redwing and whimbrel (*Numenius phaeopus*). The location and distribution of these records are shown in figure 5 (see Figures section at the end of this report).

A total of 62 notable species was recorded across the over-wintering bird surveys. Figures 6 and 7 show the distribution of these combined species counts from data captured by Jacobs surveyors in 2013/2014 and 2014/2015.

The notable species included 23 species on the Red List and 29 species on the Amber List of Birds of Conservation Concern (Eaton et al., 2015).

Ten species recorded are listed under Annex I of the Directive on the Conservation of Wild Birds 79/409/EEC (the Birds Directive) (European Commission, 2014).

Twenty species are Species of Principal Importance in Wales as listed in accordance with Section 42 of the NERC Act 2006 as (WBP, 2014). Three species are listed on the Anglesey LBAP.

It should be noted that the level of legal protection and a species' conservation status are not discrete categories and there is considerable overlap between them; as such the sum of the total number of species in each category does not relate to the total number of notable bird species recorded.

Table 3.1: Summary of main habitat types on each transect

Transect (length)	Grassland – Improved	Grassland – Semi-improved	Grassland – Amenity	Grassland – Coastal	Marsh/Marshy grassland	Plantation Woodland	Dense scrub/hedgerows	Coastal heath	Arable	Built-up areas	Running water
Transect 1 (10.7km)	x	x	x	x	x	x	x	-	x	-	-
Transect 2 (9.9km)	x	x	x	x	x	x	x	x	-	-	x
Transect 3 (7.0km)	x	x	x	-	x	-	x	-	x	x	-
Transect 4 (8.7km)	x	x	-	-	x	-	x	-	-	-	x
Transect 5 (5.3km)	x	x	-	-	x	-	x	-	x	-	x
Transect 6 (5.3km)	x	x	x	-	x	-	x	-	-	x	x

## 4. Discussion and Conclusions

### 4.1 Notable Species

The majority of notable bird records obtained from Cofnod relate to birds recorded outside of the Wylfa Newydd Development Area, specifically the marine or coastal habitats at Cemlyn Bay (these habitats/sites were captured due to the 2.5km wide search area used for the desk study). The presence of the nearby marine and coastal habitats therefore accounts for the high proportion of wader and waterfowl species of conservation interest generated by the data search, relatively few of which have been previously recorded inland and even less specifically within the Wylfa Newydd Development Area. This is consistent with the field data collected which identified a diverse range of passerines, birds of prey and gulls within the terrestrial inland study area, but fewer waders and waterfowl. Additionally, many of the notable records included on the Cofnod data are of individual birds, low numbers of birds, or species recorded in one year only, and so suggest that the site is not of importance for these species.

Improved grassland was the dominant habitat type in the study area. Although this habitat can be important for some birds, such as over-wintering foraging geese, this habitat has limited conservation value for the majority of over-wintering bird species recorded during the surveys. Species of goose recorded during surveys were Canada goose (*Branta canadensis*) and greylag goose (*Anser anser*), both common and widespread species whose presence in Anglesey does not comprise a significant proportion of the national population.

The habitats considered to be most important for wintering birds include grassland (marshy, semi-improved, and coastal), arable, woodland/scrub and hedgerows, running water and built-up areas. Figures 5 and 6, when viewed in combination with Figure 1, show that these habitats were where the most species were recorded within the Wylfa Newydd Development Area and are located as follows: south of Cemlyn Bay; on semi-improved coastal grassland and heathland south of Cerrig Brith; semi-improved neutral grassland at Mynydd Ithel south of the study area; and on marshy grassland around Tregele.

Notable over-wintering species that these habitats support included the Red List species fieldfare, herring gull (*Larus argentatus*), house sparrow (*Passer domesticus*), lapwing, linnet (*Carduelis cannabina*), redwing, skylark, song thrush and starling (*Sturnus vulgaris*); and the Amber List species black-headed gull (*Chroicocephalus ridibundus*), bullfinch (*Pyrrhula pyrrhula*), curlew (*Numenius arquata*), dunnoek (*Prunella modularis*), great black-backed gull (*Larus marinus*), greylag goose (*Anser anser*), kestrel (*Falco tinnunculus*), lesser black-backed gull (*Larus fuscus*), mallard (*Anas platyrhynchos*), meadow pipit (*Anthus pratensis*), oystercatcher (*Haematopus ostralegus*), redshank (*Tringa totanus*), reed bunting (*Emberiza schoeniclus*), snipe (*Gallinago gallinago*), teal (*Anas crecca*) and turnstone (*Arenaria interpres*).

### 4.2 Value of Species Assemblage

The value of the over-wintering bird species assemblage in the study area has been quantitatively assessed, using Fuller (1980), to have a conservation importance of 'regional' level based on species richness (85 – 114 species). However, this is considered to be an over-estimation of the importance of the study area because the site value is calculated based on the number of species recorded and does not consider the actual number of individual birds present in each case. For the study area, the relatively high number of species recorded is likely to be a product of the number of survey visits made over the six month survey period, and the size of the study area. It is considered that the assemblage of species is typical of the habitat mosaic present within the study area and, as such, the site is considered as being of local conservation importance.

### 4.3 Conclusions

The habitats considered to be important for over-wintering birds include grassland (marshy, semi-improved and coastal) woodland/scrub and hedgerows and running water.

A total of 99 bird species were recorded in the study area during the over-wintering bird surveys, which included 62 notable species i.e. those afforded special legal protection or those that are of conservation concern.

Notable over-wintering species included Red List species (bullfinch, curlew, fieldfare, grey wagtail, herring gull, house sparrow, lapwing, linnets, merlin, mistle thrush, redwing, skylark, song thrush and starling) and Amber List species (black-headed gull, bullfinch, dunnoek, great black-backed gull, greylag goose, kestrel, lesser black-backed gull, mallard, meadow pipit, oystercatcher, redshank, reed bunting, snipe, teal, and turnstone).

Many of the notable records are of individual birds, low numbers of birds, or species recorded in one year only, and so suggest that the site is not of importance for these species.

The study area is considered to be of local conservation importance for over-wintering birds.

## 5. References

- Arup. 2012. *Proposed Wylfa New Nuclear Build Winter Bird Surveys 2010 & 2011*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. 2013. *Wylfa New Nuclear Power Station Wintering Bird Report 2012-2013*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Bibby, C., Burgess, N.D., Hill, D., and Mustoe, S., (2000), *Bird Census Techniques – Second Edition*, Academic Press, London, England.
- Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D., and Gregory, R.D. 2015. Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man, *British Birds*, 108: 708-746.
- European Commission. 2014. Wild Birds: Threatened bird species in Annex I [[http://ec.europa.eu/environment/nature/conservation/wildbirds/threatened/index\\_en.htm](http://ec.europa.eu/environment/nature/conservation/wildbirds/threatened/index_en.htm)] Accessed June 2015
- Fuller, R.J. 1980. A method for assessing the ornithological interest of sites for conservation. *Biological Conservation*. 17: 229-239.
- Gilbert, G., Gibbons, D.W. and Evans, J. 1998. *Bird monitoring methods: a manual of techniques for key UK species*, Royal Society for the Protection of Birds.
- Jacobs. 2014. *Consultancy Report - Wintering Bird Survey Baseline Report 2013/14*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. W202.01-S5-PAC-REP-00017.
- Jacobs. 2015. *Consultancy Report - Wintering Birds Survey Baseline Report 2014/15*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. WN03.01.01-S5-PAC-REP-00016.
- Joint Nature Conservation Committee. 2001. SPA description - Ynys Feurig, Cemlyn Bay and The Skerries Special Protection Area [<http://jncc.defra.gov.uk/page-2055-theme=default>] Accessed June 2015
- Royal Society for the Protection of Birds. 2014. RBBP Reports online [<http://www.rbbp.org.uk/rbbp-online-reports.php>] Accessed September 2015.
- Wales Biodiversity Partnership. 2014. Section 42 list [<http://www.biodiversitywales.org.uk/Section-42-Lists>] Accessed September 2015.

## Figures

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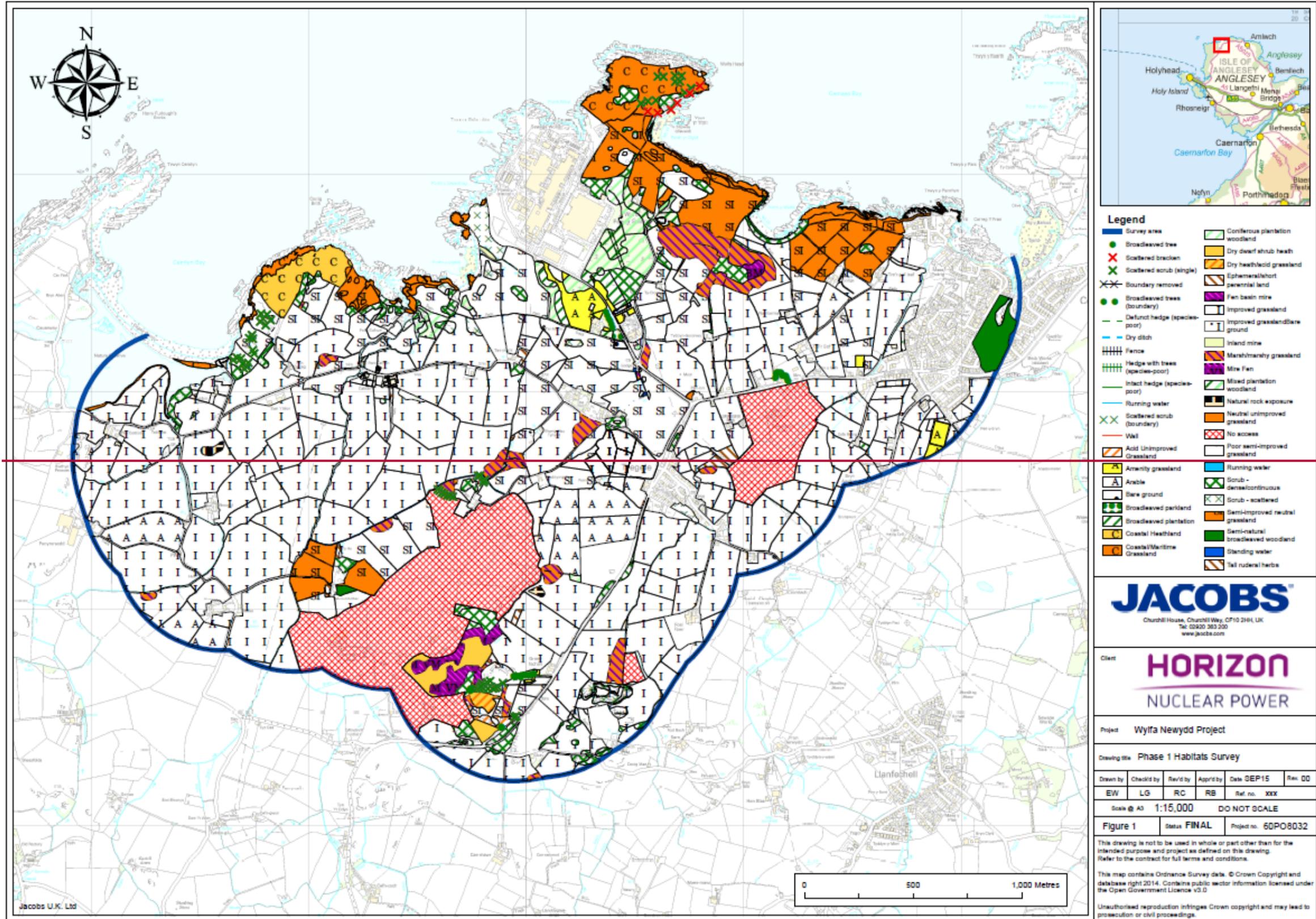


Figure 1 Phase 1 Habitat Survey Results

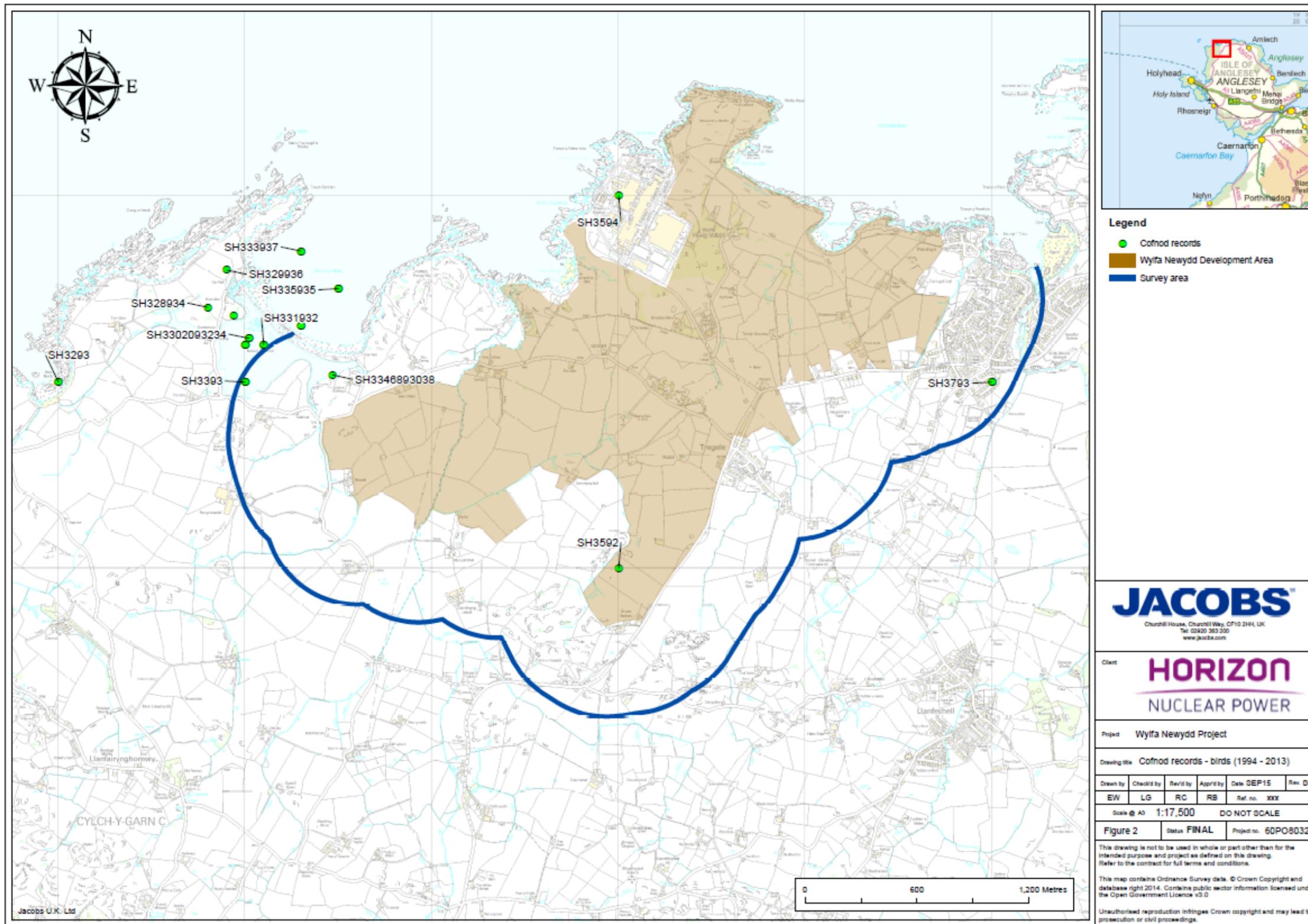


Figure 2 Cofnod Data – Wintering birds

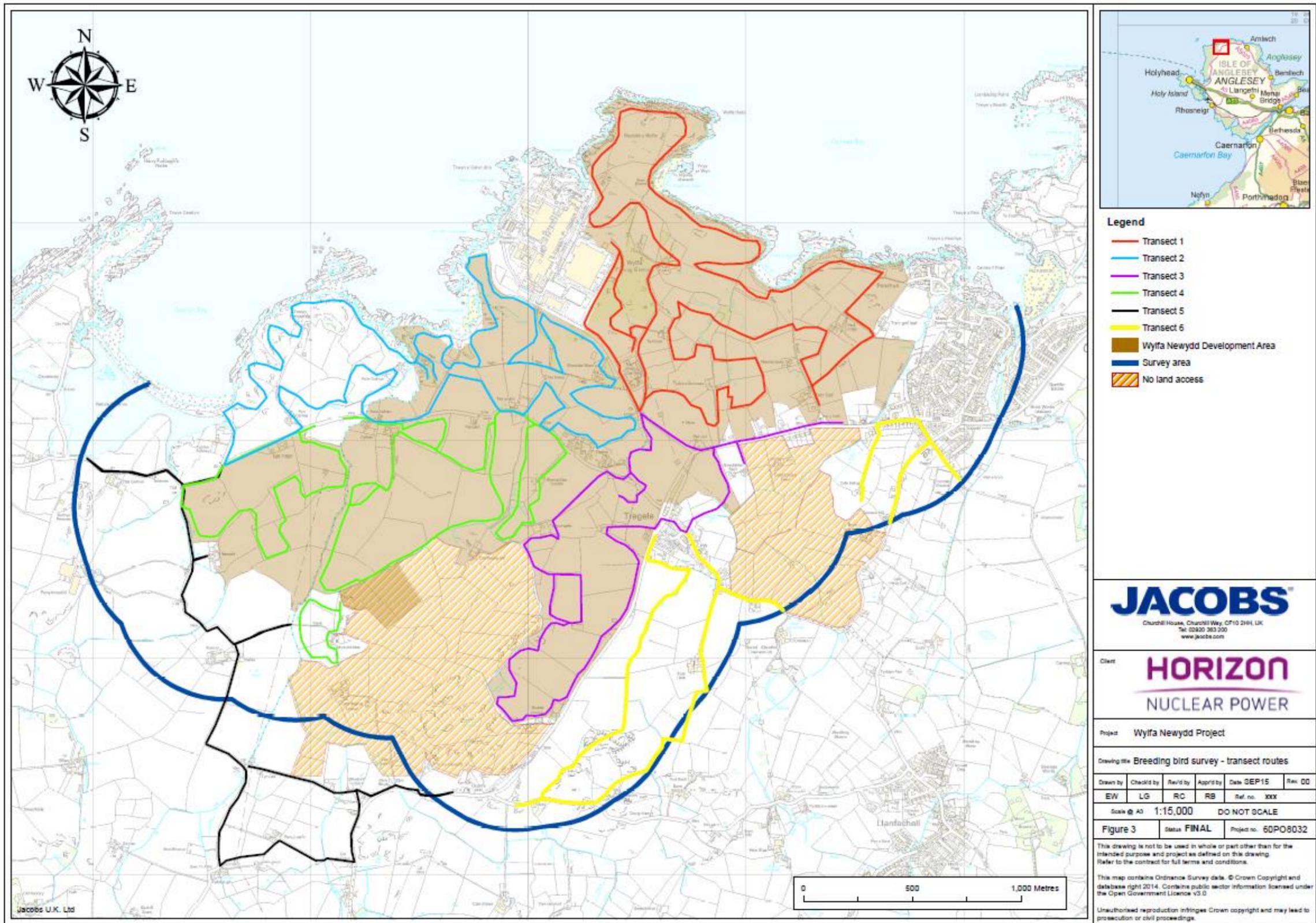


Figure 3 Transect Routes

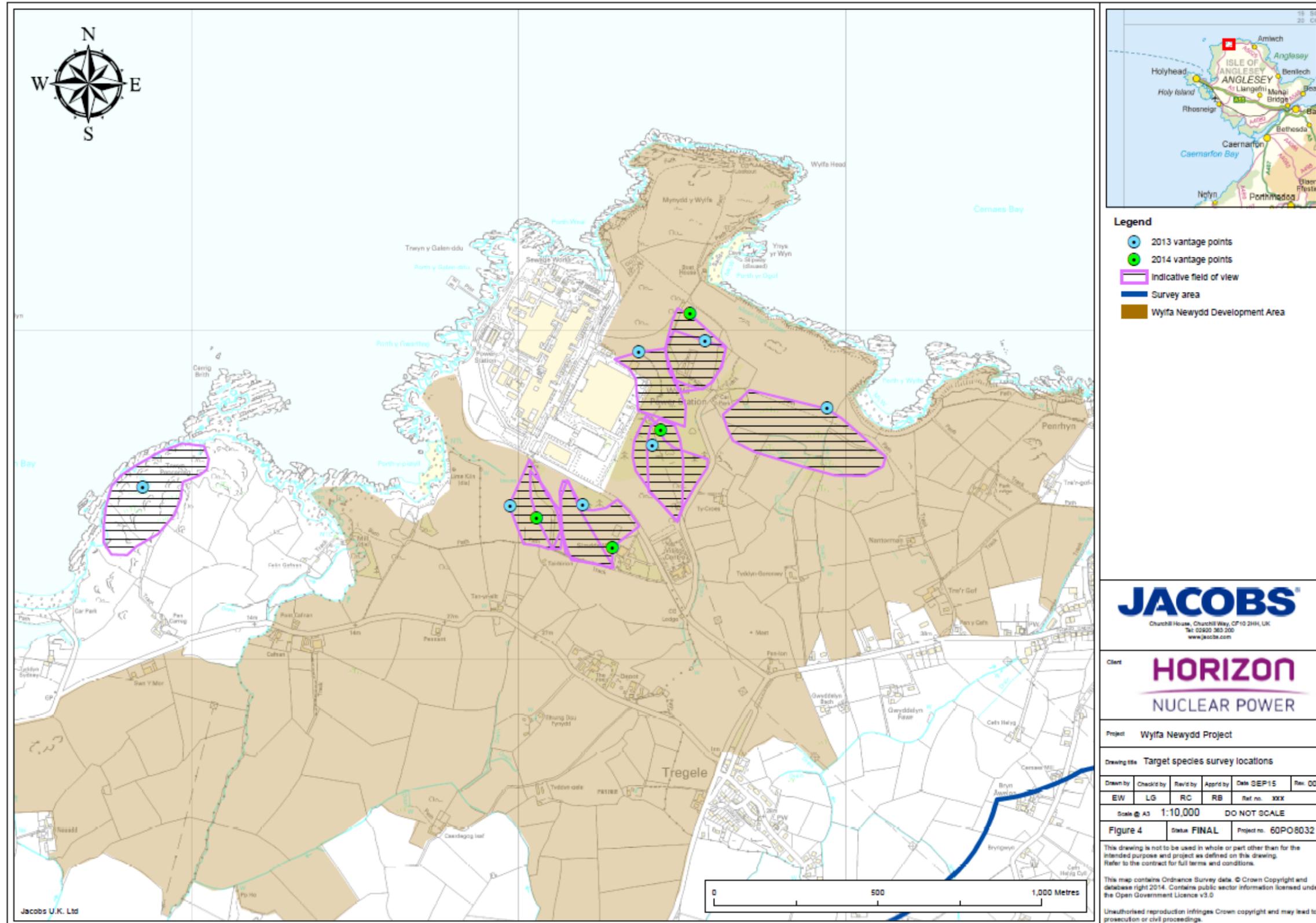


Figure 4 Vantage Points Survey Locations

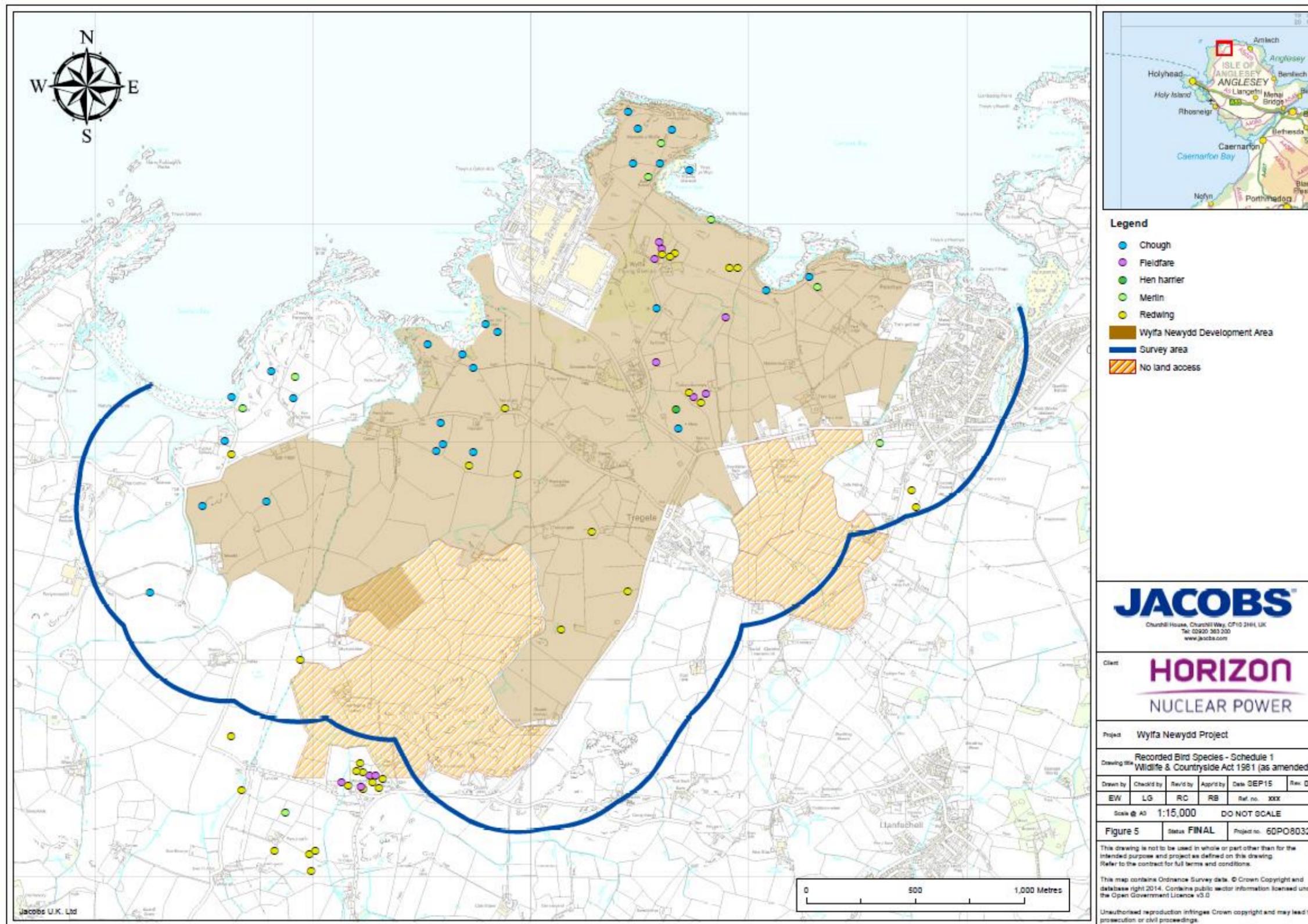


Figure 5 Bird Survey Results – Schedule 1 Wildlife and Countryside Act 1981 (as amended)

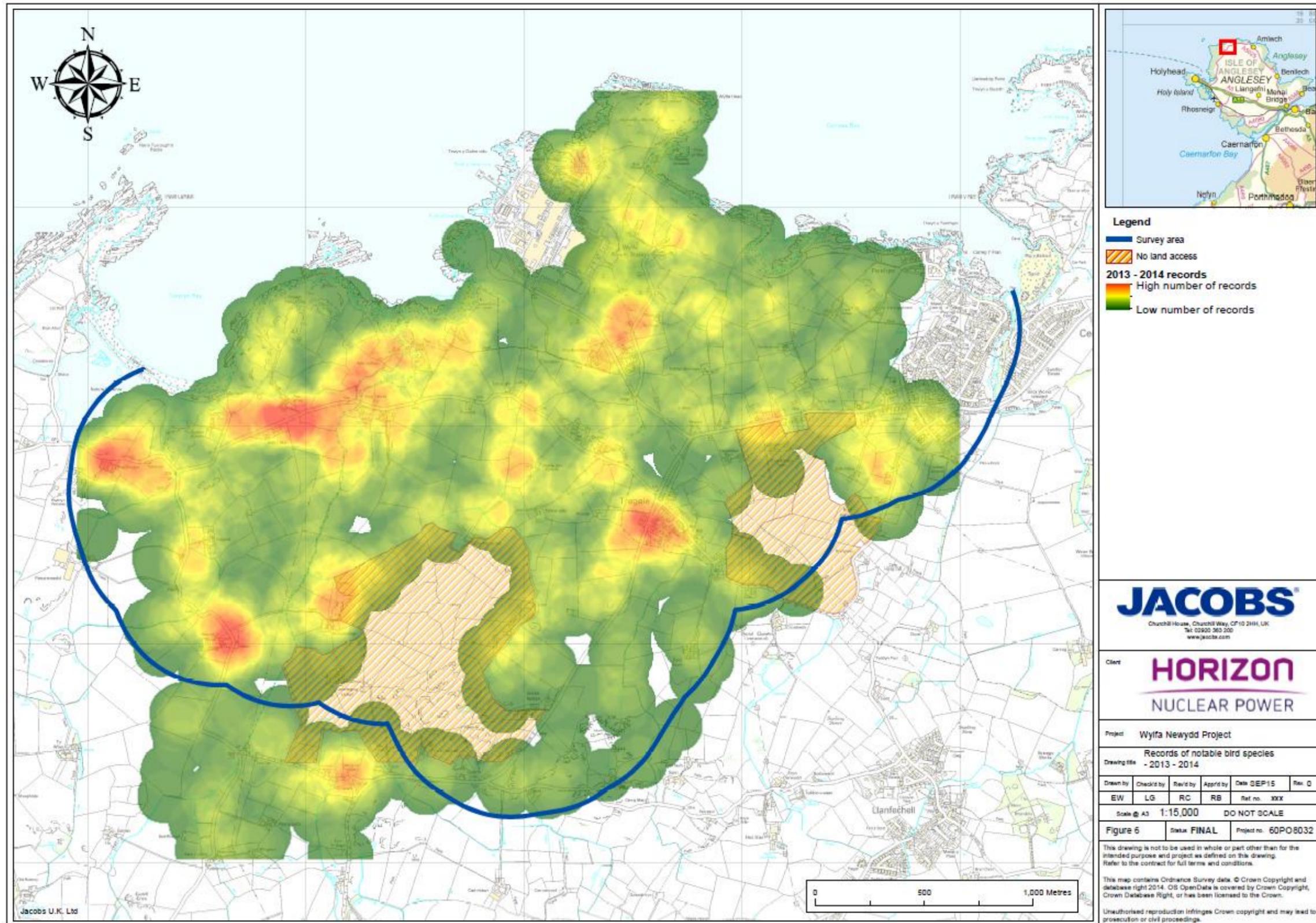


Figure 6 Bird Survey Results – Notable species 2013-2014

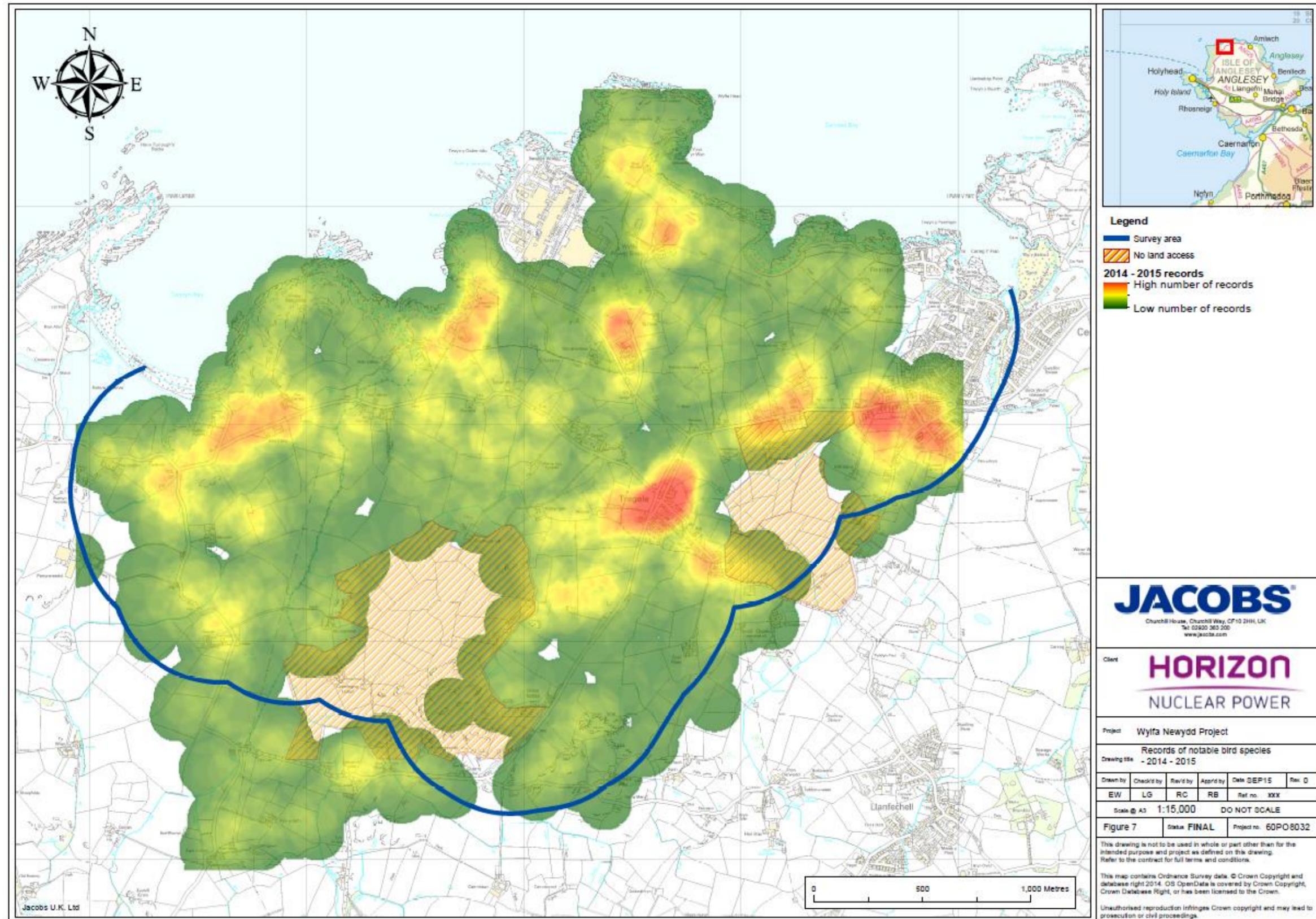


Figure 7 Bird Survey Results – Notable species 2014-2015

## Appendix A. Cofnod Data

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Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Accipiter gentilis</i>	Goshawk	1	SH3793	Cemaes Bay	24/06/2000
<i>Alcedo atthis</i>	Kingfisher	1	SH333937	Cemlyn Bay	23/09/2004
<i>Alcedo atthis</i>	Kingfisher	1	SH334928	Cemlyn Bay; Lagoon	25/12/2000
<i>Alcedo atthis</i>	Kingfisher	1	SH3393	Cemlyn	16 records September 1994 - 01/07/2011
<i>Alcedo atthis</i>	Kingfisher	1	SH3793	Cemaes Bay	5 records 12/09/2000 - 08/08/2008
<i>Anas acuta</i>	Northern Pintail	1	SH3293	Cemlyn	5 records 30/08/1999 - 02/01/2006
<i>Anas querquedula</i>	Garganey	1	SH330932	Cemlyn	2 records 2002 - 2003
<i>Anas querquedula</i>	Garganey	1	SH333933	Cemlyn Bay	17/07/2006
<i>Anas querquedula</i>	Garganey	1	SH3393	Cemlyn Bay	5 records 29/05/1994 - 22/07/2006
<i>Anser anser</i>	Greylag Goose	1	SH3293	Cemlyn	27/05/1996
<i>Anser anser</i>	Greylag Goose	1	SH3302093234	Cemlyn	02/06/2012
<i>Anser anser</i>	Greylag Goose	1	SH330932	Cemlyn	6 species - 2002 - 09/05/2008
<i>Anser anser</i>	Greylag Goose	1	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Anser anser</i>	Greylag Goose	1	SH3393	Cemlyn	123 records - May 1994 - 11/08/2013
<i>Anthus trivialis</i>	Tree Pipit	1	SH330932	Cemlyn	22/05/2003
<i>Anthus trivialis</i>	Tree Pipit	1	SH3393	Cemlyn	11 records - 10/05/1994 - 30/04/2012
<i>Aythya marila</i>	Greater Scaup	1	SH332928	Cemlyn	5 records -28/10/2000 - 25/12/2000
<i>Aythya marila</i>	Greater Scaup	1	SH3393	Cemlyn	46 records - 12/06/1998 - 07/08/2010
<i>Branta bernicla subsp. bernicla</i>	Dark-bellied Brent Goose	1	SH3393	Cemlyn Bay	25/12/2000
<i>Bucephala clangula</i>	Goldeneye	1	SH329936	Cemlyn Bay	25/12/2004
<i>Bucephala clangula</i>	Goldeneye	1	SH331932	Cemlyn	2 records - 26/01/2008 - 25/03/2008
<i>Bucephala clangula</i>	Goldeneye	1	SH333933	Cemlyn Bay	4 records - 09/01/2003 - 08/12/2003
<i>Bucephala clangula</i>	Goldeneye	1	SH335935	Cemlyn	7 records - 30/01/2007 - 25/12/2008
<i>Bucephala clangula</i>	Goldeneye	1	SH3393	Cemlyn	81 records - 07/06/1994 - 02/03/2008
<i>Calcarius lapponicus</i>	Lapland Longspur	1	SH3393	Cemlyn	26 records - 26/03/1999 - 06/03/2011
<i>Calidris maritima</i>	Purple Sandpiper	1	SH329936	Cemlyn Bay	2 records - 21/01/2004 - 25/12/2004
<i>Calidris maritima</i>	Purple Sandpiper	1	SH330932	Cemlyn	14/05/2003
<i>Calidris maritima</i>	Purple Sandpiper	1	SH331932	Cemlyn NWWT Reserve	4 records - 03/01/2008 - 18/05/2013
<i>Calidris maritima</i>	Purple Sandpiper	1	SH333942	Cemlyn	25/12/2000
<i>Calidris maritima</i>	Purple Sandpiper	1	SH335935	Cemlyn	3 records - 25/12/2006 - 25/12/2007
<i>Calidris maritima</i>	Purple Sandpiper	1	SH3393	Cemlyn	65 records - May 1997 - 30/04/2012
<i>Carduelis cabaret</i>	Lesser Redpoll	1	SH330932	Cemlyn	2 records - 25/07/2008 - 18/05/2013
<i>Carduelis cabaret</i>	Lesser Redpoll	1	SH3393	Cemlyn	28 records - 05/05/1995 - 14/05/2013
<i>Carduelis cabaret</i>	Lesser Redpoll	1	SH3793	Cemaes Bay	2 records - 07/03/1999 - 13/01/2000
<i>Carpodacus erythrinus</i>	Common Rosefinch	1	SH3393	Cemlyn	2 records - 05/06/2010 - 06/06/2010
<i>Charadrius dubius</i>	Little Plover	1	SH3393	Cemlyn	3 records - 15/05/2005 - 03/06/2010
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH329933	Cemlyn; Shingle ridge	Spring 2011
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH3302093234	Cemlyn	2 records - all 02/06/2012
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH33039365	Cemlyn Bay Nature Reserve	18/05/2011
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH330932	Cemlyn	25 records - 2002 - 23/07/2008
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH330938	Cemlyn; Trwyn	2 records - 17/05/2011 - 22/05/2011
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH3317493825	Cemlyn	02/06/2012
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH331932	Cemlyn NWWT Reserve	6 records - 26/01/2008 - 18/05/2013
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH332932	Cemlyn; Shingle ridge	4 records - spring 2011 - 25/07/2011

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH333933	Cemlyn Bay	4 records - 29/04/2006 - 25/12/2006
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH335935	Cemlyn	2 records - 14/05/2007 - 13/09/2007
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH3393	Cemlyn	189 records - May 1994 - 08/08/2013
<i>Charadrius hiaticula</i>	Ringed Plover	1	SH3793	Cemaes Bay	26/12/2008
<i>Charadrius morinellus</i>	Dotterel	1	SH3393	Cemlyn; Fields north of Tyn Llan farm	5 records - 10/05/2005 - 23/05/2010
<i>Chlidonias niger</i>	Black Tern	1	SH329936	Cemlyn Bay	23/09/2004
<i>Chlidonias niger</i>	Black Tern	1	SH330932	Cemlyn; Lagoon Islands	02/05/2011
<i>Chlidonias niger</i>	Black Tern	1	SH3393	Cemlyn	13 records - April 1994 - 09/06/2011
<i>Circus aeruginosus</i>	Marsh Harrier	1	SH330932	Cemlyn	09/08/2003
<i>Circus aeruginosus</i>	Marsh Harrier	1	SH3393	Cemlyn	15 records - 06/05/1994 - 02/05/2012
<i>Circus cyaneus</i>	Hen Harrier	1	SH330932	Cemlyn	07/05/2008
<i>Circus cyaneus</i>	Hen Harrier	1	SH3393	Cemlyn	3 records - 05/05/2006 - 28/04/2011
<i>Clangula hyemalis</i>	Long-tailed Duck	1	SH3393	Cemlyn	2 records - 04/06/1994 - 31/05/1999
<i>Coturnix coturnix</i>	Quail	1	SH330932	Cemlyn	04/07/2008
<i>Coturnix coturnix</i>	Quail	1	SH3393	Cemlyn	2 records - 19/06/1997 - 13/05/2000
<i>Coturnix coturnix</i>	Quail	1	SH3793	Cemaes Bay	03/06/2005
<i>Cuculus canorus</i>	Cuckoo	1	SH329936	Cemlyn Bay	2 records - 24/05/2004-21/07/2004
<i>Cuculus canorus</i>	Cuckoo	1	SH330932	Cemlyn	4 records - 12/05/2002 - July 2008
<i>Cuculus canorus</i>	Cuckoo	1	SH333933	Cemlyn Bay	27/07/2006
<i>Cuculus canorus</i>	Cuckoo	1	SH3393	Cemlyn	34 records - 10/05/1994 - 16/07/2012
<i>Cuculus canorus</i>	Cuckoo	1	SH3793	Cemaes Bay	22/05/2004
<i>Cygnus cygnus</i>	Whooper Swan	1	SH3393	Cemlyn	7 records - 16/02/1999 - 17/10/2008
<i>Emberiza citrinella</i>	Yellowhammer	1	SH3393	Cemlyn; Flying over	2 records - 06/08/2010 - 16/05/2013
<i>Emberiza citrinella</i>	Yellowhammer	1	SH3693	Cemaes Bay	10 records - 27/01/1999 - 07/07/1999
<i>Emberiza citrinella</i>	Yellowhammer	1	SH3793	Cemaes Bay	20 records - 12/01/2000 - 12/04/2005
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH330932	Cemlyn	5 records - 2002 - 13/05/2008
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH331932	Cemlyn NWWT Reserve	4 records - 03/01/2008 - 18/05/2013
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH3354392999	Cemlyn	Jun-10
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH3393	Cemlyn	1 record - Spring 1999 – Summer 1999
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH3393	Cemlyn	73 records - May 1994 - 24/04/2012
<i>Emberiza schoeniclus</i>	Reed Bunting	1	SH3693	Cemaes Bay	12/02/1999
<i>Falco columbarius</i>	Merlin	1	SH33139389	Cemlyn	26/04/2012
<i>Falco columbarius</i>	Merlin	1	SH3393	Cemlyn	59 records - May 1997 - 26/05/2013
<i>Falco columbarius</i>	Merlin	1	SH3493	Cafnan, Cemlyn	15/01/2000
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH3293	Cemlyn	1 record - 07/05/1996 – 05/08/1996
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH330932	Cemlyn	22 records - 10/05/2002 - 02/07/2008
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH331932	Cemlyn	03/01/2008
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH335935	Cemlyn Bay	25/12/2006
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH3393	Cemlyn	74 records - 08/05/1994 - 01/08/2013
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH3592	Tregele	21/07/2000
<i>Falco peregrinus</i>	Peregrine Falcon	1	SH3793	Cemaes	5 records - 07/03/1999 - 29/07/2000
<i>Falco subbuteo</i>	Hobby	1	SH330932	Cemlyn	26/05/2003
<i>Falco subbuteo</i>	Hobby	1	SH3393	Cemlyn	2 records - 24/05/2003 - 02/06/2007
<i>Falco tinnunculus</i>	Kestrel	1	SH3282692991	Cemlyn	03/06/2012

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Falco tinnunculus</i>	Kestrel	1	SH3293	Cemlyn	2 records - Spring 1996 - Summer 1996
<i>Falco tinnunculus</i>	Kestrel	1	SH3308892907	Cemlyn	06/07/2013
<i>Falco tinnunculus</i>	Kestrel	1	SH330932	Cemlyn	4 records - 2002 - 15/07/2008
<i>Falco tinnunculus</i>	Kestrel	1	SH331932	Cemlyn	2 records - 03/01/2008 - 20/01/2008
<i>Falco tinnunculus</i>	Kestrel	1	SH3391	Tregele	18/06/2013
<i>Falco tinnunculus</i>	Kestrel	1	SH3393	Cemlyn	99 records - 03/05/1994 - 03/06/2012
<i>Falco tinnunculus</i>	Kestrel	1	SH3394	Trwyn Cemlyn	16/06/2010
<i>Falco tinnunculus</i>	Kestrel	1	SH3592	Tregele	3 records - 09/06/2008 - 01/12/2008
<i>Falco tinnunculus</i>	Kestrel	1	SH3793	Cemaes Bay	5 records - 06/07/2008 - 27/12/2008
<i>Ficedula hypoleuca</i>	Pied Flycatcher	1	SH330932	Cemlyn	2008
<i>Ficedula hypoleuca</i>	Pied Flycatcher	1	SH3393	Cemlyn	20/09/1995
<i>Fringilla montifringilla</i>	Brambling	1	SH3393	Cemlyn Bay	6 records - 17/10/2005 - 31/10/2005
<i>Gavia</i>	Indet. Diver	1	SH3393	Cemlyn; Trwyn Cemlyn	20/06/1994
<i>Gavia arctica</i>	Black-throated Diver	1	SH3393	Cemlyn	6 records - 17/02/1999 - 18/07/2005
<i>Gavia immer</i>	Great Northern Diver	1	SH330932	Cemlyn	19/05/2002
<i>Gavia immer</i>	Great Northern Diver	1	SH331932	Cemlyn	26/01/2008
<i>Gavia immer</i>	Great Northern Diver	1	SH333937	Cemlyn Bay	18/09/2004
<i>Gavia immer</i>	Great Northern Diver	1	SH3393	Cemlyn Bay	9 records - 07/11/1999 - 17/12/2005
<i>Gavia immer</i>	Great Northern Diver	1	SH3793	Cemaes Bay	19/01/2004
<i>Gavia stellata</i>	Red-throated Diver	1	SH329936	Cemlyn Bay	2 records - 17/03/2004 - 23/09/2004
<i>Gavia stellata</i>	Red-throated Diver	1	SH330930	Cemlyn	22/04/2008
<i>Gavia stellata</i>	Red-throated Diver	1	SH333936	Cemlyn Bay	3 records - 09/01/2003 - 15/03/2003
<i>Gavia stellata</i>	Red-throated Diver	1	SH335935	Cemlyn	3 records - 04/01/2007 - 25/12/2007
<i>Gavia stellata</i>	Red-throated Diver	1	SH3393	Cemlyn	55 records - 30/04/1998 - 31/05/2013
<i>Gavia stellata</i>	Red-throated Diver	1	SH355945	Wylfa; Head	08/10/2008
<i>Lanius collurio</i>	Red-backed Shrike	1	SH330932	Cemlyn	2002
<i>Lanius collurio</i>	Red-backed Shrike	1	SH3393	Cemlyn	23/08/2002
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH33059333	Cemlyn Bay Nature Reserve	18/05/2011
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH33069331	Cemlyn; Main Island	23/04/2012
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH330930	Cemlyn	29/04/2008
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH330932	Cemlyn	8 records - May 2002 - 01/06/2008
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH330933	Cemlyn; Main island	April 2011 – July 2011
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH331932	Cemlyn NWWT Reserve	4 records - 11/05/2013 - 18/05/2013
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH333933	Cemlyn Bay	2 records - 03/06/2006 - 28/06/2006
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH335935	Cemlyn	21/03/2007
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH338933	Cemlyn Bay	26/06/1999
<i>Larus melanocephalus</i>	Mediterranean Gull	1	SH3393	Cemlyn	82 records - 04/05/1995 - 08/05/2012
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH329936	Cemlyn Bay	3 records - 04/06/2004 - 18/09/2004
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH330932	Cemlyn	10 records - 17/05/2002 - June 2008
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH330933	Cemlyn; Main Island	May 2011 – June 2011
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH330937	Cemlyn Bay; Trwyn Cemlyn	01/09/2008
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH331932	Cemlyn NWWT Reserve	2 records - all 18/05/2013
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH335935	Cemlyn	30/04/2007
<i>Limosa lapponica</i>	Bar-tailed Godwit	1	SH3393	Cemlyn	47 records - 10/05/1994 - 28/07/2013

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH329936	Cemlyn Bay	2 records - 04/06/2004 - 03/07/2004
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH3304493305	Cemlyn	2 records - all 29/04/2013
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH330932	Cemlyn	8 records - 25/05/2002 - 06/07/2008
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH330936	Cemlyn Bay	23/04/2007
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH331932	Cemlyn NWWT Reserve	11/05/2013
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH332928	Cemlyn Bay	05/10/2000
<i>Limosa limosa</i>	Black-tailed Godwit	1	SH3393	Cemlyn	59 records - 10/05/1994 - 06/08/2013
<i>Locustella naevia</i>	Common Grasshopper Warbler	1	SH330932	Cemlyn	5 records - May 2002 - 28/07/2008
<i>Locustella naevia</i>	Common Grasshopper Warbler	1	SH3393	Cemlyn	33 records - 08/05/1994 - 23/04/2013
<i>Locustella naevia</i>	Common Grasshopper Warbler	1	SH344931	Cemlyn Bay	07/05/2004
<i>Loxia curvirostra</i>	Common Crossbill	1	SH3393	Cemlyn	19 records - 24/07/1994 - 01/08/2013
<i>Loxia curvirostra</i>	Common Crossbill	1	SH3593	Wylfa; Nature Trail	3 records - 19/03/2000 - 22/03/2000
<i>Loxia curvirostra</i>	Common Crossbill	1	SH3594	Wylfa	22/03/2000
<i>Luscinia svecica</i>	Bluethroat	1	SH3393	Cemlyn	25/04/2009
<i>Melanitta fusca</i>	Velvet Scoter	1	SH3393	Cemlyn	4 records - 27/06/1997 - 14/10/2004
<i>Melanitta nigra</i>	Common Scoter	1	SH3293	Cemlyn	4 records - 29/06/1996 - 12/07/1996
<i>Melanitta nigra</i>	Common Scoter	1	SH329936	Cemlyn Bay	3 records - 03/07/2004 - 23/09/2004
<i>Melanitta nigra</i>	Common Scoter	1	SH330932	Cemlyn	05/08/2002
<i>Melanitta nigra</i>	Common Scoter	1	SH333933	Cemlyn Bay	3 records - 03/06/2006 - 21/08/2006
<i>Melanitta nigra</i>	Common Scoter	1	SH335935	Cemlyn	5 records - 04/01/2007 - 19/07/2007
<i>Melanitta nigra</i>	Common Scoter	1	SH3393	Cemlyn	43 records - 06/07/1994 - 25/07/2013
<i>Merops apiaster</i>	Bee-eater	1	SH3393	Cemlyn	3 records - 13/06/2010 - 26/05/2012
<i>Milvus milvus</i>	Red Kite	1	SH330932	Cemlyn	24/07/2008
<i>Milvus milvus</i>	Red Kite	1	SH3393	Cemlyn	2 records - 23/04/2006 - 24/05/2009
<i>Motacilla flava subsp. flavissima</i>	Yellow Wagtail	1	SH330932	Cemlyn	6 records - 02/05/2002 - July 2008
<i>Motacilla flava subsp. flavissima</i>	Yellow Wagtail	1	SH3393	Cemlyn	43 records - 02/05/1994 - 31/07/2011
<i>Muscicapa striata</i>	Spotted Flycatcher	1	SH335935	Cemlyn	2 records - 02/06/2007 - 22/05/2008
<i>Muscicapa striata</i>	Spotted Flycatcher	1	SH3393	Cemlyn	36 records - 06/05/1994 - 25/04/2013
<i>Muscicapa striata</i>	Spotted Flycatcher	1	SH3592	Tregele	31/07/1999
<i>Muscicapa striata</i>	Spotted Flycatcher	1	SH3793	Cemaes Bay	19/06/2008
<i>Numenius arquata</i>	Curlew	1	SH329917		2005 approx
<i>Numenius arquata</i>	Curlew	1	SH329936	Cemlyn Bay	2 records - 23/09/2004 - 30/09/2004
<i>Numenius arquata</i>	Curlew	1	SH330932	Cemlyn	6 records - May 2002 - 18/07/2008
<i>Numenius arquata</i>	Curlew	1	SH331932	Cemlyn NWWT Reserve	3 records - 26/01/2008 - 18/05/2013
<i>Numenius arquata</i>	Curlew	1	SH333933	Cemlyn Bay	08/06/2006
<i>Numenius arquata</i>	Curlew	1	SH335935	Cemlyn	4 records - 01/10/1999 - 01/01/2008
<i>Numenius arquata</i>	Curlew	1	SH3393	Cemlyn	259 records - May 1994 - 01/08/2013
<i>Numenius phaeopus</i>	Whimbrel	1	SH3293	Cemlyn/Henborth	26/04/2008
<i>Numenius phaeopus</i>	Whimbrel	1	SH329936	Cemlyn Bay	2 records - 07/05/2004 - 24/08/2004
<i>Numenius phaeopus</i>	Whimbrel	1	SH330932	Cemlyn	7 records - 12/05/2002 - 02/05/2008
<i>Numenius phaeopus</i>	Whimbrel	1	SH331932	Cemlyn NWWT Reserve	5 records - 24/04/2008 - 18/05/2013
<i>Numenius phaeopus</i>	Whimbrel	1	SH333933	Cemlyn Bay	4 records - 27/04/2006 - 03/08/2006
<i>Numenius phaeopus</i>	Whimbrel	1	SH335935	Cemlyn	7 records - 30/04/2007 - 03/06/2008
<i>Numenius phaeopus</i>	Whimbrel	1	SH3393	Cemlyn	96 records - May 1994 - 29/04/2013

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Numenius phaeopus</i>	Whimbrel	1	SH3793	Cemaes Bay	04/05/1999
<i>Numenius phaeopus</i>	Whimbrel	1	SH3794	Llanbadrig	27/04/2000
<i>Oceanodroma leucorhoa</i>	Leach's Storm-petrel	1	SH3393	Cemlyn Bay	7 records - 03/10/1999 - 02/10/2005
<i>Oriolus oriolus</i>	Golden Oriole	1	SH3393	Cemlyn	09/06/2007
<i>Pandion haliaetus</i>	Osprey	1	SH3393	Cemlyn	2 records - 02/06/2011 - 26/05/2013
<i>Passer domesticus</i>	House Sparrow	1	SH3294393545	Cemlyn – Car Park (North)	02/06/2012
<i>Passer domesticus</i>	House Sparrow	1	SH3303293555	Cemlyn	02/06/2012
<i>Passer domesticus</i>	House Sparrow	1	SH3308892907	Cemlyn	02/06/2012
<i>Passer domesticus</i>	House Sparrow	1	SH330932	Cemlyn	5 records - 2002 - 30/05/2008
<i>Passer domesticus</i>	House Sparrow	1	SH331932	Cemlyn NWWT Reserve	3 records - 26/01/2008 - 18/05/2013
<i>Passer domesticus</i>	House Sparrow	1	SH3393	Cemlyn	298 records - May 1994 - 08/08/2013
<i>Passer montanus</i>	Tree Sparrow	1	SH3393	Cemlyn Bay	2 records - 03/06/1999 - 30/09/2003
<i>Perdix perdix</i>	Grey Partridge	1	SH3393	Cemlyn	8 records - 14/06/1994 - 12/05/2012
<i>Pernis apivorus</i>	Honey-buzzard	1	SH3393	Cemlyn	27/07/2002
<i>Phalaropus lobatus</i>	Red-necked Phalarope	1	SH3393	Cemlyn	2 records - all 08/06/2006
<i>Philomachus pugnax</i>	Ruff	1	SH3302093234	Cemlyn	07/05/2013
<i>Philomachus pugnax</i>	Ruff	1	SH3304493305	Cemlyn	07/05/2013
<i>Philomachus pugnax</i>	Ruff	1	SH330933	Cemlyn; Main island	24/04/2011
<i>Philomachus pugnax</i>	Ruff	1	SH335935	Cemlyn	2 records - 25/12/2006 - 30/01/2007
<i>Philomachus pugnax</i>	Ruff	1	SH3393	Cemlyn	23 records - May 1994 - 09/05/2011
<i>Phoenicurus ochruros</i>	Black Redstart	1	SH3393	Cemlyn	8 records - 19/02/1999 - 02/05/2013
<i>Platalea leucorodia</i>	Spoonbill	1	SH330932	Cemlyn	2 records - 10/07/2002 - 04/05/2003
<i>Platalea leucorodia</i>	Spoonbill	1	SH3393	Cemlyn	2 records - 19/06/2000 - 16/05/2009
<i>Plectrophenax nivalis</i>	Snow Bunting	1	SH335935	Cemlyn	25/12/2007
<i>Plectrophenax nivalis</i>	Snow Bunting	1	SH3393	Cemlyn Bay	20 records - 23/10/1999 - 24/12/2005
<i>Pluvialis apricaria</i>	Golden Plover	1	SH328934	Cemlyn Bay	6 records - 09/01/2003 - 08/12/2003
<i>Pluvialis apricaria</i>	Golden Plover	1	SH329936	Cemlyn Bay	4 records - 21/01/2004 - 30/09/2004
<i>Pluvialis apricaria</i>	Golden Plover	1	SH3308892907	Cemlyn	07/08/2013
<i>Pluvialis apricaria</i>	Golden Plover	1	SH330932	Cemlyn	8 records - 26/04/2002 - 12/07/2008
<i>Pluvialis apricaria</i>	Golden Plover	1	SH330934	Cemlyn Bay	3 records - 03/03/2008 - 27/10/2008
<i>Pluvialis apricaria</i>	Golden Plover	1	SH330936	Cemlyn Bay	2 records - 19/03/2007 - 24/09/2007
<i>Pluvialis apricaria</i>	Golden Plover	1	SH331932	Cemlyn	3 records - 26/01/2008 - 24/04/2008
<i>Pluvialis apricaria</i>	Golden Plover	1	SH332928	Cemlyn	28/10/2000
<i>Pluvialis apricaria</i>	Golden Plover	1	SH333933	Cemlyn Bay	3 records - 27/04/2006 - 03/08/2006
<i>Pluvialis apricaria</i>	Golden Plover	1	SH335935	Cemlyn	7 records - 30/07/2007 - 25/12/2007
<i>Pluvialis apricaria</i>	Golden Plover	1	SH3393	Cemlyn	330 records - 10/05/1994 - 21/06/2013
<i>Podiceps auritus</i>	Slavonian Grebe	1	SH3349293702	Cemlyn	02/06/2013
<i>Podiceps auritus</i>	Slavonian Grebe	1	SH335935	Cemlyn Bay	25/12/2006
<i>Podiceps auritus</i>	Slavonian Grebe	1	SH3393	Cemlyn Bay	58 records - 07/01/1999 - 12/03/2000
<i>Puffinus mauretanicus</i>	Balearic Shearwater	1	SH3393	Cemlyn	8 records - 03/10/1999 - 14/08/2008
<i>Puffinus mauretanicus</i>	Balearic Shearwater	1	SH3594	Wylfa; Wylfa Head seawatches	3 records - 12/08/2006 - 02/09/2006
<i>Pyrrhocorax pyrrhocorax</i>	Chough	1	SH328934	Cemlyn Bay	25/07/2003
<i>Pyrrhocorax pyrrhocorax</i>	Chough	1	SH329936	Cemlyn Bay	2 records - 30/09/2004 - 25/12/2004
<i>Pyrrhocorax pyrrhocorax</i>	Chough	1	SH330932	Cemlyn	5 records - 08/06/2002 - June 2008

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<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH3314893316	Cemlyn	02/06/2012
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH331928	Cemlyn; Plas Cemlyn	Summer 2011
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH331932	Cemlyn	30/05/2008
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH3321993032	Cemlyn	02/06/2012
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH332939	Cemlyn Bay	15/01/2007
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH3393	Cemlyn	90 records - 18/05/1994 - June 2011
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH3594	Wylfa; Head	4 records - 05/02/2000 - 17/02/2008
<i>Pyrhacorax pyrrhacorax</i>	Chough	1	SH3794	Llanbadrig	3 records - 10/03/1999 - 05/04/1999
<i>Recurvirostra avosetta</i>	Pied Avocet	1	SH330932	Cemlyn	2 records - 17/05/2008 - 18/05/2008
<i>Recurvirostra avosetta</i>	Pied Avocet	1	SH330935	Cemlyn	18/05/2008
<i>Recurvirostra avosetta</i>	Pied Avocet	1	SH3393	Cemlyn; Lagoon	2 records - 17/05/2008 - 18/05/2008
<i>Regulus ignicapilla</i>	Firecrest	1	SH3393	Cemlyn; In scrub by Bryn Abber	2 records - 31/10/2005 - 02/05/2013
<i>Stercorarius parasiticus</i>	Arctic Skua	1	SH329936	Cemlyn Bay	23/09/2004
<i>Stercorarius parasiticus</i>	Arctic Skua	1	SH330932	Cemlyn	3 records - 15/06/2002 - 2008
<i>Stercorarius parasiticus</i>	Arctic Skua	1	SH333933	Cemlyn Bay	03/06/2006
<i>Stercorarius parasiticus</i>	Arctic Skua	1	SH3393	Cemlyn	47 records - 15/05/1994 - 18/09/2011
<i>Stercorarius parasiticus</i>	Arctic Skua	1	SH3594	Wylfa; Wylfa Head seawatches	5 records - 02/08/2006 - 02/09/2006
<i>Sterna dougallii</i>	Roseate Tern	1	SH329936	Cemlyn Bay	5 records - 12/06/2004 - 02/08/2004
<i>Sterna dougallii</i>	Roseate Tern	1	SH3304493305	Cemlyn	3 records - 23/05/2013 - 27/06/2013
<i>Sterna dougallii</i>	Roseate Tern	1	SH330932	Cemlyn	11 records - 26/05/2002 - 17/06/2008
<i>Sterna dougallii</i>	Roseate Tern	1	SH330933	Cemlyn; Main Island	20/06/2011 – 11/07/2011
<i>Sterna dougallii</i>	Roseate Tern	1	SH332933	Cemlyn	01/07/2008
<i>Sterna dougallii</i>	Roseate Tern	1	SH333933	Cemlyn Bay	2 records - 28/06/2006 - 17/07/2006
<i>Sterna dougallii</i>	Roseate Tern	1	SH335935	Cemlyn	07/06/2007
<i>Sterna dougallii</i>	Roseate Tern	1	SH3393	Cemlyn	103 records - 1994 - 09/07/2011
<i>Sternula albifrons</i>	Little Tern	1	SH330932	Cemlyn	5 records - 31/05/2002 - 05/07/2008
<i>Sternula albifrons</i>	Little Tern	1	SH330933	Cemlyn; Main island	13/05/2011
<i>Sternula albifrons</i>	Little Tern	1	SH3393	Cemlyn	36 records - 21/05/1994 - 25/05/2013
<i>Streptopelia turtur</i>	Turtle Dove	1	SH330932	Cemlyn	28/05/2003
<i>Streptopelia turtur</i>	Turtle Dove	1	SH3393	Cemlyn	3 records - 10/05/1994 - 23/05/2004
<i>Tringa glareola</i>	Wood Sandpiper	1	SH330932	Cemlyn; Small Island	3 records - 16/07/2002 - 06/05/2011
<i>Tringa glareola</i>	Wood Sandpiper	1	SH3393	Cemlyn	6 records - 06/05/1994 - 04/05/2008
<i>Tringa nebularia</i>	Common Greenshank	1	SH328934	Cemlyn Bay	11/08/2003
<i>Tringa nebularia</i>	Common Greenshank	1	SH329936	Cemlyn Bay	21/01/2004
<i>Tringa nebularia</i>	Common Greenshank	1	SH3304493305	Cemlyn	2 records - 07/05/2013 - 12/05/2013
<i>Tringa nebularia</i>	Common Greenshank	1	SH330932	Cemlyn	7 records - May 2002 - August 2003
<i>Tringa nebularia</i>	Common Greenshank	1	SH3393	Cemlyn	56 records - 01/05/1994 - 27/07/2013
<i>Tringa ochropus</i>	Green Sandpiper	1	SH3293	Cemlyn/Henborth	27/07/2004
<i>Tringa ochropus</i>	Green Sandpiper	1	SH329936	Cemlyn Bay	24/08/2004
<i>Tringa ochropus</i>	Green Sandpiper	1	SH330932	Cemlyn	4 records - 04/05/2002 - 05/07/2008
<i>Tringa ochropus</i>	Green Sandpiper	1	SH3393	Cemlyn	13 records - 13/06/1999 - 28/07/2011
<i>Turdus iliacus</i>	Redwing	1	SH331932	Cemlyn	03/01/2008
<i>Turdus iliacus</i>	Redwing	1	SH3393	Cemlyn Bay	39 records - 07/01/1999 - 16/10/2005
<i>Turdus iliacus</i>	Redwing	1	SH3593	Wylfa; Power Station Nature trail	3 records - 16/02/1999 - 23/02/1999

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<i>Turdus iliacus</i>	Redwing	1	SH3691	Llanfechell	16/01/2005
<i>Turdus iliacus</i>	Redwing	1	SH3793	Cemaes Bay; Gadlys	6 records - 12/10/2000 - 25/12/2008
<i>Turdus pilaris</i>	Fieldfare	1	SH330932	Cemlyn	29/05/2002
<i>Turdus pilaris</i>	Fieldfare	1	SH331932	Cemlyn	03/01/2008
<i>Turdus pilaris</i>	Fieldfare	1	SH3393	Cemlyn Bay	25 records - 07/01/1999 - 16/10/2005
<i>Turdus pilaris</i>	Fieldfare	1	SH3691	Llanfechell	16/01/2005
<i>Turdus pilaris</i>	Fieldfare	1	SH3693	Cemaes Bay	23/03/1999
<i>Turdus pilaris</i>	Fieldfare	1	SH3793	Cemaes Bay; Tae Hen	06/01/2008
<i>Turdus torquatus</i>	Ring Ouzel	1	SH3393	Cemlyn Bay	3 records - 30/03/1999 - 02/04/2005
<i>Turdus torquatus</i>	Ring Ouzel	1	SH3793	Cemaes; Park Lodge	17/02/2008
<i>Tyto alba</i>	Barn Owl	1	SH329917		2005 approx
<i>Tyto alba</i>	Barn Owl	1	SH330932	Cemlyn	3 records - 12/07/2002 - 2008
<i>Tyto alba</i>	Barn Owl	1	SH331932	Cemlyn NWWT Reserve	11/05/2013
<i>Tyto alba</i>	Barn Owl	1	SH332292965	Cemlyn	12/06/2010
<i>Tyto alba</i>	Barn Owl	1	SH335935	Cemlyn	3 records - 14/05/2007 - 07/06/2007
<i>Tyto alba</i>	Barn Owl	1	SH3393	Cemlyn	10 records - 1994 - 24/05/2012
<i>Tyto alba</i>	Barn Owl	1	SH343930	Cemlyn; Cafnan Farm	26/07/2001
<i>Tyto alba</i>	Barn Owl	1	SH3793	Cemaes Bay	2 records - 17/01/2002 - 17/03/2006
<i>Tyto alba subsp. guttata</i>	Dark-breasted Barn Owl	1	SH3393	Cemlyn	1 record - Spring 1998 – Summer 1998
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH329917		2005 approx
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH329936	Cemlyn Bay	26/12/2004
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH330932	Cemlyn	17 records - 2002 - July 2008
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH331932	Cemlyn	26/01/2008
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH332928	Cemlyn	28/10/2000
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH333933	Cemlyn Bay	2 records - 21/08/2006 - 25/12/2006
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH335935	Cemlyn	3 records - 30/01/2007 - 25/12/2007
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH336921	Cemlyn Bay	06/02/2006
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH3393	Cemlyn	216 records - May 1994 - 22/07/2013
<i>Vanellus vanellus</i>	Northern Lapwing	1	SH3793	Cemaes	18/02/2002
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH3293	Cemlyn/Henborth	26/04/2008
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH329936	Cemlyn Bay	04/08/2004
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH3302093234	Cemlyn	13/05/2013
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH330932	Cemlyn	9 records May 2002 - 05/07/2008
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH333933	Cemlyn Bay	21/08/2006
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH335935	Cemlyn	30/04/2007
<i>Actitis hypoleucos</i>	Common Sandpiper	2	SH3393	Cemlyn	64 records 03/05/1994 - 09/08/2013
<i>Aegithalos caudatus</i>	Long-tailed Tit	2	SH3393	Cemlyn	30/07/2005
<i>Aegithalos caudatus</i>	Long-tailed Tit	2	SH3793	Cemaes Bay	11/11/2008
<i>Alauda arvensis</i>	Sky Lark	2	SH329917		2005
<i>Alauda arvensis</i>	Sky Lark	2	SH330932	Cemlyn	5 records May 2002 - 12/11/2008
<i>Alauda arvensis</i>	Sky Lark	2	SH3393	Cemlyn	32 records 25/05/1994 - 03/08/2013
<i>Anas clypeata</i>	Northern Shoveler	2	SH330932	Cemlyn	20/06/2002
<i>Anas clypeata</i>	Northern Shoveler	2	SH331932	Cemlyn	26/01/2008

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<i>Anas clypeata</i>	Northern Shoveler	2	SH333933	Cemlyn Bay	3 records 09/01/2003 - 28/06/2006
<i>Anas clypeata</i>	Northern Shoveler	2	SH335935	Cemlyn	25/12/2007
<i>Anas clypeata</i>	Northern Shoveler	2	SH3393	Cemlyn	72 records 23/04/1994 - 23/04/2013
<i>Anas crecca</i>	Teal	2	SH3302093234	Cemlyn	8 records in 2013
<i>Anas crecca</i>	Teal	2	SH330932	Cemlyn	26/07/2008
<i>Anas crecca</i>	Teal	2	SH331932	Cemlyn	26/01/2008
<i>Anas crecca</i>	Teal	2	SH333933	Cemlyn Bay	27/07/2006
<i>Anas crecca</i>	Teal	2	SH333937	Cemlyn Bay	16/08/2004
<i>Anas crecca</i>	Teal	2	SH335935	Cemlyn	02/06/2007
<i>Anas crecca</i>	Teal	2	SH3393	Cemlyn	69 records 02/05/1994 - 28/04/2013
<i>Anas penelope</i>	Wigeon	2	SH328934	Cemlyn Bay	15/03/2003
<i>Anas penelope</i>	Wigeon	2	SH3302093234	Cemlyn	02/08/2013
<i>Anas penelope</i>	Wigeon	2	SH330932	Cemlyn	17/05/2002
<i>Anas penelope</i>	Wigeon	2	SH331932	Cemlyn	12/11/2008
<i>Anas penelope</i>	Wigeon	2	SH333933	Cemlyn Bay	6 records in 2006
<i>Anas penelope</i>	Wigeon	2	SH333937	Cemlyn Bay	4 records in 2004
<i>Anas penelope</i>	Wigeon	2	SH335935	Cemlyn	6 records in 2007
<i>Anas penelope</i>	Wigeon	2	SH3393	Cemlyn	238 records 07/05/1994 - 23/10/2009
<i>Anas penelope</i>	Wigeon	2	SH3793	Cemaes Bay	20/09/2002
<i>Anas platyrhynchos</i>	Mallard	2	SH3293	Cemlyn	6 records in 1996
<i>Anas platyrhynchos</i>	Mallard	2	SH3302093234	Cemlyn	02/06/2012
<i>Anas platyrhynchos</i>	Mallard	2	SH3308892907	Cemlyn	02/06/2012
<i>Anas platyrhynchos</i>	Mallard	2	SH330932	Cemlyn	10 records - 2002 - 03/07/2008
<i>Anas platyrhynchos</i>	Mallard	2	SH331932	Cemlyn NWWT Reserve	4 records 2008 - 2013
<i>Anas platyrhynchos</i>	Mallard	2	SH33579312	Cemlyn Bay	4 record 2003
<i>Anas platyrhynchos</i>	Mallard	2	SH3393	Cemlyn	218 records - May 1994 - 03/06/2012
<i>Anas platyrhynchos</i>	Mallard	2	SH37279354	Anglesey	24/04/2010
<i>Anas platyrhynchos</i>	Mallard	2	SH3793	Cemaes Bay	03/05/2008
<i>Anas strepera</i>	Gadwall	2	SH3302093234	Cemlyn	1 record - 26/04/2013 – 30/04/2013
<i>Anas strepera</i>	Gadwall	2	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Anas strepera</i>	Gadwall	2	SH3393	Cemlyn	9 records 06/08/1998 - 22/05/2012
<i>Anser albifrons</i>	Greater White-fronted Goose	2	SH3393	Cemlyn Bay	3 records - 2000
<i>Anthus pratensis</i>	Meadow Pipit	2	SH330932	Cemlyn	8 records 2002 - 28/07/2008
<i>Anthus pratensis</i>	Meadow Pipit	2	SH3311193874	Cemlyn	02/06/2012
<i>Anthus pratensis</i>	Meadow Pipit	2	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Anthus pratensis</i>	Meadow Pipit	2	SH331932	Cemlyn	26/01/2008
<i>Anthus pratensis</i>	Meadow Pipit	2	SH3393	Cemlyn	100 records - June 1994 - 28/04/2012
<i>Anthus pratensis</i>	Meadow Pipit	2	SH3793	Cemaes Bay	18/03/2005
<i>Apus apus</i>	Common Swift	2	SH3294393545	Cemlyn – Car Park (North)	03/06/2012
<i>Apus apus</i>	Common Swift	2	SH330932	Cemlyn	3 records - 19/06/2002 - 22/07/2008
<i>Apus apus</i>	Common Swift	2	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Apus apus</i>	Common Swift	2	SH333933	Cemlyn Bay	27/04/2006
<i>Apus apus</i>	Common Swift	2	SH3393	Cemlyn	42 records - 07/05/1994 - 16/05/2013
<i>Apus apus</i>	Common Swift	2	SH3793	Cemaes Bay	10 records 05/05/1999 - 28/07/2008

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Arenaria interpres</i>	Turnstone	2	SH330932	Cemlyn	6 records - 30/04/2002 - 30/05/2008
<i>Arenaria interpres</i>	Turnstone	2	SH3317493825	Cemlyn	02/06/2012
<i>Arenaria interpres</i>	Turnstone	2	SH331932	Cemlyn NWWT Reserve	6 records - 03/01/2008 - 18/05/2013
<i>Arenaria interpres</i>	Turnstone	2	SH333933	Cemlyn Bay	4 records - 29/04/2006 - 25/12/2006
<i>Arenaria interpres</i>	Turnstone	2	SH333937	Cemlyn Bay	5 records - 02/08/2004 - 30/09/2004
<i>Arenaria interpres</i>	Turnstone	2	SH335935	Cemlyn	6 records - 30/01/2007 - 25/12/2007
<i>Arenaria interpres</i>	Turnstone	2	SH3393	Cemlyn	177 records - May 1994 - 26/07/2013
<i>Arenaria interpres</i>	Turnstone	2	SH3793	Cemaes Bay	3 records - 28/02/2008 - 26/12/2008
<i>Asio flammeus</i>	Short-eared Owl	2	SH330932	Cemlyn	2008
<i>Asio flammeus</i>	Short-eared Owl	2	SH332928	Cemlyn Bay	22/06/2000
<i>Asio flammeus</i>	Short-eared Owl	2	SH3393	Cemlyn	15 records - 03/05/1995 - 11/06/2009
<i>Aythya ferina</i>	Pochard	2	SH3293	Cemlyn	22/07/1996
<i>Aythya ferina</i>	Pochard	2	SH3393	Cemlyn	6 records - 24/05/1994 - 27/04/2010
<i>Aythya fuligula</i>	Tufted Duck	2	SH3293	Cemlyn	2 records - 17/05/1996 - 03/07/1996
<i>Aythya fuligula</i>	Tufted Duck	2	SH3302093234	Cemlyn	3 records - 05/07/2013 - 28/07/2013
<i>Aythya fuligula</i>	Tufted Duck	2	SH330932	Cemlyn	2 records - 10/06/2002 - 08/07/2003
<i>Aythya fuligula</i>	Tufted Duck	2	SH3393	Cemlyn	39 records - 03/08/1991 - 01/08/2011
<i>Branta bernicla</i>	Brent Goose	2	SH3293	Cemlyn	25/05/1996
<i>Branta bernicla</i>	Brent Goose	2	SH3393	Cemlyn	3 records - 01/07/1998 - 24/04/2012
<i>Branta bernicla subsp. hrota</i>	Pale-Breasted Brent Goose	2	SH330932	Cemlyn	1 record - 03/06/2008 - 07/06/2008
<i>Branta bernicla subsp. hrota</i>	Pale-Breasted Brent Goose	2	SH330933	Cemlyn Bay	28/04/2008
<i>Branta bernicla subsp. hrota</i>	Pale-Breasted Brent Goose	2	SH331932	Cemlyn	04/06/2008
<i>Branta bernicla subsp. hrota</i>	Pale-Breasted Brent Goose	2	SH3393	Cemlyn	6 records - 02/11/1999 - 03/06/2008
<i>Branta leucopsis</i>	Barnacle Goose	2	SH3393	Cemlyn	2 records - 06/05/1997 - 27/04/1998
<i>Calidris alba</i>	Sanderling	2	SH330932	Cemlyn	16 records - 12/05/2002 - 17/07/2008
<i>Calidris alba</i>	Sanderling	2	SH3317493825	Cemlyn - Compartment 64	3 records - all 02/06/2012
<i>Calidris alba</i>	Sanderling	2	SH331932	Cemlyn NWWT Reserve	3 records - 11/05/2013 - 18/05/2013
<i>Calidris alba</i>	Sanderling	2	SH332934	Cemlyn	23/05/2000
<i>Calidris alba</i>	Sanderling	2	SH333937	Cemlyn Bay	18/09/2004
<i>Calidris alba</i>	Sanderling	2	SH335935	Cemlyn	25/12/2008
<i>Calidris alba</i>	Sanderling	2	SH3393	Cemlyn	67 records - May 1994 - 05/07/2013
<i>Calidris alpina</i>	Dunlin	2	SH3302093234	Cemlyn	03/06/2012
<i>Calidris alpina</i>	Dunlin	2	SH3304493305	Cemlyn	02/06/2012
<i>Calidris alpina</i>	Dunlin	2	SH330932	Cemlyn	10 records - 2002-17/07/2008
<i>Calidris alpina</i>	Dunlin	2	SH3317493825	Cemlyn	02/06/2012
<i>Calidris alpina</i>	Dunlin	2	SH331932	Cemlyn NWWT Reserve	7 records - 26/01/2008 - 18/05/2013
<i>Calidris alpina</i>	Dunlin	2	SH333933	Cemlyn Bay	2 records - 29/04/2006 - 23/05/2006
<i>Calidris alpina</i>	Dunlin	2	SH335935	Cemlyn	3 records - 14/05/2007 - 23/11/2007
<i>Calidris alpina</i>	Dunlin	2	SH3393	Cemlyn	198 records - May 1994 - 28/07/2013
<i>Calidris alpina subsp. schinzii</i>	Calidris alpina subsp. schinzii	2	SH3393	Cemlyn	Jun-10
<i>Calidris canutus</i>	Knot	2	SH330932	Cemlyn	5 records - 17/05/2002 - 24/07/2008
<i>Calidris canutus</i>	Knot	2	SH331932	Cemlyn NWWT Reserve	3 records - 03/01/2008 - 18/05/2013
<i>Calidris canutus</i>	Knot	2	SH333933	Cemlyn Bay	21/08/2006
<i>Calidris canutus</i>	Knot	2	SH335935	Cemlyn Bay	13/09/2007

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Calidris canutus</i>	Knot	2	SH3393	Cemlyn	58 records - 09/05/1994 - 27/07/2013
<i>Carduelis cannabina</i>	Linnets	2	SH3294393545	Cemlyn – Car Park (North)	02/06/2012
<i>Carduelis cannabina</i>	Linnets	2	SH3308892907	Cemlyn	02/06/2012
<i>Carduelis cannabina</i>	Linnets	2	SH330932	Cemlyn	6 records - 02/07/2002 - July 2008
<i>Carduelis cannabina</i>	Linnets	2	SH331932	Cemlyn NWWT Reserve	5 records - 03/01/2008 - 18/05/2013
<i>Carduelis cannabina</i>	Linnets	2	SH335935	Cemlyn	09/04/2008
<i>Carduelis cannabina</i>	Linnets	2	SH3393	Cemlyn	54 records - May 1994 - 29/04/2013
<i>Carduelis flavirostris</i>	Twites	2	SH329936	Cemlyn Bay	05/11/2000
<i>Carduelis flavirostris</i>	Twites	2	SH3393	Cemlyn Bay	5 records - 27/06/1996 - 03/11/2000
<i>Cephus grylle</i>	Black Guillemot	2	SH330932	Cemlyn	7 records - 25/05/2002 - 2008
<i>Cephus grylle</i>	Black Guillemot	2	SH331932	Cemlyn NWWT Reserve	11/05/2013
<i>Cephus grylle</i>	Black Guillemot	2	SH3349293702	Cemlyn	02/06/2012
<i>Cephus grylle</i>	Black Guillemot	2	SH3393	Cemlyn; Bay area	20 records - 06/07/1994 - 03/06/2012
<i>Corvus cornix</i>	Hooded Crow	2	SH331934	SSSI: Cemlyn Bay	Winter 1995
<i>Corvus cornix</i>	Hooded Crow	2	SH3393	Cemlyn	12 records - 10/05/1994 - 26/05/2013
<i>Corvus cornix subsp. cornix</i>	Hooded Crow	2	SH331934	SSSI: Cemlyn Bay	Summer 1997
<i>Corvus cornix subsp. cornix</i>	Hooded Crow	2	SH3393	Cemlyn	29/04/2007
<i>Cygnus olor</i>	Mute Swan	2	SH3293	Cemlyn	2 records - 09/05/1996 - Summer 1996
<i>Cygnus olor</i>	Mute Swan	2	SH330932	Cemlyn	8 records - 2002 - 21/05/2008
<i>Cygnus olor</i>	Mute Swan	2	SH331932	Cemlyn NWWT Reserve	3 records - 11/05/2013 - 18/05/2013
<i>Cygnus olor</i>	Mute Swan	2	SH335925	Cemlyn Bay	Jun-06
<i>Cygnus olor</i>	Mute Swan	2	SH3393	Cemlyn	91 records - May 1994 - 03/06/2012
<i>Cygnus olor</i>	Mute Swan	2	SH3592	Tregele	07/03/2008
<i>Delichon urbicum</i>	House Martin	2	SH3294393545	Cemlyn – Car Park (North)	02/06/2012
<i>Delichon urbicum</i>	House Martin	2	SH330932	Cemlyn	3 records - 2002 - 23/05/2008
<i>Delichon urbicum</i>	House Martin	2	SH331932	Cemlyn NWWT Reserve	2 records - all 18/05/2013
<i>Delichon urbicum</i>	House Martin	2	SH333933	Cemlyn Bay	27/04/2006
<i>Delichon urbicum</i>	House Martin	2	SH335935	Cemlyn	09/04/2008
<i>Delichon urbicum</i>	House Martin	2	SH337928	Cemlyn	2011
<i>Delichon urbicum</i>	House Martin	2	SH3393	Cemlyn	44 records - 06/05/1994 - 17/05/2012
<i>Fratercula arctica</i>	Puffin	2	SH330932	Cemlyn	6 records - 13/05/2002 - 2008
<i>Fratercula arctica</i>	Puffin	2	SH3349293702	Cemlyn	04/05/2013
<i>Fratercula arctica</i>	Puffin	2	SH3393	Cemlyn	22 records - 28/06/1994 - 08/08/2010
<i>Fratercula arctica</i>	Puffin	2	SH3394	Cemlyn; Off headland	2011
<i>Gallinago gallinago</i>	Common Snipe	2	SH330932	Cemlyn	26/07/2008
<i>Gallinago gallinago</i>	Common Snipe	2	SH331932	Cemlyn	26/01/2008
<i>Gallinago gallinago</i>	Common Snipe	2	SH335935	Cemlyn	2 records - 30/01/2007 - 19/07/2007
<i>Gallinago gallinago</i>	Common Snipe	2	SH3393	Cemlyn	67 records - 25/04/1994 - 28/07/2013
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3293993356	Cemlyn	02/06/2012
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH329934	Cemlyn; Bryn Aber and the Weir	2011
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3302093234	Cemlyn	4 records - 02/06/2012 - 26/04/2013
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3303293555	Cemlyn	02/06/2012
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH330932	Cemlyn; Small Island	17 records - 2002 - 17/05/2011
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH330933	Cemlyn; Main Island	2011

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<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3317493825	Cemlyn	02/06/2012
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH331932	Cemlyn NWWT Reserve	5 records - 26/01/2008 - 18/05/2013
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH332932	Cemlyn; Ridge	22/05/2011
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH33579312	Cemlyn Bay	2 records - November 2003 - 15/11/2003
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3393	Cemlyn	154 records - May 1994 - 03/06/2012
<i>Haematopus ostralegus</i>	Oystercatcher	2	SH3793	Cemaes	2 records - 07/03/1999 - 09/07/2000
<i>Hirundo rustica</i>	Swallow	2	SH3302093234	Cemlyn	02/06/2012
<i>Hirundo rustica</i>	Swallow	2	SH3303293555	Cemlyn	02/06/2012
<i>Hirundo rustica</i>	Swallow	2	SH330932	Cemlyn	8 records - 11/05/2002 - 2008
<i>Hirundo rustica</i>	Swallow	2	SH331932	Cemlyn NWWT Reserve	4 records - 12/11/2008 - 18/05/2013
<i>Hirundo rustica</i>	Swallow	2	SH333933	Cemlyn Bay	27/04/2006
<i>Hirundo rustica</i>	Swallow	2	SH335935	Cemlyn	2 records - 04/04/2007 - 09/04/2008
<i>Hirundo rustica</i>	Swallow	2	SH3393	Cemlyn	87 records - May 1994 - 08/08/2013
<i>Hirundo rustica</i>	Swallow	2	SH3592	Tregele	05/04/1999
<i>Hirundo rustica</i>	Swallow	2	SH3793	Cemaes Bay	19/04/2005
<i>Hydrobates pelagicus</i>	Storm-petrel	2	SH3293	Cemlyn	2 records - 29/06/1996 - 01/07/1996
<i>Hydrobates pelagicus</i>	Storm-petrel	2	SH329936	Cemlyn Bay	03/07/2004
<i>Hydrobates pelagicus</i>	Storm-petrel	2	SH330932	Cemlyn	3 records - 14/05/2002 - 2008
<i>Hydrobates pelagicus</i>	Storm-petrel	2	SH3393	Cemlyn	13 records - 10/07/2000 - 14/06/2010
<i>Hydrobates pelagicus</i>	Storm-petrel	2	SH3594	Wylfa; Wylfa Head seawatches	2 records - 02/08/2006 - 28/08/2006
<i>Larus argentatus</i>	Herring Gull	2	SH330932	Cemlyn	6 records - 2002 - 2008
<i>Larus argentatus</i>	Herring Gull	2	SH331932	Cemlyn NWWT Reserve	4 records - 26/01/2008 - 18/05/2013
<i>Larus argentatus</i>	Herring Gull	2	SH3393	Cemlyn	33 records - May 1994 - 08/08/2013
<i>Larus argentatus</i>	Herring Gull	2	SH3592	Tregele	18/02/2002
<i>Larus argentatus</i>	Herring Gull	2	SH37299354	Anglesey	24/04/2010
<i>Larus canus</i>	Common Gull	2	SH3304493305	Cemlyn	7 records - 23/04/2013 - 15/05/2013
<i>Larus canus</i>	Common Gull	2	SH330932	Cemlyn	8 records - May 2002 - 01/07/2008
<i>Larus canus</i>	Common Gull	2	SH331932	Cemlyn	26/01/2008
<i>Larus canus</i>	Common Gull	2	SH335935	Cemlyn	21/03/2007
<i>Larus canus</i>	Common Gull	2	SH3393	Cemlyn	28 records - 05/06/1995 - 17/05/2013
<i>Larus canus</i>	Common Gull	2	SH3592	Tregele	18/02/2002
<i>Larus fuscus</i>	Lesser Black-backed Gull	2	SH3302093234	Cemlyn	02/06/2012
<i>Larus fuscus</i>	Lesser Black-backed Gull	2	SH330932	Cemlyn	5 records - 2002 - 12/05/2008
<i>Larus fuscus</i>	Lesser Black-backed Gull	2	SH331932	Cemlyn NWWT Reserve	2 records - 26/01/2008 - 18/05/2013
<i>Larus fuscus</i>	Lesser Black-backed Gull	2	SH3393	Cemlyn	25 records - 05/05/1994 - 08/08/2013
<i>Larus marinus</i>	Great Black-backed Gull	2	SH3303293555	Cemlyn	02/06/2012
<i>Larus marinus</i>	Great Black-backed Gull	2	SH330932	Cemlyn	5 records - 2002-2008
<i>Larus marinus</i>	Great Black-backed Gull	2	SH331932	Cemlyn NWWT Reserve	6 records - 03/01/2008 - 18/05/2013
<i>Larus marinus</i>	Great Black-backed Gull	2	SH3393	Cemlyn	27 records - May 1994 - 08/08/2013
<i>Lymnocyptes minimus</i>	Jack Snipe	2	SH3393	Cemlyn Bay	3 records - 17/01/2002 - 24/12/2005
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3293	Cemlyn	3 records - May 1996 - July 1996
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3302093234	Cemlyn	4 records - 02/06/2012 - 09/08/2013
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH330932	Cemlyn	12 records - 2002 - 12/07/2008
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3317493825	Cemlyn	02/06/2012

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH331932	Cemlyn NWWT Reserve	5 records - 23/01/2008 - 18/05/2013
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH333933	Cemlyn Bay	2 records - 27/07/2006 - 21/08/2006
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3349293702	Cemlyn	2 records - all 02/06/2012
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH335935	Cemlyn	2 records - 30/04/2007 - 14/05/2007
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3393	Cemlyn	147 records - 06/06/1994 - 03/06/2012
<i>Mergus serrator</i>	Red-breasted Merganser	2	SH3793	Cemaes Bay	05/04/1999
<i>Morus bassanus</i>	Northern Gannet	2	SH3293	Cemlyn	2 records - Spring 1996 - Summer 1996
<i>Morus bassanus</i>	Northern Gannet	2	SH330932	Cemlyn	5 records - 03/06/2002 - 12/07/2008
<i>Morus bassanus</i>	Northern Gannet	2	SH331932	Cemlyn NWWT Reserve	4 records - 11/05/2013 - 18/05/2013
<i>Morus bassanus</i>	Northern Gannet	2	SH333933	Cemlyn Bay	27/04/2006
<i>Morus bassanus</i>	Northern Gannet	2	SH3393	Cemlyn	80 records - 27/08/1994 - 23/06/2013
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH330932	Cemlyn	7 records - 02/05/2002 - 03/05/2008
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH3311193874	Cemlyn	02/06/2012
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH331932	Cemlyn NWWT Reserve	4 records - 11/05/2013 - 18/05/2013
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH333933	Cemlyn Bay	27/04/2006
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH333937	Cemlyn Bay	4 records - 17/03/2004 - 30/09/2004
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH335935	Cemlyn	4 records - 21/03/2007 - 09/04/2008
<i>Oenanthe oenanthe</i>	Northern Wheatear	2	SH3393	Cemlyn	104 records - 02/05/1994 - 07/05/2013
<i>Oenanthe oenanthe subsp. leucorhoa</i>	Greenland Wheatear	2	SH3393	Cemlyn; Tyn Llan Track	01/05/1994
<i>Periparus ater</i>	Coal Tit	2	SH331928	Cemlyn; Plas Cemlyn	2 records - 18/06/2011 - 20/06/2011
<i>Periparus ater</i>	Coal Tit	2	SH3393	Cemlyn Bay	8 records - 21/06/1995 - 03/11/2000
<i>Periparus ater</i>	Coal Tit	2	SH3793	Cemaes Bay	2 records - 04/10/2005 - 29/10/2008
<i>Phalacrocorax carbo</i>	Great Cormorant	2	SH3293	Cemlyn	Spring 1996 – Summer 1996
<i>Phalacrocorax carbo</i>	Great Cormorant	2	SH3302093234	Cemlyn	24/04/2013 – 08/08/2013
<i>Phalacrocorax carbo</i>	Great Cormorant	2	SH330932	Cemlyn	3 records - 05/08/2002 - 08/06/2008
<i>Phalacrocorax carbo</i>	Great Cormorant	2	SH331932	Cemlyn NWWT Reserve	6 records - 03/01/2008 - 18/05/2013
<i>Phalacrocorax carbo</i>	Great Cormorant	2	SH3393	Cemlyn	131 records - 26/08/1994 - 03/06/2012
<i>Phoenicurus phoenicurus</i>	Common Redstart	2	SH3393	Cemlyn	3 records - 12/10/2005 - 11/05/2013
<i>Phylloscopus trochilus</i>	Willow Warbler	2	SH330932	Cemlyn	6 records - 2002 - 26/07/2008
<i>Phylloscopus trochilus</i>	Willow Warbler	2	SH331932	Cemlyn NWWT Reserve	2 records - all 18/05/2013
<i>Phylloscopus trochilus</i>	Willow Warbler	2	SH333933	Cemlyn Bay	27/04/2006
<i>Phylloscopus trochilus</i>	Willow Warbler	2	SH3393	Cemlyn	63 records - May 1994 - 28/04/2013
<i>Phylloscopus trochilus</i>	Willow Warbler	2	SH3693	Cemaes Bay	29/03/1999
<i>Pluvialis squatarola</i>	Grey Plover	2	SH329936	Cemlyn Bay	3 records - 21/01/2004 - 25/12/2004
<i>Pluvialis squatarola</i>	Grey Plover	2	SH330932	Cemlyn	5 records - 30/04/2002 - June 2003
<i>Pluvialis squatarola</i>	Grey Plover	2	SH330933	Cemlyn Bay	2 records - 15/01/2007 - 17/12/2007
<i>Pluvialis squatarola</i>	Grey Plover	2	SH331932	Cemlyn NWWT Reserve	4 records - 26/01/2008 - 18/05/2013
<i>Pluvialis squatarola</i>	Grey Plover	2	SH332928	Cemlyn	3 records - 05/10/2000 - 07/12/2000
<i>Pluvialis squatarola</i>	Grey Plover	2	SH333933	Cemlyn Bay	29/04/2006
<i>Pluvialis squatarola</i>	Grey Plover	2	SH333942	Cemlyn	25/12/2000
<i>Pluvialis squatarola</i>	Grey Plover	2	SH335935	Cemlyn	10 records - 25/12/2006 - 25/12/2008
<i>Pluvialis squatarola</i>	Grey Plover	2	SH3393	Cemlyn	106 records - 14/05/1994 - 18/05/2013
<i>Podiceps grisegena</i>	Red-necked Grebe	2	SH3393	Cemlyn Bay	4 records - 30/01/1999 - 28/03/1999
<i>Puffinus griseus</i>	Sooty Shearwater	2	SH3293	Cemlyn	2 records - 26/06/1996 - 13/07/1996

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<i>Puffinus griseus</i>	Sooty Shearwater	2	SH332940	SSSI: Cemlyn Bay; Headland	Dec-01
<i>Puffinus griseus</i>	Sooty Shearwater	2	SH333933	Cemlyn Bay	21/08/2006
<i>Puffinus griseus</i>	Sooty Shearwater	2	SH3393	Cemlyn	9 records - 07/07/1995 - 14/08/2008
<i>Puffinus griseus</i>	Sooty Shearwater	2	SH3594	Wylfa; Wylfa Head seawatches	2 records - 02/08/2006 - 02/09/2006
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH3293	Cemlyn	1 record - Spring 1996 – Summer 1996
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH330930	Cemlyn	29/04/2008
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH330932	Cemlyn	6 records - 2002 - 17/07/2008
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH331932	Cemlyn NWWT Reserve	3 records - 11/05/2013 - 18/05/2013
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH333933	Cemlyn Bay	6 records - 27/04/2006 -03/08/2006
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH335935	Cemlyn	30/07/2007
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH3393	Cemlyn	60 records - May 1994 - 21/05/2013
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH3594	Wylfa; Wylfa Head seawatches	4 records - 12/08/2006 - 02/09/2006
<i>Puffinus puffinus</i>	Manx Shearwater	2	SH3793	Cemaes Bay	23/06/1999
<i>Pyrrhula pyrrhula</i>	Common Bullfinch	2	SH3393	Cemlyn	40 records - 05/05/1998 - 11/07/2009
<i>Pyrrhula pyrrhula</i>	Common Bullfinch	2	SH3592	Tregele	25/11/2002
<i>Pyrrhula pyrrhula</i>	Common Bullfinch	2	SH3594	Wylfa	3 records - 23/03/2000 - 14/05/2002
<i>Pyrrhula pyrrhula</i>	Common Bullfinch	2	SH3693	Cemaes Bay	17/08/1999
<i>Pyrrhula pyrrhula</i>	Common Bullfinch	2	SH3793	Cemaes Bay	10 records - 12/01/2002 - 27/12/2008
<i>Regulus regulus</i>	Goldcrest	2	SH3393	Cemlyn	21 records - 28/04/1998 - 05/08/2010
<i>Riparia riparia</i>	Sand Martin	2	SH330932	Cemlyn	4 records - 04/05/2002 - 25/07/2008
<i>Riparia riparia</i>	Sand Martin	2	SH331932	Cemlyn NWWT Reserve	3 records - 11/05/2013 - 18/05/2013
<i>Riparia riparia</i>	Sand Martin	2	SH333933	Cemlyn Bay	4 records - 27/04/2006 - 03/08/2006
<i>Riparia riparia</i>	Sand Martin	2	SH335935	Cemlyn	3 records - 04/04/2007 - 09/04/2008
<i>Riparia riparia</i>	Sand Martin	2	SH3393	Cemlyn	71 records - 1994 - 28/06/2013
<i>Riparia riparia</i>	Sand Martin	2	SH3594	Wylfa	22/03/2000
<i>Riparia riparia</i>	Sand Martin	2	SH3793	Cemaes Bay	05/04/2002
<i>Scolopax rusticola</i>	Woodcock	2	SH329917		2005 approx
<i>Scolopax rusticola</i>	Woodcock	2	SH3393	Cemlyn	01/01/2008
<i>Scolopax rusticola</i>	Woodcock	2	SH3793	Cemaes Bay	29/01/1999
<i>Somateria mollissima</i>	Common Eider	2	SH329936	Cemlyn Bay	01/05/2004
<i>Somateria mollissima</i>	Common Eider	2	SH3393	Cemlyn	13 records - 14/06/1994 - 15/05/2013
<i>Stercorarius longicaudus</i>	Long-tailed Skua	2	SH330932	Cemlyn	2008
<i>Stercorarius longicaudus</i>	Long-tailed Skua	2	SH3594	Wylfa; Wylfa Head seawatches	12/08/2006
<i>Sterna hirundo</i>	Common Tern	2	SH3302093234	Cemlyn	02/06/2012
<i>Sterna hirundo</i>	Common Tern	2	SH3304493305	Cemlyn	02/06/2012
<i>Sterna hirundo</i>	Common Tern	2	SH33069330	SSSI: Cemlyn Bay; Islands	1996
<i>Sterna hirundo</i>	Common Tern	2	SH330932	Cemlyn	20 records - 2002 -2008
<i>Sterna hirundo</i>	Common Tern	2	SH33149324	Cemlyn Bay Nature Reserve	18/05/2011
<i>Sterna hirundo</i>	Common Tern	2	SH331934	Cemlyn Lagoon 1	2000
<i>Sterna hirundo</i>	Common Tern	2	SH335935	Cemlyn	30/04/2007
<i>Sterna hirundo</i>	Common Tern	2	SH3393	Cemlyn	65 records - 1994 - 24/04/2012
<i>Sterna paradisaea</i>	Arctic Tern	2	SH329936	Cemlyn Bay	01/05/2004
<i>Sterna paradisaea</i>	Arctic Tern	2	SH3302093234	Cemlyn	02/06/2012
<i>Sterna paradisaea</i>	Arctic Tern	2	SH3304493305	Cemlyn	02/06/2012

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Sterna paradisaea</i>	Arctic Tern	2	SH33069330	SSSI: Cemlyn Bay; Islands	1996
<i>Sterna paradisaea</i>	Arctic Tern	2	SH330930	Cemlyn	29/04/2008
<i>Sterna paradisaea</i>	Arctic Tern	2	SH330932	Cemlyn	11 records - 2002 - 2008
<i>Sterna paradisaea</i>	Arctic Tern	2	SH33149324	Cemlyn Bay Nature Reserve	18/05/2011
<i>Sterna paradisaea</i>	Arctic Tern	2	SH331934	Cemlyn Lagoon 1	2000
<i>Sterna paradisaea</i>	Arctic Tern	2	SH332934	Cemlyn Bay	25/04/2000
<i>Sterna paradisaea</i>	Arctic Tern	2	SH333933	Cemlyn Bay	2 records - 27/04/2006 - 29/04/2006
<i>Sterna paradisaea</i>	Arctic Tern	2	SH3349293702	Cemlyn	02/06/2012
<i>Sterna paradisaea</i>	Arctic Tern	2	SH335935	Cemlyn Bay	30/04/2007
<i>Sterna paradisaea</i>	Arctic Tern	2	SH3393	Cemlyn	61 records - 1994 - 14/05/2011
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH328934	Cemlyn Bay	10/04/2003
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH3302093234	Cemlyn	02/06/2012
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH3304493305	Cemlyn	3 records - 02/06/2012 - June 2013
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH33069330	SSSI: Cemlyn Bay; Islands	1996
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH330932	Cemlyn	13 records - 2002 - 2008
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH331932	Cemlyn NWWT Reserve	5 records - 24/04/2008 - 18/05/2013
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH331934	Cemlyn Lagoon 1	2000
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH333933	Cemlyn; Bay	2 records - 27/04/2006 - 01/06/2011
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH335935	Cemlyn	2 records - 04/04/2007 - 09/04/2008
<i>Sterna sandvicensis</i>	Sandwich Tern	2	SH3393	Cemlyn	123 records - 1994 - 23/04/2012
<i>Sturnus vulgaris</i>	Common Starling	2	SH330932	Cemlyn	4 records - 29/06/2002 - 28/06/2008
<i>Sturnus vulgaris</i>	Common Starling	2	SH3393	Cemlyn	192 records - May 1994 - 08/07/2013
<i>Sturnus vulgaris</i>	Common Starling	2	SH3593	Wylfa; Power Station Nature trail	5 records - 14/02/1999 - 03/03/1999
<i>Sturnus vulgaris</i>	Common Starling	2	SH3691	Llanfechell	05/11/2004
<i>Sylvia borin</i>	Garden Warbler	2	SH3393	Cemlyn; Along coastal path	3 records - 06/05/2006 - 05/08/2011
<i>Sylvia borin</i>	Garden Warbler	2	SH343932	Cemlyn Bay	15/05/2003
<i>Sylvia borin</i>	Garden Warbler	2	SH3594	Wylfa	11/10/2002
<i>Sylvia communis</i>	Common Whitethroat	2	SH3282692991	Cemlyn	02/06/2012
<i>Sylvia communis</i>	Common Whitethroat	2	SH3302093234	Cemlyn	02/06/2012
<i>Sylvia communis</i>	Common Whitethroat	2	SH330932	Cemlyn	6 records - 2002 - 12/07/2008
<i>Sylvia communis</i>	Common Whitethroat	2	SH331928	Cemlyn; Plas Cemlyn	16/06/2011
<i>Sylvia communis</i>	Common Whitethroat	2	SH331932	Cemlyn NWWT Reserve	5 records - 24/04/2008 - 18/05/2013
<i>Sylvia communis</i>	Common Whitethroat	2	SH333933	Cemlyn Bay	2 records - 27/04/2006 - 23/05/2006
<i>Sylvia communis</i>	Common Whitethroat	2	SH3393	Cemlyn	92 records - May 1994 - 03/06/2012
<i>Tadorna tadorna</i>	Common Shelduck	2	SH3293	Cemlyn	3 records - Spring 1996 - Summer 1996
<i>Tadorna tadorna</i>	Common Shelduck	2	SH3294393545	Cemlyn – Car Park (North)	02/06/2012
<i>Tadorna tadorna</i>	Common Shelduck	2	SH3302093234	Cemlyn	3 records - 02/06/2012 - 03/06/2012
<i>Tadorna tadorna</i>	Common Shelduck	2	SH330932	Cemlyn	10 records - 10/05/2002 - 2008
<i>Tadorna tadorna</i>	Common Shelduck	2	SH331932	Cemlyn NWWT Reserve	5 records - 26/01/2008 - 18/05/2013
<i>Tadorna tadorna</i>	Common Shelduck	2	SH333933	Cemlyn Bay	08/06/2006
<i>Tadorna tadorna</i>	Common Shelduck	2	SH33579312	Cemlyn Bay	2 records - 2003-15/112003
<i>Tadorna tadorna</i>	Common Shelduck	2	SH3393	Cemlyn	253 records - 08/05/1994 - 30/04/2013
<i>Tringa erythropus</i>	Spotted Redshank	2	SH335935	Cemlyn	01/10/2007
<i>Tringa erythropus</i>	Spotted Redshank	2	SH3393	Cemlyn	4 records - 01/09/1994 - 02/10/2002

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<i>Tringa totanus</i>	Common Redshank	2	SH3302093234	Cemlyn	2 records - 02/06/2012 - 03/06/2012
<i>Tringa totanus</i>	Common Redshank	2	SH330932	Cemlyn	13 records - 06/05/2002 - 19/07/2008
<i>Tringa totanus</i>	Common Redshank	2	SH3317493825	Cemlyn	02/06/2012
<i>Tringa totanus</i>	Common Redshank	2	SH331932	Cemlyn NWWT Reserve	5 records - 26/01/2008 - 18/05/2013
<i>Tringa totanus</i>	Common Redshank	2	SH3393	Cemlyn	189 records - May 1994 - 23/07/2013
<i>Turdus philomelos</i>	Song Thrush	2	SH330932	Cemlyn	4 records - 2002 - 2008
<i>Turdus philomelos</i>	Song Thrush	2	SH3393	Cemlyn	214 records - 13/08/1994 - June 2011
<i>Turdus philomelos</i>	Song Thrush	2	SH3593	Wylfa; Power Station nature Trail	5 records - 14/02/1999 - 03/03/1999
<i>Uria aalge</i>	Common Guillemot	2	SH330932	Cemlyn	6 records - 08/05/2002 - 28/05/2008
<i>Uria aalge</i>	Common Guillemot	2	SH331932	Cemlyn	3 records - 03/01/2008 - 12/11/2008
<i>Uria aalge</i>	Common Guillemot	2	SH3393	Cemlyn	23 records - 28/06/1994 - 08/08/2010
<i>Uria aalge</i>	Common Guillemot	2	SH3394	Cemlyn; Off shore	2011
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3293	Cemlyn	4 records 02/06/1996 - 24/07/1996
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3293993356	Cemlyn	02/06/2012
<i>Accipiter nisus</i>	Sparrowhawk	3	SH330932	Cemlyn	9 records 05/05/2002 - 18/05/2013
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3346893038	Cemlyn	02/06/2012
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3393	Cemlyn	59 records 19/05/1994 - July 2011
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3592	Tregele	06/12/2008
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3594	Wylfa	15/03/2006
<i>Accipiter nisus</i>	Sparrowhawk	3	SH3793	Cemaes Bay	14 records 09/04/2000 - 24/09/2008
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH3293	Cemlyn/Henborth	27/07/2004
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH330932	Cemlyn	7 records 2002 - 22/07/2008
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH333933	Cemlyn Bay	29/04/2006
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH335935	Cemlyn	14/05/2007
<i>Acrocephalus schoenobaenus</i>	Sedge Warbler	3	SH3393	Cemlyn	70 records 1999 - Spring 2011
<i>Acrocephalus scirpaceus</i>	Reed Warbler	3	SH330932	Cemlyn	01/06/2008
<i>Acrocephalus scirpaceus</i>	Wylfa	3	SH3393	Cemlyn	6 records 10/05/1997 - 39/07/2010
<i>Alca torda</i>	Razorbill	3	SH330932	Cemlyn	5 records 26/05/2002 - 26/01/2008
<i>Alca torda</i>	Razorbill	3	SH3393	Cemlyn	19 records 04/06/1994 - 03/06/2012
<i>Alca torda</i>	Razorbill	3	SH3394	Cemlyn; Off shore	2011
<i>Anthus petrosus</i>	Rock Pipit	3	SH330932	Cemlyn	7 records 04/05/2002 - July 2008
<i>Anthus petrosus</i>	Rock Pipit	3	SH331193874	Cemlyn	12/05/2013
<i>Anthus petrosus</i>	Rock Pipit	3	SH331932	Cemlyn NWWT Reserve	3 records 2005 - 2008
<i>Anthus petrosus</i>	Rock Pipit	3	SH335935	Cemlyn	6 records 2008
<i>Anthus petrosus</i>	Rock Pipit	3	SH3393	Cemlyn	24 records - 13/06/1994 - 29/04/2013
<i>Athene noctua</i>	Little Owl	3	SH332928	Cemlyn Bay	23/06/2000
<i>Athene noctua</i>	Little Owl	3	SH333933	Cemlyn Bay	29/04/2006
<i>Athene noctua</i>	Little Owl	3	SH335935	Cemlyn	4 records - 14/05/2007 - 13/09/2007
<i>Athene noctua</i>	Little Owl	3	SH3393	Cemlyn	35 records - 1994 - 08/08/2010
<i>Athene noctua</i>	Little Owl	3	SH343932	Cafnan, Cemlyn	15/05/2003
<i>Athene noctua</i>	Little Owl	3	SH344931	Cemlyn Bay	01/05/2004
<i>Athene noctua</i>	Little Owl	3	SH3691	Llanfechell	18/07/2005
<i>Athene noctua</i>	Little Owl	3	SH3793	Cemaes Bay	23/03/1999

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<i>Buteo buteo</i>	Buzzard	3	SH330932	Cemlyn	6 records - 18/07/2002 - 2003
<i>Buteo buteo</i>	Buzzard	3	SH331932	Cemlyn NWWT Reserve	4 records - 26/01/2008 - 18/05/2013
<i>Buteo buteo</i>	Buzzard	3	SH335935	Cemlyn	09/04/2008
<i>Buteo buteo</i>	Buzzard	3	SH3393	Cemlyn	134 records - 12/05/1994 - 08/08/2013
<i>Buteo buteo</i>	Buzzard	3	SH3592	Tregele	3 records - 10/06/2008 - 20/06/2008
<i>Buteo buteo</i>	Buzzard	3	SH3594	Wylfa	17/02/2008
<i>Buteo buteo</i>	Buzzard	3	SH3793	Cemaes Bay	8 records - 03/03/1999 - 25/09/2008
<i>Calidris ferruginea</i>	Curlew Sandpiper	3	SH330932	Cemlyn	3 records - 20/05/2002 - 25/07/2002
<i>Calidris ferruginea</i>	Curlew Sandpiper	3	SH335935	Cemlyn	13/09/2007
<i>Calidris ferruginea</i>	Curlew Sandpiper	3	SH3393	Cemlyn	18 records - 31/05/1997 - 27/05/2012
<i>Calidris minuta</i>	Little Stint	3	SH330931	Cemlyn; Lagoon area	2 records - 26/05/2011 - 03/06/2011
<i>Calidris minuta</i>	Little Stint	3	SH3393	Cemlyn	11 records - 12/05/1994 - 02/08/2010
<i>Carduelis carduelis</i>	Goldfinch	3	SH3308892907	Cemlyn	02/06/2012
<i>Carduelis carduelis</i>	Goldfinch	3	SH330932	Cemlyn	3 records - 03/05/2002 - 20/07/2008
<i>Carduelis carduelis</i>	Goldfinch	3	SH331932	Cemlyn NWWT Reserve	4 records - 03/01/2008 - 18/05/2013
<i>Carduelis carduelis</i>	Goldfinch	3	SH3393	Cemlyn	36 records - 04/05/1994 - 31/07/2013
<i>Carduelis carduelis</i>	Goldfinch	3	SH3793	Cemaes Bay	25/04/2008
<i>Carduelis chloris</i>	Greenfinch	3	SH330932	Cemlyn	6 records - June 2002 - 20/07/2008
<i>Carduelis chloris</i>	Greenfinch	3	SH3393	Cemlyn	127 records - May 1994 - 08/08/2010
<i>Carduelis chloris</i>	Greenfinch	3	SH3593	Wylfa; Power Station Nature Trail	4 records - 16/02/1999 - 03/03/1999
<i>Carduelis flammaea</i>	Mealy Redpoll	3	SH3393	Cemlyn	9 records - 03/05/1994 - 18/06/1999
<i>Carduelis spinus</i>	Siskin	3	SH3393	Cemlyn	20 records - 17/05/1994 - 16/05/2013
<i>Carduelis spinus</i>	Siskin	3	SH3693	Cemaes Bay	27/03/1999
<i>Carduelis spinus</i>	Siskin	3	SH3793	Cemaes Bay	9 records - 13/01/2000 - 28/04/2008
<i>Certhia familiaris</i>	Treecreeper	3	SH3793	Cemaes Bay	2 records - 12/01/2000 - 13/01/2000
<i>Columba oenas</i>	Stock Pigeon	3	SH331932	Cemlyn	2 records - all 26/01/2008
<i>Columba oenas</i>	Stock Pigeon	3	SH3393	Cemlyn	4 records - 30/05/1998 - 13/07/2011
<i>Corvus corax</i>	Common Raven	3	SH328927	Cemlyn; Bwthyn Penreos	2011
<i>Corvus corax</i>	Common Raven	3	SH330932	Cemlyn	5 records - 23/06/2002 - 2008
<i>Corvus corax</i>	Common Raven	3	SH331932	Cemlyn NWWT Reserve	3 records - 26/01/2008 - 18/05/2013
<i>Corvus corax</i>	Common Raven	3	SH333933	Cemlyn Bay	6 records - 27/04/2006 - 25/12/2006
<i>Corvus corax</i>	Common Raven	3	SH335935	Cemlyn	7 records - 30/01/2007 - 25/12/2007
<i>Corvus corax</i>	Common Raven	3	SH3393	Cemlyn	123 records - 23/06/1994 - 24/04/2012
<i>Corvus corax</i>	Common Raven	3	SH3593	Wylfa; Power Station Nature trail	3 records - 21/02/1999 - 03/03/1999
<i>Corvus corax</i>	Common Raven	3	SH3793	Cemaes Bay	20 records - 11/02/2002 - 09/09/2002
<i>Corvus corax</i>	Common Raven	3	SH3794	Llanbadrig	7 records - 15/02/1999 - 18/04/1999
<i>Cyanistes caeruleus</i>	Blue Tit	3	SH330932	Cemlyn	5 records - 2002 - 2008
<i>Cyanistes caeruleus</i>	Blue Tit	3	SH331932	Cemlyn NWWT Reserve	2 records - 26/01/2008 - 18/05/2013
<i>Cyanistes caeruleus</i>	Blue Tit	3	SH3393	Cemlyn	240 records - 20/06/1994 - 08/08/2013
<i>Cyanistes caeruleus</i>	Blue Tit	3	SH3593	Wylfa; Power station nature trail	6 records - 14/02/1999 - 03-03-1999
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH327928	Cemlyn; Bwthyn Penreos	4 records - 21/06/2011 - 07/07/2011
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH330932	Cemlyn	2 records - 12/07/2003 - 15/07/2008
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH335935	Cemlyn	01/10/2007
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH3393	Cemlyn	9 records - 06/06/1998 - 01/05/2012

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH3493	Cemlyn Bay; Cafnan	18/01/2000
<i>Dendrocopos major</i>	Great Spotted Woodpecker	3	SH3793	Cemaes Bay	2 records - 27/02/2002 - 27/09/2005
<i>Egretta garzetta</i>	Little Egret	3	SH3302093234	Cemlyn	4 records - 19/07/2013 - 02/08/2013
<i>Egretta garzetta</i>	Little Egret	3	SH3304493305	Cemlyn; In lagoon	23/04/2013 – 26/05/2013
<i>Egretta garzetta</i>	Little Egret	3	SH330932	Cemlyn	29/04/2008 – 10/05/2008
<i>Egretta garzetta</i>	Little Egret	3	SH330933	Cemlyn Bay	15/01/2007
<i>Egretta garzetta</i>	Little Egret	3	SH331932	Cemlyn NWWT Reserve	6 records - 26/01/2008 - 18/05/2013
<i>Egretta garzetta</i>	Little Egret	3	SH333933	Cemlyn Bay	17/07/2006
<i>Egretta garzetta</i>	Little Egret	3	SH335935	Cemlyn	4 records - 25/12/2006 - 25/12/2008
<i>Egretta garzetta</i>	Little Egret	3	SH3393	Cemlyn	72 records - 02/05/1994 - 17/05/2012
<i>Egretta garzetta</i>	Little Egret	3	SH3793	Cemaes Bay	17/12/2008
<i>Mergus merganser</i>	Goosander	3	SH3393	Cemlyn	3 records - 21/07/2005 - 09/06/2011
<i>Motacilla alba</i>	Pied Wagtail	3	SH3308792863	Cemlyn; Outside Warden's house	02/06/2012
<i>Motacilla alba</i>	Pied Wagtail	3	SH331932	Cemlyn NWWT Reserve	2 records - all 18/05/2013
<i>Motacilla alba</i>	Pied Wagtail	3	SH3393	Cemlyn	4 records - May 1998 - 03/06/2012
<i>Motacilla alba subsp. alba</i>	White Wagtail	3	SH3293	Cemlyn/Henborth	26/04/2008
<i>Motacilla alba subsp. alba</i>	White Wagtail	3	SH330932	Cemlyn	03/05/2008
<i>Motacilla alba subsp. alba</i>	White Wagtail	3	SH335935	Cemlyn	09/04/2008
<i>Motacilla alba subsp. alba</i>	White Wagtail	3	SH3393	Cemlyn	51 records - May 1994 - 03/06/2012
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH328934	Cemlyn; Bryn Aber	Spring 2011
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH3294393545	Cemlyn – Car Park (North)	02/06/2012
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH330932	Cemlyn	8 records - 2002 - July 2008
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH331928	Cemlyn; Plas Cemlyn	Spring 2011
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH331932	Cemlyn NWWT Reserve	3 records - 26/01/2008 - 18/05/2013
<i>Motacilla alba subsp. yarrellii</i>	Pied Wagtail	3	SH3393	Cemlyn	63 records - May 1994 - 03/06/2012
<i>Motacilla cinerea</i>	Grey Wagtail	3	SH330932	Cemlyn	20/07/2008
<i>Motacilla cinerea</i>	Grey Wagtail	3	SH3393	Cemlyn	43 records - 26/06/1995 - 28/06/2013
<i>Motacilla cinerea</i>	Grey Wagtail	3	SH3793	Cemaes Bay	48 records - 10/04/1999 - 27/12/2008
<i>Motacilla flava</i>	Yellow Wagtail	3	SH3393	Cemlyn	26 records - 30/04/1998 - 15/05/2013
<i>Motacilla flava subsp. flava</i>	Blue-Headed Wagtail	3	SH3393	Cemlyn	11 records - 14/05/1994 - 06/05/2011
<i>Parus major</i>	Great Tit	3	SH328934	Cemlyn; Bryn Aber	Jun-11
<i>Parus major</i>	Great Tit	3	SH330932	Cemlyn	5 records - 2002 - 2008
<i>Parus major</i>	Great Tit	3	SH331932	Cemlyn NWWT Reserve	2 records - 26/01/2008 - 18/05/2013
<i>Parus major</i>	Great Tit	3	SH335929	Cemlyn; Tyddyn Sidney	Jun-11
<i>Parus major</i>	Great Tit	3	SH3393	Cemlyn	136 records - May 1994 - 08/08/2013
<i>Parus major</i>	Great Tit	3	SH3593	Wylfa; Power station nature trail	6 records - 14/02/1999 - 03-03-1999
<i>Phalacrocorax aristotelis</i>	Shag	3	SH3293	Cemlyn	2 records - 06/05/1996 - 27/06/1996
<i>Phalacrocorax aristotelis</i>	Shag	3	SH330932	Cemlyn	4 records - 05/08/2002 - 20/06/2008
<i>Phalacrocorax aristotelis</i>	Shag	3	SH331932	Cemlyn NWWT Reserve	5 records - 03/01/2008 - 18/05/2013
<i>Phalacrocorax aristotelis</i>	Shag	3	SH3393	Cemlyn	29 records - 30/06/1994 - 03/06/2012
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH330932	Cemlyn	21/05/2002
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH331932	Cemlyn NWWT Reserve	18/05/2013
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH335935	Cemlyn	2 records - 14/05/2007 - 09/04/2008
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH3393	Cemlyn	43 records - 02/05/1994 - 01/06/2013

Scientific Name	Common Name	Importance Category	Grid Reference	Location	Records Summary
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH3594	Wylfa	2 records - 30/03/2002 - 14/05/2002
<i>Phylloscopus collybita</i>	Common Chiffchaff	3	SH3793	Cemaes Bay	3 records - 31/03/2002 - 26/03/2005
<i>Podiceps cristatus</i>	Great Crested Grebe	3	SH330932	Cemlyn	17/05/2008
<i>Podiceps cristatus</i>	Great Crested Grebe	3	SH3349293702	Cemlyn	3 records - 24/04/2013 - 21/05/2013
<i>Podiceps cristatus</i>	Great Crested Grebe	3	SH3393	Cemlyn	24 records - 26/08/1994 - 07/05/2013
<i>Prunella modularis</i>	Dunnock	3	SH330932	Cemlyn	5 records - 2002 - 2008
<i>Prunella modularis</i>	Dunnock	3	SH331932	Cemlyn NWWT Reserve	4 records - 26/01/2008 - 18/05/2013
<i>Prunella modularis</i>	Dunnock	3	SH3393	Cemlyn	205 records - 1994 - 03/06/2012
<i>Prunella modularis</i>	Dunnock	3	SH3594	Wylfa; Power Station nature Trail	5 records - 14/02/1999 - 03/03/1999
<i>Rallus aquaticus</i>	Water Rail	3	SH335935	Cemlyn	4 records - 25/12/2006 - 23/11/2007
<i>Rallus aquaticus</i>	Water Rail	3	SH3393	Cemlyn Bay	12 records - 18/09/1995 - 22/12/2000
<i>Rallus aquaticus</i>	Water Rail	3	SH3493	Cafnan, Cemlyn	10 records - 06/01/2000 - 17/12/2000
<i>Rissa tridactyla</i>	Kittiwake	3	SH3304493305	Cemlyn	3 records - 29/04/2013 - 10/05/2013
<i>Rissa tridactyla</i>	Kittiwake	3	SH330931	Cemlyn; Lagoon	2011
<i>Rissa tridactyla</i>	Kittiwake	3	SH330932	Cemlyn	5 records - 26/05/2002 - 29/06/2008
<i>Rissa tridactyla</i>	Kittiwake	3	SH331932	Cemlyn NWWT Reserve	4 records - 03/01/2008 - 18/05/2013
<i>Rissa tridactyla</i>	Kittiwake	3	SH3393	Cemlyn	48 records - May 1994 - 03/06/2012
<i>Rissa tridactyla</i>	Kittiwake	3	SH3594	Wylfa; Wylfa Head seawatches	4 records - 12/08/2006 - 02/09/2006
<i>Saxicola rubetra</i>	Whinchat	3	SH330932	Cemlyn	02/05/2002
<i>Saxicola rubetra</i>	Whinchat	3	SH333933	Cemlyn Bay	27/07/2006
<i>Saxicola rubetra</i>	Whinchat	3	SH335935	Cemlyn	30/07/2007
<i>Saxicola rubetra</i>	Whinchat	3	SH3393	Cemlyn	51 records - 02/05/1994 - 17/05/2013
<i>Saxicola torquata</i>	Stonechat	3	SH330932	Cemlyn	8 records - 2002 - June 2008
<i>Saxicola torquata</i>	Stonechat	3	SH331932	Cemlyn NWWT Reserve	6 records - 03/01/2008 - 18/05/2013
<i>Saxicola torquata</i>	Stonechat	3	SH3393	Cemlyn	138 records - 1994 - 2011
<i>Stercorarius skua</i>	Great Skua	3	SH330932	Cemlyn	29/05/2002
<i>Stercorarius skua</i>	Great Skua	3	SH3393	Cemlyn	15 records - 08/07/1994 - 18/07/2011
<i>Stercorarius skua</i>	Great Skua	3	SH3594	Wylfa; Wylfa Head seawatches	3 records - 28/08/2006 - 02/09/2006
<i>Strix aluco</i>	Tawny Owl	3	SH330932	Cemlyn	May-08
<i>Strix aluco</i>	Tawny Owl	3	SH3393	Cemlyn	4 records - 01/06/1996 - 31/07/2007
<i>Sylvia atricapilla</i>	Blackcap	3	SH330932	Cemlyn	2 records - 28/04/2008 - 03/05/2008
<i>Sylvia atricapilla</i>	Blackcap	3	SH3393	Cemlyn	14 records - 18/05/1998 - 08/07/2013
<i>Sylvia atricapilla</i>	Blackcap	3	SH3592	Tregele; The Firs	02/05/1999
<i>Sylvia atricapilla</i>	Blackcap	3	SH3793	Cemaes Bay	19 records - 19/01/2000 - 31/03/2008
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH330932	Cemlyn	3 records - 09/05/2002 - 04/05/2008
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH333933	Cemlyn Bay	17/07/2006
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH335929	Cemlyn; Tyddyn Sidney	11/07/2011
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH335935	Cemlyn	14/05/2007
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH3393	Cemlyn	15 records - 20/05/1996 - 03/08/2013
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH344931	Cemlyn Bay	07/05/2004
<i>Sylvia curruca</i>	Lesser Whitethroat	3	SH3594	Wylfa	14/05/2002

## Appendix B. Combined Results – Summary

Table B.1 : Over-wintering Birds Results Summary

Species	Protection/Conservation Status						Survey Year			
	Annex I	Schedule 1 (WCA, 1981)	Section 42 (NERC Act, 2006)	LBAP	Red List	Amber List	2009/2010 & 2010/2011	2012-2013	2013-2014	2014-2015
Bar-tailed godwit	X	-	X	-	-	X	-	-	X	-
Black-tailed godwit	-	X	-	-	X	-	X	-	-	-
Black redstart	-	X	-	-	X	-	X	-	-	-
Blackbird	-	-	-	-	-	-	X	X	X	X
Black-headed gull	-	-	X	-	-	X	X	X	X	X
Blue tit	-	-	-	-	-	-	X	X	X	X
Bullfinch	-	-	X	-	-	X	X	X	X	X
Buzzard	-	-	-	-	-	-	X	X	X	X
Canada goose	-	-	-	-	-	-	X	X	X	X
Carrion crow	-	-	-	-	-	-	X	X	X	X
Chaffinch	-	-	-	-	-	-	X	X	X	X
Chiffchaff	-	-	-	-	-	-	X	-	X	X
Chough	X	X	X	X	-	-	X	X	X	X
Coal tit	-	-	-	-	-	-	X	-	X	X
Collared dove	-	-	-	-	-	-	X	X	X	X
Common gull	-	-	-	-	-	X	X	X	X	-
Common sandpiper	-	-	-	-	-	X	X	-	-	-
Common snipe	-	-	-	-	-	X	X	X	X	X
Coot	-	-	-	-	-	-	-	X	-	X
Cormorant	-	-	-	-	-	-	X	X	-	-
Curlew	-	-	X	-	X	-	X	X	X	X
Dunnock	-	-	X	-	-	X	X	X	X	X

Species	Protection/Conservation Status						Survey Year			
	Annex I	Schedule 1 (WCA, 1981)	Section 42 (NERC Act, 2006)	LBAP	Red List	Amber List	2009/2010 & 2010/2011	2012-2013	2013-2014	2014-2015
Feral pigeon	-	-	-	-	-	-	X	X	X	X
Fieldfare	-	X	-	-	X	-	X	X	X	X
Gadwall	-	-	-	-	-	X	-	X	-	-
Goldcrest	-	-	-	-	-	-	X	X	X	X
Golden plover	X	-	X	-	-	-	X	X	-	-
Goldfinch	-	-	-	-	-	-	X	X	X	X
Goshawk	X	X	-	-	-	-	-	X	-	-
Great black-backed gull	-	-	-	-	-	X	X	X	X	X
Great crested grebe	-	-	-	-	-	-	-	X	-	-
Great spotted woodpecker	-	-	-	-	-	-	X	X	X	X
Great tit	-	-	-	-	-	-	X	X	X	X
Greater scaup	-	X	-	-	X	-	-	X	-	-
Green woodpecker	-	-	-	-	-	X	-	X	-	-
Greenfinch	-	-	-	-	-	-	X	X	X	X
Greenshank	-	X	-	-	-	X	-	X	-	-
Grey heron	-	-	-	-	-	-	X	X	X	X
Grey plover	-	-	-	-	-	X	X	-	-	-
Grey wagtail	-	-	-	-	X	-	X	X	X	X
Greylag goose	-	-	-	-	-	X	X	X	X	X
Guillemot	-	-	-	-	-	X	-	X	-	-
Hen harrier	X	X	X	-	X	-	-	-	X	-
Herring gull	-	-	X	-	X	-	X	X	X	X
House sparrow	-	-	X	-	X	-	X	X	X	X
Jackdaw	-	-	-	-	-	-	X	X	X	X

Species	Protection/Conservation Status						Survey Year			
	Annex I	Schedule 1 (WCA, 1981)	Section 42 (NERC Act, 2006)	LBAP	Red List	Amber List	2009/2010 & 2010/2011	2012-2013	2013-2014	2014-2015
Kestrel	-	-	X	-	-	X	X	X	X	X
Lapwing	-	-	X	-	X	-	X	X	X	X
Lesser black-backed gull	-	-	-	-	-	X	X	X	X	X
Lesser redpoll	-	-	X	-	X	-	-	-	X	-
Linnet	-	-	X	-	X	-	X	X	X	X
Little egret	X	-	-	-	-	-	X	X	X	X
Long-tailed tit	-	-	-	-	-	-	X	X	X	X
Magpie	-	-	-	-	-	-	X	X	X	X
Mallard	-	-	-	-	-	X	X	X	X	X
Meadow pipit	-	-	-	-	-	X	X	X	X	X
Merlin	X	X	-	-	X	-	-	X	X	X
Mistle thrush	-	-	-	-	X	-	X	X	X	X
Moorhen	-	-	-	-	-	-	-	-	X	-
Mute swan	-	-	-	-	-	-	X	X	-	-
Oystercatcher	-	-	-	-	-	X	X	X	X	X
Peregrine	X	X	-	-	-	-	X	X	X	X
Pheasant	-	-	-	-	-	-	X	X	X	X
Pied wagtail	-	-	-	-	-	-	X	X	X	X
Pintail	-	X	-	-	-	X	-	X	-	-
Raven	-	-	-	-	-	-	X	X	X	X
Red-breasted merganser	-	-	-	-	-	-	-	X	-	-
Red-legged partridge	-	-	-	-	-	-	-	X	X	-
Redshank	-	-	-	-	-	X	X	X	-	X
Redwing	-	X	-	-	X	-	X	X	X	X

Species	Protection/Conservation Status						Survey Year			
	Annex I	Schedule 1 (WCA, 1981)	Section 42 (NERC Act, 2006)	LBAP	Red List	Amber List	2009/2010 & 2010/2011	2012-2013	2013-2014	2014-2015
Red kite	X	X	-	-	-	-	-	X	-	-
Reed bunting	-	-	X	-	-	X	X	X	X	X
Ringed plover	-	-	X	-	X	-	X	-	-	-
Robin	-	-	-	-	-	-	X	X	X	X
Rock pipit	-	-	-	-	-	-	X	X	X	X
Rook	-	-	-	-	-	-	X	X	X	X
Shag	X	-	-	-	X	-	-	X	-	-
Shelduck	-	-	-	-	-	X	X	X	X	-
Siskin	-	-	-	-	-	-	X	-	X	-
Skylark	-	-	X	X	X	-	-	-	X	X
Song thrush	-	-	X	X	X	-	X	X	X	X
Sparrowhawk	-	-	-	-	-	-	X	X	X	X
Starling	-	-	X	-	X	-	X	X	X	X
Stock dove	-	-	-	-	-	X	-	X	X	-
Stonechat	-	-	-	-	-	-	X	X	-	X
Tawny owl	-	-	-	-	-	X	-	X	-	X
Teal	-	-	-	-	-	X	X	X	X	X
Treecreeper	-	-	-	-	-	-	-	X	X	X
Tufted duck	-	-	-	-	-	-	-	X	-	-
Turnstone	-	-	-	-	-	X	X	X	-	X
Twite	-	-	X	-	X	-	-	X	-	-
Water rail	-	-	-	-	-	-	X	-	-	-
Wheatear	-	-	-	-	-	-	X	X	-	-
Whimbrel	-	X	-	-	X	-	-	X	-	-

Species	Protection/Conservation Status						Survey Year			
	Annex I	Schedule 1 (WCA, 1981)	Section 42 (NERC Act, 2006)	LBAP	Red List	Amber List	2009/2010 & 2010/2011	2012-2013	2013-2014	2014-2015
Whinchat	-	-	-	-	X	-	-	X	-	-
Wigeon	-	-	-	-	-	X	X	X	X	-
Wood pigeon	-	-	-	-	-	-	X	X	X	X
Woodcock	-	-	-	-	X	-	X	X	X	-
Wren	-	-	-	-	-	-	X	X	X	X
<b>Totals</b>	<b>10</b>	<b>14</b>	<b>20</b>	<b>3</b>	<b>23</b>	<b>29</b>	<b>73</b>	<b>85</b>	<b>69</b>	<b>63</b>



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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-13  
Consultancy Report: Bat Technical  
Summary Report**

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## Wylfa Newydd Project

Horizon Nuclear Power Wylfa Ltd

### Technical Summary Report - Bats

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## Executive Summary

This technical summary report provides a single resource regarding all survey and background data available for bats in the study area that comprises the Wylfa Newydd Development Area and the surrounding 500m. Surveys of the study area for bats have taken place in consecutive years between 2009 and 2015 and have included:

- habitat assessment surveys;
- building inspection surveys;
- tree inspection surveys;
- building dusk emergence surveys;
- static activity surveys; and
- transect activity surveys.

This report collates the information from the surveys listed above and a background data search to provide an assessment of the value and sensitivity of the overall bat population in the study area. This also identifies the most important habitats for bats, including the most significant roosting structures.

The habitat assessment and activity surveys showed that the composition of bats using the study area for foraging and commuting are what would be expected for a similarly sized area anywhere in north Wales. The composition was dominated by the most common and widespread species (common and soprano pipistrelle (*Pipistrellus pipistrellus* and *P. pygmaeus* respectively) species, brown long-eared (*Plecotus auritus*) and commoner *Myotis* species), with rare occurrences of noctule (*Nyctalus noctula*) and Nathusius' pipistrelle (*Pipistrellus nathusii*). These species tended to be recorded more frequently in areas of greater habitat heterogeneity, including wooded areas and field boundaries, although it is recognised that this is partly an artefact of the transect routes used. However, bats did tend to be less frequently using marshy grassland areas, and showed an affinity to coastal interface environments.

The study area supports very small numbers of trees with features that have the potential to support roosting bats, with no tree roosts identified following surveys. The geographical location of the study area also makes it very unlikely that the study area supports any of the rarer bat species of higher conservation value and sensitivity that primarily roost in trees e.g. barbastelle (*Barbastella barbastellus*). The survey effort to date has not extended to include emergence surveys of all trees with features that have the potential to support roosting bats. This is because the number of activity surveys carried out is so extensive that the generalised use of the site can be determined for impact assessment purposes. However, surveys to determine the presence of any tree roosts would still be undertaken prior to felling of suitable trees (if required), thereby protecting bats and complying with the relevant wildlife legislation.

The emergence and internal inspection surveys have shown that bats use 36 of the 100 extant buildings for roosting in the study area. These roosts predominantly comprise low numbers of bats, with only two buildings ever having supported more than seven bats. The predominant species recorded are the same as those mentioned for the activity surveys, although whiskered (*Myotis mystacinus*)/Brandt's (*Myotis brandti*) bat roosts were confirmed. A single Nathusius pipistrelle bat was also found during demolitions of unsafe buildings in 2013. There were also no 'rarer' species or noctule bat records, indicating a population of lower value and sensitivity, unlikely to be of significance outside of the boundary of the study area. Not all building roosts were occupied by bats each year and therefore the total number of occupied roosts varied greatly between years.

The two most significant roosts in the study area are the maternity colony of pipistrelle species in the Tyn y Maes bat barn, and the Natterer's bat (*Myotis nattereri*) colony in the Lodge. The Tyn y Maes bat barn and associated habitat enhancement works were completed as compensation following the demolition of Tyn y Maes house in 2013. This building was occupied in 2015 by over 50 bats from four species and is an example

of successful mitigation. The blueprint for this mitigation strategy would therefore be useful for the displacement of the Lodge roost that will be required as part of enabling works.

The Lodge roost is considered to be the most ecologically valuable and sensitive bat feature in the study area and is of local importance for bats. Secondary in importance to the Lodge roost is the Tyn y Maes population of commoner species i.e. brown long-eared, common pipistrelle, and soprano pipistrelle. All things considered, the bat population as a whole within the study area is of local value and significance.

The next steps for the Project consenting process is to develop the impact assessment for ecological receptors (including bats) and to devise appropriate mitigation where required.

## 1. Introduction

This report is intended to provide a technical summary of the data related to bats collected within the Wylfa Newydd Development Area, and from sites within a 500m buffer zone around the boundary. This area combined is referred to as the “study area” in this report, and is shown in Figure 6.1 (Appendix A).

### 1.1 Overview

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) comprises the proposed new nuclear power station (the Wylfa Newydd Generating Station), including the reactors, associated plant and ancillary structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities. The Project will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a Development Consent Order (DCO).

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Power Station Site. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station and Associated Development<sup>1</sup>.

### 1.2 Wylfa Newydd Project

The Project includes the Wylfa Newydd Generating Station and Associated Development. The Wylfa Newydd Generating Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and ancillary structures and features. In addition to the reactors, development on the Power Station Site (the indicative area of land and sea within which the majority of the permanent Wylfa Newydd Generating Station buildings, plant and structures would be situated) will include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments will include a Cooling Water System (CWS) and breakwater, and a Marine Off-Loading Facility (MOLF).

Horizon aims to be in a position to finalise the DCO submission in 2017 with the other permissions likely to be running in parallel to the DCO process.

### 1.3 Site Description

The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site, the Wylfa National Policy Statement Site<sup>2</sup> and the surrounding areas that would be used for the construction and operation of the Wylfa Newydd Generating Station) covers an area of approximately 380ha. It is bounded to the north by the coast and the existing Magnox power station (the Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregale. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

The Wylfa Newydd Development Area includes the headland south of Wylfa Head candidate Wildlife Site. There is one designated site for nature conservation within the Wylfa Newydd Development Area, Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of

<sup>1</sup> Development needed to support delivery of the Wylfa Newydd Generating Station is referred to as Associated Development. This includes highway improvements along the A5025, park and ride facilities for construction workers, Logistics Centre, Temporary Workers' Accommodation, specialist training facilities, Horizon's Visitor Centre and media briefing facilities.

<sup>2</sup> The site identified on Anglesey by the National Policy Statement for Energy EN-6/NPS EN-6 as potentially suitable for the deployment of a new nuclear power station.

Conservation (SAC) and SSSI, and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA).

None of the statutory and non-statutory designated sites listed above include bats as cited characteristics. However, bats may use habitats within these sites for foraging. This is discussed in greater detail in Section 3.

## 1.4 Aims and Objectives

The purpose of this technical summary is to provide a single resource regarding all survey and background data available for bats to inform and support the Ecological Chapter of the Environmental Impact Assessment (EIA) for the development of the Wylfa Newydd Generating Station.

The specific aims of the studies completed to date were to:

- review background data from local records centres to contextualise the survey findings from the study area;
- identify commuting routes and foraging habitats suitable for bats within the study area;
- determine the presence of roosts and availability of potential roosts within the study area;
- identify the bat species present; and
- identify where lessons learned from previous mitigation implementation can be applied in the future.

## 1.5 Summary of Work

Bat surveys have been completed in the study area every year between 2009 and 2015. The scope of the surveys that have taken place each year has varied and is summarised in Table 1.1. The justification for the survey effort is discussed in Section 2.

**Table 1.1 Summary of bat surveys completed to date**

	2009 (Arup, 2012a)	2010 (Arup, 2012b)	2011 (Arup, 2012b)	2012 (Arup, 2013)	2013 (Jacobs, 2014)	2014 (Jacobs, 2015a)	2015 (Jacobs, 2015b)
Internal building inspections	Yes	Yes	Yes	Yes	Yes	Yes	No
Building emergence surveys	No	Yes	Yes	Yes	Yes	Yes	Yes
Tree assessment surveys	No	Yes	Yes	Yes	Yes	No	No
Transect activity surveys	Yes	No	No	No	Yes	Yes	No
Static activity surveys	Yes	No	No	No	Yes	Yes	No
Mitigation monitoring	<sup>-3</sup>	-	-	-	Yes	Yes	Yes

<sup>3</sup> Compensation roosts were built in 2013.

## 1.6 Legal Status

In the UK, bats are afforded protection under Section 9 of the Wildlife and Countryside Act 1981 (as amended) (HMSO, 2015a) and Regulation 41 of The Conservation of Habitats and Species Regulations 2010 (as amended) (HMSO, 2015b). In conjunction, legislation makes it an offence to undertake any of the following acts with regards to bats:

- deliberately capture, injure or kill bats;
- damage or destroy a breeding site or resting place used by bats;
- deliberately disturb bats in a way which is likely to:
  - impair their ability to survive, breed, rear or nurture their young, hibernate or migrate; or
  - affect significantly the local distribution or abundance of the species to which they belong.

## 2. Methodology

### 2.1 Desk Survey

A background data search was requested in order to inform the scope of surveys required to inform future EIA and Habitats Regulations Assessments (HRA). This was requested from Cofnod (North Wales Environmental Information Service) and included all legally protected and notable species records, including bats, within 2.5km of the study area. This data was then analysed, and mapped where required.

### 2.2 Personnel

Field surveys for bats have generally been completed by Cambrian Ecology Limited (CEL) (formerly the Cambrian Ecological Partnership) as sub-contractors to Arup (2009-2013), and then Jacobs (2013-2015). CEL comprises a team of three ecologists who are all licenced bat workers. All internal building inspection surveys were led by at least one of these bat workers. Where survey assistants were required to cover larger buildings during emergence surveys or during activity surveys, only experienced assistants were used, and under supervision from CEL at all times.

### 2.3 Building Surveys

The number of buildings that have been surveyed in the study area has varied between survey years. This has been caused by expansions of the study area as the Project design has developed. The most significant change was between 2012 and 2013 when the study area was increased to include a 500m buffer zone around the boundary of the Wylfa Newydd Development Area. This area was added to the scope of surveys to enable ecologists to understand the context of bat populations in the Wylfa Newydd Development Area within the wider environment. Although the number of buildings that were surveyed in the 500m buffer zone was limited by access constraints (see Section 2.8), a number of additional bat roosts were still identified in 2013 and 2014.

Building surveys have also varied as demolition works have taken place in the Wylfa Newydd Development Area. These demolitions were carried out by Horizon on health and safety grounds with a view to removing any hazardous buildings on land in their possession. Some of these buildings did have bat roosts present, and, where necessary, European Protected Species Mitigation Licences were obtained to legalise the works. This has caused the pattern of bat use of buildings in the study area to vary. This is described in greater detail in Section 3.

Demolition of buildings containing bat roosts required Horizon to provide alternative roosting locations for bats in order to maintain the favourable conservation status of the species, as set out in the method statements that accompany the European Protected Species Mitigation Licences. Horizon therefore constructed two buildings specifically to act as alternative roosts for bats in areas that would be unaffected by the Project. Since construction, these buildings have also been monitored to gauge their success. Horizon also installed bat boxes in an area of woodland to the east of the Existing Power Station, and carried out habitat enhancement works including construction of a pond. The results from checks of these bat boxes are also included in this report.

#### 2.3.1 Preliminary roost assessment

Preliminary roost assessment surveys form the first stage in determining the potential for a building to support roosting bats. Typically surveys consist of an external inspection to identify access points for bats, followed by an internal inspection focussing on the search for field signs of bats. These were completed in line with the Bat Conservation Trust (BCT) Bat Surveys - Good Practice Guidelines (Hundt, 2012).

Access points for bats identified during the external inspection could include:

- broken or missing tiles or slates;
- lead flashing;

- weather boarding; and/or
- cracks and crevices in render/stone/brickwork.

Internal inspections involved systematically searching all roof spaces, crevices and other likely roosting areas of buildings for signs of bat occupation, such as droppings, staining and feeding remains, as well as for the animals themselves.

The buildings were then categorised according to their potential as roosts prior to the emergence surveys taking place. The buildings were placed in one of four categories: high, medium, low and no potential. These assessments were made with a view to determining the scope of further surveys required for each building.

The preliminary roost assessment surveys were not repeated on buildings previously surveyed unless there was reason to do so. Reasons for a reassessment could include a significant change in the structure of the building e.g. damage to the roof allowing access to a previously sealed roof void, or evidence from incidental sightings suggesting that the roost status in a particular building had changed.

### **2.3.2 Emergence surveys**

Emergence surveys of buildings have taken place between 2010 and 2015, as shown in Table 1.1. These surveys were completed to gather survey data to establish the baseline conditions, and to inform European Protected Species Mitigation Licence applications where demolition was required (see Section 2.3).

Following the building assessments, the emergence survey schedules consisted of:

- three emergence surveys of known roost buildings;
- three emergence surveys of high potential buildings;
- two emergence surveys of medium potential buildings; and
- one emergence survey of low potential buildings.

All emergence surveys were carried out in appropriate weather conditions with dusk temperatures in excess of 10°C and avoided periods of heavy rain or strong wind<sup>4</sup>.

Each surveyor used an Anabat SD1 or SD2 unit in conjunction with a 'Bat Box Duet' frequency division bat detector. Confirmation of field identifications were completed via computer analysis of sonogram traces recorded on the Anabats using Analook software.

The emergence surveys commenced 15 minutes before sunset and continued until 90 minutes after sunset to allow for the possible presence of late emerging species, such as brown long-eared or Natterer's bats. Where required, Yukon head-mounted night vision monoculars, Sony Nightshot camcorders with infra-red floodlighting and a Flir E50 thermal imaging camera were used to look for later emerging species against darker backgrounds.

Where possible, identified roosts were categorised into the following:

- maternity roost;
- day roost – regular;
- day roost – occasional;
- night roost; or
- hibernation roost.

<sup>4</sup> The survey conditions during each emergence survey between 2010 and 2015 have not been included in this report as they do not aid an understanding of the bat population within the study area.

## 2.4 Tree Assessment Surveys

Tree surveys were first completed in December 2010 (Arup, 2012a). This involved ground level assessment of trees in the Wylfa Newydd Development Area only, with follow up dusk emergence surveys and dawn re-entry surveys of trees that were identified as having features with the potential to support roosting bats.

The ground level assessments were completed during the winter months when trunks and branches are not obscured by leaves (in deciduous trees). Surveyors used binoculars to record any trees with features that had the potential to support roosting bats. These features would include rot-holes, woodpecker holes, cracks, splits, dense epicormic growth, tear-outs or significant areas of lifted bark. Trees were then categorised as either having features with the potential to support roosting bats which would require further survey, or were scoped out. The follow up surveys were completed using the same approach used for building emergence surveys as described in Section 2.3.2.

Tree surveys within the Wylfa Newydd Development Area were also completed in 2012 and used the same methods as in the 2010-2011 surveys. The scope of the 2012 surveys was to identify those trees that had not been surveyed in 2010, and so only included nine trees. Although the survey methods were the same, the categorisation of potential roosts followed those of the BCT guidelines (Hundt, 2012), as shown in Table 2.1.

**Table 2.1 Criteria for assessment of trees with the potential to support roosting bats**

Category	Criteria
Confirmed roost	Trees with known bat roosts or evidence of bat presence.
1*	Trees with multiple highly suitable features capable of supporting larger bat roosts.
1	Trees with definite bat potential, and features capable of supporting small number of bats.
2	Trees with no obvious potential, although the tree is of a size and age that potential roost features could be present.
3	Trees with no potential to support roosting bats.

The 2013 surveys re-assessed all trees surveyed in previous years and also included a small number of trees around Cafnan House, Cafnan Barns and the nearby stream corridor that had not been included in previous years of survey data. The methods used in 2013 were the same as those used in 2012.

The surveys did include those trees which were outside of the Wylfa Newydd Development Area but that were within the 500m buffer zone of the boundary. These were scoped out from surveys in 2014 as they were considered to be of limited value to informing the baseline.

## 2.5 Transect Activity Surveys

Transect surveys were first completed in 2009 and involved dividing the Wylfa Newydd Development Area into five transects. In 2013, transect surveys were repeated and the Wylfa Newydd Development Area was divided into eight transects. In 2014, transect surveys were extended to cover the whole study area, and comprised 10 transects. The routes taken during these transects is shown in Figure 6.2 and Figure 6.3, and the frequency of surveys is summarised in Table 2.2.

Transect activity surveys were not completed in 2015 due to the similarity of results between 2013 and 2014 as it was considered unlikely that further survey data would significantly change the baseline condition. The data to support this approach is presented in Section 3 and discussed further in Section 3.3.

**Table 2.2 Summary of frequency of bat transect activity surveys**

Year	No. of transects	Month of survey	Frequency
2009	5	September	Once
2013	8	May to October	Monthly
2014	10	April to October	Monthly

Each transect was walked by two surveyors using Anabat SD2 units connected to GPS units. This created geo-referenced call files which were analysed using Analook. A 'Bat Box Duet' frequency division bat detector was used at all times to listen for quieter species, which may not be detected when using an Anabat.

Each transect started approximately 40 minutes after sunset and lasted approximately two hours to account for peak foraging times for the range of species which could feasibly be on site based on records across the region of north Wales. Guidance from Hundt (2012) suggest that these surveys should start at 15 minutes before sunset but this was not followed. The reason this was not followed was that the aim was to record bat commuting and foraging activity only, and not activity associated close to their roosts.

Transect routes were planned to minimise retracing areas in the same survey, making an assessment of activity more accurate. The chance of duplicate recordings was reduced with this approach and avoided making an area appear more significant than may be the case.

## 2.6 Static Activity Surveys

Static Anabat SD2 units were used in 2009, 2013 and 2014 to automatically monitor bat activity in locations throughout the study area as summarised in Table 2.3, with locations given in Figure 6.3.

Static activity surveys were not completed in 2015 due to the similarity of results between 2013 and 2014 making it unlikely that further baseline information would be obtained from repeat surveys. The data to support this approach is presented in Section 3 and discussed further in Section 3.3.

**Table 2.3 Static activity surveys summary**

Year	No. of locations	Months monitored	No. of nights per month
2009	10	September	1
2013	16	Each month between May and September	4
2014	22	Each month between May and October	3

The Anabats were programmed to switch on 15 minutes before sunset and switch off 15-minutes after sunrise and were suitably camouflaged to discourage theft. Microphones were protected from water ingress using a single sheet of cling-film. External batteries were used to ensure recording for the entire duration. Call files were analysed using Analook software.

This longer-term monitoring of fixed points should allow a seasonal assessment of key area usage to be carried out and create a baseline data set identifying areas which may be positively enhanced as part of the mitigation/compensation strategy. The monitoring locations were therefore carefully selected to take into account the initial site layout. This method should also increase the probability of encountering species not recorded within emergence surveys, due to the extended time periods and locations that the detectors were deployed.

## 2.7 Demolition supervision records

In addition to the results from the surveys listed above, bats have been recorded by licensed ecologists supervising the demolition of unsafe buildings in the study area under European Protected Species Licences. These records are also provided in this report for reference.

## 2.8 Limitations

Bats are highly mobile animals and some species move their roosting sites on a regular basis. It is possible that bats could move into any building after the survey had taken place.

The Anabat bat detection system uses computerised analysis of recorded bat calls. However, compiled data must be interpreted with care. The system cannot give an accurate picture of bat numbers as multiple recordings can be made of an individual bat. These will therefore only give an indication of the level of bat activity along with precise timing of bat calls and in most cases accurate species identification.

The echo-location calls of *Myotis* bats have not been separated for the purposes of the static monitoring and transect survey results sections. This is due to the very close similarity and characteristic crossovers between *Myotis* bat species.

During static monitoring the microphone must be protected from water ingress as noted in Section 2.6 above. The commonly used solution to this is to wrap the detector's microphone in cling-film. However, this inevitably reduces sensitivity and may limit the detection of quieter species, such as brown long-eared bats.

Access restrictions to buildings and areas of land in the 500m buffer zone of the study area throughout the study period does mean that there may be roosts present that have not been found, and/or that there are areas of habitats that are hot-spots for foraging or commuting bats that are not known about.

### 3. Results

#### 3.1 Desk Survey

The data from the 2013 Cofnod background data search is summarised in Table 3.1.

**Table 3.1 : Summary of background data search from Cofnod records**

Species	Years	Live bat records	Dead bat records	Roosts recorded
Unknown	1989-2006	11	1	2
<i>Myotis</i> species	1986-1992	9	0	0
Whiskered bat	1994	0	1	0
Noctule bat	1998	1	0	0
Pipistrelle species	1986-2005	3	0	0
Common pipistrelle bat	1990-2008	20	0	0
Brown long-eared bat	1990	15	0	1

#### 3.2 Building Surveys

As described in Section 2.3, the building surveys that have taken place in the study area have varied significantly between years due to the extent of the study area changing and building demolitions. Therefore to simplify the survey results, each of the buildings has been placed into one of the following categories with results tables provided in Appendix B:

1. Buildings in the study area that have been demolished (see Table 6.1) – these have been included as they give context to the bat population baseline.
2. Buildings in the study area that have been surveyed that are unlikely to be affected by the Project but were included in the scope of surveys because they give context to the bat population baseline (including bat mitigation buildings) (see Table 6.2).
3. Buildings in the study area that would be demolished as part of the Project construction phase (Table 6.3).
4. Mitigation buildings and bat boxes (Table 6.4).

A summary of the results is provided in Table 3.2 that provides the peak number of bats recorded in each building across all years of survey data within each of the four categories above. This therefore provides an indication of the upper limit of the population of roosting bats of the study area. This measure is then used in Section 4.1.1 to discuss the success of mitigation already put in place, and future targets for provision of compensation roosts.

Table 3.2 Summary of building roost survey results<sup>5</sup>

Category	Description	BLE	P45	P55	P45/55	WH/BR	MYO	NATS	Total
A	Combined peak count of roosting bats recorded in all buildings since 2009 (Category A=B+D+E)	30	51	67	1	6	8	41	<b>204</b>
B	Combined peak count of roosting bats recorded in buildings demolished prior to 2015	12	36	25	0	3	1	1	<b>78</b>
C	Combined peak count of roosting bats recorded in mitigation buildings	1	26	21	0	8	0	0	<b>56</b>
D	Combined peak count of roosting bats recorded in buildings that would be demolished as part of the Project	15	10	25	1	2	5	40	<b>98</b>
E	Combined peak count of roosting bats recorded in roosts unlikely to be affected by the Project	3	5	17	0	1	2	0	<b>28</b>
F	Target for mitigation following enabling works (F=A-C-E)	26	20	29	1	-3	6	41	<b>120</b>

<sup>5</sup> The results tables use the following key to provide the names for the species recorded during the surveys, these are: BLE – Brown long-eared bat; P45 – Common pipistrelle; P55 – Soprano pipistrelle; P45/55 Common or soprano pipistrelle; WH/BR – whiskered or Brandt's bat; MYO – Myotis species; NATS – Natterer's bat



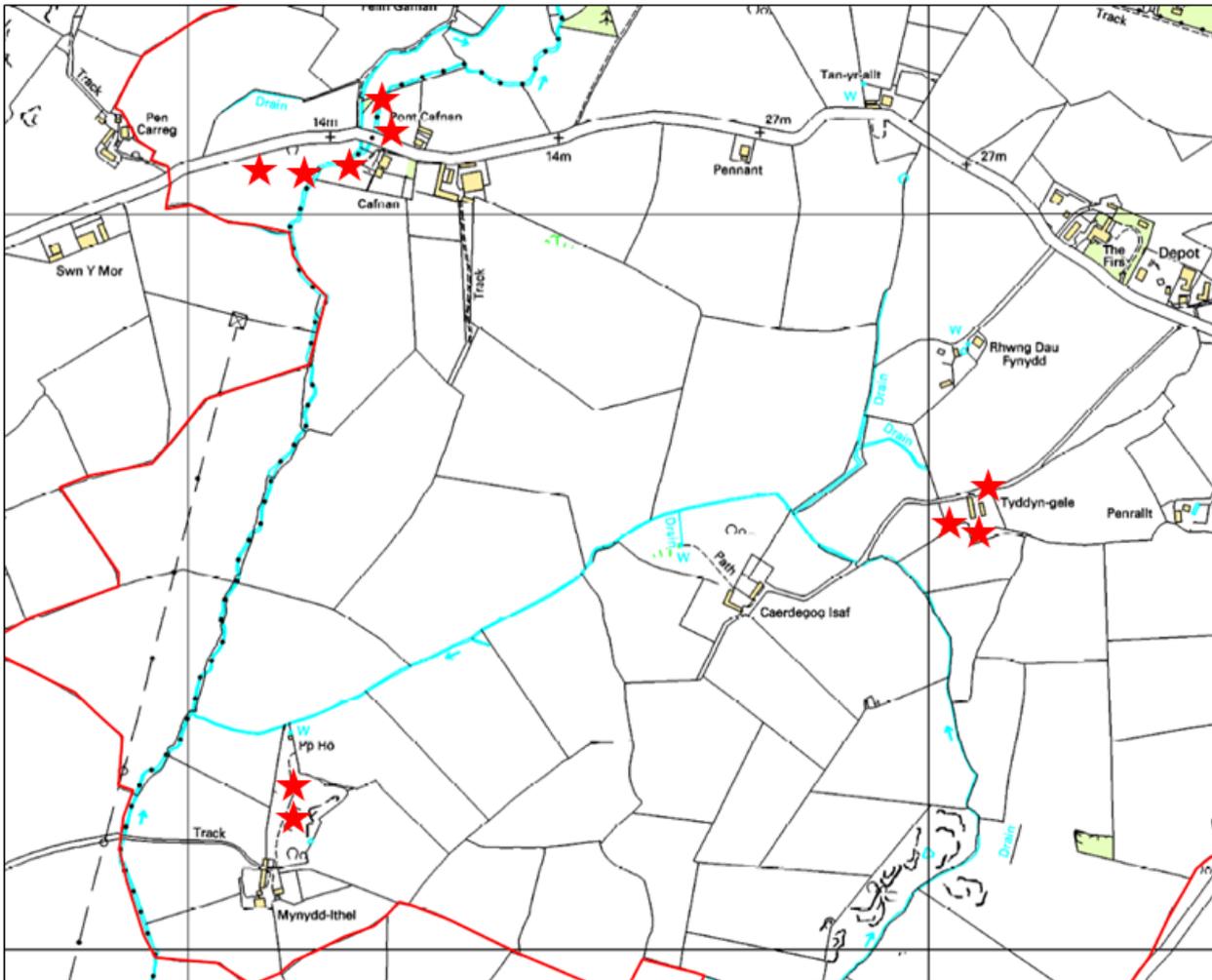


Figure 3.2 Location of surveyed trees during the 2012 surveys (from Arup, 2012b)

### 3.3.3 2013 tree assessment surveys

The 2013 surveys re-assessed all trees surveyed between 2010 and 2012 and recorded any changes in potential to support roosting bats. However, an additional area of trees was assessed in the vicinity of Pont Cafnan in the western half of the study area, as shown in Figure 3.3. The re-assessed trees were found to be in the same condition as was suggested by the previous reports. In the additional areas, the survey recorded six individual trees with the potential to support roosting bats, and a line of trees that were assessed collectively. The features of these trees were described in a qualitative way only, which identified them as Category 2 trees according to BCT guidelines.

In 2013, emergence surveys were also carried out of a single mature ash located at the Firs Hotel, and other ash trees within the grounds of the Leisure Centre with the results all negative for bat roosts. The 2013 surveys therefore provide relatively limited additional data to inform the baseline. This is discussed further in Section 3.6.

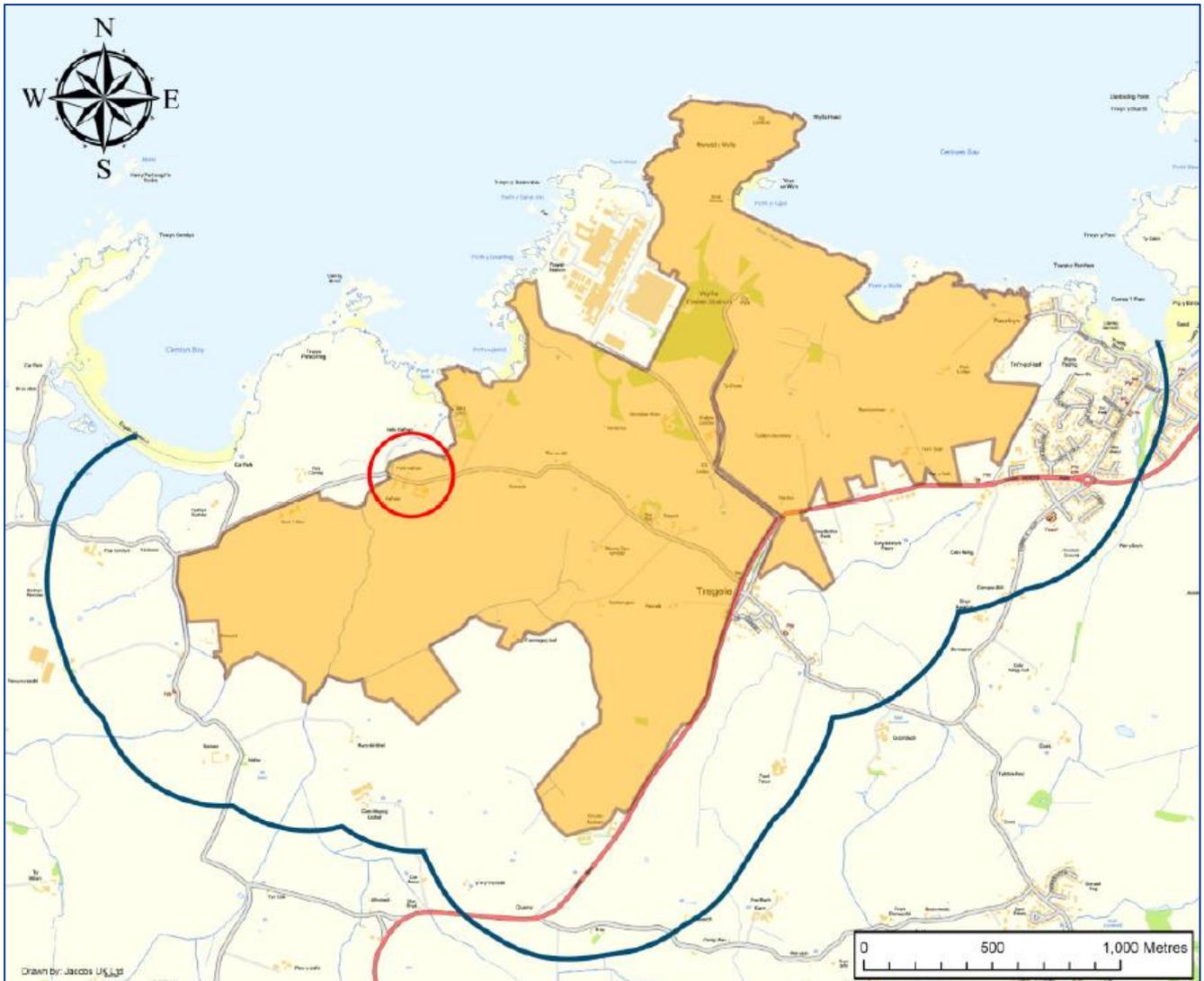


Figure 3.3 Location of additional trees surveyed in 2013 (from Jacobs, 2014)

### 3.4 Transect Activity Surveys

The transect survey data from 2009 is shown in Figure 3.4 and is taken directly from the Arup report (2012a). The figure shows that, in general, the highest levels of activity were from the following areas: around the Fisherman’s car park north-west of Tre’r Gof on the boundary of the plantation woodland; the area south of Tre’r Gof; and around the Firs Depot on Cemlyn Road. Also identified were three smaller areas of increased activity: around Porth y Wylfa; east of Caerdegog Isaf; and on Cafnan Stream on the western boundary of the 2009 study area. These data in general are of limited use as they only show bat activity from one month, and there was a gap of four years before activity surveys were repeated. This is discussed further in Section 3.6.



Figure 3.4 Transect activity survey data from 2009, all species (from Arup, 2012a)

The transect area used in 2013 are shown in

Figure 3.5 and the data collected are shown in Figure 3.6. This figure combines all records of all species from all months of survey. For the purposes of this report it is not considered necessary to separate out the results from each survey month for comparison. This is because the identification of hot spots of activity is made clearer when the results are combined.

The results from 2013 also show clear hot spots of activity to the east of the Tre'r Gof SSSI and around the Firs Depot on Cemlyn Road. However, the survey shows that bat activity is much more widespread than in 2009, with areas of denser activity on Wylfa Head; in the fields to the east of the study area adjacent to Cemaes; west of Treglele; around Cafnan Farm; towards Cemlyn Lagoon; and around Felin Gafnan and Cestyll Gardens

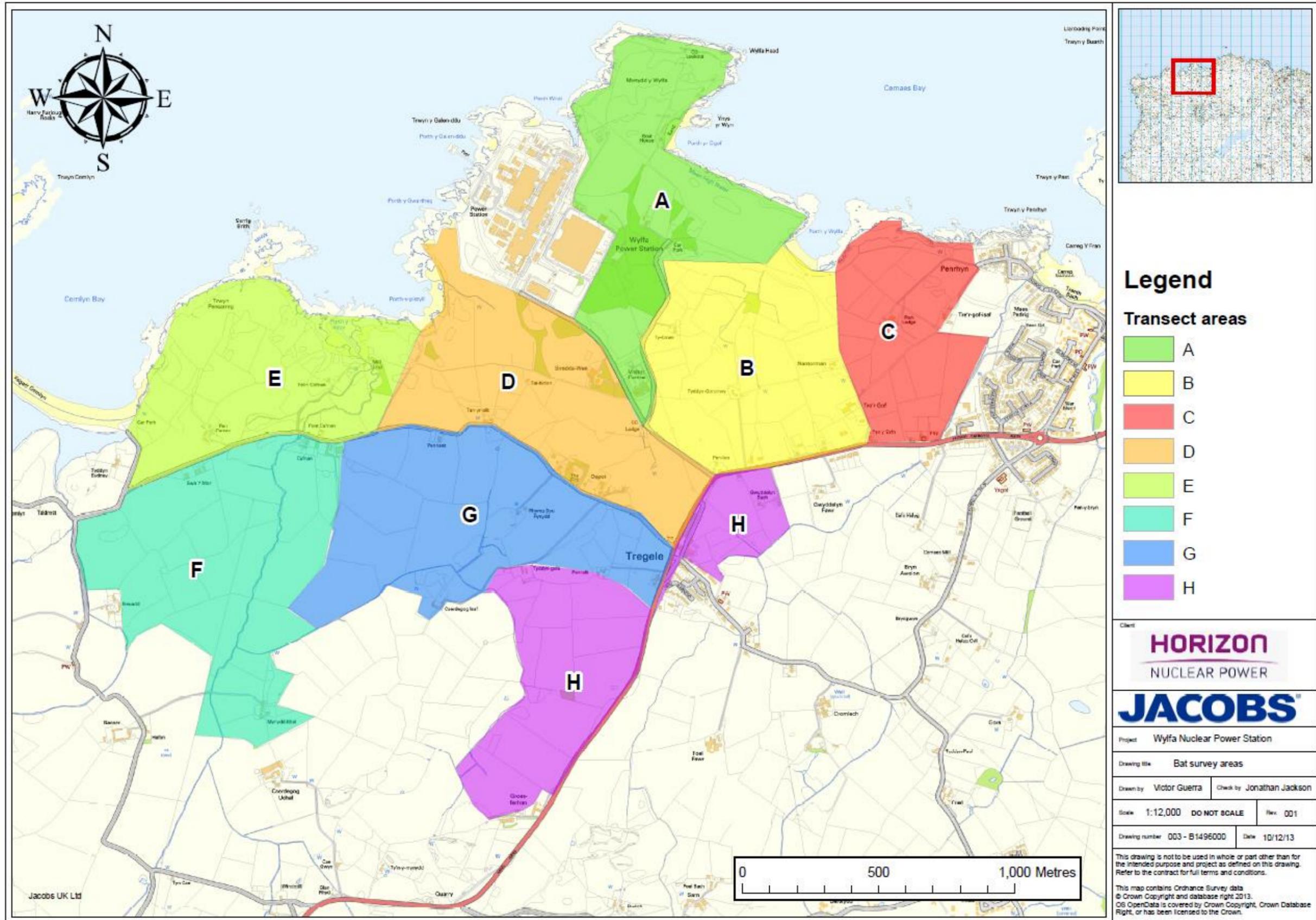


Figure 3.5: Areas covered by transects in 2013

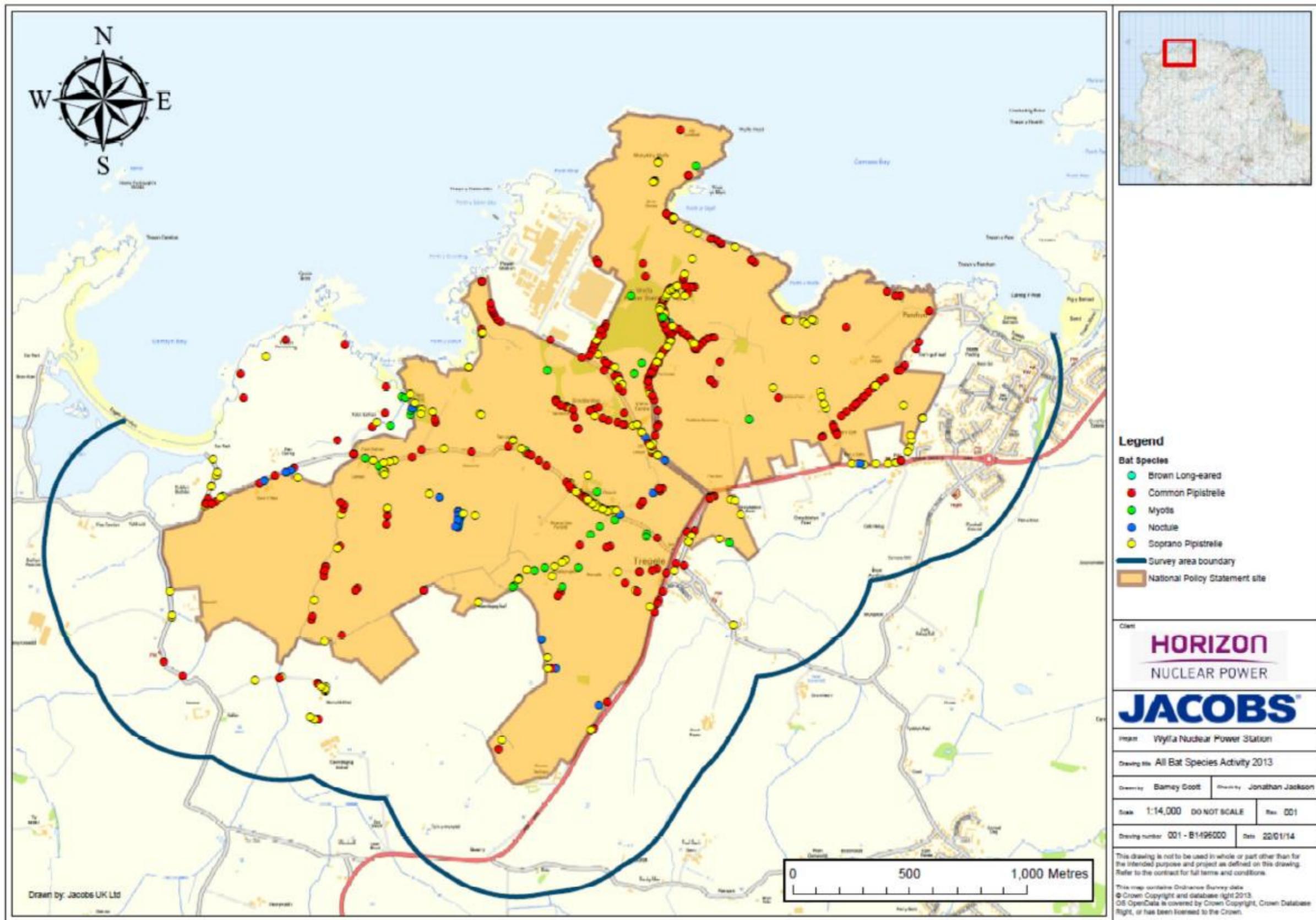


Figure 3.6 Transect activity survey data from 2013, all species (from Jacobs, 2014)

The transect data from 2014 is shown in Figure 3.7, which like Figure 3.6 does not show the results from individual survey months. The results from the 2014 surveys show that the same hot spots to the north and west of Tre'r Gof were present. The results also show that Cemlyn Road provides an important corridor across the centre of the study area. The additional transect routes recorded mainly soprano pipistrelle activity east of Cemaes in the river corridor, and south and east of the A5025 in the buffer zone around the boundary of the Wylfa Newydd Development Area.

The three years of survey data show that there are five types of bat that use the study area:

- brown long-eared bats;
- common pipistrelle bats;
- *Myotis* species (likely to be Natterer's bats, Daubenton's bats (*Myotis daubentonii*) or whiskered/Brandt's bats);
- noctule bats; and
- soprano pipistrelle bats.

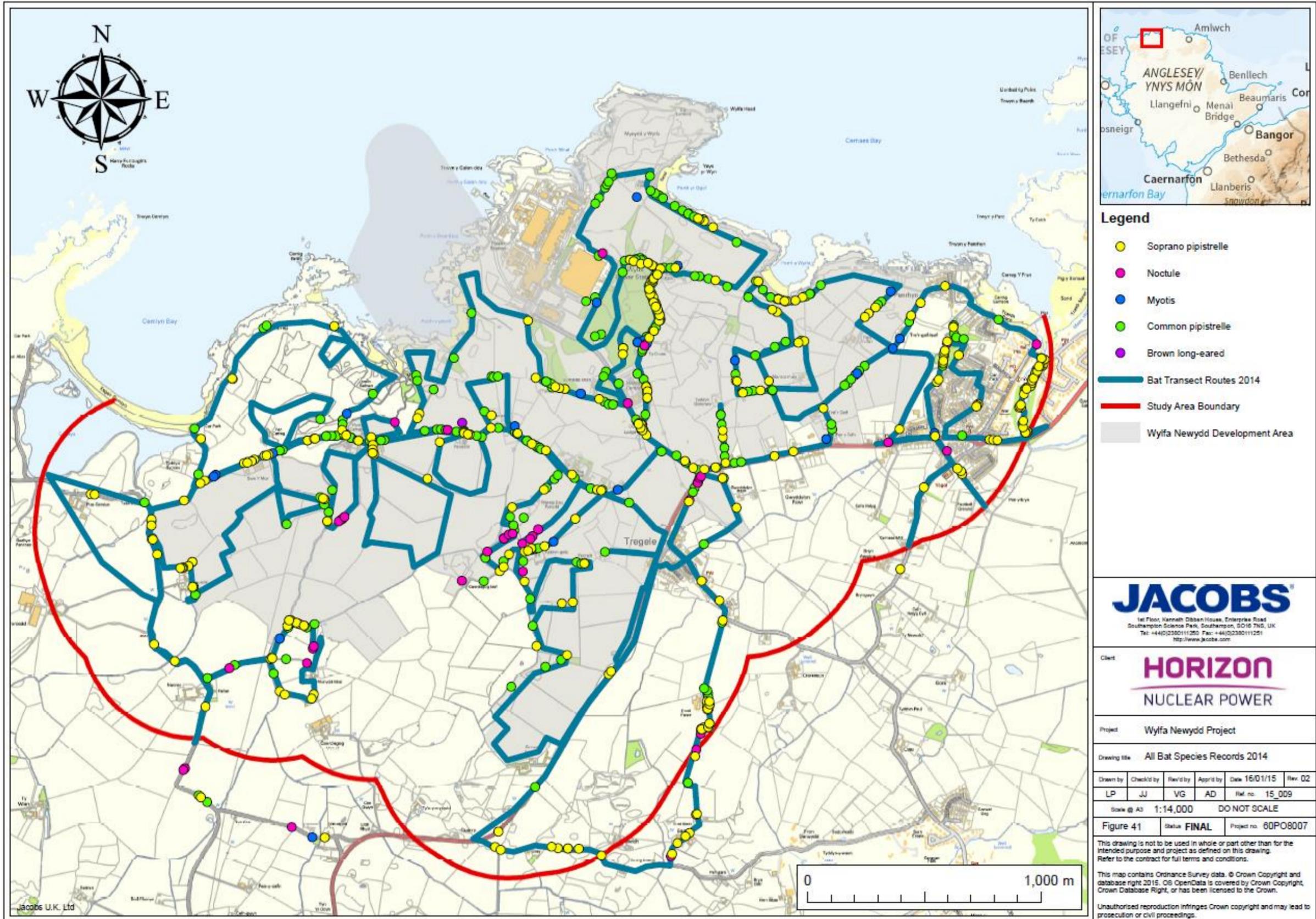


Figure 3.7 Transect activity survey data from 2014, all species (from Jacobs, 2015a)

### 3.5 Static Activity Surveys

There were a total of 27 static activity survey locations within the study area, as shown in Figure 6.3. The average numbers of passes per night by each species is shown in each of these locations in Table 3.3. These results are discussed in greater detail on a species-by-species basis, and based on a site-by-site comparison.

Table 3.3 Combined static activity survey results

Anabat location	Brown long-eared <sup>6</sup>			Common pipistrelle			Soprano pipistrelle			Noctule			Myotis species			Nathusius' pipistrelle		
	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014
1	0	0	0	35	49	20	388	84	121	3	1	1	19	10	4	0	0	0
2	0	0	0	-	33	9	-	10	5	-	0	0	-	7	2	-	0	0
3	0	0	0	-	63	154	-	14	1	-	1	0	-	1	1	-	0	0
4	0	0	0	-	56.5	47	-	2	4	-	1	0	-	2	1	-	0	0
5	0	0	0	-	2	4	-	2	3	-	1	1	-	1	0	-	0	0
6	0	0	0	-	9	5	-	35	4	-	1	0	-	1	1	-	0	0
7	0	3	0	12	128	270	1026	36	219	2	1	1	19	1	16	0	0	0
8	0	1	0	516	35	21	26	29	1	0	0	0	2	3	1	0	0	0
9	0	1	0	4	67	22	38	54	35	0	1	1	4	83	31	0	0	0
10	0	1	0	9	4	4	53	3	2	0	1	1	12	2	1	0	1	0
11	0	0	0	-	10	18	-	21	17	-	0	0	-	3	4	-	0	0
12	0	1	0	-	3	54	-	19	23	-	0	1	-	5	2	-	0	1
13	0	0	0	-	5	9	-	3	10	-	1	1	-	1	1	-	0	0
14	0	1	0	-	31	29	-	28	5	-	1	1	-	5	8	-	0	0
15	0	1	0	-	10	27	-	11	19	-	1	1	-	1	4	-	0	0
16	0	0	0	-	5	13	-	7	13	-	1	1	-	14	2	-	0	0
17	0	-	0	-	-	2	-	-	11	-	-	1	-	-	1	-	-	1
18	0	-	0	-	-	1	-	-	13	-	-	1	-	-	1	-	-	0

<sup>6</sup> No brown long-eared bats were recorded during transect surveys in 2009.

Anabat location	Brown long-eared <sup>6</sup>			Common pipistrelle			Soprano pipistrelle			Noctule			Myotis species			Nathusius' pipistrelle		
	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014	2009	2013	2014
19	0	-	0	-	-	4	-	-	26	-	-	1	-	-	9	-	-	1
20	0	-	0	-	-	2	-	-	5	-	-	1	-	-	1	-	-	0
21	0	-	0	-	-	9	-	-	5	-	-	1	-	-	2	-	-	0
22	0	-	0	-	-	15	-	-	146	-	-	0	-	-	141	-	-	0
23	0	-	0	4	-	-	2	-	-	0	-	-	0	-	-	0	-	0
24	0	-	0	9	-	-	574	-	-	3	-	-	5	-	-	2	-	0
25	0	-	0	2	-	-	0	-	-	0	-	-	6	-	-	0	-	0
26	0	-	0	6	-	-	1	-	-	0	-	-	22	-	-	0	-	0
27	0	-	0	38	-	-	5	-	-	0	-	-	0	-	-	0	-	0

### 3.6 Demolition supervision records

All bats found during the supervision of demolition of unsafe buildings in the study area between 2013 and 2015 are provided in Table 3.4.

**Table 3.4 Records of bats found during supervision of demolition of unsafe buildings in the study area**

Species	Date	Life stage	Number/Sex	Location	Grid Ref.
Brown long-eared bat	April 2013	Adult	1 X Male	Penralt	SH35336 92588
Nathusius pipistrelle	April 2013	Adult	1 X Male	Firs Hotel	SH35237 92971
Soprano pipistrelle	April 2013	Adult	1 X Male	Ty Croes	SH35618 93479
Soprano pipistrelle	April 2013	Adult	1 X Male 1 X Female	Tyn y Maes	SH35504 93829
Soprano pipistrelle	April 2013	Adult	2 X Male 1 X Female	Haul y Gwynt	SH35516 93877
Common pipistrelle	April 2013	Adult	1 X Male	Cafnan Farm (B5)	SH34360 93069
Brown long-eared bat	October 2014	Adult	3 X Male	Bronydd Garage	SH35186 92999
Brown long-eared bat	October 2014	Adult	1 X Male	Cafnan Farm (B8)	SH34360 93069
Brown long-eared bat	April 2015	Adult	1 X Female	Cafnan Farm (B1)	SH34360 93069

## 4. Discussion

The interpretation of the bat survey results has been split into two sections in this report. The first section includes a description of the current status of the bat roosts in the study area compared to the situation in the study area in 2010, including tree assessment survey results and building survey results. The second section in the discussion concerns the use of the site by bats when foraging and commuting as identified by transect and static surveys; this section also identifies those areas used most frequently by bats, and can therefore determine which habitat types and locations are of greatest value.

### 4.1 Interpretation of Roost Survey Results

#### 4.1.1 Interpretation of Building Roost Surveys

Currently there are 36 buildings identified in the study area that support roosting bats. Twenty-one of these buildings would be demolished as part of enabling works, and 15 would not be affected by the Project.

The results show that the study area has buildings that support roosting bats from five individual species. The data also shows that in a small number of instances, bats that were recorded exiting buildings could not be identified to species level i.e. common and soprano pipistrelle bats, and whiskered and Brandt's bats. These results are not considered to be significant in the context of determining the overall population of bats in the study area. The species recorded are considered to be typical of a very sparsely wooded landscape with roosting opportunities generally limited to scattered anthropogenic structures. The lack of rarer species is also indicative of an area of limited value to bats. However, this can be explained largely by the geographical location of Anglesey making it highly unlikely that bats with a more southerly distribution would be present. The individual ecology of these five species is not discussed here, as the foraging behaviour (as a primary driver in determining the ecology) is discussed in greater detail in Section 4.2.

The numbers of individuals in each building was generally low and mostly only supported one or two bats, although there were several exceptions. The building at Tyn y Maes had a peak count of 27 bats roosting at any one time prior to demolition and was a maternity roost for pipistrelle bat species, and the Lodge supports a maternity roost of Natterer's bats. All other buildings supported less than seven bats. With the exception of the maternity roosts the counts in buildings between years have been highly variable and indicate that roosts are transitory, with negative results in some years in roosts that have been occupied in the past. This tentatively suggests that the number of bats roosting in the study area is much lower than the number of recorded roosts suggest, and that the numbers of roosts are more likely to be a product of bats regularly switching between roosts. This is supported by the data that shows buildings which were not roosts became occupied following the first round of building demolitions. However, this highlights that the bats in the study area require a variety of roosting opportunities to be available to sustain the requirements of the population. This potentially has implications for compensation design for the remaining roosts, and suggests that mitigation should not only be limited to a low number of larger structures, but a network of different opportunities throughout the study area.

As described above, Tyn y Maes supported a maternity roost of pipistrelle species and a low number of whiskered/Brandt's bats before it was demolished. This represented 15% of the peak count of bats roosting in the study area. Prior to demolition a "bat barn" was built with the purpose of acting as compensation for the loss of the roost. In the area around Tyn y Maes habitat works were also carried out including the clearance of an area of pines, replanting of broadleaved trees, and the construction of a pond. The monitoring of this structure in 2015 found that the building was supporting a peak of 56 bats, representing over 20% of the peak count of roosting bats found in the study area. The Lodge that supports a maternity colony of Natterer's bats will also require the construction of a bat barn and potentially habitat enhancement works, and the lessons learned from Tyn y Maes should be applied. This would maximise the chances of ensuring that the Natterer's bat roost relocates to a building nearby (ideally in the study area), and is not displaced outside of the study area or is permanently lost.

#### 4.1.2 Interpretation of Tree Survey Results

The tree surveys in the study area have recorded a total of 57 trees with features that have the potential to support roosting bats, and five areas of trees where a holistic assessment has also determined that they might support roosting bats. However, emergence surveys have not proved presence of a bat roost in any tree. This is not considered to be unusual as roosts in trees are used differently by bats than building roosts.

The main difference is that tree roosts tend to be used for a much shorter period of time, and so are only occupied for a small number of days before being abandoned. The primary driver for this behaviour is parasite loading caused by humid conditions in tree roosts. Bats will use tree roosts for longer periods when breeding, although breeding roosts are most often found in trees much larger than those found in the study area. Therefore, while the likelihood of maternity roosts should not be discounted, none have been found. The roost types in the study area are likely to be of the lowest significance rating compared to those that support breeding bats (Hundt, 2012), which supports the assertion that there are no bat roosts in trees that could alter the overall assessment for the value and sensitivity of the bat population in the study area.

In the study area, the potential presence of species that exclusively roost in trees is limited as many of the UK tree roosting specialist species are outside their natural range in Wales and are extremely rarely recorded e.g. barbastelle, Bechstein's (*Myotis bechsteinii*), serotines (*Eptesicus serotinus*), and Leisler's (*Nyctalus leisleri*). These species have therefore been scoped out of this report. Furthermore, no evidence of species such as greater horseshoe bats (*Rhinolophus ferrumequinum*) and lesser horseshoe bats (*Rhinolophus hipposideros*) has ever been recorded in the study area. The risk of finding a tree roost of either horseshoe species has therefore also been scoped out.

Bat species most likely to use trees in the study area for roosting would be common and soprano pipistrelles, brown long-eared, noctules, whiskered/Brandt's and Natterer's. These species are classed as the most common in the UK and, even with regular occupancy of all potential roost features, the species composition would make it unlikely that bats roosting in trees would be an ecological receptor of more than local significance.

Prior to this report there has been no attempt to quantify the number of bat roosts in trees found in the study area that could be affected by the Project. This report suggests that there are a maximum of 57 trees and five groups of trees with collective capacity, and represents a potential density of one feature per 5ha. This value is similar to the roosting opportunities offered by the buildings in the study area. The results from the building surveys combined with the activity surveys suggest a total bat population that is not unusual or exceptional in terms of species composition or density, and there is nothing to suggest that the bats using trees for roosting would alter that assessment. It is considered that the habitats present are the limiting factor for the bat population in the study area rather than the number of roosts. This is supported by the evidence from the emergence surveys that shows low occupancy rates for many buildings that have the potential to support many more bats.

Proving the presence or likely absence of roosts can be extremely difficult. In tree holes evidence of usage degrades quickly and is often consumed by detritivores. This can mean that the only way of proving a roost is being used, is by seeing bats in features, or recording them exiting/entering features during activity surveys. For the number of trees present it has therefore not been attempted to establish whether each feature has been used. The value of knowing the number of roosts at any one time is also of limited value in itself for this Project because it is highly likely that the exact number would fluctuate, while the overall assessment would not be affected. It is therefore considered that overall the species accounts produced following analysis of the activity surveys (Section 4.2) are more useful to the determination of the value and sensitivity of bats than the data from the tree roost surveys.

The Project would require the majority of trees identified in Section 3.3 to be removed as part of the site preparations and construction phases. In line with the relevant wildlife legislation, this would require appropriate measures to be in place to protect bats during works. This may include obtaining European Protected Species Mitigation Licences to legalise situations where roosts will be destroyed, or precautionary measures of works where the chances of bats or their roosts being disturbed is sufficiently low. It is not the intention of this report

to establish where each approach will be adopted, but does introduce the decision-making process with regard to the need for further surveys. This is expanded on in Section 5.

## 4.2 Interpretation of Activity Survey Results

Activity hot spots are indicated by the collated activity maps (Figure 3.4, Figure 3.6 and Figure 3.7). These hot spots were identified in 2013 and include around the edges of the Tre'r Gof SSSI and plantation, areas around the visitor centre, Cemlyn Road, Cestyll Gardens and Cafnan Farm area. Following the results of 2014 surveys, further hotspots have been identified, including the area around Tyddyn Gele, the two Community woodlands within Cemaes and the farm known as Foel Fawr. These hot-spots were loosely associated with the presence of trees.

Across the study area, the collated records clearly showed linear features as having the highest levels of activity. This reflects the tendency of many species of bat to commute and forage along linear features. However, this was also a reflection of the transect route as footpaths and gateways tend to be located along such linear features. Where transects cross more open habitat, the data showed that bats were encountered in these areas but at a far lower frequency. Open habitats should therefore not be dismissed as unused, but they are clearly not as significant.

There was an absence of bats recorded in the larger blocks of agricultural land across the site. In some instances this reflected the transect routes. However, in many cases it clearly showed bat preference for landscape features of value i.e. features providing connectivity with areas of higher-quality foraging potential, or those that are of sufficient value in themselves to offer foraging. This is seen across the agricultural land to the south of Cafnan Farm where bats were recorded following a watercourse despite it being within a large block of agricultural grassland. The records indicated that pipistrelle and *Myotis* bats were still using the Tre'r Gof SSSI for foraging as was the case in 2013. The majority of bats probably entered the area from the west although several bats were noted commuting towards the SSSI from the south-east. This suggests that there could be bats roosting within the houses along the A5025 that have not been included in the scope of surveys. It is notable that very few bats were recorded foraging over marshy areas near Cafnan Farm and the Lower Farm wetland, which could be expected to offer higher foraging potential. The numbers of airborne invertebrates in these wetland habitats would be expected to be high, as they were relatively sheltered and well-connected. The reasons for this unexpected result are unknown.

Coastal habitats on the northern side of the study area remain heavily used by foraging bats, particularly pipistrelle species; typically this type of habitat would not be expected to experience high levels or regular bat activity (although there are examples from elsewhere in the UK of bat species using coastal areas e.g. Beer Quarry Caves in Devon that support eight species of hibernating bat (Natural England, 2015), or activity in coastal areas as a result of migrations (BSG Ecology, 20014)). It is considered that in this study area the high use of the area by foraging bats is likely to be due to the number of invertebrates in this area, and that the invertebrate populations may be higher due to the presence of the strand lines, and the topography of the land offering shelter from the prevailing westerly winds.

### 4.2.1 Brown long-eared bats

The static activity survey results show that brown long-eared bats were only recorded at seven of the Anabat locations. The results also show that the average number of passes in any survey period was only one for six of these sites, and that Site 7 was the only location where the average number of passes was any higher (three). These results suggest that the site is used sparingly by brown long-eared bats. This is most likely to be a product of the lack of woodland in the study area, which is the habitat that the species prefers for foraging. However, long-eared bat species are also notoriously difficult to detect using recording equipment alone (Hundt, 2012). It is therefore possible that brown long-eared bats are under-represented in the static activity survey data. This is supported by the evidence from building surveys that have found several, albeit small, brown long-eared bat roosts.

It is therefore considered that the evidence from the static activity surveys alone are of limited value in determining the baseline use of the study area by brown long-eared bats, and that determining the baseline

conditions is more likely to be established using the combined data from all survey methods i.e. including building surveys and transect activity survey results.

Overall the value of the population of brown long-eared bats in the study area would be low as there are no roosts of any significant size, or evidence to suggest that the study area is used by large numbers of brown long-eared bats for foraging or commuting. The Welsh population is also estimated to be 17,500 making brown long-eared bats among the most common in Wales (Harris et al., 1995).

#### 4.2.2 *Myotis*/Natterer's bats

The activity surveys recorded *Myotis* bats to genus level only due to the difficulty in differentiating between the calls to individual species level. However, many of the recorded calls are likely to belong to Natterer's bats as they are the most numerous in terms of *Myotis* species roosting in the area. The other potential species with a distribution that includes north Wales would be Daubenton's bat *Myotis daubentonii*, for which there are records within 10km of the study area (Arup, 2012). Whiskered/brandt's bats are *Myotis* species that have been reported in background data searches and from roost surveys in two buildings in the study area i.e. the Lodge and mitigation barn at Tyn y maes (see 5.2). It is therefore probable that some *Myotis* recordings belonged to Whiskered/brandt's bats.

Daubenton's bat is affiliated with water that it uses to trawl its prey. The species has never been recorded as roosting in the study area as there are no suitable structures but Static Monitoring Locations 9 and 22 (see Figure 6.3) are within close proximity to water (Cestyll Garden and Afron Gwry). This potentially indicates that Daubenton's bats are using the watercourses for foraging and commuting, but as a common and widespread species that is increasing its range, this is not surprising or significant.

The transect activity survey results from 2009, 2013 and 2014 do little to show what habitats are preferred by the population of Natterer's bats in the study area. This is because *Myotis* in general have been recorded throughout the study area in all habitat types. The static monitoring locations (excluding the potential Daubenton's bat records described above) are also of limited value for the same reasons as above. However, there is some evidence to suggest that *Myotis* species have a stronger affiliation to wooded areas e.g. Static Monitoring Location 1, 7 and 26 around Dame Sylvia Crow's Mound and the Magnox Depot on Cemlyn Road. This fits with their ecology and high aspect wing ratio that gives them greater manoeuvrability for hunting in tight and cluttered places.

The activity survey data gathered from within the study area has therefore not conclusively proved where the bats from the Lodge (in particular) are foraging. There are two hypotheses proposed to overcome this constraint on the understanding of the species. Either, the species could be commuting to foraging areas outside of the study area, in which case maintaining commuting routes is important, or the bats disperse and forage across the study area without any specific area being of particular importance over another. This issue is not without precedent and the feeding habitat requirements are poorly known (BCT, 2015).

The Welsh abundance and distribution of all *Myotis* species has not been provided here as it would add little to the understanding of the bat population that the study area supports. However, it is useful to understand the Welsh population of Natterer's bats as they are confirmed as breeding in the study area. In Wales the latest estimate is that there are 12,500 Natterer's bats distributed throughout all of Wales, although it is described as being relatively scarce (Harris et al., 1995). The maternity roost in the Lodge building is the most significant in the study area and is also the highest value feature of the species. The value assessment for the species is therefore medium, and is based on the highest value feature.

#### 4.2.3 *Nathusius*' pipistrelle bats

There have been a total of six recordings of *Nathusius*' pipistrelle bats from five locations in the study area, and a single *Nathusius* was found during the building demolitions in 2013. The evidence therefore shows that the species does use the study area but not in numbers consistent with a population of anything other than local significance. The potential for *Nathusius* pipistrelle to be found in other buildings in the future in the study area should therefore not be discounted.

#### 4.2.4 Noctule bats

The static activity survey results show that noctule bats were recorded in 19 locations. The average number of passes in these locations was between one and three times per survey period. At eight locations noctule bats have never been recorded. These surveys are therefore suggestive of infrequent use of the study area. Furthermore, usage is probably limited to occasional passage, rather than using the study area for foraging. It is therefore very unlikely that noctule bats will be significantly affected by the Project. This is supported by the lack of evidence from the roost surveys that have not recorded any roosting noctule bats in the study area. It is recognised that this may change following the results of the tree roost surveys, but activity surveys would not suggest that there is a significant roost that would be affected by the Project.

The UK population of noctule bats is relatively poorly understood with estimates based on limited population data. In Wales the estimate is 4,750 making the species uncommon (Harris et al., 1995). The number of records of the species in the study area would therefore make it unlikely that the value of the population would be anything other than low.

#### 4.2.5 Pipistrelle species

The two species of bat recorded with the greatest frequency are the common and soprano pipistrelle. These are the most common and widespread species in the UK and are fairly eclectic in their habitat requirements using woodland, grassland, hedgerows, farmland and suburban environments. To put the population data in context there are estimated to be 2.4 million common pipistrelles and 1.3 million soprano pipistrelles in the UK (Harris et al., 1995). Their diet consists of invertebrates caught on the wing by aerial hawking, and their only limitation is their adaptation for reliance on buildings for roosting, thereby making them vulnerable to disturbance. In virtually any development in the UK on the scale of a Nationally Significant Infrastructure Project (NSIP) pipistrelle bats are likely to be the most frequently encountered and potentially affected species. The Wylfa Newydd Project study area is no exception, and both building and activity surveys suggest that there is a population present that is not exceptional.

### 4.3 Interpretation of the Building Demolition Supervision Results

With the exception of the *Nathusius pipistrelle* which is a rarely recorded species (see 4.2.3), the results from the building demolition supervision results were as predicted. The buildings were not supporting maternity roosts, and only contained low numbers of mostly male bats. The data are therefore useful in terms of providing evidence to suggest that previous impact assessments have been accurate, and that protection measures have been appropriate. However, the data do not aid the determination of the bat population in the study area and are not discussed further in this report.

## 5. Conclusions and Recommendations

### 5.1 Desk Study

The desk study data has been of limited value compared to the site specific survey data. It is therefore considered that there is not a requirement to update this data search to inform any assessment of the value and sensitivity of the bat population in the study area for the purposes of the EIA.

### 5.2 Building Surveys

The building survey results show that the number of buildings in the study area that support roosting bats is 36 and that these generally comprised roosts containing only one or two bats at a time. The species present were generally common and widespread and typical for a site in north Wales. The survey data also show that bats had some fidelity towards certain buildings, but that occupancy was often irregular. This was highlighted following the start of demolition in 2012 whereby previously unoccupied buildings became bat roosts. These roosts are of the lowest value and sensitivity rating in the context of the study area (Hundt, 2012).

There is also one building in the study area that supports a maternity roost of Natterer's bats (The Lodge) that has not been demolished, and Tyn y Maes which supported a maternity roost of pipistrelle bats. The Lodge is the most significant roost of bats in the study area and supports a population of around 40 individuals as well as low numbers of brown long-eared and whiskered/Brandt's bats.

Tyn y Maes was demolished in 2013 and as part of the mitigation a compensation roost was built in the form of a bat barn. In 2015 this building was found to support 50 individual bats, and it is likely that these are the same bats previously roosting in Tyn y Maes. The bat barn was also found to be supporting higher numbers of whiskered/Brandt's bats than the original building. While this clearly demonstrates the adaptability of bats to new roosts, and is supported by the evidence of transitory roosts that are swapped frequently, this is not evidence to suggest that the Natterer's bats in The Lodge will relocate successfully. However, the design of the bat barn was successful and should be used to contribute towards the design of other bat barns that will be built as compensation in the future.

Overall the number of roosts is not considered to be exceptional in terms of density for an area the size of the study area. Similarly, the numbers and composition of species that are supported is also not beyond what would be expected for a site with the range of buildings and habitats present. However, there are two roosts of greater significance: the Tyn y Maes bat barn and the population of Natterer's bats in the Lodge. Both these roosts are of a value and sensitivity above a site-only level, and with at least local significance, and would be of primary concern when devising mitigation for the Project.

### 5.3 Tree Roosts

The survey results show that there have been 57 individual trees identified in the study area that have features with the potential to support roosting bats, and five areas of trees with combined low potential, but no roosts have been confirmed.

The activity surveys show that the study area does not support rarer woodland specialist species (with the occasional exception of Nathusius' pipistrelle bats as discussed in Section 4.2.3). It therefore follows that the potential roosts in trees are also unlikely to support rare species. This suggests that the bats which may use the potential tree roost features form part of a study area total population dominated by common and widespread species. These species are also found in abundances typical for similar habitats in that geographical area. If there are any tree roosts, these would also be highly unlikely to be exceptional and alter the value and sensitivity rating of the study area. However, the legal protection afforded to bats and their roosts requires each potential roost to be assessed individually. Should any potential roost be disturbed or damaged then further survey and/or mitigation will be required, as described below.

At this stage it is not considered that further surveys would be required to inform any impact assessment for the Project. This is because the data available from activity surveys is such that the bat population using the study

area is very well understood. However, pre-works surveys would be required to protect bats using tree roosting features immediately prior to being felled. These surveys would include:

- dawn re-entry surveys sufficiently in advance of works to inform appropriate licensing to be in place before felling i.e. no longer than 12 months before (this is likely to be for the most high-risk trees only, i.e. if any trees are known roosts, or are classified as Category 1 or 1\* prior to being felled); and/or
- inspections immediately prior to felling potentially using mobile operating platforms or tree climbers.

For the majority of trees in the study area there is a low likelihood of the features supporting bats roosts. This would mean that provided pre-works surveys confirmed the absence of bats, they could be removed immediately without licences being required. However, soft-felling techniques may still be required where surveys have been unable to definitively prove absence, as per best practice guidelines (Hundt, 2012). This involves felling trees in sections and then inspecting them on the ground.

If pre-works surveys do find bats then licences would need to be in place before felling commences. The planning of felling works should therefore include flexibility to allow for the time that it would take to obtain European Protected Species Mitigation Licences to legalise the works. This would include details of the mitigation that would be needed i.e. protection measures and compensation. It is understood that for the purposes of planning, the competent authority in granting licences (Natural Resources Wales) have issued licences in the past for the Wylfa Newydd Project that covered the demolition of a number of buildings. This negated the need for multiple licence applications. This approach would also be adopted for potential tree roosts as it would achieve cost-effective adherence to the legislation protecting bats, without disproportionate delays to work schedules.

## 5.4 Activity Surveys

Activity surveys identified several hot-spots of foraging and commuting behaviour in 2013 including: around the edges of the Tre'r Gof SSSI and plantation; areas around the visitor centre; Cemlyn Road; Cestyll Gardens; and Cafnan Farm area. Following the results of 2014 surveys, further hotspots were added to this list, including the area around Tyddyn Gele, the two Community woodlands within Cemaes and the farm known as Foel Fawr.

The areas given above offer higher levels of habitat heterogeneity compared to the large blocks of heavily grazed pasture, and include wooded areas. Field boundaries and streams were also used with greater frequency by bats. However, it is acknowledged that there is the potential for bias in the method to skew the results as many of the transect routes followed paths using topographical features as navigation aids i.e. hedges, rather than routes through the centres of fields. Despite the limitations of the data, it is considered that the use of linear features for foraging and commuting bats, and habitat heterogeneity, would still be of primary importance in preparing habitat reinstatement designs as mitigation for the Project.

The survey data also show that the usage of the study area by bats does not necessary conform to what might be expected for a broadly agricultural area. This includes a lower level of usage by bats of marshy grassland areas and an increased usage of coastal areas. This would be important for influencing the determination of habitat enhancement measures for the study area, and maintaining habitat connectivity in particular.

The species composition of the bat population recorded during the activity surveys is not considered to be exceptional and mainly comprised the most common and widespread species in the UK. This compares favourably with the building roost survey results that give pipistrelle bat species, commoner *Myotis* species, and brown long-eared as being the most abundant. However, the activity surveys did record low numbers of noctule bats and Nathusius' pipistrelle bats that were not recorded roosting in the study area. The presence of either species is not considered to be significant as they are within their known ranges, and do not occur in a frequency suggestive of an exceptional population of anything other than an importance at a site level.

## 6. References

- Arup, (2012a), *Initial Bat Activity and Building Assessment Report*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2012b), *Report on Bat Surveys 2010 & 2011*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2013), *Bat Roost Survey Report 2012*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- BCT, (2015), *Natterer's Bat – Myotis nattereri: Species Information Sheet*, [online] available at [http://www.bats.org.uk/data/files/Species\\_Info\\_sheets/natterers\\_11.02.13.pdf](http://www.bats.org.uk/data/files/Species_Info_sheets/natterers_11.02.13.pdf) [accessed 23/10/15].
- BSG Ecology, (2014), *Pembroke Islands Bat Report*, unpublished report, [online] available at [http://www.bsg-ecology.com/wp-content/uploads/2014/12/Pembroke\\_Islands\\_Bat\\_Report.pdf](http://www.bsg-ecology.com/wp-content/uploads/2014/12/Pembroke_Islands_Bat_Report.pdf) [accessed 06/11/15].
- Harris S., Morris, P., Wray, S. and Yalden, D., (1995), *A review of British mammals: population estimates and conservation status of British mammals other than cetaceans*. JNCC: Peterborough.
- Hundt, L., (2012), *Bat Surveys Good Practice Guidelines*, 2<sup>nd</sup> Edition, Bat Conservation Trust: UK.
- Jacobs, (2014), *Consultancy Report: Bat Monitoring 2013*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. W202.01-S5-PAC-REP-00021.
- Jacobs, (2015a), *Consultancy Report: Bat Monitoring 2014*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. WN03.01.01-S5-PAC-REP-00011.
- Jacobs, (2015b), *Consultancy Report: Addendum to Bat Monitoring 2014*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. WN034-JAC-PAC-REP-00020.
- Natural England, (2015), *SSSI Citation for Beer Quarry and Caves*, [online] available at [http://www.sssi.naturalengland.org.uk/citation/citation\\_photo/1001396.pdf](http://www.sssi.naturalengland.org.uk/citation/citation_photo/1001396.pdf) [accessed 06/11/15].

## Appendix A. Figures

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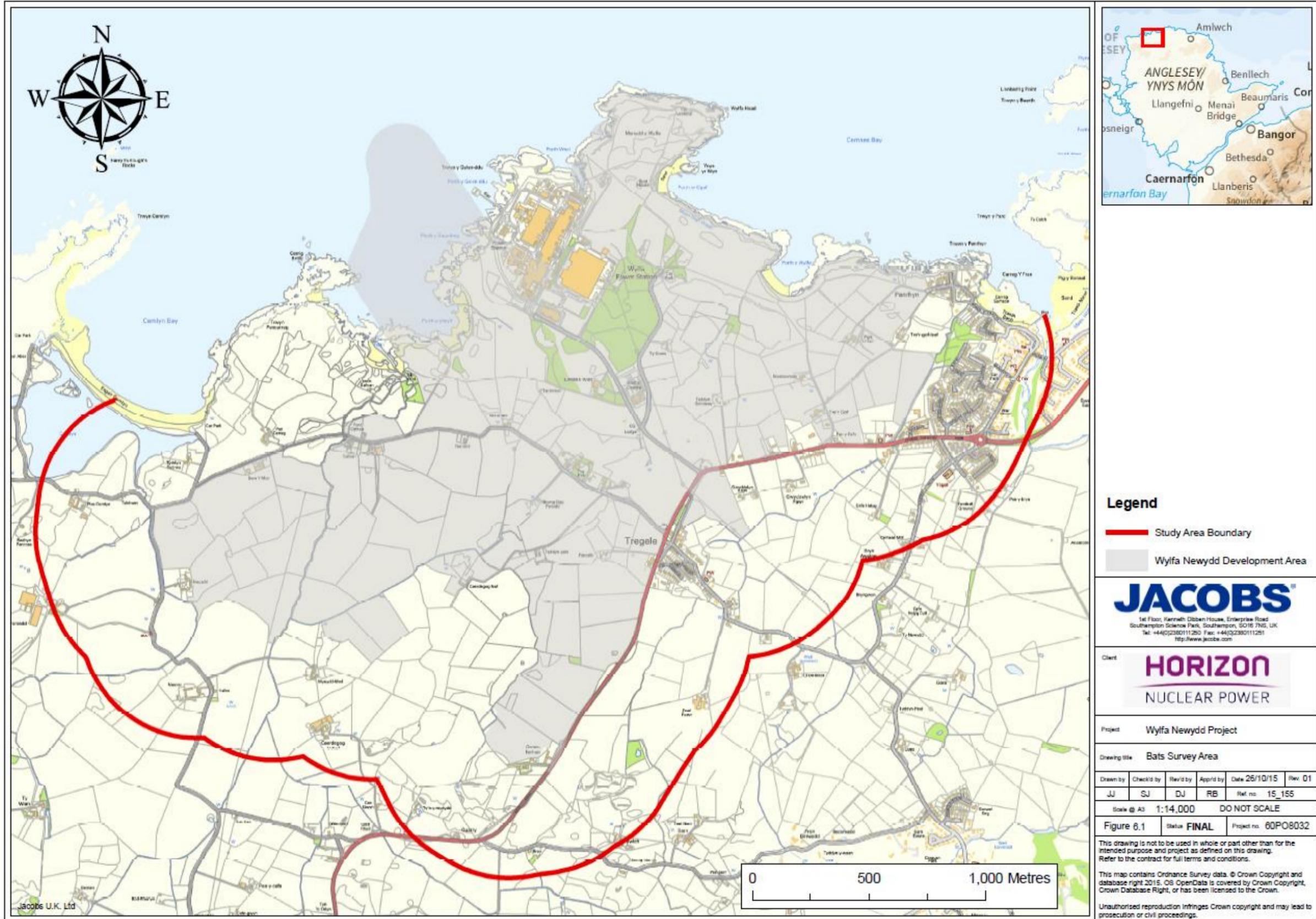


Figure 6.1 The study area



Figure 6.2 Activity survey transect routes 2009

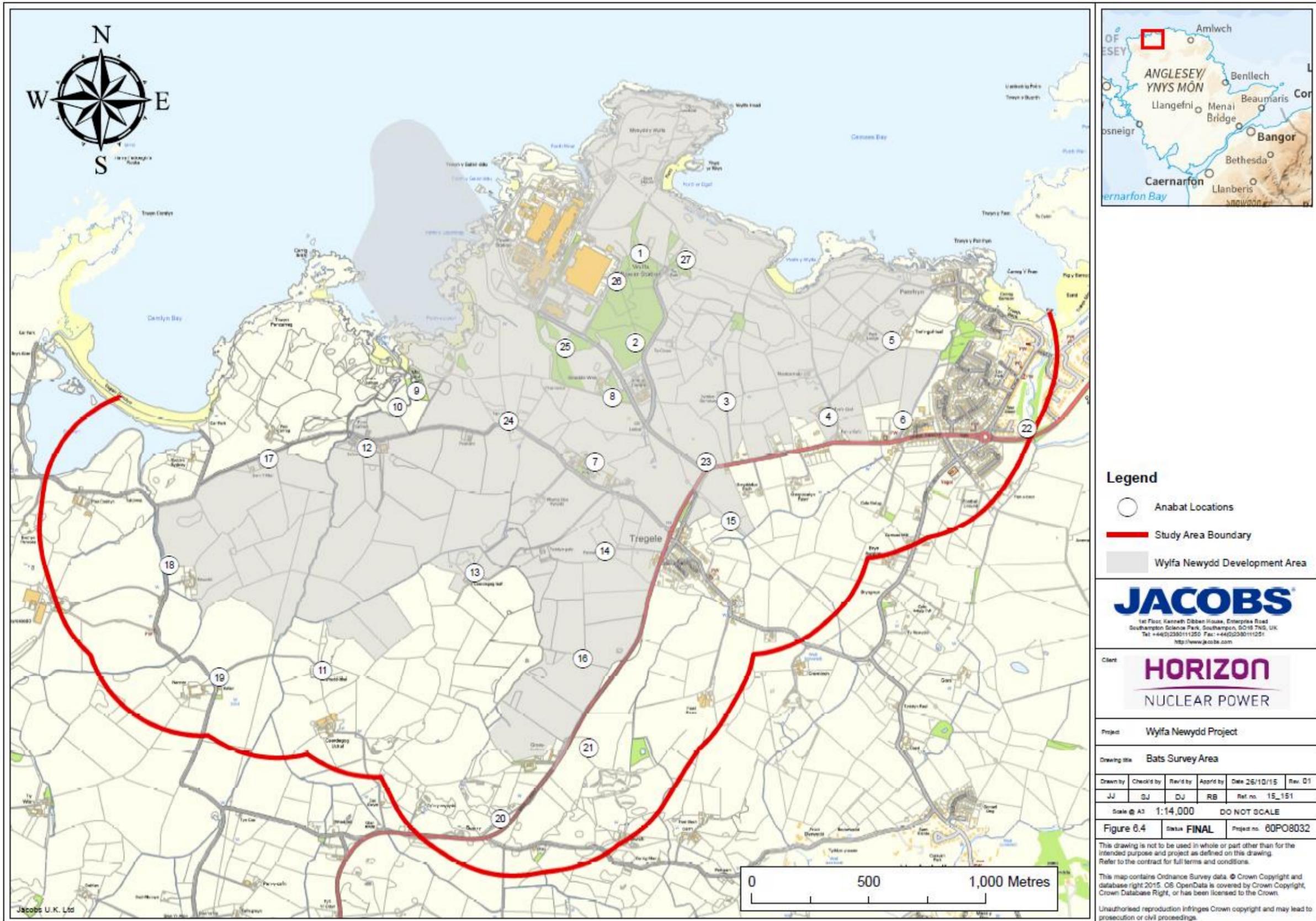


Figure 6.3 Activity survey static detector locations

## Appendix B. Building Survey Summary Tables

The results tables (Table 6.1, Table 6.2, Table 6.3 and Table 6.4) all use the same key to provide the names for the species recorded during the surveys, these are:

- BLE – Brown long-eared bat
- LE – Long-eared bat species (almost certainly brown long-eared based on the southerly distribution of grey long-eared)
- MYO – *Myotis* bat species
- NAT – Natterer's bat
- P45 – Common pipistrelle bat
- P55 – Soprano pipistrelle bat
- Pip – Common or soprano pipistrelle bat
- Uk – Unknown bat species
- WH/BR – Whiskered or Brandt's bat

Table 6.1 Survey results prior to demolition of buildings in the study area

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
Bronydd Garage	Garage	Known roost	BLE x 1	BLE x 1	BLE x 1	BLE x 2 P45 x 1	BLE x 2	Demolished
Bronydd House	Main house	Medium	No bats	No bats	No bats	Demolished	-	-
Bryn Tirion Farm	1	Known roost	-	-	-	-	BLE x 1	Demolished
	2	High	-	-	-	-	No bats	Demolished
	3	Known roost	-	-	-	-	BLE x 1	Demolished
	4	Low	-	-	-	-	No bats	Demolished
	5	Negligible	-	-	-	-	No bats	Demolished
	6	Negligible	-	-	-	-	No bats	Demolished
	7	Negligible	-	-	-	-	No bats	Demolished
Cafnan Farm buildings	1	Known roost	-	BLE x 2	BLE x 2 P45 x 1	BLE x 5	No bats	Demolished
	2	Unknown	-	-	P45 x 1	Demolished	-	-
	3	Unknown	-	-	No bats	Demolished	-	-
	4	Unknown	-	-	No bats	Demolished	-	-
	5	Known roost	-	-	P45 x 1	Demolished	-	-
	6	Unknown	-	-	No bats	Demolished	-	-
	7	Unknown	-	-	No bats	Demolished	-	-
	8	Known roost	-	-	P45 x 1	P55 x 1	No bats	Demolished
	9	Unknown	-	-	No bats	No bats	No bats	Demolished
	10	Known roost	-	-	P55 x 2	P55 x 1	P55 x 1	Demolished

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
	11	Unknown	-	-	No bats	Demolished	Demolished	-
	12	Medium	-	-	No bats	No bats	No bats	Demolished
Chequers and Carina	1	Low	-	No bats	Demolished	-	-	-
Clonmel	Main Building	High	-	No bats	Demolished	-	-	-
	Garage	Low	-	No bats	Demolished	-	-	-
Haul Y Gwynt	Main House	Known roost	P45 x 1	No bats	No bats	Demolished	-	-
	Outbuilding	Low	No bats	-	No bats	Demolished	-	-
Park Lodge	1	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	2	Known roost	-	P45 x 1	No bats	P55 x 1	No bats	Demolished
	3	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	4	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	5	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	6	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	7	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	8	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	9	Unknown	-	No bats	No bats	No bats	No bats	Demolished
	10	Known roost	-	No bats	No bats	No bats	P55 x 1	Demolished
Penrallt corrugated tin sheds	House	Medium	No bats	No bats	No bats	Demolished	-	-
	Outbuilding 1	Known roost	LE x 1	LE x 1	BLE x 1	Demolished	-	-
	Outbuilding 2	Medium	No bats	No bats	No bats	Demolished	-	-
Pen Lon	Main building	Low	No bats	Demolished	-	-	-	-

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
	Outbuilding A	Low	No bats	Demolished	-	-	-	-
	Outbuilding B	Low	No bats	Demolished	-	-	-	-
Pennant House & garage	House	Medium	No bats LE and Pip droppings only	No bats LE and Pip droppings only	No bats	Demolished	-	-
	Garage	Medium	No bats	No bats	No bats	Demolished	-	-
Rhwng Dau Fynydd	House	Unknown	No bats	Demolished	-	-	-	-
	Outbuilding 1	Unknown	No bats	Demolished	-	-	-	-
	Outbuilding 2	Unknown	No bats	Demolished	-	-	-	-
	Outbuilding 3	Unknown	No bats	Demolished	-	-	-	-
Tai-Hirion Barn	Barn	Known roost	MYO x 1	MYO x 1	No bats	Demolished	-	-
Tan-yr-Allt	House	Known roost	P45 x 4 P55 x 1 MYO x 1 BLE x 1	P55 x 1 MYO x 1 LE x 1	P55 x 1	Demolished	-	-
	Barn 1	High	No bats	No bats	No bats	Demolished	-	-
	Barn 2	Medium	No bats	No bats	No bats	Demolished	-	-
	Pig sty	Medium	No bats	No bats	No bats	Demolished	-	-
	Garage	Low	No bats	No bats	No bats	Demolished	-	-
The Boat House	1	Known roost	P45 x 1 NAT x 1	P45 x 2	P45 x 1	Demolished	-	-
The Firs Cottage	House	Low	No bats	Demolished	-	-	-	-
	Garage	Low	No bats	Demolished	-	-	-	-

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
The Firs Hotel	Hotel	Known roost	P55 x 1	-	No bats	Demolished	-	-
Tre'r Gof Uchaf farm buildings	1	Known roost	-	P45 x 3	No bats	Demolished	-	-
	3	Known roost	-	P45 x 1	No bats	Demolished	-	-
Ty Banner	1	Medium	-	-	No bats	No bats	Demolished	-
	Outbuilding 1	Low	-	-	No bats	-	Demolished	-
	Outbuilding 2	Low	-	-	No bats	-	Demolished	-
Ty Croes	1	Known roost	P45 x 1 P55 x 2 LE x 1	P45 x 1 P55 x 1	P55 x 1	Demolished	-	-
	2	Medium	No bats	No bats	No bats	Demolished	-	-
	3	Low	No bats	No bats	No bats	Demolished	-	-
	4	Known roost	No bats	No bats	P55 x 2	Demolished	-	-
	5	Low	No bats	No bats	No bats	Demolished	-	-
Tyddyn Ddu & The Cottage	1	Known roost	P55 x 4	P45 x 1	No bats	Demolished	-	-
Tyn y Maes	House	Known roost	Uk x 1	P45 x 17 P55 x 4 WH/BR x 2	P45 x 10 P55 x 10 WH/BR x 3	Demolished	-	-
	Outbuilding	Low	-	-	-	Demolished	-	-

Table 6.2 Survey results of buildings in the study area unlikely to be affected by the Project

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014
Cafnan Barns	1	Known roost	-	-	P55 x 1	P55 x 1	No bats
	2	High	-	-	No bats	No bats	No bats
	3	High	-	-	No bats	No bats	No bats
Cafnan House	1	Known roost	-	-	No bats	P55 x 4 WH/BR x 1	P45 x 1 P55 x 5 WH/BR x 1
	2	Known roost	-	-	No bats	BLE x 1	No bats
	3	Known roost	-	-	BLE x 1	BLE x 1	No bats
	4	Low	-	-	No bats	No bats	No bats
	5	Known roost	-	-	No bats	No bats	P55 x 1
	6	Low	-	-	No bats	No bats	No bats
	7	High	-	-	No bats	No bats	No bats
	8	Low	-	-	No bats	No bats	No bats
	9	Medium	-	-	No bats	No bats	No bats
Cestyll Gardens Pump House	1	Known roost	-	BLE x 1	No bats	P55 x 2	No bats
	2	Low	-	No bats	No bats	No bats	No bats
Cestyll Mill	1	Known roost	-	MYO x 2 P45 x 1 P55 x 1	P45 x 1	P45 x 1 Uk x 2	P45 x 2 P55 x 1
Felin Cafnan	House	Low	-	-	No bats	-	-
	Barn	High	-	-	No bats	-	-
Morlais	1	Negligible	-	No bats	No bats	No bats	-

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014
Mynydd Ithel	1	Medium	-	-	No bats	No bats	No bats
	2	High	-	-	No bats	No bats	No bats
	3	Known roost	-	-	No bats	P55 x 1	No bats
	4	Known roost	-	-	No bats	P55 x 1	No bats
	5	Low	-	-	No bats	No bats	No bats
	6	Medium	-	-	No bats	No bats	No bats
	7	Low	-	-	No bats	No bats	No bats
	8	High	-	-	No bats	No bats	No bats
	9	Negligible	-	-	No bats	No bats	No bats
	10	Known roost	-	-	P45 x 1	P55 x 1	P55 x 1
Pen Lon	Main building	Low	No bats	Demolished	-	-	-
	Outbuilding A	Low	No bats	Demolished	-	-	-
	Outbuilding B	Low	No bats	Demolished	-	-	-
Ruined Barn (2014)	1	Low	-	-	-	-	No bats
Swan y Mor, House and Farm (2014)	1	Low	-	-	-	-	No bats
	2	Low	-	-	-	-	No bats
	3	Low	-	-	-	-	No bats
	4	Low	-	-	-	-	No bats
	5	Low	-	-	-	-	No bats
	6	Low	-	-	-	-	No bats
	7	Low	-	-	-	-	No bats
	8	Negligible	-	-	-	-	No bats

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014
	9	Negligible	-	-	-	-	No bats
	10	Known roost	-	-	-	-	P55 x 2
	11	Known roost	-	-	-	-	P55 x 1
Tre'r Gof Isaf (2014)	1	Medium-high	-	-	-	-	No bats
	2	Low	-	-	-	-	No bats
	3	Low	-	-	-	-	No bats
	4	-	-	-	-	-	No bats
	5	-	-	-	-	-	No bats
	6	Known roost	-	-	-	-	P55 x 1
	7	Low	-	-	-	-	No bats
Ysgubor Ddegwn	1	Known roost	-	-	No bats	P45 x 1	No bats

Table 6.3 Buildings in the study area that would be demolished as part of the Project

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
Back up Office Facility/Back up Auxiliary Facility	1	Negligible	-	No bats	No bats	No bats	-	No Access
	2	Known roost	-	BLE x 3	BLE x 1	BLE x 2	BLE x 2	No Access
	3	Unknown	-	No bats	No bats	No bats	-	No Access
Caerdegog Isaf	1	Known roost	-	-	No bats	P45 x 1 P55 x 2	P55 x 2	No bats
	2	High	-	-	No bats	No bats	No bats	No bats

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
Coast Guard Lookout	1	Low	-	-	-	-	No bats	No bats
Gardener's cottage outbuildings and wall	House	Known roost	BLE x 2 NAT x 1	LE x 1	No bats	-	-	No bats
	Outbuilding A	Low	No bats	No bats	No bats	-	-	No bats
	Outbuilding B	Low	No bats	No bats	No bats	-	-	No bats
	Outbuilding C	Negligible	No bats	No bats	No bats	-	-	No bats
Leisure Centre	1	Known roost	-	P45 x 1	No bats	No bats	No bats	No bats
	2	Known roost	-	No bats	No bats	No bats	Uk x 1	No bats
	Outbuilding	Low	-	-	No bats	-	-	-
Lower Farm	1	High	-	-	No bats	No bats	No bats	No bats
	2	Known roost	-	-	P55 x 1	P55 x 2	P55 x 1	No bats
	3	Known roost	-	-	No bats	P55 x 1	P55 x 1	P55 x 1
Magnox Depots on Cemlyn Rd	1	Negligible	No bats	No bats	No bats	No bats	No bats	No bats
	2	Known roost	BLE x 3	BLE x 1	No bats	BLE x 2	BLE x 3	BLE x 1 MYO x 1
	3	Medium	No bats	No bats	No bats	No bats	No bats	No bats
Nant Orman	1	Known roost	-	No bats	No bats	P55 x 1	No bats	P55 x 1
	2	High	-	No bats	LE droppings only	No bats	No bats	No bats

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
	3	Known roost	-	No bats	No bats	P55 x 2	No bats	No bats
	4	Negligible	-	-	-	-	-	-
Penralt	Outbuilding 2	Medium	No bats	No bats	No bats	-	No bats	No bats
Pont Cafnan	1	Known roost	-	No bats	No bats	P45/55 x 1	No bats	-
The Firs Hotel	Outbuilding	Known roost	No bats	-	-	NAT x 1	No bats	No bats
The Lodge	The Lodge	Known maternity roost	BLE x 2 MYO x 2 P55 x 1	BLE x 2 MYO x 8 P55 x 2	BLE x 5 NAT x 12	BLE x 5 NAT x 26 (+ young)	BLE x 3 NAT x 38 (+ young) WH X 1	BLE x 4 NAT x 34 (+ young)
The Petrol Station	1	Low	-	-	No bats	No bats	No bats	-
	2	Negligible	-	-	No bats	No bats	No bats	-
	Pump shelter	Negligible	-	-	No bats	No bats	No bats	-
Tre'r Gof Uchaf farm buildings	2 and 4 (buildings are joined)	Known roost	-	P45 x 1 BLE x 1	No bats	P45 x 2 P55 x 2	P45 x 1	No bats
	5	Low	-	No bats	No bats	-	-	No bats
	6	Negligible	-	No bats	No bats	-	-	No bats
Tyddyn Gele	1	Known roost	-	-	P55 x 1 WH/BR x 1	P55 x 2 WH/BR x 1	P45 x 1 P55 x 6	No bats
	2	High	-	-	No bats	No bats	No bats	No bats

Property name	Buildings	Potential rating	2010	2011	2012	2013	2014	2015
	3	Known roost	-	-	No bats	P45 x 1 P55 x 1	BLE x 1	No bats
	4	Known roost	-	-	No bats	No bats	P55 x 1	No bats
	5	Negligible	-	-	No bats	No bats	No bats	No bats
	6	Known roost	-	-	No bats	No bats	P55 x 2	No bats
	7	Low	-	-	No bats	No bats	No bats	No bats
	Containers	Negligible	-	-	No bats	No bats	No bats	-
Tyddyn Grononwy Farm	1	Known roost	-	No bats	No bats	P55 x 1	P45 x 1	P45 x 1
	2	Medium	-	No bats	No bats	No bats	No bats	No bats
	3	Known roost	-	No bats	No bats	No bats	P45 x 1	No bats
	4	Low	-	No bats	No bats	No bats	No bats	No bats
	5	Negligible	-	No bats	No bats	No bats	No bats	No bats
Wylfa Visitor Centre	1	Known roost	P45 x 1	P45 x 1	P55 x 2	P45 x 1	MYO x 4	-
	2	Negligible	No bats	No bats	No bats	No bats	No bats	-
	3	Negligible	No bats	No bats	No bats	No bats	No bats	-

Table 6.4 Mitigation buildings and bat boxes

Mitigation building	2013	2014	2015
Tyn y Maes Bat Barn	P55 X 3	P55 X 9, WH/BR X 8	BLE X 1, P45 X 26, P55 X 31, WH/BR X 8
Tyn y Maes Bat Boxes	No bats	P55 X 2	P55 X 4
Cafnan Farm Wildlife Tower	No bats	No bats	No bats
Caedegog Isaf Wildlife Barn	No bats (three visits)	No bats (two visits)	No bats (two visits)

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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-14  
Consultancy Report: Otter and Water  
Vole Technical Summary Report**

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## Wylfa Newydd

Horizon Nuclear Power (Wylfa) Ltd

### Otter and Water Vole Technical Summary Report

60PO8032/TER/REP/004 | 2

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**APPENDIX C. Cofnod Background Data Search Records**

**APPENDIX D. Survey Data**

## Executive Summary

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey (the Wylfa Newydd Generating Station) as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to different regulators. Jacobs UK Ltd (Jacobs) was commissioned to collect baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Generating Station.

Habitats that had the potential to support otter (*Lutra lutra*) and water vole (*Arvicola amphibius*) were first identified in the Wylfa Newydd Development Area during Phase 1 Habitat surveys in 2009. The habitats present included freshwater rivers, streams, ditches and ponds. The surveys also showed that the marine littoral zone habitats had the potential to support otter. Surveys were extended into a 500m buffer around the boundary of the Wylfa Newydd Development Area in 2013, this is referred to as the 'study area' in this report.

This report summarises the results of surveys of all suitable habitats completed since 2009 for both species, and includes an interpretation of background data gathered for the study area from Cofnod (North Wales Environmental Information Service) and incidental sighting by ecologists completing other surveys throughout the same time period.

The results from the surveys show that there are 29 individual watercourses with the potential to support otter and water vole (including Cemlyn Lagoon). The results also show that the coastal areas either side of the Existing Power Station (Coastal Stretch 1 and Coastal Stretch 2) both have the potential to support otter. Searches for field signs were used as the primary source of evidence in support of species presence.

The evidence from the otter surveys show that otter activity is widespread across the study area, but is focussed to the west, around Cemlyn Lagoon and Watercourse 10 and 12. Evidence is generally limited to spraints, although some prints have been recorded. There have been no live sightings of otter by ecologists from Arup or Jacobs during surveys since 2009, but there is a background data search record from 2001 when a live individual was seen. There is no evidence to suggest that there is breeding in the study area, and it is therefore the foraging resources that are most valuable to otter. The results can also be interpreted to suggest that coastal areas are used for commuting between freshwater outflows, to use the foraging resources. The final conclusion is that the amount of evidence suggests that the study area is likely to fall within the territory of one or two otters, and that it is used regularly but not heavily.

The results from the water vole surveys suggest that water vole are now only present in Watercourses 10, 13, 15 and 19, and that there have been localised extinctions from other watercourses that did have populations of water vole in the past (Watercourse 1, 3 and 8). The most likely causative factor of localised extinctions are: flooding; agricultural practices (especially poaching and over-grazing); prolonged lapses in appropriate management (especially scrub encroachment); and habitat isolation. However, the results also show that the species will persist in sub-optimal areas, tentatively indicating that with some habitat enhancement, populations in the study area could be increased relatively easily.

This evidence shows that otter and water vole are present in the study area and have the potential to be affected by the Project during construction, operation and decommissioning phases. Mitigation in the form of avoidance, minimisation and compensation should therefore be formulated and included within the Project design, development and consenting process.

This report does not recommend that any further baseline surveys are completed to inform any formal impact assessment produced up to the end of 2016 for both species. Should impact assessments be required after this time period then surveys should be completed to update the baseline data available. However, it should be recognised that up-to-date survey data would be required to inform any application for a European Protected Species Mitigation Licence (for otter) or a 'conservation licence' (for water vole) for any activity that would result in an offence being committed.

## 1. Introduction

This report is intended to provide a technical summary of the data collected on otter and water vole within the study area during surveys completed between 2009 and 2014. These data will be used to inform the likely impacts the Project may have on the species, and determine appropriate mitigation where necessary.

### 1.1 Overview

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) comprises the proposed new nuclear power station (the Wylfa Newydd Generating Station), including the reactors, associated plant and ancillary structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities. The Project will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a development consent order.

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Power Station Site. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station and Associated Development.

### 1.2 Wylfa Newydd Project

The Project includes the Wylfa Newydd Generating Station and Associated Development<sup>1</sup>. The Wylfa Newydd Generating Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and ancillary structures and features. In addition to the reactors, development on the Power Station Site (the indicative area of land and sea within which the majority of the permanent Wylfa Newydd Generating Station buildings, plant and structures would be situated) will include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments will include a Cooling Water System (CWS) and breakwater, and a Marine Off-Loading Facility (MOLF).

### 1.3 Site Description

The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site, the Wylfa NPS<sup>2</sup> Site and the surrounding areas that would be used for the construction and operation of the Wylfa Newydd Generating Station) covers an area of approximately 380 ha. It is bounded to the north by the coast and the existing Magnox power station (the Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregle. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

The Wylfa Newydd Development Area includes the headland south of Wylfa Head candidate Wildlife Site. There is one designated site for nature conservation within the Wylfa Newydd Development Area; Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1 km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of Conservation (SAC) SSSI, and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA).

<sup>1</sup> Development needed to support delivery of the Wylfa Newydd Generating Station is referred to as Associated Development. This includes highway improvements along the A5025, park and ride facilities for construction workers, Logistics Centre, Temporary Workers' Accommodation, specialist training facilities, Horizon's Visitor Centre and media briefing facilities.

<sup>2</sup> The site identified on Anglesey by the National Policy Statement for Energy EN-6/NPS EN-6 as potentially suitable for the deployment of a new nuclear power station.

Tre'r Gof is a small basin mire adjacent to the Existing Power Station, west of Cemaes. The area receives mineral-enriched waters from the surrounding boulder clay leading to the development of notable flora. It is the botanical interest that provides the reason for the designation of the site as a SSSI.

Cae Gwyn SSSI is located immediately to the south of the site to the west of Llanfechell. The site comprises two wetland areas separated by an outcrop of rock with heathland vegetation. The southern wetland is confined by a rock basin and is dominated by bogmoss (*Sphagnum* spp.) and a wide variety of common wetland herbs. The northern wetland has a different flora containing denser areas of willow (*Salix* spp.) and common reed (*Phragmites communis*).

## 1.4 Report Aims and Objectives

The purpose of this technical summary is to provide a single resource regarding all survey and background data available for otter and water vole to inform and support the Ecological Chapter of the Environmental Impact Assessment (EIA) for development of the Wylfa Newydd Generating Station.

The specific aims of the surveys completed to date were to:

- identify foraging habitats suitable for otter and water vole within the study area;
- identify presence, distribution, and abundance of otter and water vole in the study area;
- identify the likely breeding status of otter and water vole in the study area; and,
- inform the need for further survey and mitigation.

## 1.5 Previous Work

This report summarises the results of otter and water vole surveys undertaken in the following years:

- extended Phase 1 Habitat Survey Results – 2009 (Arup, 2009 and Arup, 2012a);
- otter surveys – 2010 and 2011 (Arup, 2012b);
- water vole surveys – 2010 and 2011 (Arup, 2012c);
- otter surveys and desk study – 2013 (Jacobs, 2013a);
- water vole surveys – 2013 (Jacobs, 2013b); and
- combined otter and water vole surveys – 2014 (Jacobs, 2014a).

## 1.6 Legal Status

A summary of the legal protection afforded to otter and water vole is provided below.

### 1.6.1 Otter Legal Protection

Otters are protected under UK law by the Wildlife and Countryside Act 1981 (as amended) and also under European law by the EC Habitat Directive (transposed into UK law by the Conservation of Habitats and Species Regulations 2010 (as amended)). The combined effect of this legislation makes it an offence to:

- intentionally or deliberately kill, injure or capture (take) otter;
- deliberately or recklessly disturb otter in such a way which is likely to –
  - i. impair their ability to;
    - survive, to breed or reproduce, or to rear or nurture their young; or
    - migrate;
  - ii. affect significantly the local distribution or abundance of otter; and
- damage, destroy or obstruct access to a breeding site or resting place.

Otter is also included in the UK post 2010 Biodiversity Framework, the Anglesey Local Biodiversity Action Plan, and is listed in accordance with the requirements of Section 42 of the Natural Environment and Rural Communities Act 2006 (NERC). This means that otter must be treated as a material consideration within the planning process.

### **1.6.2 Water Vole Legal Protection**

Water voles in Wales are fully protected under Section 9 of the Wildlife and Countryside Act 1981 (as amended). This legislation makes it an offence to:

- intentionally kill, injure or take water voles;
- intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a water vole; and/or
- intentionally or recklessly disturb water voles occupying any structure or place used for shelter or protection.

Water voles are also included in the UK post 2010 Biodiversity Framework, the Anglesey Local Biodiversity Action Plan and are listed in accordance with Section 42 of the NERC Act. This means that water vole must be treated as a material consideration within the planning process.

## 2. Methodology

### 2.1 Study Area

The study area is dominated by grazed agricultural land and is bounded to the north by coastal grassland and a rocky coastline. There are also stands of woodland, planted as landscaping during the construction of the Existing Power Station, along with areas of scrub and wetland (Jacobs 2013c). There are also habitats present with the potential to support otter and water vole. This includes freshwater habitats e.g. ditches, rivers, ponds and wet areas, and there is also the potential for the intertidal marine habitats to support otter.

Locations of the study area and water bodies are shown in Figure 6.1 (Appendix B). The extent of the study area has expanded since the first surveys in 2009. In 2009 the study area only covered the Power Station Site whereas the most recent surveys in 2014 (Jacobs, 2014a) comprise the Wylfa Newydd Development Area and a 500m buffer zone to give the results more context.

In this report the 'study area' is the term used to describe the area in which all surveyed watercourses were located as shown in Figure 6.1, and no reference is made to any other boundary described in previous reports. The naming of the waterbodies has also changed between survey years. This report brings together the names used into a definitive list providing a clearer understanding of all the evidence collected to date.

The report also includes a review of biological records for the study area and a 2km search radius as provided by Cofnod (The North Wales Environmental Information Service). Data will also be summarised from information contained within incidental records collected by Jacobs ecologists during surveys for other habitats and species between 2013 and 2015 (see Table 6.1, Appendix A).

### 2.2 Otter Survey Methods

The primary survey method has been to search all areas of suitable habitat in the study area for field signs left by otter. This included searching both freshwater habitats and coastal areas. Field signs could include footprints, lying-up sites (couches and hovers), potential holts, prey remains, spraint (see below), and otter paths (Chanin, 2003).

Often the most diagnostic field sign left by otter are faecal remains known as spraint, which were also recorded where found. These were divided into three categories according to their age as listed below.

1. fresh – spraint that is still wet and likely to have been deposited in the past 48 hours.
2. recent – spraint that is still in good condition meaning that it retains its shape and smell. these are likely to have been deposited in the last two weeks.
3. old – spraint that is still recognisable but is washed out and may be degrading in structure and lacks the distinctive smell of spraint. these are likely to have been deposited over two weeks previously.

The surveys also recorded the potential for areas in the immediate vicinity of the watercourse to be used for lying-up by otter, i.e. areas under tree roots, patches of scrub, reedbeds and occasionally man-made structures. The surveys carried out in 2013-2014 also established the likely use of watercourses by otter. This was based on a professional judgement of prey availability for foraging, or whether the watercourse was only likely to act as a commuting route for otter across the study area between foraging grounds. The determination of likely prey species and abundance also included discussions with Jacobs aquatic ecologists who have completed electro-fishing surveys in many of the watercourses present in the study area (see Jacobs, 2015).

### 2.3 Water Vole Survey Methods

The primary survey method in the study area has been to search all areas of suitable habitat in the study area for field signs made by water vole. Field signs left by the species include live sightings, burrows, latrines, feeding remains, and waterside runways in vegetation. The surveys were generally carried out in the spring and then repeated in the autumn. These are the seasons when the animals would be expected to be territorially active and vegetation is generally less thick and field sign is easier to find (Strachan *et al.*, 2011).

Surveyors in 2013-2014 also used professional judgement to determine arbitrary value for the suitability of habitats present to support water vole. This placed the watercourses into one of three categories:

- not suitable – watercourses that do not have the potential to support water vole;
- sub-optimal – this included habitats that do have the potential to support water vole but any likely population may be limited by high levels of poaching or scrub encroachment; or
- optimal – watercourses with habitats that could be described as ideal for water vole.

Surveyors in 2013-2014 also used professional judgement to assess the habitat connectivity of each watercourse. This was based on the number of connections with other watercourses that were present. These assigned to each watercourse one of the following habitat suitability classifications:

- good – watercourses with two or more connections; or
- poor – watercourse with zero or one connection.

## 2.4 Survey Limitations

### 2.4.1 Otter Specific Limitations

It is not possible to accurately assess the population of otter in an area using the survey methods employed to determine the baseline in the study area (Kruuk and Conroy, 1987). However, it is considered that this is mitigated for by the amount of data gathered during four years of surveys, and that there is sufficient information to be able to inform an impact assessment for otter.

Otters are known to occupy extensive territories of up to 30 – 40km, in which they pursue a semi-nomadic existence exploiting seasonally available food sources (Green *et al.*, 1984). Therefore, within an otter territory some areas may not be visited for some time. This could lead to no field signs being recorded in an area for a considerable period despite being within the territory of an otter. This will lead to an assumption that otters are not present at a site, when in fact the resident otter is elsewhere and absent from the site in the short term. This is a limitation caused by the lifestyle of the otter that should be factored in to any impact assessment produced in the future.

Within each year of survey there have also been limitations specific to every survey period e.g. access constraints or flooding in some watercourses. This report does not discuss those limitations in isolation, because there are none that are considered likely to fundamentally alter the conclusions of this report.

### 2.4.2 Water Vole Limitations

Due to the meta-population dynamics of this species, colonies and distribution naturally fluctuate. It is possible that some colonies within the local meta-population could disappear on occasions, only for the watercourse to be re-colonised in the future by dispersing young animals. This factor should be taken into account in any mitigation strategy, and surveys should be updated where necessary where any impacts are likely to affect habitats that could support the water vole.

### 2.4.3 General Limitations

During each year of survey there have been limitations reported that are specific to that year. This most commonly included constraints relating to access, including permission to various watercourses being denied by landowners.

In 2014 access permission was sought for Watercourses 22-24 and 27 located in the south-eastern half of the study area (see Figure 6.1), but was not granted (Jacobs, 2014a). These watercourses are outside of the Wylfa Newydd Development Area but are within the 500m buffer zone, and information would therefore have been useful to provide further context to the results from other watercourses. However, because these watercourses are outside of the Wylfa Newydd Development Area and are unlikely to be directly affected by the Project, it is considered that not having data from these watercourses will not significantly affect the outcome of any impact assessment.

Other limitations are described in individual reports and include thick vegetation or livestock presence preventing surveyors from thoroughly searching some sections of bank. It is considered that these limitations have been mitigated for by the number of years over which survey data has been gathered, and therefore are also unlikely to significantly affect the conclusions of any impact assessment for the Project.

## 3. Results

### 3.1 Background Data Search

The data from Cofnod returned four records of otter between 1981 and 2011. These records included one live sighting and three records of spraint, all from around the Cemlyn Bay Area, and are shown in Appendix C.

Cofnod also have seven records of water vole between 1986 and 2005. These records are also all from the Cemlyn Bay area and include live sighting, prints and burrows. These records are also provided in Appendix C.

### 3.2 Habitat Descriptions

Habitat descriptions are provided below for all 28 watercourses, Cemlyn Lagoon, and the two coastal stretches. These have been extracted from the report that gives the most recent description from that location, and are referenced where necessary. The locations of all watercourses are provided in Figure 6.1.

#### 3.2.1 Watercourse 1

Watercourse 1 is a ditch that runs through the Tre'r Gof SSSI and drains via an underground pipe at the top of the steep coastal bank into the sea at Porth-y-Wylfa. This narrow stream flows through a crevice in the rocks and is only above ground for approximately 20m (Jacobs, 2014a).

#### 3.2.2 Watercourse 2

Watercourse 2 is a ditch that flows into the Tre'r Gof SSSI from the heavily grazed fields to the south and appears to be prone to drying out during the summer months. The banks show some areas are heavily grazed and poached in places. There are also some areas of dense scrub (Jacobs, 2014a).

#### 3.2.3 Watercourse 3

Watercourse 3 forms the eastern boundary of the study area. This narrow stream is approximately 1m wide with banks that are densely vegetated between Cemaes Bay and the culvert under the A5025. The course of the stream is heavily disturbed with a footpath used by dog walkers running along the eastern bank. The water is very shallow over a stony substrate (Jacobs, 2013b).

#### 3.2.4 Watercourse 4

Watercourse 4 is a continuation of Watercourse 3 and flows into the sea at Grid Reference SH 36936 93685 at Cemaes Bay via a culvert. This watercourse flows through pasture and private gardens and is only accessible for a 30m stretch before becoming inaccessible due to a dense stand of giant rhubarb *Gunnera tinctoria*, and dense scrub. A large percentage of the watercourse was not surveyed due to access constraints on the left bank and dense scrub on the right bank (Jacobs, 2014a).

#### 3.2.5 Watercourse 5

Watercourse 5 is a small drainage ditch located at the bottom of an improved grassland field that runs along the road directly south-east of the Visitor Centre. The banks are heavily grazed by sheep. The watercourse is 0.5m wide and has shallow earth banks. The watercourse has poor habitat connectivity and a tendency to dry out during the summer months. Towards the northern end there is a dense sward of vegetation cover dominated by soft rush *Juncus effusus* (Jacobs, 2014a).

#### 3.2.6 Watercourse 6

Watercourse 6 is a relatively short stream that drains the marshy grassland area in the south-east of the survey area and enters the sea at Porth-y-pistyll at Grid Reference SH 34732 93653; it has evidence of poaching by cattle in the past. The stream is overgrown with fool's watercress *Apium nodiflorum* and watercress *Nasturtium*

*officinale* (syn. *Rorippa nasturtium-aquaticum*) which grades into an increasingly dense sward of reed sweet-grass *Glyceria maxima* and branched bur-reed *Sparganium erectum* (Jacobs, 2014a).

### 3.2.7 Watercourse 7

Watercourse 7 is a small ditch located west of Rhwng Dau Fynydd. The channel is around 0.5m in width with earth banks and dense scrub with gorse *Ulex europaeus* and bramble *Rubus fruticosus agg.* (Jacobs, 2013b).

### 3.2.8 Watercourse 8

Watercourse 8 is a large drainage ditch located south of Rhwng Dau Fynydd. The channel is around 1m wide with shallow earth banks and dense vegetation cover and slow-flowing water (Jacobs, 2013b).

### 3.2.9 Watercourse 9

Watercourse 9 is a poached, shallow ditch with a muddy substrate and low banks that drain a pond which borders pasture fields. There is some scrub encroachment into the watercourse by damson/bullace *Prunus domestica* ssp. *insititia*, gorse and hawthorn *Crataegus monogyna* (Jacobs, 2014a).

### 3.2.10 Watercourse 10

Watercourse 10 is up to 4m wide and has a variable depth of up to 0.5m. This stream has a mixture of riparian habitats with a combination of dense scrub, heavily poached and grazed areas and more open areas where emergent vegetation had been able to develop. However, this is limited to areas where either livestock access is restricted by fencing, or cattle are absent (Jacobs, 2014a).

### 3.2.11 Watercourse 11

Watercourse 11 is a spring that flows into the fields to the south of the Tre'r Gof SSSI. For most of its length this stream is little more than a trickle that runs across poached and grazed marshy grassland (Jacobs, 2014a).

### 3.2.12 Watercourse 12

Watercourse 12 is a former mill stream that is a continuation of Watercourse 10, and flows into the sea at Grid Reference SH 34392 93543. Watercourse 12 is approximately 1.5m wide for most of its length and fast flowing where it passes through an ornamental garden planted with a range of exotic plant species (Cestyll Gardens). Upstream of the garden the banks are heavily vegetated with dense scrub dominated by gorse and blackthorn *Prunus spinosa* with occasional hawthorn shrubs (Jacobs, 2014a).

### 3.2.13 Watercourse 13

Watercourse 13 is narrow at only 1m in width for most of its canalised length. Although the watercourse opens out towards the confluence with Watercourse 8 at the eastern end, the remainder of the banks are covered with very dense scrub dominated by bramble (Jacobs, 2013b).

### 3.2.14 Watercourse 14

Watercourse 14 is a very variable stream with the majority of the watercourse swamped by dense scrub on the east bank. The west bank is more open in places but there was no access permission for this bank at the time of the 2013 May survey. The stream is less than 1m in width for the majority of its length, but does open out in places and in these areas there is a dense growth of emergent vegetation with very little open water (Jacobs, 2013b).

### 3.2.15 Watercourse 15

Watercourse 15 is a wide ditch at 3-4m in width that drains from a small conifer plantation at Grid Reference SH 35222 92143 into Watercourse 14. The ditch contains very dense emergent vegetation which is more diverse

at the south-western end near the confluence with Watercourse 14 with greater reedmace *Typha latifolia* being the dominant species. The watercourse has a more grassy monoculture at the eastern end. The banks are very shallow and grazed by sheep. This watercourse was outside the survey boundary during previous surveys (Jacobs, 2013b).

### 3.2.16 Watercourse 16

Watercourse 16 is a shallow ditch that runs adjacent to the Cemlyn Road along the length of one field. For the majority of the length the banks are poached by cattle. The dominant marginal plant is fool's watercress with occasional great willowherb *Epilobium hirsutum*, yellow flag iris *Iris pseudacorus* and soft rush (Jacobs, 2014a).

### 3.2.17 Watercourse 17

Watercourse 17 is upstream of Watercourse 16 and flows through pasture. It is shallow and heavily shaded by overhanging scrub and shrubs. The banks are almost vertical and 1.5m high. Part of this watercourse is adjacent to the properties at Neuadd (Grid Reference SH 33525 92408), and could not be surveyed due to access constraints (Jacobs, 2014a).

### 3.2.18 Watercourse 18

Watercourse 18 is poached in places resulting in a deep muddy bed. The watercourse has open water sections up to 5m wide in certain stretches. It flows along the side of a boundary wall between two fields and drains the farmland at Penyrorsedd. There is a mix of marginal plants that were encroaching into the watercourse in less poached stretches. There is a stand of dense scrub and shrubs on the northern bank (Jacobs, 2014a).

### 3.2.19 Watercourse 19

This watercourse is a continuation of Watercourse 16 which drains into Cemlyn Lagoon. It is heavily poached and up to 0.4m deep in places. Dense bramble is present on the western bank at the upper reaches of the ditch. Downstream both banks are poached with one small stretch on the eastern bank that is vegetated with soft rush before flowing into Cemlyn Lagoon (Jacobs, 2014a).

### 3.2.20 Watercourse 20

Watercourse 18 is a narrow ditch that was up to 0.8m deep, with a deep muddy bed and several stretches that are inaccessible due to overgrowing bramble and scrub. Further downstream the deep mud subsides into a stony bed. At this point the banks are 1.5 - 2m high and clear of overhanging vegetation for approximately 30m (Jacobs, 2014a).

### 3.2.21 Watercourse 21

Watercourse 21 is a ditch that has been widened by poaching along the upstream reach where it flows from the south, draining several pasture fields. The banks are heavily grazed along this section. The ditch then passes through a wet marshy grassland area before flowing into Watercourse 20 (Jacobs, 2014a).

### 3.2.22 Watercourse 22

This watercourse was included in the schedule for 2014 surveys but was not surveyed due to access constraints (Jacobs, 2014a). The limitations of not being able to survey this watercourse are discussed in Section 2.4.3.

### 3.2.23 Watercourse 23

This watercourse was included in the schedule for 2014 surveys but was not surveyed due to access constraints (Jacobs, 2014a). The limitations of not being able to survey this watercourse are discussed in Section 2.4.3.

### 3.2.24 Watercourse 24

This watercourse was included in the schedule for 2014 surveys but was not surveyed due to access constraints (Jacobs, 2014a). The limitations of not being able to survey this watercourse are discussed in Section 2.4.3.

### 3.2.25 Watercourse 25

Watercourse 25 is the river known as the Afon Wygyr and measures 0.2 - 1.5m in depth and 2.5 - 10m in width. The river contains characters such as riffles, slumps, small vegetated islands and runs. The majority of the banks are undercut and the bed is firm and composed of stones and cobbles with scattered boulders. Only a small stretch of suitable water vole habitat exists on the river. This was not surveyed for water vole due to the high level flows when in spate. This was considered to make it unlikely that the species could persist in such an unstable environment (Jacobs, 2014a).

### 3.2.26 Watercourse 26

Watercourse 26 is described under the heading "The Cae Gwyn SSSI" in Jacobs (2013b) and was included in the otter survey in 2013 due to its direct habitat connectivity with watercourses on which evidence of otters had previously been found during Phase 1 Habitat Surveys (Arup, 2009). The SSSI citation mentions two wetland areas within its boundary. The southern wetland is confined by a rock basin and has a 'lawn' of *Sphagnum* spp. and common wetland plants such as bogbean *Menyanthes trifoliata* and marsh cinquefoil *Potentilla palustris*. There was no standing water in this wetland area at the time of the survey. The northern wetland area is characterised by dense growth of common reed *Phragmites communis* and willow *Salix* spp. This dense growth has resulted in the drying out of this wetland and the incursion of dense scrub dominated by bramble. Large areas of this SSSI are rocky outcrops covered primarily with gorse (Jacobs, 2013b).

### 3.2.27 Watercourse 27

This watercourse was included in the schedule for 2014 surveys but was not surveyed due to access constraints (Jacobs, 2014a). The limitations of not being able to survey this watercourse are discussed in Section 2.4.3.

### 3.2.28 Watercourse 28

Watercourse 28 flows along the boundary of one field, under a wall and then beside a second field. A wall is present on the southern bank at the upstream stretch and on the northern bank of the downstream stretch. The banks of the watercourse are heavily grazed and poached on the field sides of the ditch. On the opposite bank dense swards of marginal plants are present (Jacobs, 2014a).

### 3.2.29 Cemlyn Lagoon

The water body at Cemlyn is a brackish lagoon bordered by pasture fields and the Esgair Gemlyn, which is a partly vegetated shingle bar. The lagoon is shallow with a gravel and stone bed. Two large islands are located at the northern end close to the shingle bar. Towards the southern end a stand of greater reedmace is located and several large boulders and large cobbles are situated at the eastern end (Jacobs, 2014a).

### 3.2.30 Coastal Stretch 1

This stretch of coastline comprises the upper shore rocks and splash zone abutting the coastal grassland and heathland of Trwyn Pencarreg to the west, Porth-y-felin and Porth-y-pistyll in the centre, and the Existing Power Station to the east (Jacobs, 2014a).

### 3.2.31 Coastal Stretch 2

This stretch of coastline comprises upper shore rocks and splash zone located at Wylfa Head to the west, Porth yr Ogof and Porth Wylfa in the centre, and Trwyn-y-Penrhyn to the east. The remaining stretch includes part of the beach at Cemaes Bay (Jacobs, 2014a).

## 3.3 Otter Survey Results

Table 6.3 (Appendix D) gives the results of all otter field sign surveys undertaken in 2010, 2011, 2013 and 2014. The table shows which watercourses were surveyed each year and the otter field signs that were found. Table 6.3 also includes incidental records from 2009 when old spraint was recorded in Watercourses 10 and 12 within Cestyll Gardens during Phase 1 Habitat Surveys (Arup, 2012a), and where fresh spraints were recorded in November 2012 at Cemlyn Lagoon by Jacobs ecologists completing marine bird surveys (see Table 6.1 Appendix A).

The locations of the field signs recorded in 2013 and 2014 are given in Figure 6.2. This figure excludes data from 2009-2012 as all locations where evidence from years prior to 2013 were found were re-found in the same location in either 2013 or 2014 and so would be obscured in the figure (e.g. the mouth of Watercourse 1).

In summary the data show that evidence of otter has been found in the following watercourses (including the dates of most the recent records of field signs):

Watercourse 1 – 2013	Watercourse 16 – 2014
Watercourse 3 – 2013	Watercourse 28 – 2014
Watercourse 4 – 2014	Cemlyn Lagoon – 2014
Watercourse 10 – 2014	Coastal Stretch 1 – 2013
Watercourse 12 – 2014	Coastal Stretch 2 – 2014
Watercourse 13 – 2013	

## 3.4 Water Vole Survey Results

Table 6.4 (Appendix D) summarises the results of all water vole field sign surveys undertaken in 2009, 2010, 2011, 2013 and 2014. The table shows the year each watercourse was surveyed and the water vole field signs that were found. The locations of the field signs recorded are given in Figure 6.3.

In summary the data show that evidence of water vole has been found in the following watercourses (including the dates of most the recent records of field signs):

Watercourse 1 – 2010	Watercourse 13 – 2013
Watercourse 3 – 2010	Watercourse 15 – 2013
Watercourse 8 – 2011	Watercourse 19 – 2014
Watercourse 10 – 2014	

## 4. Discussion

### 4.1 Background Data Search

The results from the background data search do not provide any additional information that increases the understanding of the populations of otter and water vole in the study area. This is because the numbers of sightings of both species were very low, and there are no records from areas that are different from those where evidence has been returned in field survey data.

### 4.2 Otter

#### 4.2.1 Interpretation of Otter Survey Data

The results show that there are 11 watercourses in which evidence of otter presence has been recorded during the two survey seasons i.e. 2013 and 2014, although there has been some variation between years. Within these watercourses, only six showed evidence in more than a single year (Watercourses 1, 4, 10, 12, Cemlyn Lagoon and Coastal Stretch 2). This suggests the use of watercourses by otter is potentially sporadic and the habitats are only being used by low numbers of otter.

Figure 6.2 shows that there are four watercourses that are used more frequently by otter (Cemlyn Lagoon, Watercourse 10, 12, 19 and 25), and that the highest of all are Watercourses 10 and 12 (N.B. these watercourses combined are referred to as “Cafnan Stream” or “Afon Cafnan” in other reports). These watercourses are likely to have the highest value for otter due to a number of factors including foraging resources and cover for lying-up sites or potentially, breeding. These factors are discussed in Section 4.2.2, 4.2.3 and 4.2.4.

#### 4.2.2 Otter Foraging Resources

Otter are large animals and inland populations must have access to high quality water habitats with an abundant supply of food. Food for otter includes crustaceans, amphibians and fish, but may also include molluscs and occasionally birds and their eggs (Chanin, 2003). It is therefore reasonable to assume that the watercourses in the study area with the highest levels of prey are likely to have most evidence of otter activity.

Freshwater electrofishing surveys and incidental sightings confirm that the fish fauna in the study area is typical of small coastal streams, and that watercourses generally support brown trout *Salmo trutta*, European eel *Anguilla anguilla*, ninespine stickleback *Pungitius pungitius* and three-spined stickleback *Gasterosteus aculeatus* (Jacobs, 2015). These are all species that would be within the dietary range of otter. The results of freshwater surveys also show that the watercourses that support the highest number of fish are those with the widest and deepest profiles, i.e. Watercourse 10, 12, 19 and 25. This correlates with the watercourses where the highest levels of otter activity have been recorded (see Figure 6.2). Cemlyn Lagoon has also been found to support common goby *Pomatoschistus microps*, flounder *Pleuronectes flesus*, and mullet (*Chelon* spp. or *Liza* spp) (Jacobs 2013d), and helps explain the presence of otter at that location.

The diets of otter are varied and not all prey items are of equal importance as evidenced by their proportional representation in faecal remains. Studies of the diet of otters in Pembrokeshire (CCW, 2009) found that eels were recorded in 67% of samples and are therefore a highly significant prey item. European eels have been recorded throughout the study area during freshwater surveys, and any reduction in eel prevalence could therefore alter the use of the study area by otter. Any new cooling water systems where sea water is extracted for the Project, should therefore consider catadromous species e.g. European eel and brown trout, and the effects that obstructing migration could have on otter.

Amphibians have been found to be an important food resource for otter in the spring as species such as common frog *Rana temporaria* and common toad *Bufo bufo* aggregate in ponds to spawn (Strachan et al., 2006). Preserving amphibian populations in the study area throughout the Project should be a consideration due to the potential for otter to prey on them.

It is known from the composition and prevalence of spraint near the coast that the otters are exploiting the marine environment to some extent (Arup 2012a). This is supported by similar results from the research done in Snowdonia National Park and the Llyn Peninsula (Hall and Williamson 2002a, 2002b).

#### 4.2.3 Otter Laying-up Habitat

Laying up habitat for otter is any cover temporarily used by the species. In the study area this would mostly comprise scrub and represents 2% of the total habitat (see Figure 6.2 – N.b. areas less than 20m<sup>2</sup> are not included in this figure due to issues of resolution). No live otter have ever been sighted in the study area by ecologists during six years of survey work covering a range of habitats and species. This suggests that watercourses are potentially accessed mainly from the coast and then used for foraging by otter, before returning to laying-up or holt sites outside the study area. It also suggests the use of the study area is exclusively nocturnal.

The areas shown in Figure 6.2 include Tre'r Gof SSSI as lying-up habitat, but not as potential breeding habitat. This is because of intermittent floods during the winter and spring, and possible flash flooding during the summer months, posing too high a risk to pups. There is a possibility for the site to be used for lying-up, but it is considered that this would only be possible during the summer months when water levels are lower.

#### 4.2.4 Otter Breeding Habitat

There are a number of habitat characteristics that are commonly shared among known breeding sites, including (after Liles, 2003):

- security from disturbance;
- one or more potential natal den sites;
- play areas for cubs;
- no risk of flooding; and
- access to an abundant food supply.

It is considered that habitats which fulfil all of these criteria are rare within the study area and no evidence of breeding otter has ever been recorded e.g. juvenile otter prints, habitat features that appear to be used as holts, or amounts of spraint suggestive of the high levels of activity associated with a female otter supporting pups. It is therefore considered that the study area has not supported a female with dependent young during the study period, but that areas around Cae Gwyn SSSI and Cemlyn Lagoon have habitats with the potential to do so. This would include gorse thickets as there are examples in Wales of natal dens having been reported in above-ground situations e.g. scrub thickets including gorse (Liles, 2003).

Cae Gwyn SSSI has direct connectivity with watercourses regularly used by otters, and to the coast via these watercourses. The very dense scrub habitats combined with the wetland element of this area suggest that this is the most likely potential breeding site in the survey area. It is therefore considered that the study area has never supported a female with dependent young, but that areas around Cae Gwyn SSSI and Cemlyn Lagoon have habitats with the potential to do so.

In Britain, it is generally accepted that there is no definitive breeding season and that births occur in every month of the year (Mason and Macdonald, 1986, from Liles, 2003). However, data collected from road casualties, orphaned otters and juvenile otter sightings suggest that in Wales there is a bias towards autumn and winter births (Liles, 2003), with births occurring in late winter potentially taking advantage of amphibians as a readily available resource (Strachan et al., 2006).

#### 4.2.5 Otter Populations on Anglesey

The results of the 2010 National Otter Survey of Wales show a significant increase in the otter population on Anglesey since the previous surveys (Strachan, 2010). In the 1977-78 survey 18% of the survey sites on the island were positive (Strachan, 2010). This dropped to 0% in both the 1984-85 and the 1991 surveys, before recovering to 18% in 2002 (Andrews and Crawford, 1986, Jones and Jones, 2004).

The results of the 2014 survey show that 67.5% of the sites surveyed have now shown use by otter (Jacobs, 2014a), and that carrying capacity is likely to be reached within the next ten years.

Although the number of spraint does not have a direct correlation to the number of resident otters present (Kruuk and Conroy, 1987), the results from several years of survey are suggestive of habitats within the survey area falling into territory of at least one otter, and that use of the study area is sparing but regular. As a result of the continued population expansion, occupied male and female home ranges will increasingly overlap to larger degrees. As time passes, the probability of breeding otters within the survey area boundary will become more likely, therefore, the current rate of otter range expansion and the potential for the site to support a larger population must be considered in any future assessments.

## 4.3 Water Vole

### 4.3.1 Water vole in the Study Area

The survey data (Figure 6.3) show that there have been a total of seven watercourses that have supported water vole within the study area since 2010 (Watercourses 1, 3, 8, 10, 13, 15 and 19). The data also show that water vole is likely to have disappeared from Watercourses 1, 3 and 8 as there have not been records of the species since 2011. The loss of water vole from Watercourses 1, 3 and 8 has been attributed to several different factors, described below.

Watercourse 1 is a very short section of ditch that is only above ground for 20m. The ditch is within the mire habitats of Tre'r Gof SSSI and only Watercourses 2 and 11 are nearby, making Watercourse 1 poor in terms of habitat connectivity. It has previously been concluded that flooding of the area may have been the primary cause of the extinction (Jacobs, 2013b), and that isolation from other populations in the study area may inhibit recolonisation.

In Watercourse 3, evidence of water vole activity was recorded in 2009 (Arup, 2009) including feeding remains and latrines. In 2010 the evidence recorded in Watercourse 3 was extremely limited and consisted of a single water vole dropping (Arup, 2010). By 2013 no evidence of water vole was found (Jacobs, 2013b). The habitats in this watercourse are generally sub-optimal due to the rocky substrate and lack of connectivity with other populations in the study area. Scrub encroachment was also observed to make the suitability of the watercourse progressively worse for water vole following each year of survey.

Evidence of water vole was last recorded in Watercourse 8 in 2011, although the details of the evidence have not been provided in baseline reports (Arup, 2012 or Arup, 2013). There was no evidence of water vole activity recorded in Watercourse 8 in 2013, surveys showing that the ditch had silted up and was heavily poached by cattle, and that there was no open water (Jacobs, 2013b). This level of habitat degradation is likely to have significantly contributed to extinction of water vole in Watercourse 8 and, although the ditch is connected to an extant population nearby, significant management would be required to make it possible for water vole to return.

Watercourses 10, 13 and 15 are all interconnected providing populations of water vole the potential to migrate into new areas. The opportunity for water vole to recolonise other watercourses is vital for the maintenance of a long-term viable population. Moreover, this mitigates the impacts of future extinction events by allowing recolonisation in the future.

Water vole populations in Watercourse 19 are likely to be vulnerable to extinction due to three factors:

1. The size of the suitable habitat is limited to a 40m<sup>2</sup> stretch that is very unlikely to be able to support a viable population in the long term.
2. The heavy poaching by cattle is preventing establishment of marginal plants in the area and therefore severely restricting expansion of suitable habitat.
3. The nearest suitable habitat is 150m upstream at Watercourse 16.

As evidenced by populations disappearing in Tre'r Gof SSSI and Watercourse 3, localised extinctions have occurred in the past and must be considered a possibility when determining likely impacts of environmental changes caused by the Project.

All of the surveyed watercourses and/or their associated habitat would provide some level of foraging resource, cover, burrowing substrate or nesting materials. However, several watercourses have limiting factors such as scrub encroachment, shading (reducing macrophyte cover), short length, poor connectivity, heavy grazing and/or suffer from poaching pressure. However, it is noteworthy that Watercourses 10 and 19 both suffer from over-grazing and poaching. This indicates that water vole are using areas that could be considered to be sub-optimal, and highlights the potential for enhancement measures to some watercourses which would not need to be very extensive to have positive benefit.

All of the aforementioned factors will contribute in reducing the ability of water vole to maintain a viable population in the long term. However, connectivity is considered to be the most important factor to conserve water voles in the study area by enabling the species to react to environmental changes and stochastic events.

#### **4.3.2 Water Vole Populations on Anglesey**

Water voles are found throughout England, Wales and Scotland, but are absent from Ireland. The British water vole population has suffered a steady decline disappearing from approximately 94% of their former range (The Mammal Society, 2013) owing to habitat loss and agricultural intensification (Strachan et al., 2006). This decline has been rapidly accelerated in recent years through predation by feral American mink *Mustela vison* (Strachan et al., 2011).

Anglesey is potentially of national importance for water voles in Britain due to the abundance of the species and habitats with the potential to support them e.g. small rivers and lakes (Menter Môn, 2013). Menter Môn therefore created The Water Vole Project with the aim of improving habitats for the species as well as halting the impact of mink, which were first caught on the island in 2005. The results of this work have been encouraging in that water vole numbers are stable, and it appears that the mink population is at such low numbers that the population of water vole is still able to thrive.

The evidence suggests that the four small watercourses in the study area do not support high numbers of water voles. It is therefore considered that the population is potentially not significant in the context of the whole of Anglesey or the UK, and would be of local value. However, the evidence also suggests that water vole were more prevalent in the past. What has happened in the study area is therefore potentially representative of what has happened to water vole in the UK over the past few decades e.g. land management practices have resulted in modifications to the riparian corridor thus reducing the quality of available habitat for water voles.

## 5. Conclusions and Recommendations

The results from the surveys show that otter and water vole are both species that have a long history of being present in the study area, and although they are present in low numbers, they are protected species that do form important ecological receptors and could be affected by the Project.

The evidence from the otter surveys show that otter activity is widespread across the study area, but is focussed to the west, around Cemlyn Lagoon and Watercourses 10 and 12. Field evidence is generally limited to spraints, although some prints have been recorded. There have been no live sighting by ecologists from Arup or Jacobs during surveys since 2009, but there is a record from 2001 when a live individual was seen. There is no evidence to suggest that there is breeding in the study area, and it is therefore the foraging resources that are most valuable to otter. The results can also be interpreted to suggest that coastal areas are used for commuting between freshwater outflows, to use the foraging resources. The final conclusion is that the amount of evidence suggests that the study area falls within the territory of one or two otter, and that it is used regularly but not heavily.

The results from the water vole surveys suggest that water vole are now only present in Watercourses 10, 13, 15 and 19, and that there have been localised extinctions from other watercourses that did have populations of water vole in the past. Flooding, agricultural practises, prolonged lapses in appropriate management and habitat isolation seem to be the most likely causative factors of localised extinctions. However, the results also show that the species will persist in sub-optimal areas, tentatively indicating that with some habitat enhancement, populations in the study area could be increased relatively easily.

The survey data show that the otter usage has changed relatively little over the period that this report covers. However, it should be recognised that otter numbers are increasing nationally, and although unlikely, the potential for breeding in the study area (especially around Cemlyn Lagoon) should not be discounted. This potential is extended to Cae Gwyn SSSI to a much lesser degree, when considered in the context of all the data available for the study area.

This report does not recommend that any further baseline surveys are completed to inform any formal impact assessment produced up to the end of 2016 for both species. Should impact assessments be required after this time period then surveys should be completed to update the baseline data available. However, it should be recognised that up-to-date survey data would be required to inform any application for a European Protected Species Mitigation Licence (for otter) or a 'conservation licence' (for water vole) for any activity that would result in an offence being committed.

The recommendations for mitigation approaches are not within the scope of this report but it is appropriate to introduce high-level strategies that are likely to be implemented during the Project. For both species the following methods should be employed to avoid, minimise and compensate for impacts:

- work exclusion zones around watercourses where possible;
- appropriate lighting around watercourses;
- use of culverts should be avoided where new watercourse crossings are proposed (clear-span bridges should be used instead);
- installation of otter ledges where use of culverts is unavoidable; and/or
- translocation of water vole may be required where impacts to banksides that support water vole cannot be avoided.

## 6. References

- Andrews, E., and Crawford, A.K., (1986), *Otter survey of Wales 1984 - 85*, Vincent Wildlife Trust: London.
- Arup, (2009), *Phase 1 Habitat & Protected Species Survey*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2010), *Interim Water Vole Survey Report 2010 – Wylfa New Nuclear Power Station*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2012a), *2009-2011 Ecological Baseline Report*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2012b), *Otter survey report 2010 - 11 – Wylfa Nuclear Power Station*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2012c), *Water vole survey report 2010 - 11 – Wylfa Nuclear Power Station*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup, (2013), *Consolidated Baseline and Assessment Report 2012*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- CCW, (2009), *Pembrokeshire Marine European Marine Site – Advice provided by the Countryside Council for Wales in Fulfilment of Regulation 33 of the Conservation (Natural Habitats, &c.) Regulations 1994*, [Online] Available at [http://www.ukmpas.org/pdf/Sitebasedreports/Pembrokeshire\\_Marine\\_Reg\\_33\\_Advice\\_Feb\\_2009.doc.pdf](http://www.ukmpas.org/pdf/Sitebasedreports/Pembrokeshire_Marine_Reg_33_Advice_Feb_2009.doc.pdf), [accessed 13/08/15].
- Chanin, P., (2003), *Monitoring the Otter Lutra lutra*, *Conserving Natura 2000 Rivers Monitoring Series No. 10*, English Nature: Peterborough.
- Green, J., Green, R. and Jefferies, D. J., (1984), A radio tracking survey of otters *Lutra lutra* on a Perthshire river system, *Lutra*, 27: 85 – 145.
- Hall, C. and Williamson, K., (2002a), *A Pilot Study of the Coastal Ecology of the Otter (Lutra lutra) in North Wales*, Part 1: The Lleyn Peninsula.
- Hall, C. and Williamson, K., (2002b), *A Pilot Study of the Coastal Ecology of the Otter; (Lutra lutra) in North Wales*, Part 2: The Snowdonia National Park.
- Jacobs, (2013a), *Consultancy Report: Otter (Lutra lutra) Baseline Surveys 2013*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. W202.01-S5-PAC-REP-00001.
- Jacobs, (2013b), *Consultancy Report: Water Vole Baseline Surveys 2013*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. W202.01-S5-PAC-REP-00002.
- Jacobs, (2013c), *Consultancy Report: A Phase 1 Habitat Survey*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. W202.01-S5-PAC-REP-00015.
- Jacobs, (2013d), *Consultancy Report: Cemlyn Lagoon – An Ecology Review 2013*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. B1496000/WP4-19/R001.
- Jacobs, (2014a), *Consultancy Report: Otter (Lutra lutra) and Water Vole (Arvicola amphibius) Baseline Surveys 2014*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. WN03.01.01-S5-PAC-REP-00008.

Jacobs, (2014b), *Consultancy Report: Great Crested Newt Baseline Surveys 2014*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. WN03.01.01-S5-PAC-REP-00007.

Jacobs, (2015), *Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2014*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd., Ref. WN03.01.01-S5-PAC-REP-00020.

Jones, T. and Jones, D., (2004), *Otter Survey of Wales 2002*, Environment Agency: Bristol.

Kruuk, H. and Conroy, J. W. H., (1987), *Surveying Otter Populations: A discussion of problems with spraints*, *Biological Conservation*, 41: 179 – 183.

Liles, G., (2003), *Otter Breeding Sites*, Conservation and Management Conserving Natura 2000 Rivers Conservation Techniques Series No.5, English Nature: Peterborough.

Menter Môn, (2013), *The Water Vole Project*, [Online] Available at <http://www.mentermon.com/water-vole-project.htm>, [Accessed: 18/12/13].

Strachan, R., (2010), *Fifth Otter survey of Wales 2009-2010*, Natural Resources Wales.

Strachan, R., Moorhouse, T. and Gelling, M., (2011), *Water Vole Conservation Handbook 2<sup>nd</sup> Edition*, WildCru: Oxford.

Strachan, R., Williamson, K., Hall, C. and Bayliss, J., (2006), *Dietary Study of Otters in North Wales*. Species Challenge Fund Project 2005.

The Mammal Society, (2013), *Species factsheet: Water vole (*Arvicola terrestris*)*, [Online] Available at <http://www.mammal.org.uk/watervole>, [Accessed 18/12/2013].

## Appendix A. Incidental Records

Table 6.1 Incidental records from Jacobs ecologists

Scientific Name	English Name	Location	Record Date	Abundance
<i>Lutra lutra</i>	Otter	Cemlyn Lagoon - two separate locations	01/11/12	Recent spraint
<i>Lutra lutra</i>	Otter	Cemlyn Lagoon - eastern end	01/03/13	Fresh spraint
<i>Lutra lutra</i>	Otter	Watercourse 13 west of Caedegog Isaf	31/05/13	Prints and spraint
<i>Lutra lutra</i>	Otter	Ditching running south of Pont Cafnan	22/07/13	Prints and spraint
<i>Arvicola amphibius</i>	Water vole	Cafnan Watercourse	09/07/14	Feeding station and latrine

## Appendix B. Figures

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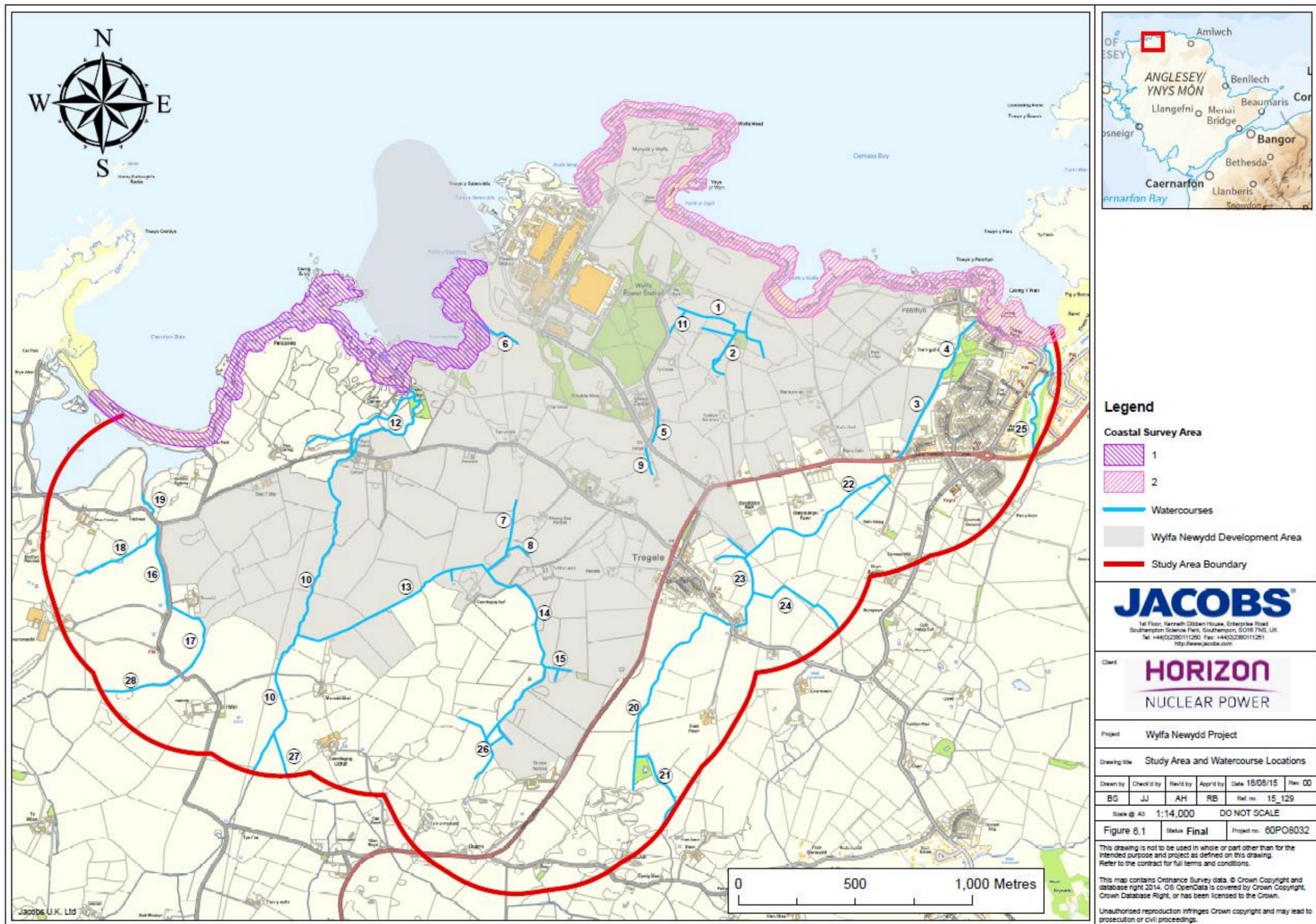


Figure 6.1 Study area and watercourse locations

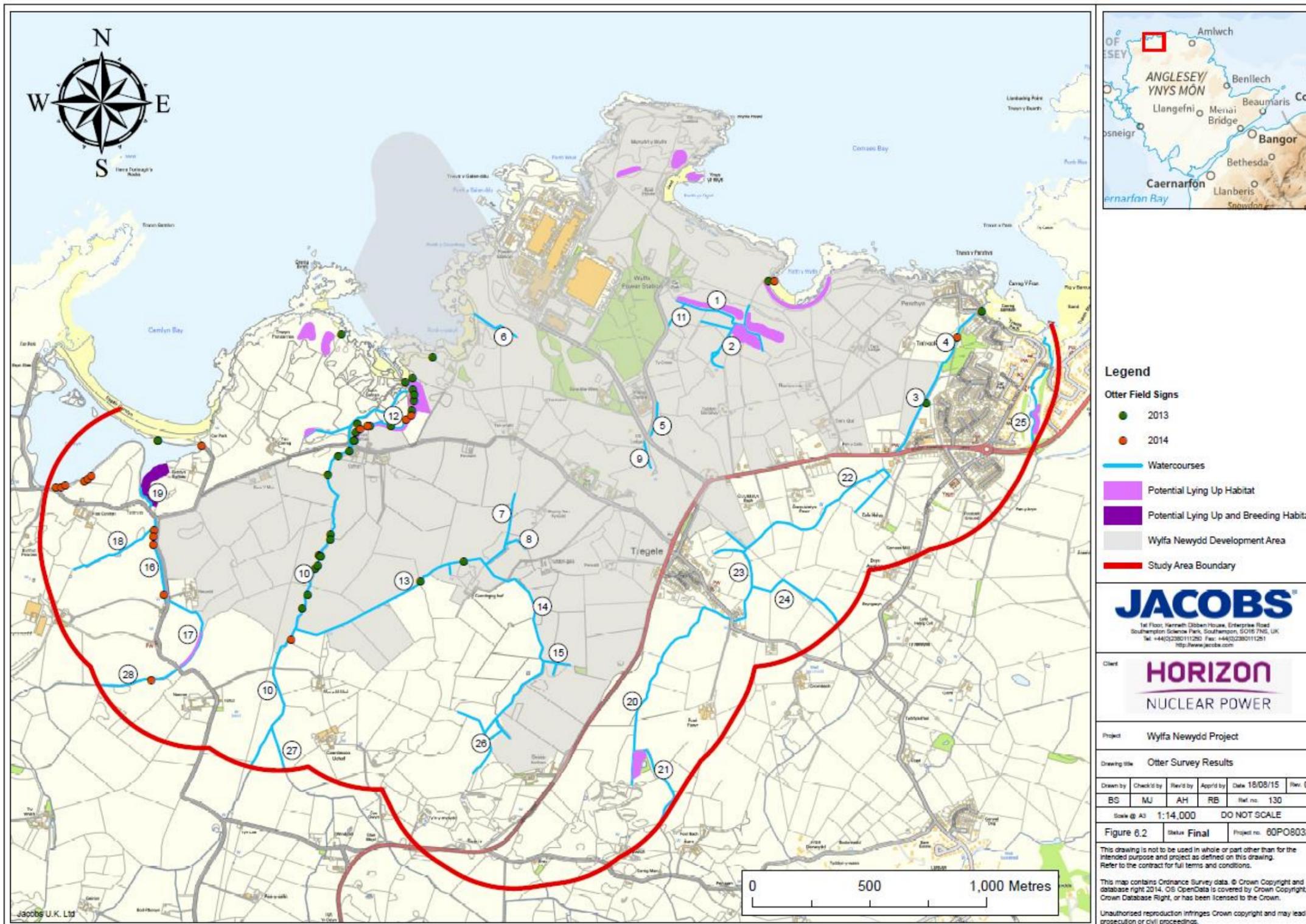


Figure 6.2 Otter survey results 2013 and 2014



Figure 6.3 Water vole survey results

## Appendix C. Cofnod Background Data Search Records

Table 6.2 Cofnod background data search records

Scientific Name	English Name	Location	Record Date	Abundance
<i>Lutra lutra</i>	Otter	Cemlyn (Compartment 13)	Before September 1990	Not given
<i>Lutra lutra</i>	Otter	In the sea	01/09/2001	1
<i>Lutra lutra</i>	Otter	SSSI: Cemlyn Bay	Before 12/08/1981	Sprint only
<i>Lutra lutra</i>	Otter	Cemlyn; The Trwyn	12/06/2011	1
<i>Arvicola amphibius</i>	Water vole	Cemlyn – Compartment 541; Eastern Car Park	09/06/1986	1
<i>Arvicola amphibius</i>	Water vole	Cemlyn – Compartment 541; Eastern Car Park	03/07/1986	2
<i>Arvicola amphibius</i>	Water vole	Cemlyn	17/05/2008	Prints only
<i>Arvicola amphibius</i>	Water vole	Cemlyn	23/05/2001 – 26/07/2001	Heard only
<i>Arvicola amphibius</i>	Water vole	Cemlyn	28/06/1999	1 (seen in mouth of weasel)
<i>Arvicola amphibius</i>	Water vole	Cemlyn	Spring 1998 – Summer 1998	Burrows
<i>Arvicola amphibius</i>	Water vole	Cemlyn	10/06/2005	1

## Appendix D. Survey Data

Table 6.3 Summary of all otter survey results (watercourses where evidence of the species has been found are highlighted in blue)

Watercourse name	Most recent survey date	Potential lying-up sites	Foraging and/or commuting habitat	2009	2010	2011	2013	2014
Watercourse 1	Jacobs (2014a)	Yes	Commuting and foraging.	No evidence.	No evidence.	Fresh spraint (same location as 2013 and 2014).	Fresh spraint.	No evidence.
Watercourse 2	Jacobs (2014a)	Yes	Commuting and foraging.	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 3	Jacobs (2013b)	Yes	Commuting and foraging.	No evidence.	No evidence.	No evidence.	Fresh spraint.	Not surveyed. <sup>3</sup>
Watercourse 4	Jacobs (2014a)	No	Commuting and foraging.	No evidence.	No evidence.	No evidence.	Fresh spraint.	Old spraint.
Watercourse 5	Jacobs (2014a)	No	Commuting only.	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 6	Jacobs (2014a)	No	Commuting and foraging.	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 7	Jacobs (2013b)	Yes	Commuting and foraging.	No evidence.	No evidence.	No evidence.	No evidence.	Not surveyed.
Watercourse 8	Jacobs (2013b)	Yes	Commuting and foraging.	No evidence.	No evidence.	No evidence.	No evidence.	Not surveyed.
Watercourse 9	Jacobs (2014a)	No	Commuting and foraging.	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.

<sup>3</sup> "Not surveyed" indicates where access permission was not granted for that watercourse in that year of survey.

Watercourse name	Most recent survey date	Potential lying-up sites	Foraging and/or commuting habitat	2009	2010	2011	2013	2014
Watercourse 10	Jacobs (2014a)	No	Commuting and foraging.	Fresh spraint (same location as 2013 and 2014).	No evidence.	No evidence.	Fresh spraint and prints.	Fresh spraint.
Watercourse 11	Jacobs (2014a)	No	Commuting only.	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 12	Jacobs (2014a)	Yes	Commuting and foraging.	Fresh spraint (same location as 2013 and 2014).	Old spraint (same location as 2013 and 2014).	Old spraint (same location as 2013 and 2014).	Old spraint and prints.	Fresh spraint.
Watercourse 13	Jacobs (2013b)	Yes	Commuting and foraging.	- <sup>4</sup>	-	-	Fresh spraint and prints.	Not surveyed.
Watercourse 14	Jacobs (2013b)	Yes	Commuting and foraging.	-	-	-	No evidence.	Not surveyed.
Watercourse 15	Jacobs (2013b)	Yes	Commuting and foraging.	-	-	-	No evidence.	Not surveyed.
Watercourse 16	Jacobs (2014a)	No	Commuting and foraging.	-	-	-	-	Fresh spraint.
Watercourse 17	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	No evidence.
Watercourse 18	Jacobs (2014a)	No	Commuting and foraging.	-	-	-	-	No evidence.
Watercourse 19	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	No evidence.
Watercourse 20	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	No evidence.

<sup>4</sup> "-" indicates that surveys of this watercourse were not included in the scope of the survey in that year.

Watercourse name	Most recent survey date	Potential lying-up sites	Foraging and/or commuting habitat	2009	2010	2011	2013	2014
Watercourse 21	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	No evidence.
Watercourse 22	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 23	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 24	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 25	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	No evidence.
Watercourse 26	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	No evidence.	Not surveyed.
Watercourse 27	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 28	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	-	Fresh spraint.
Cemlyn Lagoon	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	Fresh spraint.	Fresh spraint.
Coastal Stretch 1	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	Fresh spraint.	No evidence.
Coastal Stretch 2	Jacobs (2014a)	Yes	Commuting and foraging.	-	-	-	Fresh spraint.	Fresh spraint.

Table 6.4 Summary of all water vole survey results (watercourses where evidence of the species has been found are highlighted in green)

Watercourse name	Most recent survey date	Habitat quality assessment	Habitat connectivity assessment	2009	2010	2011	2013	2014
Watercourse 1	Jacobs (2014a)	Optimal	Poor	Burrows, latrines and feeding stations.	Latrines and feeding stations.	No evidence.	No evidence.	No evidence.
Watercourse 2	Jacobs (2014a)	Sub-optimal	Poor	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 3	Jacobs (2013c)	Optimal	Poor	Latrines and feeding stations.	Latrine	No evidence.	No evidence.	Not surveyed. <sup>5</sup>
Watercourse 4	Jacobs (2014a)	Sub-optimal	Good	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 5	Jacobs (2014a)	Sub-optimal	Poor	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 6	Jacobs (2014a)	Optimal	Poor	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 7	Jacobs (2013c)	Sub-optimal	Good	No evidence.	No evidence.	No evidence.	No evidence.	Not surveyed.
Watercourse 8	Jacobs (2013c)	Sub-optimal	Poor	No evidence.	No evidence.	Latrine	No evidence.	Not surveyed.
Watercourse 9	Jacobs (2014a)	Optimal	Poor	No evidence.	No evidence.	No evidence.	No evidence.	No evidence.
Watercourse 10	Jacobs (2014a)	Optimal	Good	No evidence.	No evidence.	No evidence.	Latrines	Latrines and feeding stations.

<sup>5</sup> "Not surveyed" indicates where access permission was not granted for that watercourse in that year of survey.

Watercourse name	Most recent survey date	Habitat quality assessment	Habitat connectivity assessment	2009	2010	2011	2013	2014
Watercourse 11	Jacobs (2014a)	Not suitable for water vole.	Poor	- <sup>6</sup>	-	-	No evidence.	No evidence.
Watercourse 12	Jacobs (2014a)	Not suitable for water vole.	Good	-	-	-	No evidence.	No evidence.
Watercourse 13	Jacobs (2013c)	Optimal	Good	-	-	Latrine	Latrines	Not surveyed.
Watercourse 14	Jacobs (2013c)	Optimal	Good	-	-	-	No evidence.	Not surveyed.
Watercourse 15	Jacobs (2013c)	Optimal	Good	-	-	-	Latrines	Not surveyed.
Watercourse 16	Jacobs (2014a)	Sub-optimal	Good	-	-	-	-	No evidence.
Watercourse 17	Jacobs (2014a)	Optimal	Good	-	-	-	-	No evidence.
Watercourse 18	Jacobs (2014a)	Optimal	Good	-	-	-	-	No evidence.
Watercourse 19	Jacobs (2014a)	Optimal	Good	-	-	-	-	Live sightings, burrows, prints, latrines and feeding stations.
Watercourse 20	Jacobs (2014a)	Optimal	Good	-	-	-	-	No evidence.

<sup>6</sup> "-" indicates that surveys of this watercourse were not included in the scope of the survey in that year.

Watercourse name	Most recent survey date	Habitat quality assessment	Habitat connectivity assessment	2009	2010	2011	2013	2014
Watercourse 21	Jacobs (2014a)	Optimal	Good	-	-	-	-	No evidence.
Watercourse 22	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 23	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 24	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 25	Jacobs (2014a)	Optimal	Good	-	-	-	-	Not surveyed.
Watercourse 26	Jacobs (2014a)	Optimal	Good	-	-	-	No evidence.	Not surveyed.
Watercourse 27	Jacobs (2014a)	Unknown	Unknown	-	-	-	-	Not surveyed.
Watercourse 28	Jacobs (2014a)	Optimal	Good	-	-	-	-	No evidence.
Cemlyn Lagoon	Jacobs (2014a)	Sub-optimal	Good	-	-	-	-	No evidence.



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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-15  
Red Squirrel Technical Summary Report**

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## Wylfa Newydd

Horizon Nuclear Power (Wylfa) Ltd

### Technical Summary Report - Red Squirrel

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## Wylfa Newydd Project

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### APPENDIX A. Figures

## Executive Summary

Horizon Nuclear Power Wylfa Limited (Horizon) is planning to develop a new Nuclear Power Station on Anglesey (the Wylfa Newydd Generating Station) as identified in the *National Policy Statement for Nuclear Power Generation (EN-6)* (Department of Energy and Climate Change, 2011). The Wylfa Newydd Project will require a number of applications to be made under different legislation to different regulators. Jacobs U.K. Limited (Jacobs) was commissioned to collect baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Generating Station.

Following two incidental sightings of red squirrel in the Wylfa Newydd Development Area, one from the Red Squirrels Trust Wales (2016) website and the second by a Horizon contractor working on the Wylfa Newydd Project, Jacobs was commissioned by Horizon to undertake red squirrel surveys.

This report summarises the results of surveys of habitats that had the potential to support red squirrel (scrub and woodland) within the Wylfa Newydd Development Area and a 50 m buffer zone. The total area surveyed is called the 'study area' in this report. The survey results indicate that squirrels are present within the study area, with feeding evidence of squirrels recorded within seven areas of woodland habitat.

Only one drey was recorded in the study area, in woodland east of the Existing Power Station, and is located 12 m outside of the area to be cleared in preparation for the Wylfa Newydd Project. This drey is therefore likely to be subject to disturbance during clearance and construction works. Other effects include habitat loss and the potential for mortality and injury effects should new dreys be recorded within the woodland that is to be felled as a result of the Wylfa Newydd Project.

This report also details mitigation to minimise the levels of potential disturbance to red squirrel and their dreys, including scheduling works to avoid the squirrel breeding season (February to September, inclusive), conducting pre-works surveys and setting up protection zones around dreys.

## 1. Introduction

This report provides a technical summary of the data collected on red squirrel (*Sciurus vulgaris*) within the study area during surveys completed in May 2016. These data are then used to identify the potential for effects on red squirrel as a result of the Wylfa Newydd Project. This report also describes a range of mitigation measures likely to minimise or compensate for any effects.

### 1.1 Overview

Horizon is currently planning to develop a new Nuclear Power Station on Anglesey, as identified in the *National Policy Statement for Nuclear Power Generation (EN-6)* (Department of Energy and Climate Change, 2011). The Wylfa Newydd Project comprises the Wylfa Newydd Generating Station, including the reactors, associated plant and Ancillary Structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities. The Wylfa Newydd Project will require a number of applications to be made under different legislation to different regulators. As a Nationally Significant Infrastructure Project under the *Planning Act 2008*, the construction and operation must be authorised by a development consent order.

Jacobs was commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Power Station Site. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station and Associated Development.

Previous background data search information provided by Cofnod to Jacobs in 2013 did not return any records of red squirrels within 2 km of the study area. Combined with the limited amount of suitable habitat in the local area and geographical separation from nearby populations, the species was therefore considered to be absent. However, there have since been two recorded sightings of red squirrels within the Wylfa Newydd Development Area. The first was in 2015 (Red Squirrels Trust Wales, 2016) and the second was in 2016 by a Horizon contractor working on the Wylfa Newydd Project (pers. com. with Horizon Environmental Coordinators). In addition, grey squirrels (*Sciurus carolinensis*) are known to have been eradicated on Anglesey in 2015 (Red Squirrel Survival Trust, 2016), which may have reduced competitive pressure on red squirrels. As a result, Jacobs was commissioned by Horizon to undertake red squirrel surveys.

### 1.2 Wylfa Newydd Project

The Wylfa Newydd Project includes the Wylfa Newydd Generating Station and Associated Development<sup>1</sup>. The Wylfa Newydd Generating Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and Ancillary Structures and features. In addition to the reactors, development on the Power Station Site (the indicative area of land and sea within which the majority of the permanent Wylfa Newydd Generating Station buildings, plant and structures would be situated) would include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, Ancillary Structures, offices and coastal developments. The coastal developments would include a Cooling Water System and breakwater, and a Marine Off-Loading Facility.

### 1.3 Site Description

The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site, the Wylfa NPS<sup>2</sup> Site and the surrounding areas that would be used for the construction and operation of the Wylfa Newydd Generating Station) covers an area of approximately 380 ha. It is bounded to the north by the coast and the existing Magnox power station (the Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-

<sup>1</sup> Development needed to support delivery of the Wylfa Newydd Generating Station is referred to as 'Associated Development'. This includes highway improvements along the A5025, Park and Ride Facilities for construction workers, Logistics Centre, Temporary Worker Accommodation, specialist training facilities, Horizon's Visitor Centre and media briefing facilities.

<sup>2</sup> The site identified on Anglesey by the *National Policy Statement for Nuclear Power Generation (EN-6)* (Department of Energy and Climate Change, 2011) as potentially suitable for the deployment of a new Nuclear Power Station.

east boundary, with a small parcel of land spanning the road to the north-east of Tregle. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

Woodland habitats are only a small component in the Wylfa Newydd Development Area, representing approximately 5 ha of the site. The largest areas are those around Dame Sylvia Crowe's Mound to the east of the Existing Power Station. These contain some areas of broadleaved tree species such as alder (*Alnus glutinosa*), hawthorn (*Crataegus monogyna*) and sycamore (*Acer pseudoplatanus*), but the largest area is dominated by Corsican pine (*Pinus nigra*) and Lodgepole pine (*Pinus contorta*). The plantation woodlands to the west of the Existing Power Station are mainly Scots pine (*Pinus sylvestris*) with some broadleaved woodland areas containing species such as beech (*Fagus sylvatica*) and sycamore (Jacobs, 2013).

## 1.4 Report Aims and Objectives

The purpose of this report is to provide a single resource regarding all survey and background data available for red squirrels to inform and support ecological chapters of Environmental Impact Assessments for each stage of the Wylfa Newydd Project.

The aims of the report will be achieved by:

- reviewing the background data available on the species;
- presenting the results of surveys completed in 2016; and,
- interpreting the results of the surveys and provide mitigation recommendations.

## 1.5 Legal Status

Red squirrel is included in Schedules 5 and 6 of the *Wildlife and Countryside Act 1981* (WCA) (as amended). The legislation has subsequently been amended, most recently by the *Countryside and Rights of Way Act 2000* for England and Wales. The inclusion of the species in Schedule 5 means that, under Section 9 of the WCA it is an offence to:

- intentionally kill, injure or capture (take) a red squirrel; and
- intentionally or recklessly damage or destroy any structure or place which a red squirrel uses for shelter or protection; or
- intentionally or recklessly disturb a red squirrel while it is occupying a structure or place which it uses for that purpose.

Currently, under the WCA there is no provision for licensing activities that may cause damage or disturbance to red squirrels and their shelters for the purpose of development. To avoid an offence it must be shown that reasonable precautions to avoid causing damage or disturbance are undertaken. However, discussions between Horizon and Natural Resources Wales have indicated that, should the Wylfa Newydd Project contravene this legislation, a conservation licence could be issued, the application for which would need to demonstrate maintenance of the favourable conservation status of the species, and conservation benefit resulting from the proposed works.

Red squirrel is also included in the *Anglesey Local Biodiversity Action Plan* (IACC, 2003) and listed as a priority species in accordance with Section 7 of the *Environment (Wales) Act 2016*, which means they are of principal importance for the purpose of conserving biodiversity.

## 2. Methodology

### 2.1 Study Area

The extent of the study area comprised all scrub and woodland within the Wylfa Newydd Development Area and a 50 m buffer zone around this. Locations of the study area and woodlands are shown in Figure 1 (Appendix A). For the purposes of the survey, woodland habitats were divided into 13 discrete areas (Table 1).

### 2.2 Survey Methods

Surveys were conducted of 13 woodlands in the study area between the 10<sup>th</sup> and 12<sup>th</sup> May 2016. Survey techniques followed methodology detailed in Gurnell *et al.* (2009). This involved walking transects and recording sightings of squirrels, dreys and feeding signs, for example chewed cones. Whether the feeding signs were fresh (clean, brightly coloured) or old (dark, discoloured) was also noted.

Surveys were undertaken during periods when squirrels are most likely to be active and were carried out in suitable weather conditions (not in heavy rain, strong winds or when it was very cold) (Table 1). Where evidence of squirrel was recorded, the woodland was surveyed for a second time on the 17<sup>th</sup> or 18<sup>th</sup> May 2016.

### 2.3 Survey Limitations

Steep terrain in Woodland 6 (Figure 1) meant that it could not be surveyed safely, and as a result, a small section of woodland at the top of a ridge immediately adjacent to the Existing Power Station could not be surveyed. However, as this woodland is outside of the area to be cleared in preparation for the Wylfa Newydd Project, it is considered that not having data from this section of the woodland is unlikely to significantly affect the outcome of any impact assessment.

## **3. Results**

### **3.1 Incidental Sightings**

There have been two recent incidental sightings of red squirrel in the Wylfa Newydd Development Area. The first was from a member of the public in October 2015 and was recorded on the Red Squirrel Trust Wales website (Red Squirrels Trust Wales, 2016) and the second was by a Kehoe Countryside Limited employee contracted to work on the Wylfa Newydd Project in March 2016 (pers. com. with Horizon Environmental Coordinators). The locations of these sightings are shown on Figure 2.

### **3.2 Survey Results**

There were no sightings of red squirrel during the surveys. However, evidence of red squirrel presence was recorded in seven areas of woodland, and one drey was recorded within Woodland 6 (Figure 2). Woodland descriptions, details of the surveys including dates, times, weather conditions, findings and any further notes are shown in Table 1 below.

Table 1: Red squirrel surveys details and results

Woodland Number	Location	Grid Reference	Woodland Description	1st Survey	Survey Times and Weather	2nd Survey	Survey Times and Weather	Feeding Signs	Dreys	Notes
1	Cestyll Gardens	SH 34522 93309	Strip of pine on east side of gardens, decorative gardens in middle and individual trees on west side	10.05.16	09:30–10:00 Dry with light rain showers. 15°C, 100% cloud cover	17.05.16	10:00–10:30 Dry with sunny spells, 14°C	Yes	No	Three bird nests including a very large raptor nest. A small number of old squirrel feeding signs were recorded.
2	Single Strip	SH 34722 93384	Single line of conifer and gardens of demolished house	10.05.16	10:00–10:10 Dry with light rain showers. 15°C, 100% cloud cover	n/a	n/a	No	No	Not suitable for squirrels as isolated and very open in structure.
3	South of Existing Power Station approach road (West)	SH 35115 93458	Pine woodland	11.05.16	09:30–10:30 Dry with light rain showers. 15°C, 100% cloud cover	17.05.16	10:45–11:20 Dry with sunny spells, 15°C	Yes	No	Three bird nests recorded. One nest is similar to a drey (SH 3511 9335) but situated along a branch and not close to the trunk, so ruled out as potential drey.
4	South of Existing Power Station approach road (East)	SH 35219 93480	Pine with sycamore on outer edges of woodland	11.05.16	10:30–11:00 Dry with light rain showers. 15°C, 100% cloud cover	17.05.16	11:20–11:45 Dry with sunny spells, 15°C	Yes	No	Two bird nests similar to dreys at SH 35187 93487 and SH 35216 93497. First nest was too large to be a drey and surrounds the tree. The second was very similar to a drey, but had a flat top and bird droppings underneath.

5	Dame Sylvia Crowe's Mound (West)	SH 35337 93587	Mound of pine woodland with broadleaved trees at the top. The outer edges are also broadleaved trees, mainly sycamore.	12.05.16	09:00–11:00 Dry with sunny spells, 15°C	18.05.16	07:30–09:30 Dry with sunny spells, 10°C	Yes	No	Fresh and old feeding signs.
6	Dame Sylvia Crowe's Mound (East)	SH 35515 93688	Pine and cypress ( <i>Cupressus</i> sp.) woodland. Very steep ridge in middle. Broadleaved trees around edges (mainly sycamore).	12.05.16	09:00–11:00 Dry with sunny spells, 15°C	18.05.16	07:30–09:30 Dry with sunny spells, 10°C	Yes	Yes	Squirrel drey is located at SH 35535 93734 in a Scots pine. Fresh and old feeding signs. Bird nest that was similar to a drey recorded at SH 35452 93950 (lots of birds droppings underneath).
7	Avenue	SH 35619 93849	Mature broadleaf woodland comprising beech and sycamore, with occasional conifer trees	12.05.16	08:40–09:00 Dry with sunny spells, 15°C	18.05.16	09:45–10:00 Dry with sunny spells, 10°C	Yes	No	Three bird nests in woodland. Old squirrel feeding signs recorded.
8	Tre'r Gof SSSI	SH 35907 93582	Young scrub and gorse ( <i>Ulex europaeus</i> )	12.05.16	11:00–11:10 Dry with sunny spells, 15°C	n/a	n/a	No	No	Not suitable for squirrels given age and structure
9	Sports Centre	SH 35341 93334	Gardens of sports centre including scattered, mixed mature trees	11.05.16	11:00–11:15 Dry with light rain showers. 15°C, 100% cloud cover	n/a	n/a	No	No	Bird nests recorded but no evidence of squirrel presence
10	The Firs	SH 35263 92927	Gardens of demolished houses including mature mixed woodland	11.05.16	09:00–09:20 Dry with light rain	17.05.16	10:30–10:50 Dry with	Yes	No	Old squirrel feeding signs recorded close to the entrance gate.

					showers. 15°C, 100% cloud cover		sunny spells, 15°C			
11	Cemaes Community Woodland	SH 36844 93473	Young broadleaf woodland	12.05.16	11:30–11:40 Dry with sunny spells, 15°C	n/a	n/a	No	No	Not suitable for squirrels – too young.
12	Tregele	SH 35675 92768	Strip of conifer alongside main road. Cones on trees, but are young.	10.05.16	10:30–10:40 Light rain, 15°C, 100% cloud cover	n/a	n/a	No	No	Not suitable for squirrels due to young age of trees.
13	A5025	SH 35212 92146	Isolated conifers	12.05.16	11:40–11:50 Dry with sunny spells, 15°C	n/a	n/a	No	No	Not suitable for squirrels as very isolated.

## 4. Conclusions and Recommendations

The presence of red squirrel was confirmed in seven of the 13 woodland areas surveyed through evidence of feeding remains, and one drey was recorded in woodland east of the Existing Power Station (Figure 2). The combined area of woodland habitat where evidence of red squirrel was found within the study area is 9.87 ha, with the largest fragment being Woodland 6 (4.35 ha).

A study conducted by Verbeylen *et al.* (2003) found that habitat fragments smaller than 3.5 ha were never occupied by squirrels. Rodriguez and Andren's (1999) study predicted that squirrels utilise fragments if they are larger than 10 ha in size and are within 600 m of a source population. However, Verboom and van Apeldoorn (1990) found that squirrels do occupy smaller fragments (the smallest 0.72 ha) and the probability of red squirrel occurrence significantly increases when a fragment is situated close to a large permanently occupied woodland or where the area of surrounding woodland increases.

The red squirrel distribution map on the Red Squirrels Trust Wales (2016) website shows that red squirrels are more common in the south and east of the island. Since 2004, there have been reintroductions of red squirrel to eight sites in Anglesey, the nearest of which is approximately 7 km from the study area at Llanfaethlu, and is the nearest known population. However, there have been two sightings in the north of the island; the sighting shown on Figure 2 near Cestyll Gardens and a second sighting over 2 km south-east from the Existing Power Station (Red Squirrel Trust Wales, 2016).

Given the amount of available suitable habitat and its relatively isolated nature from large woodland blocks and the main population centres in Anglesey, it is considered that the Wylfa Newydd Development Area supports low numbers of red squirrel and, although the species appears to be expanding its range across Anglesey, it is unlikely this area would ever support high numbers. Although it is not proposed that further survey effort is required to support a formal impact assessment for the species, the following measures are proposed to help secure the favourable conservation status of the species during the Wylfa Newydd Project:

- pre-work surveys of areas of suitable red squirrel habitat, notably Dame Sylvia Crowe's Mound where the one drey was recorded, should be undertaken;
- works affecting red squirrel habitat should be timed to avoid the breeding season (1<sup>st</sup> February – 30<sup>th</sup> September inclusive); and,
- protection zones of a minimum of 5 m or one tree buffer should be employed around active dreys.

Should works proposed as part of the Wylfa Newydd Project have the potential to contravene the legislation in place to protect red squirrel, discussion with Natural Resources Wales would be required in relation to the need for a conservation licence to be secured prior to such works taking place. For example if a drey is found during pre-works surveys in woodland that is to be felled.

## 5. References

*Countryside and Rights of Way Act 2000* (c. 37). The Stationery Office, London.

Department of Energy and Climate Change. (2011). *National Policy Statement for Nuclear Power Generation (EN-6)*. The Stationery Office, London.

*Environment (Wales) Act 2016* (anaw 3). The Stationery Office, Cardiff.

Gurnell, J., Lurz, P., Macdonald, R. and Pepper, H. (2009). *Practical techniques for surveying and monitoring squirrels*. Forestry Commission Practice Note. Forestry Commission, Edinburgh.

Isle of Anglesey County Council (IACC). 2003. *Working for the wealth of wildlife: Anglesey's local biodiversity action plan (LBAP) – B2 Habitat Action Plans (HAPs) and Species Action Plans (SAPs)*.

Jacobs. (2013). *Consultancy Report: A Phase 1 Habitat Survey*, unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. W202.01-S5-PAC-REP-00015.

*Planning Act 2008* (c. 29). The Stationery Office, London.

Red Squirrel Survival Trust. (2016). *Our Work – Anglesey*. [Online] Available at: <http://rsst.org.uk/our-work/anglesey/> [Accessed May 2016].

Red Squirrels Trust Wales. (2016). *Squirrel Locations*. [Online] Available at: <http://www.redsquirrels.info/map-holder/> [Accessed May 2016].

Rodriguez, A. and Andren, H. (1999). A comparison of Eurasian red squirrel distribution in different fragmented landscapes. *Journal of Applied Ecology* 36(5): 649–662.

Verbeylen, G., De Bruyn, L. and Matthysen, E. (2003). Patch occupancy, population density and dynamics in a fragmented red squirrel *Sciurus vulgaris* population. *Ecography* 26(1): 118–128.

Verboom, B. and van Apeldoorn, R. (1990). Effects of habitat fragmentation on the red squirrel, *Sciurus vulgaris* L. *Landscape Ecology* 4(2): 171–176.

*Wildlife and Countryside Act 1981* (WCA) (c. 69). Her Majesty's Stationery Office, London.

## Appendix A. Figures

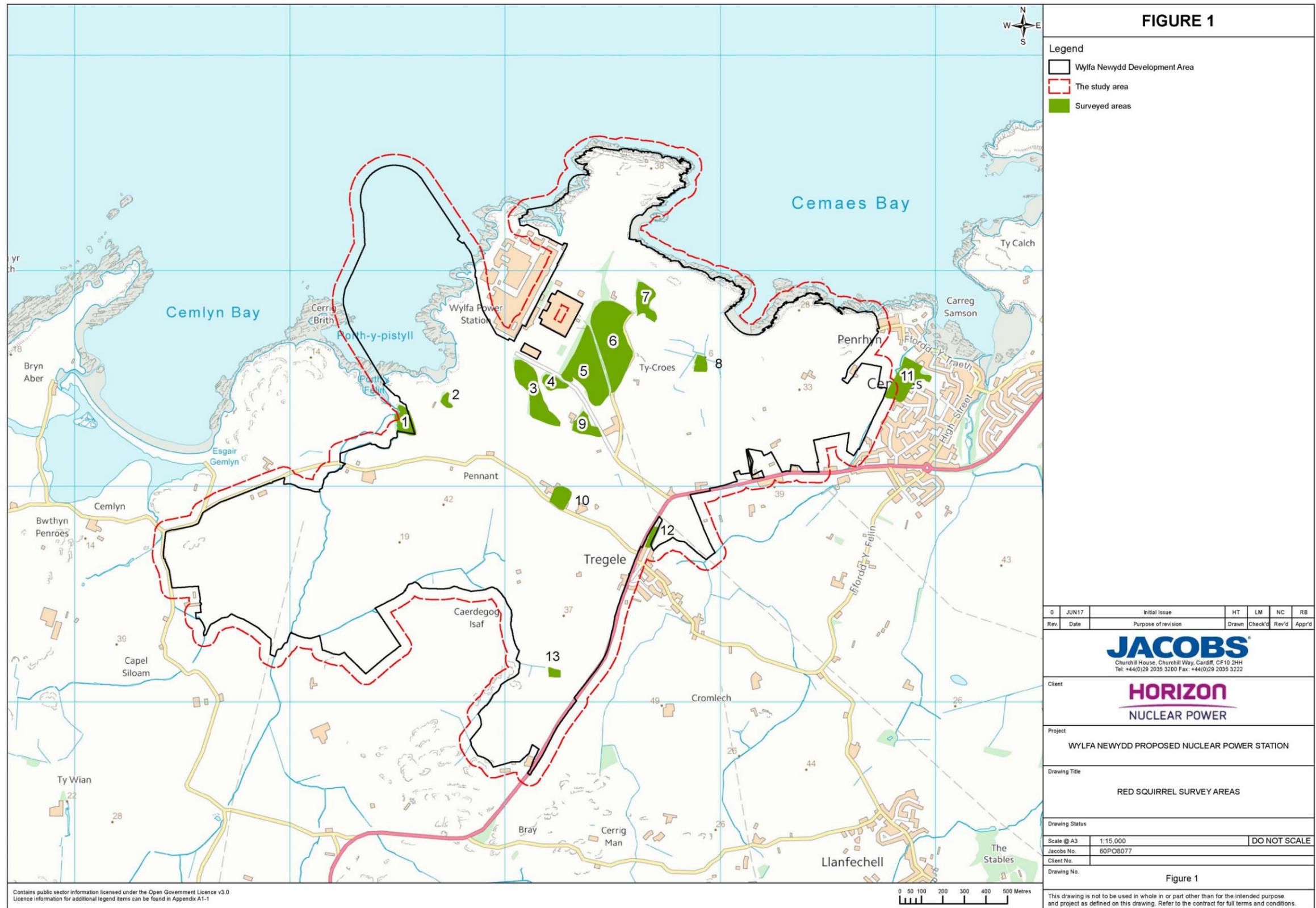


Figure 1 Red squirrel survey areas

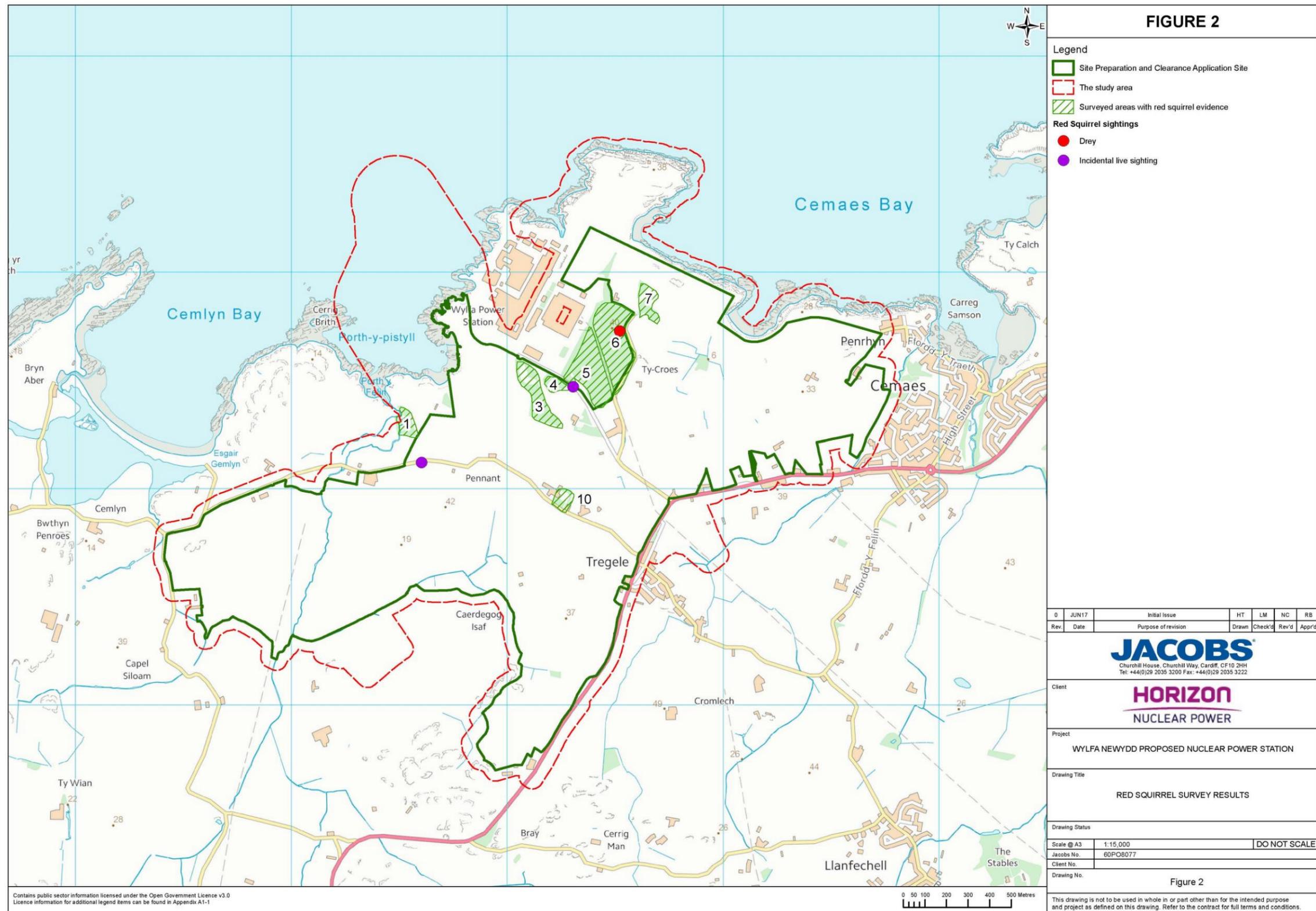


Figure 2: Red squirrel survey results

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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-16  
Consultancy Report: Other Protected  
and Notable Mammals Technical  
Summary Report**

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## Wylfa Newydd

Horizon Nuclear Power (Wylfa) Ltd

### Technical Summary Report - Other Mammals

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**Appendix C. Incidental Records**

## Executive Summary

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey (the Wylfa Newydd Generating Station) as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to different regulators. Jacobs UK Ltd. (Jacobs) was commissioned to collect baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Generating Station.

This technical summary report provides a single resource regarding all survey and background data available for badger (*Meles meles*); brown hare (*Lepus europaeus*); harvest mouse (*Micromys minutus*); hedgehog (*Erinaceus europaeus*); pine marten (*Martes martes*); polecat (*Mustela putorius*); and red squirrel (*Sciurus vulgaris*) in the study area that comprises the Wylfa Newydd Development Area and the surrounding 500m.

These species were identified as potentially being present in the study area due to their geographical distribution and habitat requirements. If present, the species could be affected by the Wylfa Newydd Project. The significance of their presence is due to the protection they receive under a variety of wildlife legislation that protects the animals themselves, and in some cases their habitats as well. All seven species listed above are material considerations within the planning process.

Data gathering to inform this report has included a review of:

- background data from the local records centre;
- habitat assessment survey results;
- species specific field surveys; and
- incidental records.

The background data search was provided by Cofnod (North Wales Environmental Information Service) and included all biological records from the study area and a 2.5km search radius from the boundary. The search found that there are records of brown hare, hedgehog and polecat, and that there is a record of a single dead badger from 2009. The data search did not return records of harvest mouse, pine marten or red squirrel. However, data from Mammals in a Sustainable Environment project (MISE, 2015) suggest that harvest mouse is present on north Anglesey.

A habitat assessment was achieved by completing Phase 1 Habitat Surveys of the study area. These results show that there is suitable habitat for badger, brown hare, harvest mouse, hedgehog and polecat within the study area; this includes rough grassland, woodland and field boundaries. The survey also recorded limited amounts of habitat with the potential to support pine marten and red squirrel in the form of small patches of coniferous plantation.

The single badger record from Cofnod is the only evidence of badger presence within the study area and follows six years of ecological surveys. Badgers are a species that are often very easy to detect due to the obvious and often abundant field signs that betray their presence. The lack of any evidence of the species ever having been recorded during field surveys is therefore considered to be sufficient to prove that badger is absent from the study area.

Surveys for brown hare were completed in 2010, 2011 and 2012 using a transect methodology. These recorded the species being resident across much of the study area. The species has also regularly been recorded incidentally during other surveys between 2009 and 2015. The population of brown hares is therefore considered to be stable and is likely to be within normal density parameters for the species in the study area. This would give a population of hares within the total study area of between 95 – 190, based on one per 2ha and one per 4ha respectively.

Surveys for harvest mouse were carried out due to the species often being under-recorded, and the potential for recording false negatives in the background data search. The surveys involved searching the areas of habitat with the highest potential to support the species in the study area. This included taller grassland areas and areas of dense rush. Harvest mouse was not recorded and has not been recorded incidentally. It is considered highly likely that the species is absent from the study area.

Hedgehog surveys were completed in 2011 and 2012 and involved the use of print trapping and walked transects. The species was recorded throughout the study area and has also been frequently encountered during nocturnal surveys for other species. Hedgehog is therefore considered to be common within the study area, and habitats for both foraging and hibernating should be considered within any impact assessment for the Wylfa Newydd Project. The population in the study area is likely to be 150 individuals based on a normal population density of one individual per 2.5 hectares.

The distribution of pine martens in the UK currently shows that the species is not found on Anglesey and that the nearest populations are found in Snowdonia. While it is considered that there are very small fragments of woodland with the potential to support the species, the likelihood of the species crossing the Menai Strait and across the relatively open habitats of Anglesey to occupy the study area is considered to be remote. The species is therefore considered to be absent from the study area, and no further surveys are considered necessary.

Polecat surveys were commissioned in 2010 and trapping surveys were completed for four consecutive years. Polecat were caught in 2010, 2011 and 2012 and were tagged using Passive Integrated Transponder (PIT) tags and then released, and no animals were caught in 2013. The PIT tagging found that there was a peak of four animals in the study area at any one time, which is a typical population density for an area the size of the study area. The negative result in 2013 is not thought to be conclusive that the species is now absent from the study area. It is therefore proposed that future impact assessments should presume the presence of a population of polecat within normal population densities, rather than attempting to prove absence by way of additional survey effort.

Red squirrels are known to be present on Anglesey with records concentrated in the more densely wooded areas in the eastern and southern quarters of the island. However, the species requires near continuous woodland in order to survive and disperse into new areas. Ordnance survey mapping of the island shows that there is a lack of woodland connectivity between known populations and the study area. Therefore the likelihood of natural colonisation of the study area by red squirrels in the future is considered to be low, and no further surveys are required.

The conclusions of this report are that badger, pine marten and red squirrel are absent from the study area and would not be affected by the Project. The data suggests that there is a sufficiently low likelihood of harvest mouse being present that they should not be considered as an ecological receptor within any impact assessment for the Project; however, they should still be mentioned in generic mitigation approaches as a species that the study area could be enhanced for in the future. Finally, this report suggests population estimates for brown hare, hedgehog and polecat within the study area on which impact assessments can be based.

## 1. Introduction

This report is intended to provide a technical summary of the data collected on badger, brown hare, harvest mouse, hedgehog, pine marten, polecat and red squirrel within the Wylfa Newydd Development Area and the surrounding 500m. This area is referred to as the 'study area' in this report, and is shown in Figure 6.1 (Appendix A). The group of species considered in this report is made up of the terrestrial mammals that receive 'lower' levels of legal protection, and does not include bats, otter (*Lutra lutra*) or water vole (*Arvicola amphibius*), each of which are considered in a separate report.

### 1.1 Overview

Horizon Nuclear Power Wylfa Ltd. (Horizon) is currently planning to develop a new nuclear power station on Anglesey as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) comprises the proposed new nuclear power station (the Wylfa Newydd Generating Station), including the reactors, associated plant and ancillary structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities. The Project will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a development consent order.

Jacobs UK Ltd. (Jacobs) was commissioned by Horizon to undertake a full ecological survey programme within the vicinity of the Power Station Site. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station and Associated Development.

### 1.2 Wylfa Newydd Project

The Project includes the Wylfa Newydd Generating Station and Associated Development<sup>1</sup>. The Wylfa Newydd Generating Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and ancillary structures and features. In addition to the reactors, development on the Power Station Site (the indicative area of land and sea within which the majority of the permanent Wylfa Newydd Generating Station buildings, plant and structures would be situated) would include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments will include a Cooling Water System (CWS) and breakwater, and a Marine Off-Loading Facility (MOLF).

### 1.3 Site Description

The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site, the Wylfa NPS<sup>2</sup> Site and the surrounding areas that would be used for the construction and operation of the Wylfa Newydd Generating Station) covers an area of approximately 380ha. It is bounded to the north by the coast and the existing Magnox power station (the Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregle. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

The Wylfa Newydd Development Area includes the headland south of Wylfa Head candidate Wildlife Site. There is one designated site for nature conservation within the Wylfa Newydd Development Area: the Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of

<sup>1</sup> Development needed to support delivery of the Wylfa Newydd Generating Station is referred to as Associated Development. This includes highway improvements along the A5025, park and ride facilities for construction workers, Logistics Centre, Temporary Workers' Accommodation, specialist training facilities, Horizon's Visitor Centre and media briefing facilities.

<sup>2</sup> The site identified on Anglesey by the National Policy Statement for Energy EN-6/NPS EN-6 as potentially suitable for the deployment of a new nuclear power station.

Conservation (SAC) and SSSI, and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA).

Tre'r Gof is a small basin mire adjacent to the Existing Power Station, west of Cemaes. The area receives mineral-enriched waters from the surrounding boulder clay leading to the development of notable flora. It is the botanical interest that provides the reason for the designation of the site as an SSSI.

Cae Gwyn SSSI is located immediately to the south of the site to the west of Llanfechell. The site comprises two wetland areas separated by an outcrop of rock with heathland vegetation. The southern wetland is confined by a rock basin and is dominated by bogmoss (*Sphagnum* spp.) and a wide variety of common wetland herbs. The northern wetland has a different flora containing denser areas of willow (*Salix* spp.) and common reed (*Phragmites communis*).

## 1.4 Aims and Objectives

The aim of this technical summary is to provide a single resource regarding all survey and background data available for badger, brown hare, harvest mouse, hedgehog, pine marten, polecat and red squirrel, with the objective of informing the Ecological Chapter of the Environmental Impact Assessment (EIA) for development of the Project.

The aim of the report will be achieved by reviewing:

- background data from the local records centre;
- scoping assessment of survey work undertaken to date;
- habitat assessment survey results;
- species specific field surveys; and
- incidental records.

## 1.5 Summary of Survey Work

Surveys in the study area for the target species have taken place since 2010 and are summarised in Table 1.1. These data are supplemented by incidental records that have been collated from 2013 until 2015. Surveys that assess the potential of the habitats in the study area to support the target species have also taken place, and are discussed in Section 2. The table shows that no species-specific surveys have been carried out for badger, pine marten and red squirrel. This is because of the results of the background data search and habitat assessment as presented in Section 3, which are discussed further in Section 4.

Table 1.1 Summary of Survey Work

Target	2010	2011	2012	2013
Brown hare (Arup, 2012a)	Transect surveys	Transect surveys	-	-
Harvest mouse (Arup, 2012b)	Nest searches	-	-	-
Hedgehog (Arup, 2012c)	-	Transect surveys	-	-
Polecat (Arup, 2012d; Arup 2012e; Jacobs, 2013a)	Trapping and PIT (winter 2010-2011 season)	Trapping and PIT (winter 2010-2011 season)	Trapping and PIT (winter 2011-2012 season)	Trapping and PIT (winter 2012-2013 season)

## 1.6 Legal Status

The legislation protecting the mammal species discussed in this report is summarised in Table 1.2 with full descriptions provided in Appendix B. There are also specific pieces of legislation that apply to badgers and brown hare that are described in more detail in Table 1.2, below.

**Table 1.2 Legal Protection of Target Species**

Species	Wild Mammals (Protection) Act 1996	Natural Environment and Rural Communities (NERC) Act 2006	Wildlife and Countryside Act 1981 (as amended)	Conservation of Habitats and Species Regulations 2010 (as amended)
Badger	Yes	-	Schedule 6	-
Brown hare	Yes	Section 42	-	-
Harvest mouse	Yes	Section 42	-	-
Hedgehog	Yes	Section 42	Schedule 6	-
Pine marten	Yes	Section 42	Schedule 5 & 6	Schedule 4
Polecat	Yes	Section 42	Schedule 6	Schedule 4
Red squirrel	Yes	Section 42	Schedule 5 & 6	-

Badgers share the same protection as other mammal species that receive a basic level of protection from cruelty under the Wild Mammals (Protection) Act 1996. However, badgers also receive specific protection from The Protection of Badgers Act 1992, which is based primarily on the need to protect badgers from baiting and deliberate harm or injury. It also contains the restrictions that apply more widely and include the following criminal offences:

- wilfully (or attempted) killing, injuring, taking, possessing or cruelly ill-treating a badger;
- intentionally or recklessly interfering with a sett.

Sett interference includes damaging or destroying a sett, obstructing access to a sett and disturbing a badger whilst it is occupying a sett. It is not illegal, and therefore a licence is not required, to carry out disturbing activities in the vicinity of a sett if no badger is disturbed and no sett is damaged or obstructed.

Brown hare also receive limited protection via the Ground Game Act 1880 and Hares Preservation Act 1892 which makes the sale of brown hare illegal between 1<sup>st</sup> March and 31<sup>st</sup> July. However, this is of limited applicability to the conservation status of the species within the study area.

## 1.7 Conservation Initiatives

Brown hares and red squirrel are listed as part of Anglesey’s Local Biodiversity Action Plan (UKBARS, 2015). This initiative aims to secure partnership work between local people and organisations to ensure local biodiversity resources are valued and looked after in the future. The action plan sets out work to be undertaken to help important habitats and species and is currently undergoing a review for 2010-2015. Red squirrel populations have also recently been boosted by reintroduction programmes in conjunction with Friends of the Anglesey Red Squirrels in 2008 (Menter Mon, 2015).

## 2. Methodology

### 2.1 Background Data Search

A background data search was requested in order to inform the scope of surveys required to inform future EIA and Habitats Regulations Assessments. This was requested from Cofnod and included all legally protected and notable species records, including the target mammal species, within 2.5km of the study area. This data was then analysed and mapped where necessary.

Data was also sought from freely available online sources where necessary, and from incidental sightings of species during other surveys (Appendix C).

### 2.2 Habitat Assessment Surveys

Habitats within the Wylfa Newydd Development Area were surveyed in 2009 using the Joint Nature Conservation Committee Phase 1 Habitat Survey methodology (Arup 2009). This was repeated in 2013 and extended to a 500m buffer around the Wylfa Newydd Development Area by Jacobs (2013). This method classifies habitat types according to broad criteria and can be used to assess the suitability of habitats to record protected species. The results from the 2013 surveys are summarised in Section 3 as these provide the most recent full audit of the habitats found.

### 2.3 Field Survey

The scope of the field surveys was informed by analysis of the background data search and high level assessment of the habitats within the study area from aerial photography. This included an assessment of likely habitat connections within the wider landscape. This scoping determined that field surveys were required for brown hare, harvest mouse, hedgehog and polecat, but that surveys were not necessary for badger, pine marten and red squirrel. Summaries of the survey methodologies adopted are provided below.

#### 2.3.1 Brown Hare

For the purposes of the hare surveys, the site was divided into two separate transects, as shown in Figure 6.2. Each transect was walked twice on a seasonal basis commencing in the autumn of 2010. The autumn and winter surveys were carried out during daylight hours, whereas the spring and summer surveys were carried out at twilight using a spot-light. These transects were designed to give good visibility of areas of suitable habitat using binoculars. This approach limited disturbance which could result in animals being counted on multiple occasions during the same transect.

Habitat surveys of each area were also carried out on a seasonal basis to record land management variables. Sward height and field boundary quality was mapped to ascertain any patterns between hare distribution and those habitat variables. Field boundaries were assessed on the basis of composition, structure and connectivity. Sward height was categorised from one to five, with 'one' being extremely short turf, generally from high density sheep, horse or rabbit grazing and 'five' being woodland. The potential influence of levels of disturbance due to dog walkers etc. was also assessed.

#### 2.3.2 Harvest Mouse

Surveys for harvest mouse were carried out over two days in October 2010. The survey method involved a fingertip search of targeted areas of suitable habitat for nests woven by this species. The autumn season was specifically chosen for the surveys as vegetation begins to die back which makes nests easier to locate, but harvest mice are still likely to be active and their nests intact. The location of the individual survey sites is shown in Figure 6.3.

### 2.3.3 Hedgehog

Three different techniques were used to determine the presence or likely absence of hedgehog in the study area. The survey methods were also designed to provide population estimates within the study area. Monthly survey transects were conducted in the study area, as shown in Figure 6.4.

The routes walked varied each time in an effort to cover as much of the ground as possible. However, certain features known to be attractive to hedgehogs were given more focus. For example, gardens, areas of previous incidental sightings and field boundaries were surveyed more intensively. The survey technique used involved walking for five minutes and then stopping to listen for sounds of hedgehogs foraging. This was repeated for transects lasting three hours. Transects were not started until at least one hour after sunset to give time for animals to emerge and begin foraging.

Spot-lighting surveys were used where there was a long-distance field of view. Spot-lighting was undertaken in conjunction with survey transects on a monthly basis. There was also some additional spot-lighting data generated during surveys undertaken for brown hares in the study area.

Footprint tunnels were positioned around the study area as shown in Figure 6.5. Three footprint-tunnel survey sessions were conducted, each lasting for six consecutive nights and using either 10 or 20 tunnels, as shown in Table 2.1. The method was an adaptation of that reported by the Mammal Society (2015).

**Table 2.1 Numbers of Footprint Tunnels Used During Surveys**

Season	Numbers of Tunnels
April – May	10
June – July	20
August - September	10

All tunnels were set on the ground and placed alongside linear features, e.g. roadside verges, field boundaries or ditches. The tubes were then baited with hotdogs in the middle of the tunnel. An ink pad, comprising black powder paint and vegetable oil, is positioned to either side of the bait along with sheets of blank paper on which the footprints are recorded.

Once the tunnels had been baited and set, they were closed and positioned. Where the substrate allowed, they were then pegged down using tent pegs. In most situations, they were then covered with lengths of half drain pipe to help protect the tunnels.

The survey area was approximately one square kilometre, focussing on the eastern half of the study area. The justification for focussing on this area is due to the higher density of incidental records and more frequent positive transect survey results. The tunnels were checked daily with the bait replenished and paper changed as necessary. Any paper with footprints on was collected and taken for identification.

### 2.3.4 Polecat

An initial habitat assessment was undertaken to determine likely habitat features that polecats could use for hunting, laying up and commuting. The assessment was based on the information from the 2009 Phase 1 Habitat Survey report (Arup, 2009). The habitat assessments were also used to determine potential trap locations. The locations for the traps set in spring and autumn are shown in Figure 6.6.

Distribution surveys of polecats are difficult, relying on labour intensive, live-trapping methods. The number of traps used within a certain area and the number of nights over which they are set, will determine the chances of catching all resident animals (Birks & Kitchener, 1999). This has to be balanced by the time and resource requirement that live trapping entails and also the fact that some animals will be entering traps regularly from day one. This can therefore potentially alter their natural behaviour over the whole trapping period which could have negative effects on the results analysis.

Each winter between 2010 and 2013, trapping was completed in October and March. During each survey month, 16 traps were set and checked for a period of seven days (i.e. 112 trap nights per month and 224 per season).

This survey used double-entry cage traps designed for mink, although only one end was set, effectively making them single-entry. Each measured approximately 76cm x 15cm x 15cm, was made from metal mesh and had sprung doors. Hay was used around the traps, enabling any animals caught to pull it in through the bars of the cage and provide themselves with bedding. Many of the traps and hay were placed beneath lengths of half plastic drainpipe to prevent incursion from the weather, damage from livestock and provide a dark, less stressful environment. Pieces of chicken were used as bait and changed after three days if undisturbed.

Most polecat activity is during the night, so traps were checked first thing in the morning, to ensure that animals did not remain trapped longer than necessary.

Sprung traps were initially examined *in-situ* through the door. polecats usually pull the hay into the trap, dig the soil / substrate around the trap door and may be visible due to their distinctive white cheek patches. The traps were then pulled from their positions using tent pegs and a hessian sack placed over the trap; this keeps the trap relatively dark and animals calm. Noise was kept to a minimum. Specially designed wooden 'combs' were used to secure the animal at the rear of the trap whilst a net bag was placed over the door. The hessian bag was then removed from the trap, placed over the net bag and the 'comb' removed. The animal can then be moved into the bag and a plastic plasterer's float used to prevent the animal from moving back again or biting the surveyor. The bag was secured shut and the animal immobilized at one end. The animal can then be scanned quickly for the presence of a PIT tag, the unique number of which was recorded if present. If no tag was present, a rubber-edged wire mesh restraint was put over the animal and a PIT tag inserted under the skin in the scruff of the neck immediately behind the head. Animals were then weighed in the mesh bag before being released. The whole process took approximately five minutes using a trained, licensed ecologist and assistant.

The weight of the animal can be sexually dimorphic, and also be used to monitor any loss / gain of condition over the period of the survey. Birks and Kitchener (1999) give figures of 550g – 1050g for female polecats and 950g – 1850g for males. However, there is an overlap where sex determination is not possible and juveniles must be taken into account.

## 2.4 Limitations

### 2.4.1 Brown Hare Surveys

During the transect surveys there was significant disturbance to brown hare individuals and the habitats that support them caused by ground investigation works and associated human activity in the study area. This included a cessation of grazing across much of the study area. The value of habitat suitability survey results is therefore considered to be negligible due to the dynamic nature of the habitats present.

Similarly, the transect survey results also provided limited insight into what is known about the study area. Brown hare populations can be assessed from transect data by using "distance sampling", which determines densities of animals across whole landscapes. However, this could not be applied in the study area due to the terrain. Distance sampling modelling requires long vistas and the relatively small fields of Anglesey are therefore not conducive to producing accurate results. Therefore, the brown hare population estimates are based on the total number of brown hare seen each year, and uses normalised populations from background data as a frame of reference.

### 2.4.2 Harvest Mouse

There are considered to be no constraints on the data provided by the results of the harvest mouse survey.

### **2.4.3 Hedgehog**

Hedgehogs are a relatively difficult animal to study due to their nocturnal habits and lack of obvious field signs. There is currently no commonly accepted survey methodology widely used by consultants or researchers. There are, however, several different proven survey techniques and the methods used in these surveys have taken advantage of several of these. The use of several different techniques allows the results to be collated and a comprehensive picture of the species distribution on the site compiled.

### **2.4.4 Polecat**

Not all polecats resident in an area will necessarily be caught during a seven-night live-trapping session. Likewise, if a particular trap site is not successful at catching polecats during the survey period, it does not mean that the animals are not present in that area at other times. The ecological behaviour of the species at different times of year means that polecat distribution and numbers can vary and this will need to be taken into account in any impact assessment based on these results.

Some animals are caught on numerous occasions over a trapping survey and are termed “trap-happy” and other animals caught only once, or not at all, and are termed “trap-shy”. Any conclusions from the surveys regarding population estimates must therefore take this behaviour into account. By undertaking the trapping study both in spring and autumn, it is hoped that information can be gathered on seasonal differences in population size and distribution and will limit the impacts of “trap-happy” and “trap-shy” animal behaviour.

The survey effort made during each year from 2010 – 2012 was not the same. Traps have not been placed in exactly the same locations and during the same time periods. The results therefore cannot be directly compared.

### 3. Results

#### 3.1 Desk Survey

There are no records of harvest mouse, pine marten, polecat or red squirrel in the study area from Cofnod or from incidental records.

There is a single record of a dead badger from 2009 being recorded on the A5025 to the south of the topic study area. This is the only evidence obtained of the species ever having been present within 2.5km of the Wylfa Newydd Development Area.

The data from Cofnod showed that there are 147 records of brown hare within 2.5km of the boundary of the study area since 1967 and 17 records from incidental observations of hares between 2013 and 2015. The species is therefore considered to have been established in the study area for many decades.

In addition to the desk study results from Cofnod, a search of harvest mouse records returned a total of 30 records from the whole of Wales (Tapping, 2013) and a consensus in the literature that the distribution of the species is poorly understood (UKBARS, 2015). This led to MISE (2015) initiating a project to determine a more accurate understanding of the population distribution of the species. The data they provided does include a record from near to the study area, but the resolution is not precise enough to be more exact. This is shown in Figure 3.1 and is discussed further in Sections 4 and 5.

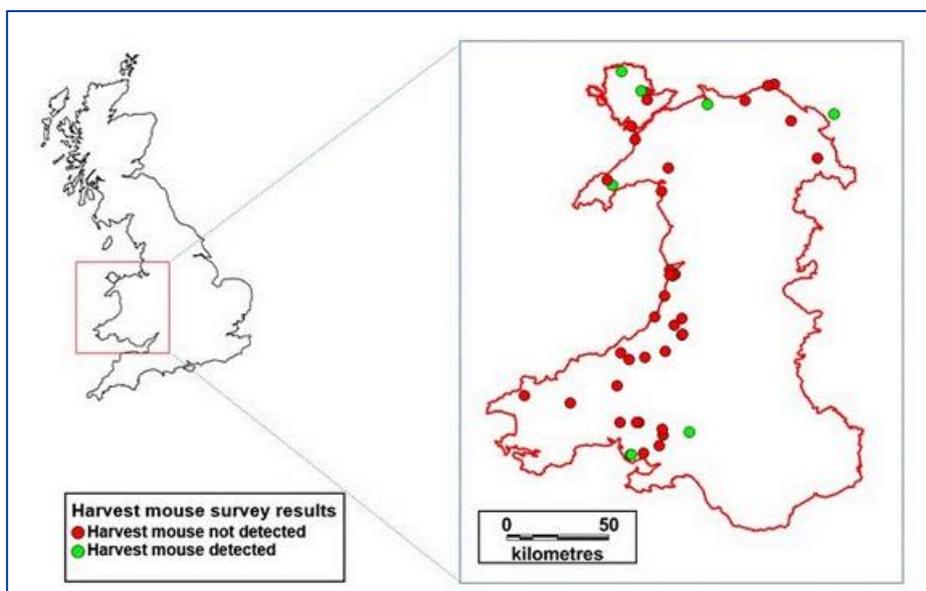


Figure 3.1 Welsh Harvest Mouse Records (after MISE, 2015)

There are 79 records of hedgehog from within 2.5km of the study area and seven records from surveys carried out between 2013 and 2014. The spread and frequency of the records suggest that the species is likely to be found in all areas of suitable habitat within the study area.

There are two records of polecat from 1994 and 1998 within the search area, and one record of a scat that was attributed to polecat on the shingle bar at Cemlyn Lagoon by Jacobs surveyors in 2014 (see Appendix C). There are also records of dead individuals being seen on the A5025 by surveyors driving to and from the study area, but these records have not formally been included in the incidental sightings database for the study area.

### 3.2 Habitat Assessment

The majority of land within the study area (78.35%) comprised low-quality agricultural habitats (arable, improved grassland, poor semi-improved grassland) totalling 479.3ha. However, there was 37ha of semi-improved neutral grassland (6.1% of the study area) which was mainly herb-rich hay meadows. The remainder of the study area mainly comprised the following habitat types (see Figure 6.7):

- woodland – Broadleaved (semi-natural) / broadleaved (plantation) / coniferous (plantation);
- scrub – Dense continuous / scattered;
- grassland – Acid / unimproved / semi-improved / marsh;
- tall ruderal;
- dwarf shrub heath;
- fen / basin mire;
- standing water / running water; and
- coastal grassland and heathland.

The significance of the composition of the habitat composition within the study area is discussed in Section 4.

### 3.3 Field Survey

#### 3.3.1 Brown Hare Field Survey Results

The results of the transect surveys from 2010 and 2011 are shown in Table 3.1 and Figure 6.8. Figure 6.8 also shows the incidental records from 2013 to 2015.

**Table 3.1 Brown Hare Transect Survey Results**

Survey Season	Individual Records from Transect 1	Individual Records from Transect 2
October / November 2010	2	0
January / February 2011	4	1
April / May 2011	6	2
July / August 2011	12	0
<b>Total</b>	<b>24</b>	<b>3</b>

During the transect surveys the vast majority of habitats within the study area comprised short sward grassland grazed by cows, or very short sward vegetation grazed by rabbit. Neither habitat was considered to provide optimal habitat for hare as they provided very little cover. The vegetation cover associated with field boundaries was found to vary widely.

The results from background data, incidental sighting and transects did not show any clear correlations between the habitats present and records of the species. This is discussed further in Section 4, with particular emphasis on the level of disturbance and dynamism of landscape management within the study area affecting brown hare distribution.

#### 3.3.2 Harvest Mouse Field Survey Results

No harvest mice or their nests were recorded during the field surveys.

### 3.3.3 Hedgehog Field Survey Results

The eight monthly transects recorded a total of four hedgehogs, all in the vicinity of Ty Croes. The print trapping surveys returned 12 positive results and there were an additional nine incidental records (including corpses) during the survey period. The combined results are shown in Figure 6.9.

### 3.3.4 Polecat Field Survey Results

A summary of the field surveys carried out in the three winter seasons between 2010 and 2013 is provided in Table 3.2, and the locations of the captures are shown in Figure 6.10. The animals shown in Table 3.2 were generally caught several times, but the detail of the number of recaptures is not thought likely to significantly contribute to an understanding of the population and has therefore been omitted.

The results from the first season of survey found that the areas of habitat east of the Existing Power Station and south of Wylfa Head candidate Wildlife Site, and habitats west of Wylfa A around Porth-y-pistyll were where polecat were most commonly caught. In the second season, polecat were only caught in the southern half of the study area, but the data relating to the specific location of traps in 2011-2012 has not been made available to inform this report. In all successful trapping months, the traps that were associated with areas containing high rabbit populations were consistently the most productive. The negative result from 2012-2013 is thought unlikely to be particularly significant, and several years of concurrent negative results would be required to confidently prove absence. This is discussed further in Section 4.

**Table 3.2 Polecat Field Survey Results**

<b>Record</b>	<b>2010 October</b>	<b>2011 March</b>	<b>2011 October</b>	<b>2012 March</b>	<b>2012 October</b>	<b>2013 March</b>
Total individual males caught	3	1	1	0	0	0
Total individual females caught	1	0	1	1	0	0

## 4. Discussion

### 4.1 Badger

The only evidence of the species ever having been present within 2.5km of the development area comes from a single dead individual on the A5025 in 2009. Badgers are highly susceptible to road mortality as they often forage over a wide range in a single night. It is likely that more records would have been returned if there was a sett in the vicinity of the study area. Field signs in areas where they are present are also often very obvious. Setts, latrines, bedding, hairs snagged on push-throughs and paths are all features that signify that badgers are present. It is considered that should badger be present within the study area then these field signs would have been seen during daytime surveys (e.g. during transects for breeding and over-wintering birds), or the animals themselves would have been recorded during night-time bat activity surveys.

### 4.2 Harvest Mouse

The surveys did not record any harvest mouse nests and the background data search only returned a single record of the species, in the generalised area of north Anglesey (see Figure 3.1). It is therefore likely that the species is absent or is present in very small and localised populations that are difficult to detect.

### 4.3 Pine Marten

The distribution of pine martens in the UK currently shows that the species is not found on Anglesey and that the nearest populations are found in Snowdonia (The Vincent Wildlife Trust, 2015). While it is considered that there are very small fragments of woodland with the potential to support pine martens, the likelihood of the species crossing the Menai Strait and across the relatively open habitats of Anglesey to occupy the site is considered to be remote.

### 4.4 Red Squirrel

Red squirrels are known to be present on Anglesey with records concentrated in the more densely wooded areas in the eastern and southern quarters of the island (Red Squirrels Trust Wales, 2015). These populations have recently been boosted by reintroduction programmes in conjunction with Friends of the Anglesey Red Squirrels in 2008 (Menter Mon, 2015). However, the species requires near continuous woodland in order to survive and disperse into new areas. Freely available online mapping of the island shows that there is a lack of woodland connectivity between known populations and the topic study area. Therefore the likelihood of natural colonisation of the study area by red squirrels in the future is considered to be low.

### 4.5 Population Estimates for Brown Hare, Hedgehog and Polecat

The results from the brown hare, hedgehog and polecat surveys all show that the species are present, and have been recorded with sufficient frequency to suggest that populations have existed in the vicinity of the study area for many years. The surveys also show that the target species are dynamic and react to changes in habitat suitability as evidenced by the lack of consistency within the results of each of the three studies.

There are significant limitations in the amount of interpretation that can be made following the results from all the studies. The main limitation is that it is not possible to infer accurate population sizes based on the results. For brown hare and hedgehog, this is due to the difficulty with which the species can be surveyed (see Section 2.4), and for polecat, the species was recorded in such low numbers as to make population estimates by statistical analysis unlikely to be accurate. The likely populations and future impacts assessments are therefore informed not only by the survey data available, but are also heavily influenced by the known generalised ecology of each species.

#### 4.5.1 Brown Hare Population Estimates

The brown hare is a common yet currently declining species throughout farmland in the UK (North Wales Wildlife Trust, 2008), and populations are estimated to have dropped by 75% since the 1940s (Tapper and Hobson, 2002). A generalised population density of brown hare in the UK is only one per 2ha – 4ha (Macdonald and Barratt, 1993). However, the Mammals of the British Isles Handbook suggests that there is a higher density of hare on Anglesey than the mainland (Harris and Yalden, 2008). It should be noted this can be much greater during the spring breeding season in localised areas when males and females aggregate (Macdonald and Barratt, 1993).

The survey data summarised in this report found that the highest number of sightings was from the southern half of the study area in July and August 2011 in fields where the sward height was shorter. Areas with higher levels of disturbance generally had lower number of brown hare records. Aggregations of males and females have not been recorded in the Wylfa Newydd Project Development Area.

It is therefore considered that the population of brown hare within the study area is at or above the generalised level of the UK, with an estimated population between 95 (one per 4ha) and 190 (one per 2ha) based on a study area of 380ha.

#### 4.5.2 Hedgehog Population Estimates

Surveys for hedgehog were completed in the Wylfa Newydd Development Area in 2010 and 2011 by Arup (Arup, 2012c). The results from these surveys found that the species was fairly ubiquitous throughout the whole study area, and evidence of breeding in the form of juvenile hedgehog footprints was also reported. The species has also been recorded during other nocturnal surveys, e.g. bat and great crested newt (*Triturus cristatus*) surveys, and dead hedgehogs have been regularly recorded on roads around the Wylfa Newydd Development Area.

There are no data on the population on Anglesey but it is suggested that the species is potentially doing marginally better than on the mainland due to the low (or largely absent) badger population which are known predators of the species.

The species is therefore considered to be present in the Wylfa Newydd Development Area and is likely to be at a population density which is normally one per 2.5ha (but ranging between 0.3 and two per hectare) (Macdonald and Barratt, 1993). Based on a normal population density, this would give an approximate population of 152 individuals within the Wylfa Newydd Development Area.

#### 4.5.3 Polecat Population Estimates

Surveys for polecat by Arup have recorded the species in the Wylfa Newydd Development Area in 2011 and 2012, and only four individual animals have ever been caught in any given year (Arup, 2012d). Surveys in 2013 did not capture any animals.

The average lifespan of polecat females at birth is 8.1 months and breeding is once yearly comprising 2-12 young (Macdonald and Barratt, 1993). The species also has large home ranges (16ha – 500ha) indicating that it lives at low population densities.

The slow reproductive rate, high mortality rate in the first year, and low population densities (Macdonald and Barratt, 1993) make it extremely hard to determine exactly what a likely population could be for the Wylfa Newydd Development Area but it is likely to typically range between zero and five. Determining the exact numbers would be extremely difficult and, despite using the best methods available, trapping surveys have only provided very limited data. However, it is considered that the survey data suggests that presence of polecat may be influenced by prey availability, primarily rabbits (*Oryctolagus cuniculus*). Therefore the densities of rabbit could be used as indicators of the likely presence of polecat in the future, and inform risk assessments of likely harm to animals during construction phases of the Project.

## 5. Conclusions and Recommendations

This report provides evidence in support of the presence or likely absence of seven species of terrestrial mammal that were identified as being potential ecological receptors that could be affected by construction and operation activities within the Wylfa Newydd Development Area.

The study area provides ideal habitat for badger in the form of small areas of woodland for cover and sett building and open pasture and rank grassland for foraging. However, the only evidence of the species being present in the study area is from a dead animal found in 2009. The lack of incidental records of field signs, roadkill or live animals during extensive nocturnal surveys for other species groups (e.g. bats and great crested newts), suggest that the species is absent from the study area and would not be affected by the Project.

The survey data show that brown hare are common and widespread within the study area and that the population size may range between 95 and 190 individuals. The species should therefore be a material consideration in the impact assessment of the Project.

The survey information and Cofnod evidence suggest that harvest mouse are absent from the study area. However, the species has been recorded in the north of Anglesey (MISE, 2015), and therefore it may be present in low numbers in isolated populations that are hard to detect. The potential for the species to be present should therefore not be completely discounted. However, the lack of confirmation of species presence means that harvest mouse as a species should not be considered as an ecological receptor in their own right for the purposes of the Project impact assessment.

Hedgehogs are common and widespread within the study area with a population size, based on a normal density, of 152 individuals. Impacts on the species should therefore be considered within any impact assessment for the Project.

Records of pine marten were not found in the background data search and these animals have never been recorded in the study area. The nearest known populations of pine marten to the study area are in Snowdonia and are therefore separated by the Menai Strait. The habitats across Anglesey are also not conducive to colonisation by the species as there is a lack of dense connected woodland, a habitat that the species has a strong affinity with. There is also only a small amount of woodland in the study area that is not large enough to have the capability to support a viable population. The species is therefore considered to be absent and would not be affected by the Project.

Polecats have been recorded in the study area in numbers that are within the bounds of the normal population for an area the size of the study area. This would give an estimated population of between zero and five animals at any one time. The data from 2013 trapping surveys returned zero animals but the numbers from previous years of survey suggest that the species is probably still present but were simply not detected. The species should be considered in any impact assessment for the Project.

Based on historic records of red squirrel, the suitability of habitat present within the Wylfa Newydd Development Area, and the availability of habitat connecting the Wylfa Newydd Development Area with the wider landscape, it is considered that the likelihood of red squirrel naturally colonising the study area is low.

## 6. References

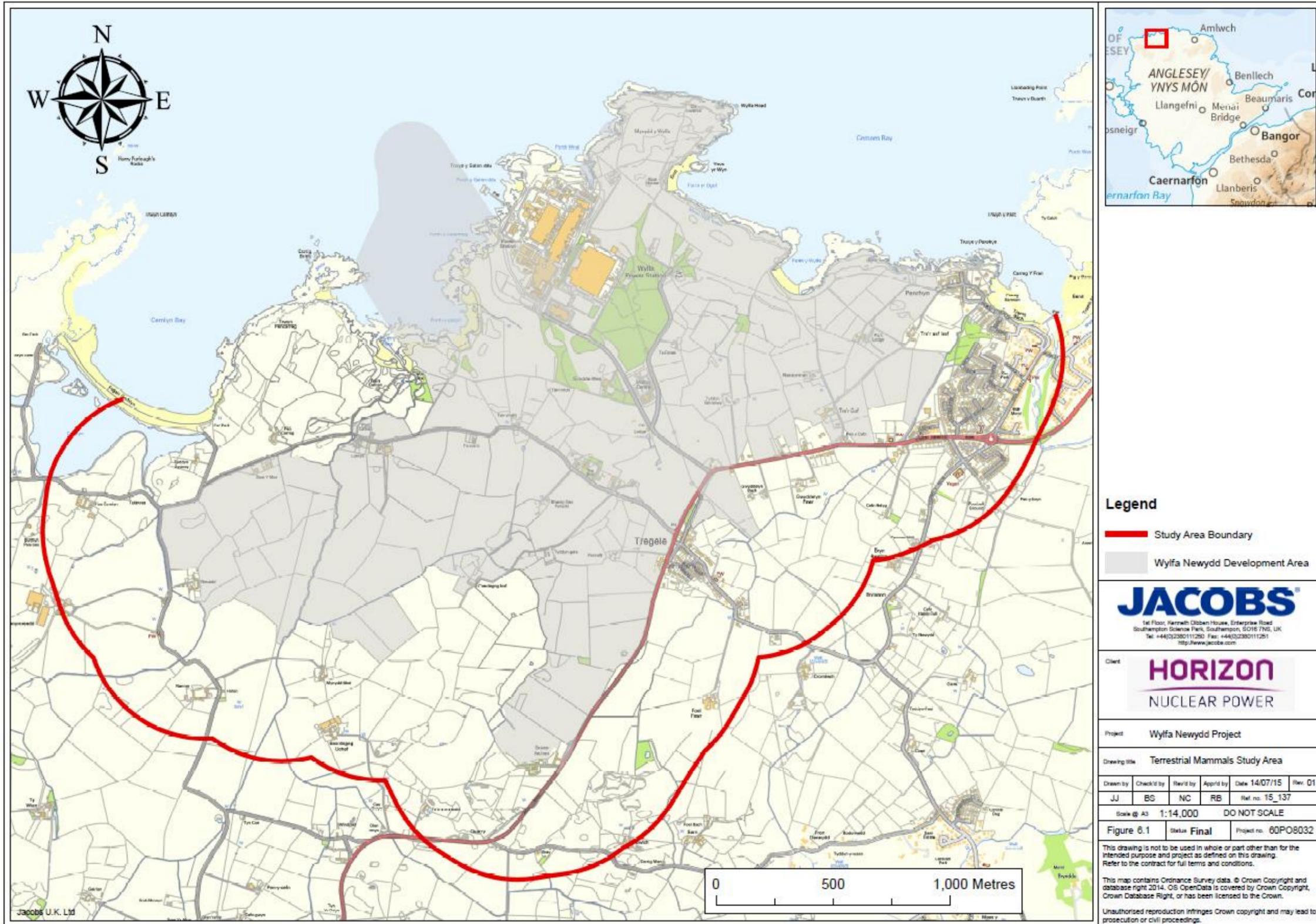
- Arup. (2009). *Phase 1 and Protected Species Survey – Wylfa Power Station*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. (2012a). *Brown Hare Survey Report*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. (2012b). *Harvest Mouse Survey Report*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. (2012c). *Report on Hedgehog Surveys 2010 & 2011*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. (2012d). *Report on Polecat Survey 2010-2011*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd.
- Arup. (2012e). *Polecat Survey Report 2012*. Unpublished report on behalf of Wylfa Nuclear Power (Wylfa) Ltd.
- Birks, J.D.S. and Kitchener, A.C. eds. (1999). *The Distribution and Status of the Polecat Mustela putorius in Britain in the 1990s*, The Vincent Wildlife Trust: London.
- Chartered Institute of Ecology and Environmental Management (CIEEM). (2006). *Guidelines for Ecological Impact Assessment*. CIEEM: Winchester.
- Harris, S. and Yalden, D. (2008). *Mammals of the British Isles Handbook*, 4<sup>th</sup> Edition, The Mammal Society.
- Jacobs. (2013a). *Consultancy Report: Polecat (Mustela putorius) Baseline Surveys 2013*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. W202.01-S5-PAC-REP-00003.
- Jacobs. (2013b). *Consultancy Report – Phase 1 Habitat Survey Report 2013*. Unpublished report on behalf of Horizon Nuclear Power (Wylfa) Ltd. Ref. W202.01-S5-PAC-REP-00015.
- Legislation.gov.uk. (2015). [online]. Available at: <http://www.legislation.gov.uk> [ Accessed: 08/12/15].
- Macdonald, D. and Barrett, P. (1993). *Collins Field Guide Mammals of Britain and Europe*, Collins: London.
- Menter Mon. (2015). *Menter Mon*. [Online]. Available at: <http://www.mentermon.com/red-squirrels.htm> [Accessed: 28/07/2015].
- MISE. (2015). *Searching for Britain's Smallest Rodent – The Harvest Mouse (Micromys minutus)*. [Online]. Available at: <http://www.miseproject.ie/the-mise-times-2/searching-for-britains-smallest-rodent-the-harvest-mouse-ilygod-yr-%C5%B7d-micromys-minutus/> [Accessed: 07/08/15].
- North Wales Wildlife Trust. (2008). *Anglesey Brown Hare Project 2007-2008*. [Online]. Available at: <http://www.northwaleswildlifetrust.org.uk/what-we-do/living-landscapes/living-landscape-projects/brown-hare-project> [Accessed: 28/07/2015].
- Red Squirrels Trust Wales. (2015). *Red Squirrels Trust Wales*. [Online]. Available at: <http://www.redsquirrels.info/map-holder> [Accessed: 22/07/2015].
- Tapper, S. and Hobson, D. (2002). *Conserving the Brown Hare*, The Game Conservancy Trust: Hampshire.
- Tapping, R. (2013). *Harvest Mice in Wales – where might they be*, Science Report No. 1036. Cofnod.
- The Mammal Society. (2015). *Footprint Tunnel Survey*. [Online]. Available at: [http://www.mammal.org.uk/footprint\\_tunnel\\_survey](http://www.mammal.org.uk/footprint_tunnel_survey) [Accessed: 14/07/15].

The Vincent Wildlife Trust. (2015). *Pine Marten (*Martes martes*)*, *The Vincent Wildlife Trust*. [Online]. Available at: <http://www.vwt.org.uk/species/pine-marten/> [Accessed: 22/07/2015].

UKBARS. (2015). link to lists of Anglesey Local Biodiversity Action Plan (LBAP) species. [Online]. Available at: [https://ukbars.defra.gov.uk/archive/plans/lbap\\_plans.asp?LBAP=%7b42A89BF7-2E26-4C14-8253-40937ACA129D%7d](https://ukbars.defra.gov.uk/archive/plans/lbap_plans.asp?LBAP=%7b42A89BF7-2E26-4C14-8253-40937ACA129D%7d) [Accessed: 28/07/2015].

## Appendix A. Figures

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**Legend**

— Study Area Boundary

■ Wylfa Newydd Development Area

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Project **Wylfa Newydd Project**

Drawing title **Terrestrial Mammals Study Area**

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Scale @ A3 **1:14,000** **DO NOT SCALE**

Figure 6.1 Status **Final** Project no. **60PO8032**

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Figure 6.1 Study area

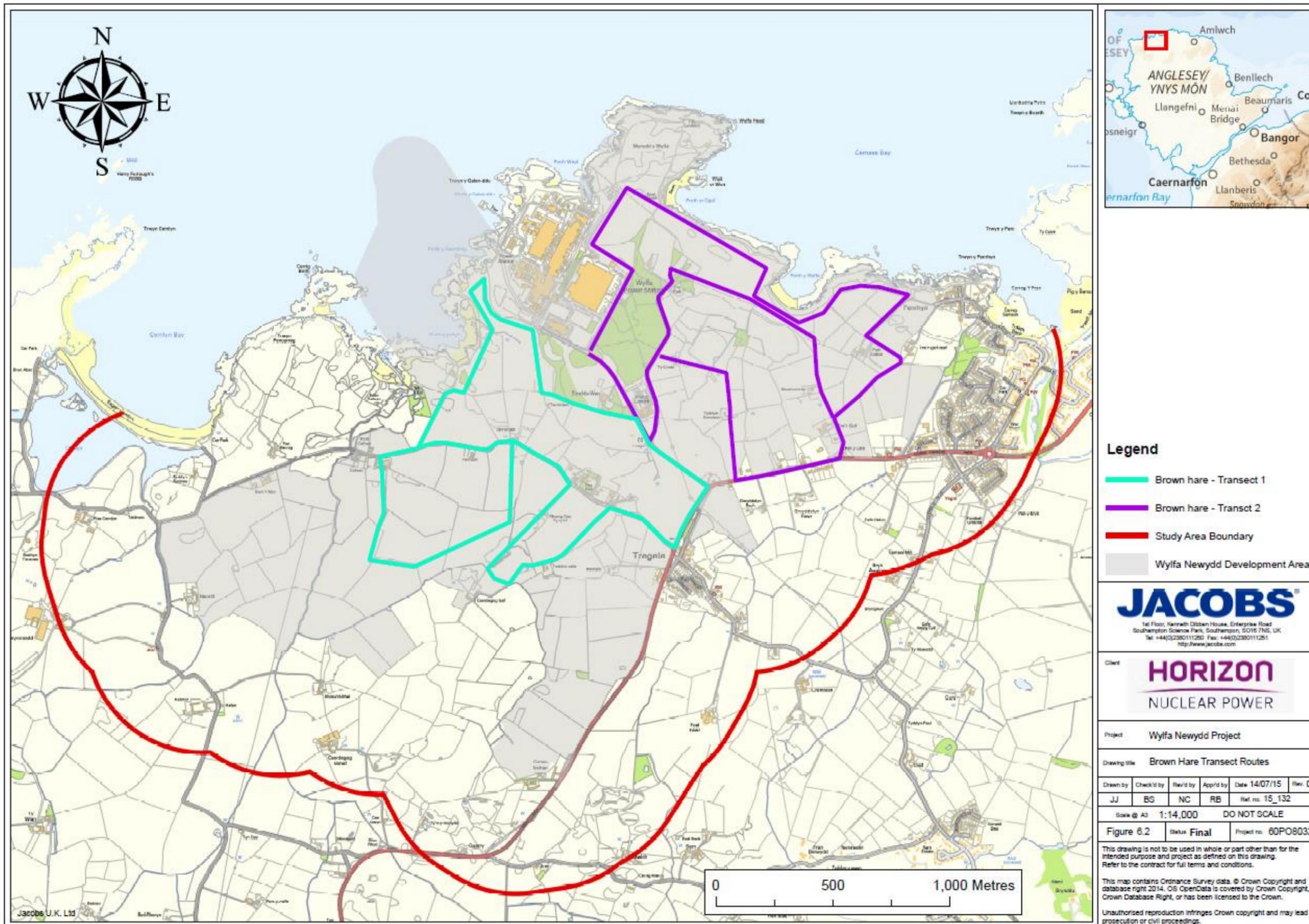
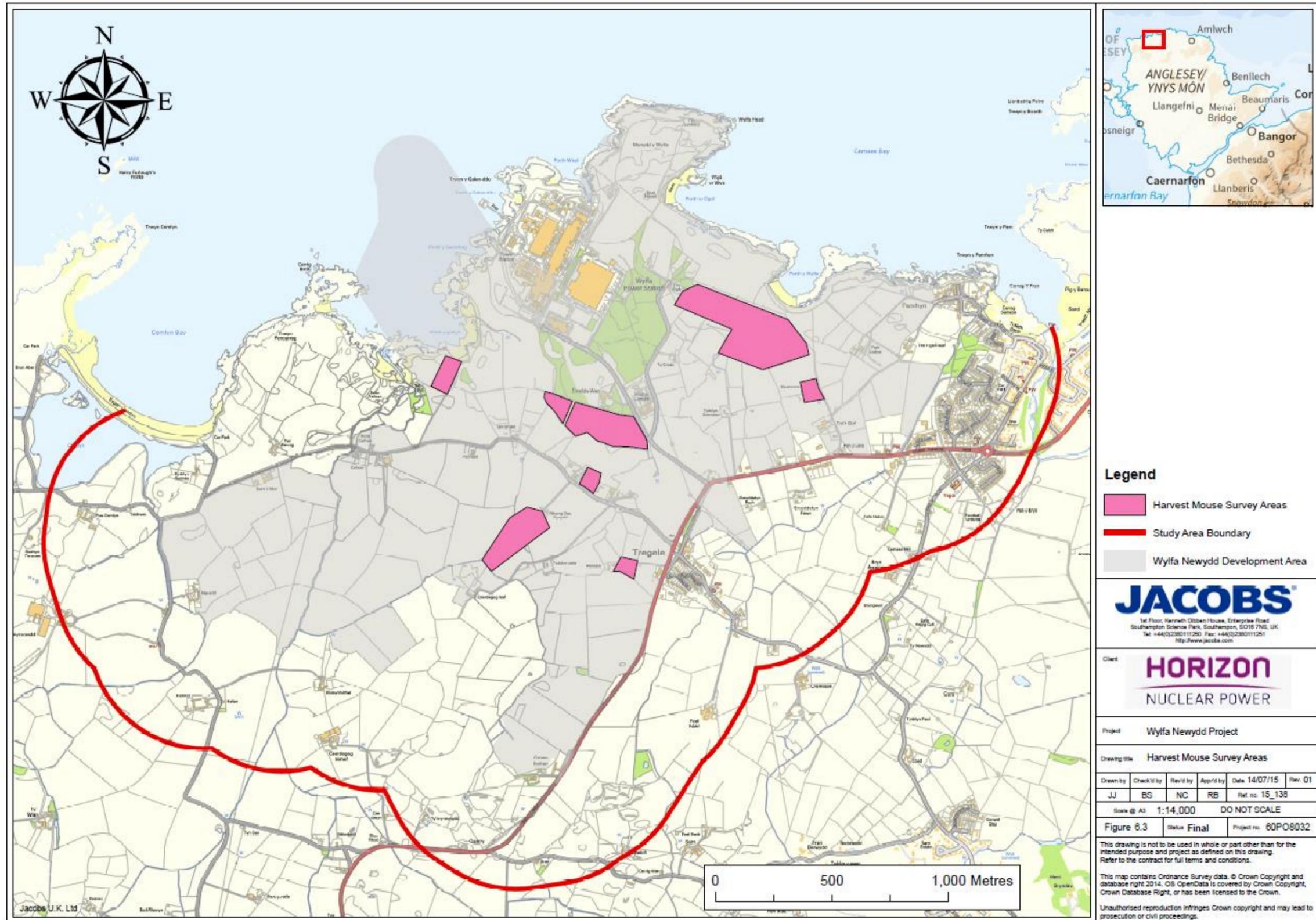


Figure 6.2 Brown Hare Transect Routes



**Legend**

- Harvest Mouse Survey Areas
- Study Area Boundary
- Wyifa Newydd Development Area

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Project **Wyifa Newydd Project**

Drawing title **Harvest Mouse Survey Areas**

Drawn by	Checked by	Revised by	Approved by	Date	Rev.
JJ	BS	NC	RB	14/07/15	01
				Ref. no.	15_138

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Figure 6.3 Status **Final** Project no. 60PO8032

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Figure 6.3 Harvest Mouse Survey Locations

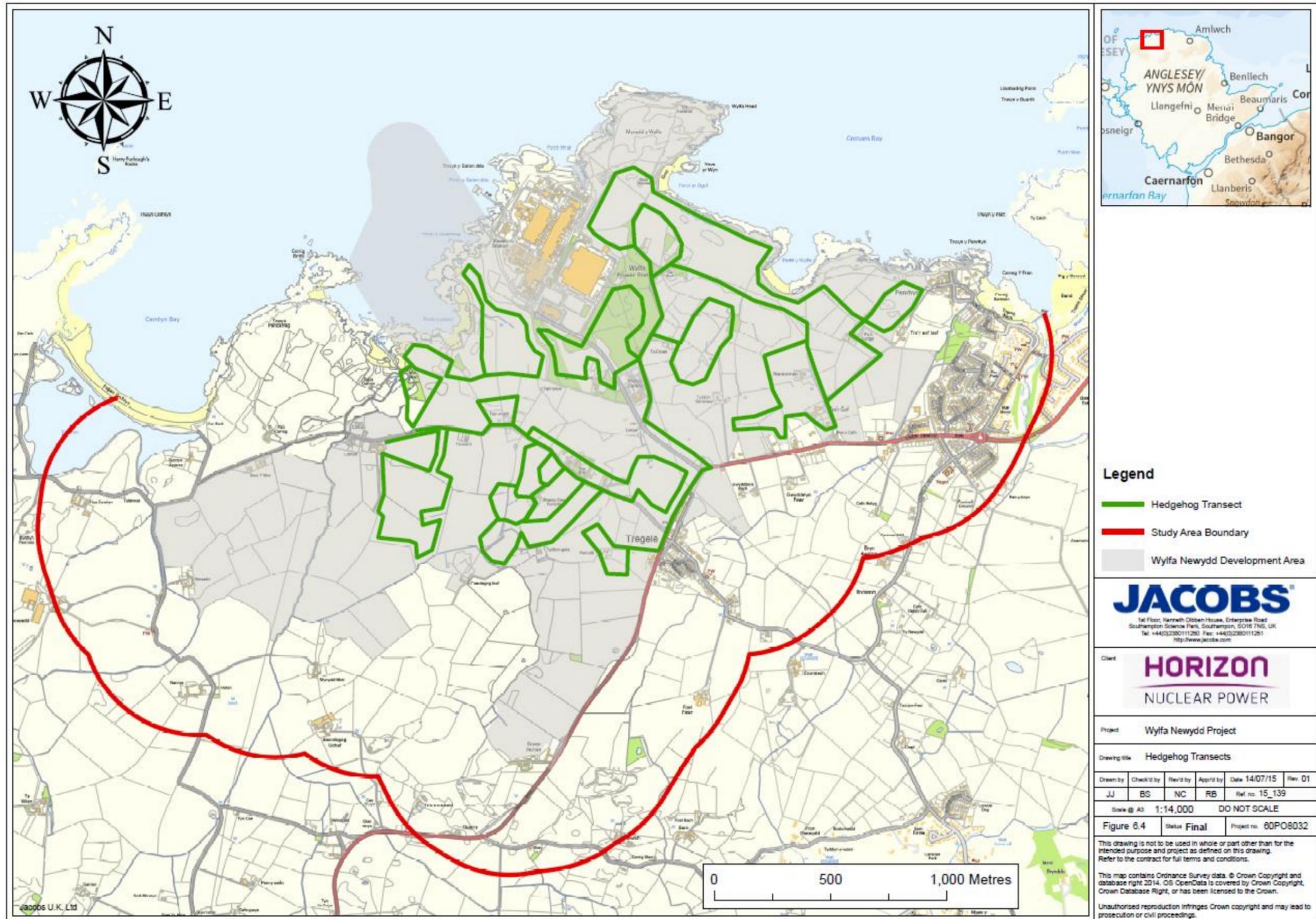


Figure 6.4 Hedgehog Transect Routes



Figure 6.5 Hedgehog Print-trap Locations

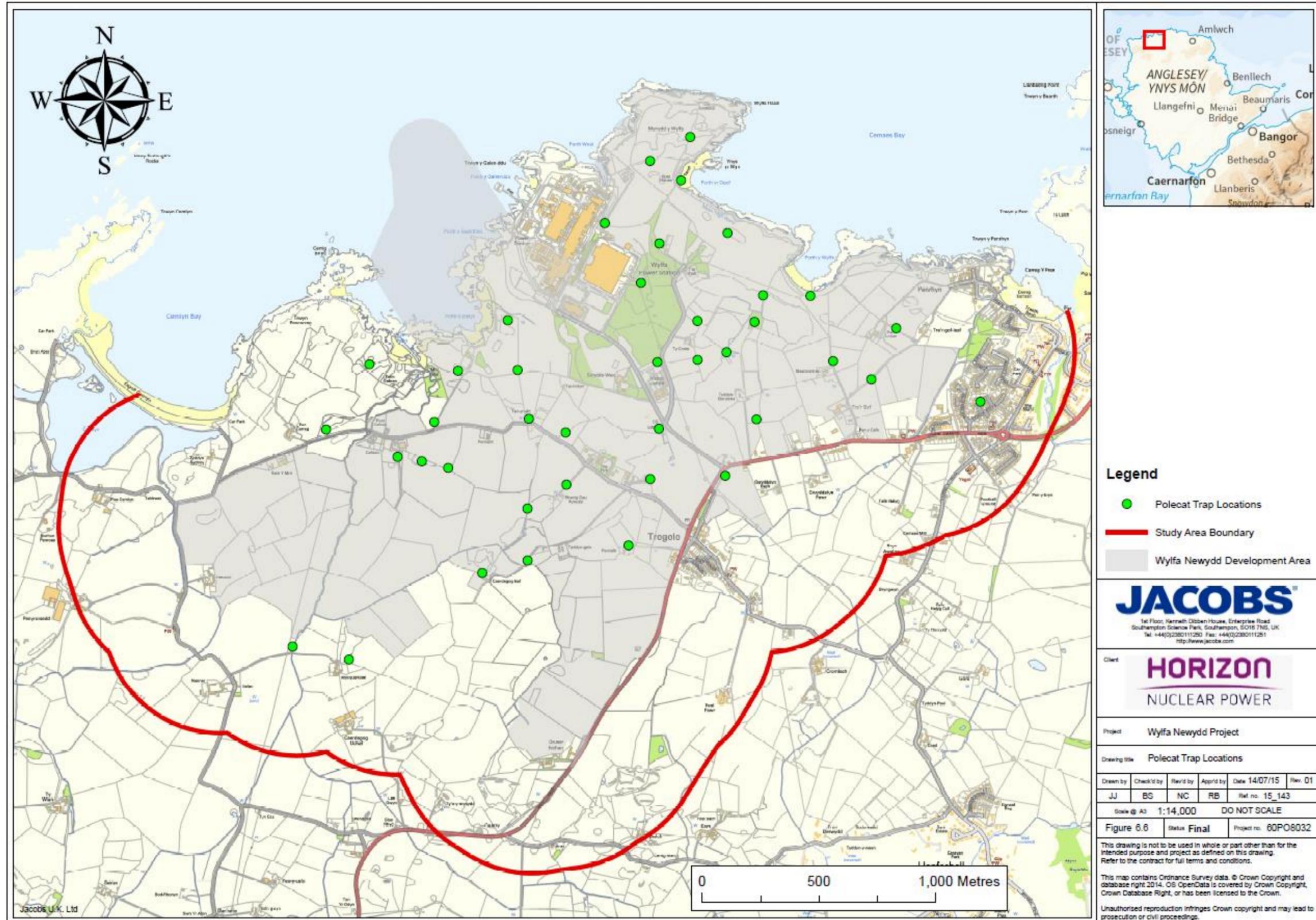


Figure 6.6 Polecat Trap Locations

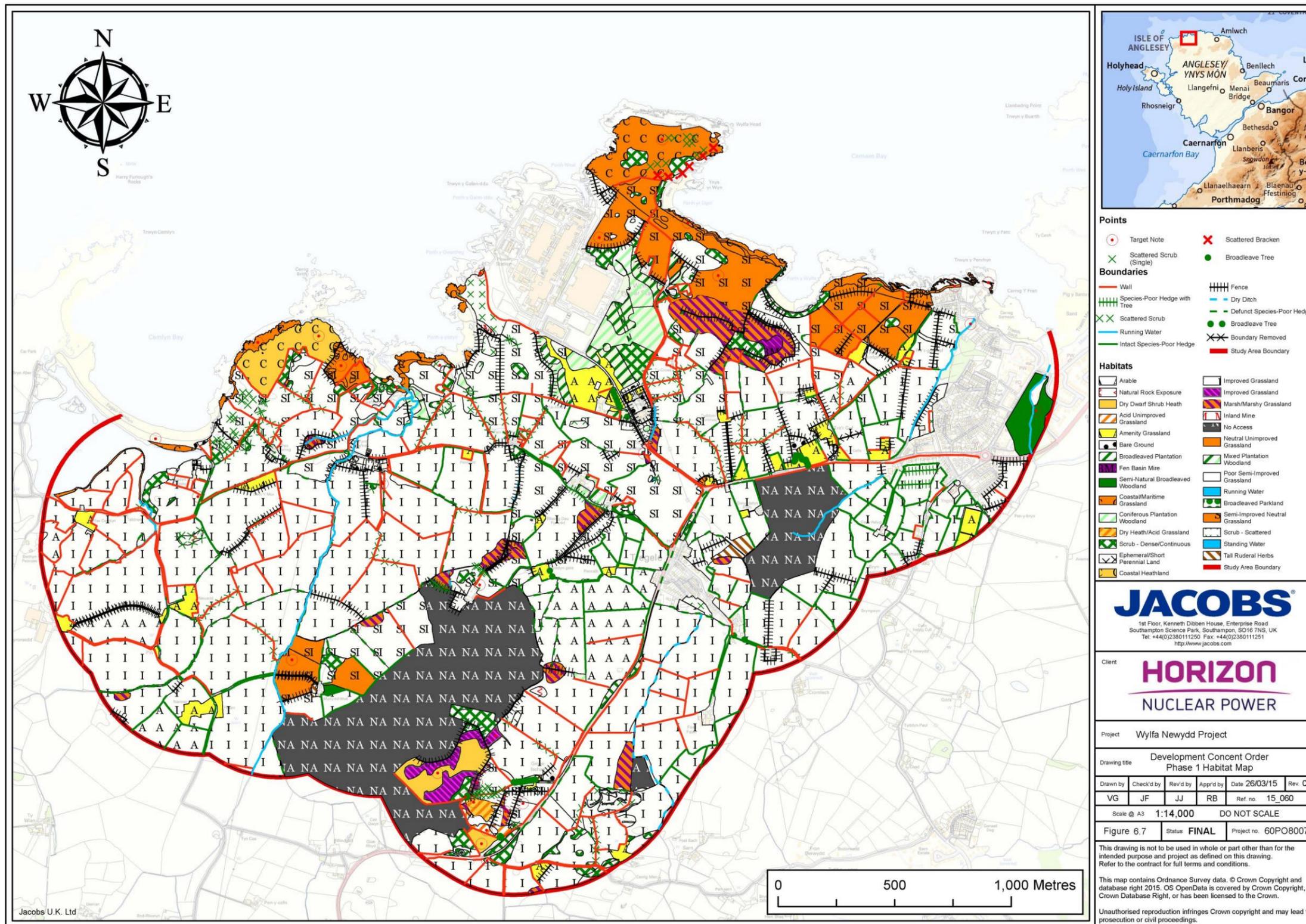


Figure 6.7 Phase 1 Habitat Survey Map (from Jacobs, 2013b)

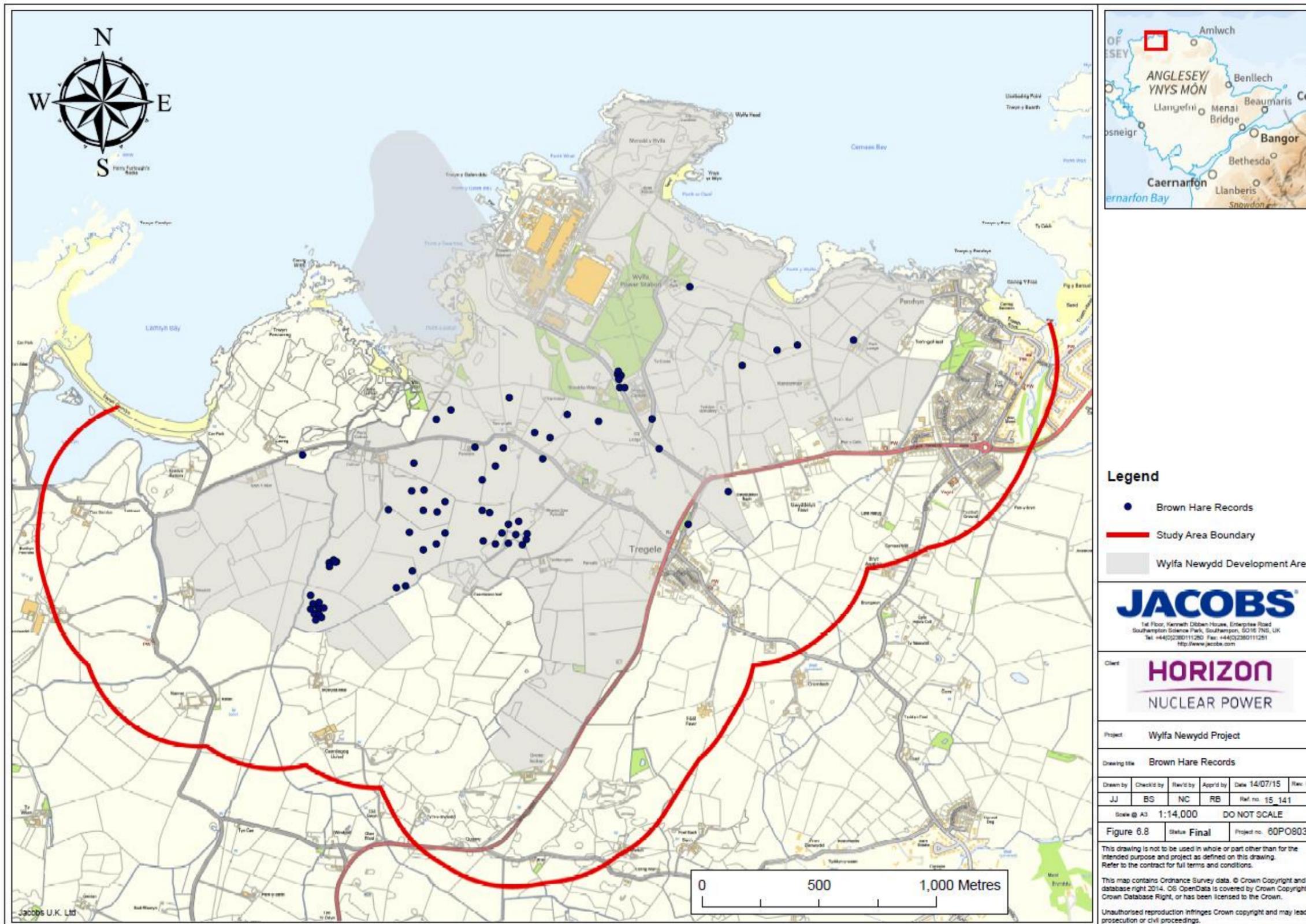


Figure 6.8 Brown Hare Transect Survey Results and Incidental Sightings



Figure 6.9 Hedgehog Combined Survey Results

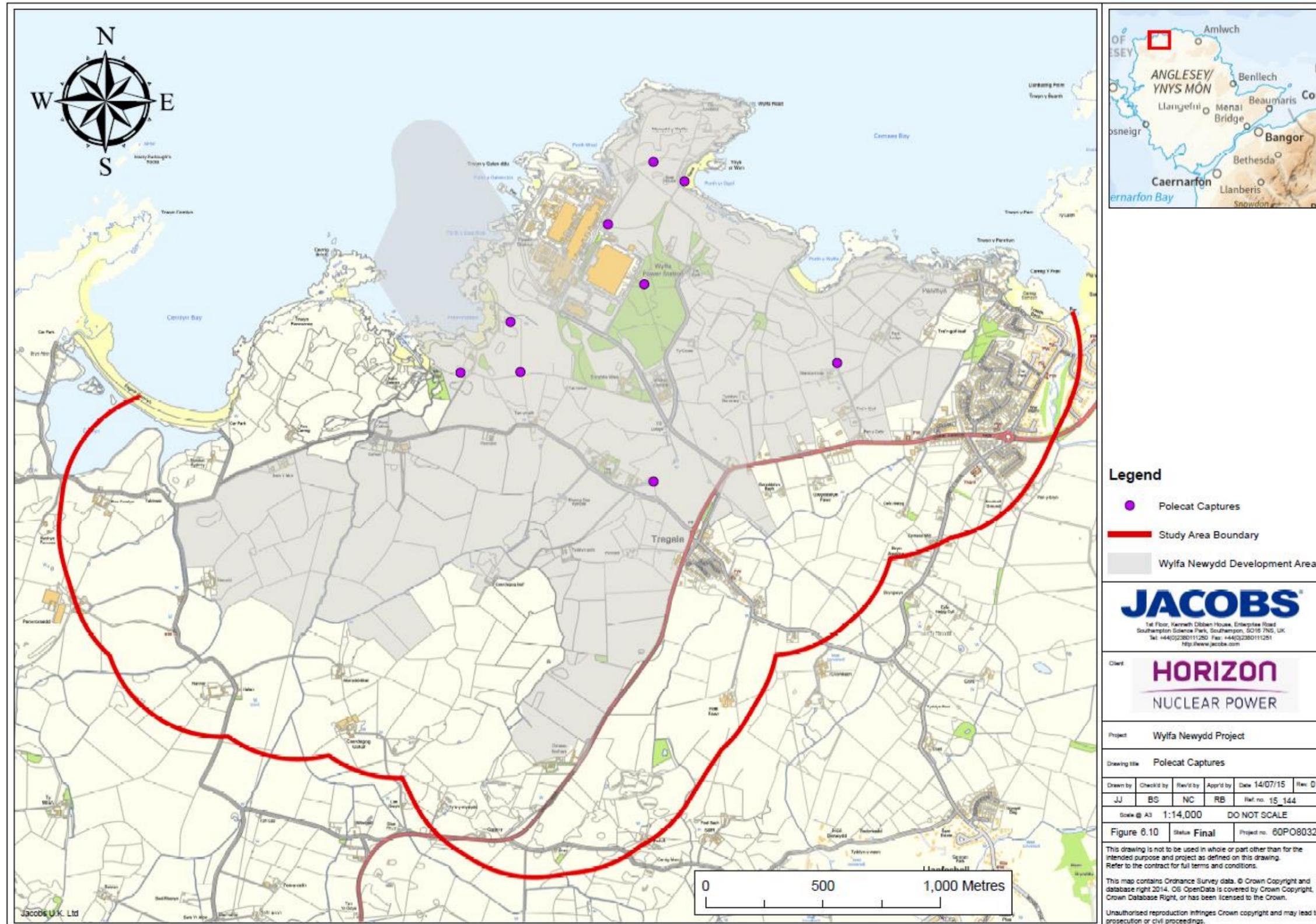


Figure 6.10 Polecat Survey Results

## Appendix B. Legislation

A summary of the relevant pieces of legislation pertaining to the species discussed in this report has been provided in the following sections. The descriptions of the legislation have been obtained from [www.legislation.gov.uk](http://www.legislation.gov.uk) (2015).

### **Wild Mammals (Protection) Act 1996**

The Wild Mammals (Protection) Act 1996 makes illegal any act of mutilation, kicking, beating, nailing, or otherwise impaling, stabbing, burning, stoning, crushing, drowning, dragging, asphyxiating against a wild mammal with intent to inflict unnecessary suffering. In the context of the construction industry, it is the potential for animals to become entombed in buried burrows and dens that is of particular relevance. Identification of potentially active burrows should therefore be a consideration during the planning of any groundworks that could trap and thereby asphyxiate any animals within.

### **The Natural Environment and Rural Communities Act 2006**

The Natural Environment and Rural Communities (NERC) Act 2006 places a statutory duty on public bodies to take, or promote the taking by others, steps to further the conservation of the listed habitats and species. In Wales, this is sanctioned by Section 42 which lists habitats and species of principal importance. Brown hare, harvest mouse, hedgehog, pine marten, polecat and red squirrel are all listed on Section 42 making them material considerations in the planning process.

### **The Wildlife and Countryside Act 1981 (as amended)**

The Wildlife and Countryside Act 1981 (as amended) is the principal piece of UK legislation relating to the protection of wildlife. It consolidates and amends existing national legislation to implement the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild flora and fauna (Habitats Directive) and Council Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive) in Great Britain.

The Act makes it an offence (subject to exceptions) to intentionally kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring or taking wild animals listed in Schedule 6.

### **Conservation of Habitats and Species Regulations 2010 (as amended)**

The Conservation of Habitats and Species Regulations 2010 (as amended) (SI No. 2010/490) update and supersede The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). The 2010 Regulations are the principal means by which the Habitats Directive is transposed in England and Wales.

Regulation 41 relates to the protection of European protected species listed under Schedule 2 of the Regulations. Taken together, it is an offence to undertake the following acts with regard to European protected species:

- deliberately capture, injure or kill any wild animal of a European protected species;
- deliberately disturb animals of any such species in such a way as to be likely to:
  - Impair their ability to survive, breed, rear or nurture their young, hibernate or migrate; or
  - Affect significantly the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The disturbance offence is generally taken to refer to a discernible effect at population level and biogeographic level, rather than simply to an individual animal. However, in certain circumstances the disturbance of one individual animal may have population-level effects.

The Conservation of Habitats and Species Regulations 2010 (as amended) also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural Resources Wales in Wales). Licences may be granted for a number of purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority has determined that the following regulations are satisfied:

- The works under the licence are being carried out for the purposes of “*preserving public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment*”.
- There is “*no satisfactory alternative*”.
- The action “*will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range*”.

To apply for a licence, the following information is required:

- The species concerned.
- The size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.
- What measures can be conducted to mitigate for the impact(s).

## Appendix C. Incidental Records

Date	Location	Species	English name	Number seen	Surveyor/s	Additional Notes	Grid reference
22/03/13	Not given	<i>Lepus europaeus</i>	Hare	5	CEP - Chris	5 hares in field	SH 34122 92401
27/05/13	Not given	<i>Erinaceus europaeus</i>	Hedgehog	1	CEP - Chris	Animal near visitor centre (Adult)	SH 35504 93163
30/05/13	Not given	<i>Erinaceus europaeus</i>	Hedgehog	1	CEP - Kate	Animal in garden of nant Orman (Adult)	SH 36204 93338
31/05/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	1 hare in field	SH 3449 92486
31/05/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	1 hare in field	SH 34129 92386
31/05/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	1 hare in field	SH 34207 92623
31/05/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	1 hare in field	SH 34804 92721
05/06/13	Wylfa Head	<i>Erinaceus europaeus</i>	Hedgehog	1	CEP - Chris	Animal on headland (Adult)	SH 35417 94343
07/06/13	Gardeners Cottage	<i>Erinaceus europaeus</i>	Hedgehog	1	CEP - Chris	Animal in field behind gardeners cottage (Adult)	SH 34577 93451
16/06/13	Cemlyn Road	<i>Lepus europaeus</i>	Hare	1	CEP - Sam	Adult on Cemlyn Road	SH 33987 93046
01/07/13	Cafnan Farm	<i>Lepus europaeus</i>	Brown Hare	1	Not given	Not given	Not given
01/07/13	Tre'r gof	<i>Lepus europaeus</i>	Hare	1	CEP - Sam	Adult on road to SSSI	SH 35542 93196
17/07/13	Visitor Centre	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	Adult on grass by Visitor Centre	SH35409 93358
18/07/13	Visitor Centre	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	Adult & leveret by Visitor Centre	SH 35409 93358
19/07/13	Visitor Centre	<i>Lepus europaeus</i>	Hare	2	CEP - Chris	2 leverets by visitor centre	SH 35409 93358
29/07/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	1 leveret by visitor centre	SH 35409 93358
01/08/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	Running across road	SH 34817 93096
01/08/13	Not given	<i>Lepus europaeus</i>	Hare	1	CEP - Chris	Running across road	SH 35599 93058
02/08/13	Not given	<i>Erinaceus europaeus</i>	Hedgehog	1	CEP - Chris	Adult on Wylfa Head	SH 35500 94496
06/08/13	Not given	<i>Lepus europaeus</i>	Hare	2	CEP - Chris	2 hares grazing in field opposite Tyddyn Gele	SH 350 927
22/01/14	South of Treglele	<i>Lepus europaeus</i>	Brown Hare	1	Jonathan Jackson	Not given	Not given
18/03/14	Dalar Hir	<i>Erinaceus europaeus</i>	Hedgehog	Prints	Mark Jackson	Not given	Not given
09/07/14	Jam Factory Road	<i>Erinaceus europaeus</i>	Hedgehog	2	Mark Jackson	dead on road	Not given
15/09/14	Cemlyn Lagoon	<i>Mustela putorius</i>	Polecat	1	Mark Jackson	Possible polecat scat was found	Not given



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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-17  
Consultancy Report: Wylfa Freshwater  
Baseline Surveys 2011-2014**

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## **Wylfa Newydd Project**

# **Freshwater Baseline Surveys 2011-2014 Report**

**March 2016**

**Document Number: 60PO8007/AQE/REP/002**  
**Horizon Ref: WN03.01.01-S5-PAC-REP-00020**  
**Document Date: March 2016**  
**Version: 0.4**

**Document control sheet**

**BPP 04 F8**

version 16 Oct 2013

<b>Project:</b>	<b>Wylfa Newydd Project</b>		
<b>Client:</b>	<b>Horizon Nuclear Power Wylfa Ltd</b>	<b>Project Number:</b>	<b>60PO8007</b>
<b>Document Title:</b>	Wylfa Newydd Project Freshwater Baseline Surveys 2011-2014		
<b>Ref. No:</b>	60PO8007/AQE/REP/002		

		<b>Originated by</b>	<b>Checked by</b>	<b>Reviewed by</b>
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		Niamh Burke	Evonne Maxwell / Liza Inglis	Matt Robson
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DATE	<b>23/12/15</b>	<b>Document status: Final</b>		

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## Executive Summary

The Wylfa Peninsula on Anglesey, north Wales has been listed as an approved site for the construction of a new nuclear facility in the National Policy Statement (NPS) for Nuclear Power Generation (EN-6), published in 2011 (Department of Energy and Climate Change, 2011).

Jacobs UK Ltd (Jacobs) was commissioned by Horizon Nuclear Power Wylfa Limited (Horizon) to undertake an ecological survey programme within the vicinity of the proposed new nuclear power station (the Wylfa Newydd Generating Station) on north Anglesey. This work has included gathering of baseline data for fish, diatoms (phytobenthos), macrophytes, macroinvertebrates, pond and stream habitat and water quality.

Survey work has been undertaken since 2011 to identify species and habitats of conservation interest and characterise the freshwater environment. An area approximately 7km<sup>2</sup>, principally to the south and south-west of the Existing Power Station and including Wylfa Head, was identified for survey. This report presents the results of all freshwater surveys undertaken up to the end of 2014.

The site contains a diverse range of aquatic habitats including ponds, streams, ditches, wetland, coastal headland pools and seepages, many of which are ephemeral waterbodies. Habitats have been characterised with habitat descriptions updated over the survey period to provide a seasonal understanding. The physical habitat of the watercourses varied between natural streams to drainage ditches or streams that have been historically over-deepened and lost much of their natural character. Many of the alterations to watercourses are associated with field boundaries and are typical of the local area. Flow types varied, ranging between riffle/run in the more natural sections to sluggish flow chiefly within the ditch habitats. The ponds within the site ranged from artificial drainage ponds, to natural groundwater fed ponds, some with ephemeral characteristics.

Environmental condition as determined by diatom populations, varied by site and season. Changes in diatom populations seen between 2012 and 2014 are likely to be a result of changes in water levels and velocity. Inter-annual comparison of the 2011 to 2014 datasets showed that the quality of most sites has remained constant with respect to their phytobenthos communities. The diatom sampling to date shows that there is a large variability in diatom populations across the study area, which would be expected given the diverse range of habitat types assessed.

Water quality data showed a general trend of low dissolved oxygen levels in the ditch, wetland and standing water habitats, with the exception of Porth Wylfa Pond and Penyrsedd Pond. Metal concentrations were generally low across all sites in 2012 and 2013 with the exception of mercury at Power Station Junction in 2013. During 2014, a number of the new pond sites indicated elevated metal concentrations on some sampling occasions. Suspended solid levels varied spatially and inter-annually, but generally suggested a stable system with limited sediment mobilisation. Nutrient levels (reactive phosphorus and ammonia) were generally fairly low although higher levels were often noted within the ponds.

The majority of macroinvertebrate species identified in the study area belonged to families of moderate to high pollution tolerance, which typically reflects pressures from agricultural land use (mainly improved pastures, where livestock often have

access to the waterbodies). In general, the macroinvertebrate communities across the study area were dominated by the more pollutant tolerant families such as leeches, crustaceans, beetles and molluscs, but well vegetated, flushed sites such as at Porth-y-pistyll and Porth Wylfa supported families of stoneflies and mayflies. The Cae Gwyn Site of Special Scientific Interest (SSSI) and Tre'r Gof SSSI areas were particularly valuable for rare beetle species, supporting their designation as important wetland areas.

Macrophyte communities tended to lack diversity and there was some evidence of nutrient enrichment. However, the majority of sites demonstrated good ecological quality. The surveys identified that the macrophyte communities are dominated by higher vascular plants, with a smaller presence of macro-algae and bryophytes. There were no species of conservation importance identified in the surveys.

Electric fishing surveys were conducted under licence at ten sites across seven waterbodies. Species recorded included the protected European eel (*Anguilla anguilla*), indicating sufficient connectivity to the marine environment in a number of the watercourses to allow eel migration across the study area. Brown trout (*Salmo trutta*), was recorded on the Cafnan watercourse, which has potential breeding habitat for this species. Three-spined stickleback (*Gasterosteus aculeatus*) has been widely recorded, with nine-spined stickleback (*Pungitius pungitius*) being recorded in smaller numbers. The presence of migratory species suggests the watercourses in the study area could provide an important resource for both diadromous and potadromous species.

To ease interpretation of the habitat quality, this report presents baseline data for the individual receptors categorised according to the main watercourses. The main Wygyr catchment has been subdivided starting in the west of the site and progressing eastwards.

The main catchments presented in this report are the following: the Cemlyn stream that outflows to Cemlyn lagoon at the west of the study area, the Cafnan watercourse, the Tre'r Gof catchment and the Cemaes watercourse in the east, flowing north to Cemaes Bay. The remaining survey sites which were not deemed to be hydrologically part of any catchment were classed as 'others' and are described individually in Sections 7 and 8.

Of the four main catchments, the Cafnan catchment was shown to exhibit the highest quality habitat in terms of fish and macroinvertebrates. Trout and European eel were caught during the surveys and potential spawning habitat was identified along the main stem of the river. The tributary stream exhibited lower habitat quality with the exception of the wetland areas at the Cae Gwyn SSSI and Groes-fechan wetland, where some species of conservation interest were found.

The Cemlyn catchment to the west showed evidence of historical realignment, with some sedimentation stress and low levels of nutrient enrichment via diffuse pollution. Apart from European eel, no species of conservation interest were identified.

The Tre'r Gof catchment exhibited little fish habitat, although incidental sightings of European eel were recorded. Low to moderate quality habitat was observed as evident from macrophyte, phytobenthos and macroinvertebrate surveys. The moss beetle *Hydraena palustris* was found in 2014 and is a Near Threatened species.

Aquatic habitats in the Cemaes catchment were influenced by low levels of nutrient enrichment via diffuse pollution, low flows and variable water quality. Apart from the European eel, no other species of conservation interest were recorded during the surveys.

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**Glossary of Acronyms:**

<b>Acronym</b>	<b>Acronym representation</b>	<b>Definition</b>
ALG	Percent algal cover	Macrophyte index used to calculate the percent algal cover.
ASPT	Average Score per Taxon	The ASPT for a given site is a calculation of the average of the tolerance scores of all macroinvertebrate families found, and ranges from 0 to 10.
BMWP	Biological Monitoring Working Party	An invertebrate scoring system which indicates the pollution tolerance of invertebrates at a given site
CCI	Community Conservation Index	CCI represents the national rarity and diversity of invertebrate species identified at a site and designates a conservation value to the sampled community based upon both a species rarity and the overall community richness.
CO	Number of Coleoptera families	Number of Coleoptera families indicates the habitat quality and diversity of a pond.
DARLEQ2	Diatom Assessment of River and Lake Ecological Quality	Microsoft Windows® program for the assessment of river and lake ecological status using diatoms.
EQI	Ecological Quality Indices	The ratio of observed to expected values (O/E) of each biotic receptor.
EQR	Ecological Quality Ratio	As per EQI above, EQR is the ratio that incorporates the key WFD requirements for ecological classification: typology, reference conditions and class boundary settings.
LEAFPACS2	N/A	A classification method that assess macrophytes in rivers according to the requirements of the Water Framework Directive (WFD).
LIFE	Lotic-invertebrate Index for Flow Evaluation	Each macroinvertebrate species or family within a sample is assigned to a flow group depending on their flow/velocity preference, giving two indices: LIFE (sp.) and LIFE (F). A high LIFE score represents a higher number of taxa with a preference for high velocity habitats and vice versa.
LIFE (F)	Lotic-invertebrate Index for Flow Evaluation – Family level	Each macroinvertebrate family within a sample is assigned to a flow group depending on their flow/velocity preference. A higher score represents a higher number of taxa with a preference for high velocity habitats, and vice versa.
LIFE (sp)	Lotic-invertebrate Index for Flow Evaluation – Species level	Each macroinvertebrate species within a sample is assigned to a flow group depending on their flow/velocity preference. A higher score represents a higher number of taxa with a preference for high velocity habitats, and vice versa. The species index is more accurate than the family level as it accounts for variable flow preference of species within a family group.
MINTA	Minimum Taxa	Represents the defining class based on the minimum of either NTAXA or ASPT indices and is used to attribute an EQR classification to the study site in question

Acronym	Acronym representation	Definition
MRV	Minimum Reporting Value	The lowest concentration of a substance that is reported in any analysis. It usually represents the acceptable background concentration for a given substance according to water quality guidelines
NFG	Number of functional groups	Number of functional groups is a macrophyte metric used to measure how truly aquatic the community is.
NGR	National Grid Reference	Ordnance Survey National Grid reference system is a system of geographic grid references used in Great Britain.
NTAXA	Number of Taxa	A measure of the number of species taxa present at a given site
OM	Number of Odonata and Megaloptera families	Number of Odonata and Megaloptera families indicates long-term quality of a pond as larvae have a long aquatic life stage.
PSI	Proportion of Sediment-sensitive Invertebrates	Macro-invertebrates within a sample are assigned a score based on their sensitivity to sediment. The resulting PSI scores indicate how sedimented the watercourse is from minimally sedimented to heavily sedimented.
PSI (F)	Proportion of Sediment-sensitive Invertebrates (Family)	Macro-invertebrate families within a sample are assigned a score based on their sensitivity to sediment. Predicted values are generated and compared to the observed, producing an EQR indicating how sedimented the watercourse is. It is interpreted as minimally, slightly, moderately or heavily sedimented.
PSYM	Predictive SYstem for Multimetrics	PSYM is a method for assessing the biological quality of still waters in England and Wales.
RICT	River Invertebrate Classification Tool	A method that enables the assessment of the condition of the quality element, 'benthic invertebrates', listed in Table 1.2.1 of Annex V of the Water Framework Directive.
RMNI	River Macrophyte Nutrient Index	The measure of which plants grow in the river and their association with high nutrients and is measured on a scale from 1-10.
SM	Number of submerged and marginal (not floating) species	The number of submerged and marginal (not floating) species indicates plant species richness of a site.
TCV	Taxon Cover Value	An estimate of the percentage cover of a particular species at a given survey site
TRS	Trophic Ranking Score	Indicator of nutrient tolerance on a scale of 1 to 10 (10 = very tolerant)
U	Number of uncommon plant species	The number of uncommon plant species is used as a measure of conservation value of a plant community.
WFD	Water Framework Directive	EU Water Framework Directive (2000/60/EU) (WFD) 2000.

**1.1 Overview**

The Wylfa Peninsula on Anglesey, north Wales has been listed as an approved site for the construction of a new nuclear facility in the National Policy Statement (NPS) for Nuclear Power Generation (EN-6), published in 2011 (Department of Energy and Climate Change, 2011). The Wylfa Newydd Development Area (the indicative areas of land and sea, including the Power Station Site<sup>1</sup>, the Wylfa NPS Site and the surrounding areas that would be used for the construction and operation of the Power Station) comprises a 380 hectare area of land to the south and east of the existing Magnox power station (the Existing Power Station).

Horizon Nuclear Power Wylfa Limited (here after referred to as Horizon) is a UK energy company developing a new generation of nuclear power station to help meet the country’s need for stable and sustainable low carbon energy.

Horizon is proposing to construct and operate the Wylfa Newydd Project (the Project). The Project comprises the proposed new nuclear power station, including the reactors, associated plant and ancillary structures and features, together with all of the development needed to support its delivery, such as highway improvements, worker accommodation and specialist training facilities.

The Project will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a Development Consent Order.

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a full ecological survey programme within the Wylfa Newydd Development Area and a buffer zone. This work has included the gathering of baseline data to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Project.

This report details the current state of freshwater aquatic receptors within the Wylfa Newydd Development Area, based upon field survey work and identifies species and habitats of conservation interest and current ecological status.

This report uses a number of technical terms and abbreviations. Key terms are capitalised and explained with their acronyms in the glossary. References to legislation are to that legislation as in force at the time of the publication of this report.

**1.2 Site Description**

The Wylfa Newydd Development Area is bounded to the north by the coast and the Existing Power Station. To the east, it is separated from Cemaes by a narrow corridor of agricultural land and a minor, unnamed tributary. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregele. To the south, the area abuts agricultural land, and to the west it adjoins the coastal hinterland.

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<sup>1</sup> The indicative area of land and sea within which the majority of the permanent Power Station buildings, plant and structures would be situated.

The Wylfa Newydd Development Area includes the headland south of Mynydd y Wylfa candidate local wildlife site. There is one designated site for nature conservation within the Wylfa Newydd Development Area: the Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of Conservation (SAC) and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA) and SSSI.

Tre'r Gof is a small basin mire adjacent to the Existing Power Station, west of Cemaes. The area receives mineral-enriched waters from the surrounding boulder clay leading to the development of notable botanics, which is the reason for the designation (fen rich habitat in north-west Wales) of the site as a SSSI.

Cae Gwyn SSSI is located immediately to the south of the Wylfa Newydd Development Area and to the west of Llanfechell. The SSSI comprises two wetland areas separated by an outcrop of rock with heathland vegetation. The southern wetland is confined by a rock basin and is dominated by bog moss (*Sphagnum* spp.) and a wide variety of common wetland herbs. The northern wetland has a different flora containing denser areas of willow (*Salix* spp.) and common reed (*Phragmites communis*).

### **1.3 Study Aims and Objectives**

The objective of the freshwater surveys is to characterise the environment and collect baseline data to inform the various applications, assessments and permits required to construct and operate the Wylfa Newydd Generating Station.

As part of the Environmental Impact Assessment and Habitats Regulations Assessment, the need for detailed temporal and spatial data on freshwater habitats has been identified. This report presents the findings of the baseline monitoring work between 2011 and 2014.

### **1.4 Previous Work**

A number of other surveys have been carried out, either prior to or concurrently with this one, with some relevance to freshwater ecology. These include:

- Phase 1 surveys (Jacobs, 2013);
- Protected species surveys for bats; great crested newts (*Triturus cristatus*); reptiles; water voles (*Arvicola amphibious*) and otters (*Lutra lutra*); breeding birds and overwintering birds (Jacobs, 2015a; Jacobs, 2015b; Jacobs, 2015c; Jacobs, 2015d; Jacobs, 2015e);
- Fluvial geomorphology report (Jacobs, 2015f); and
- Hydrological baseline report (Jacobs, 2016 - *in draft*).

### **2.1 Approach**

A walkover of the survey area in 2011 identified the main watercourses and pond/lake waterbodies within the study area. Key ecological receptors were identified and survey programmes developed to characterise and quantify the freshwater ecology within the Wylfa Newydd Development Area and the buffer zone.

The following surveys were undertaken:

- physical habitat assessment;
- diatoms;
- water quality;
- macroinvertebrates;
- macrophytes;
- fish; and
- pond surveys.

Ecological receptors were chosen to best represent the existing ecological condition of each waterbody. Further details on the methodologies for each of the survey elements are outlined in Sections 2.3.1 to 2.3.7 below.

Any incidental sightings of invasive species or of species of conservation importance were also recorded.

### **2.2 Survey Area**

Impacts beyond the boundary of the Wylfa Newydd Development Area were identified at an early stage. These included for example impacts from noise, dust and increased human activity affecting species and habitats within the surrounding area, fragmentation of species' commuting/migration routes and potential for hydrological changes. As a result, a buffer zone was added to the study area of approximately 500m where additional surveys were undertaken. As per Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines (IEEM, 2006), this buffer adopts a precautionary approach but is considered to be the area over which significant effects can reasonably be thought to have the potential to occur. At this stage, a common boundary across the range of receptors has been chosen to enable baseline data collection and environmental assessment to be consistent.

Only those waterbodies that fall within the study area and associated buffer were assessed. A walkover of the area in summer 2011 identified the main watercourses and pond/lake waterbodies within the study area. The Afon Cafnan, flowing into Porth-y-pistyll is the main freshwater feature within the study area. A number of smaller tributaries join this watercourse. There are also small networks of streams to the west and east of the study area flowing into Cemlyn lagoon and Cemaes Bay respectively. For the purposes of this report, the survey sites have been grouped according to the main watercourses (catchments) as listed in Table 2-1. Additionally, there are a number of other aquatic habitats located across the study area including wetlands, flushes and coastal headland pools. These are listed in Table 2-1 as 'others' because they are not seen as within the defined catchments.

## 2.2.1 Study Sites

Baseline data from waterbodies across the study area has been collected since 2011. Sites have been added to the programme since the original surveys due to changes in access agreements and extension of the survey programme. Table 2-1 presents the list of monitoring sites which have been surveyed at least once and Figure 2-1 shows the spatial extent of surveys within the study area. For the purposes of baseline characterisation and assessment, the sampling sites have been grouped according to catchment based on survey site groupings for the larger watercourses and ponds. Sites that were not seen as hydrologically connected were classed as 'others'.

**Table 2-1: Freshwater site survey locations (2011 – 2014)<sup>2</sup>.**

Catchment	Site	NGR	Physical Habitat Characterisation	Fish	Macrophytes	Pond Habitat (PSYM <sup>3</sup> )	Diatom	Water Quality	Macroinvertebrates
Cemlyn	Penyrsedd Pond	SH 33039 92547	✓	-	-	✓	✓	✓	-
	Penyrsedd	SH 33184 92626	✓	✓	✓	-	✓	✓	✓
	Nanner	SH 33501 92154	✓	-	-	-	✓	-	-
	U/S Neuadd	SH 33602 92287	✓	✓	✓	-	✓	✓	✓
	Neuadd	SH 33404 92747	✓	-	✓	-	✓	✓	✓
Cafnan	West of A5025 junction	SH 34148 91385	✓	No access	-	-	-	-	-
	A5025 crossing	SH 34405 91396	✓	No access	-	-	-	-	-
	Hafnan	SH 33916 92170	✓	✓	✓	-	✓	✓	✓
	Hafnan - Caerdegog Isaf	SH 34299 92385	✓	-	-	-	✓	✓	✓
	Caerdegog Isaf Pond	SH 34698 92496	✓	-	-	-	-	-	✓
	Caerdegog Isaf	SH 34882 92538	✓	✓	✓	-	✓	✓	✓
	Cae Gwyn SSSI – Caerdegog Isaf	SH 35035 92298	✓	-	-	-	-	-	✓
	Groes-fechan Wetland	SH 35090 92176	✓	-	-	-	-	-	✓
	Groes-fechan	SH 34974 92072	✓	✓	✓	-	✓	✓	✓
	Cae Gwyn SSSI	SH 34749 91786	✓	-	✓	-	✓	✓	✓
	Groes-fechan	SH 34805	✓	One-off	-	-	-	-	-

<sup>2</sup> Colour coding delineates the major watercourses (catchments) within the site boundary and the survey site included within each.

<sup>3</sup> Predictive SYstem for Multimetrics: PSYM is a method for assessing the biological quality of still waters in England and Wales.

Catchment	Site	NGR	Physical Habitat Characterisation	Fish	Macrophytes	Pond Habitat (PSYM <sup>3</sup> )	Diatom	Water Quality	Macroinvertebrates
	Tributary	91738		access					
	Groes-fechan Ponds	SH 34737 91625	✓		-	-	-	-	-
	Cafnan – Hafnan	SH 34162 92705	✓	-	-	-	-	-	✓
	Cafnan	SH 34214 93070	✓	✓	✓	-	✓	✓	✓
	Felin Gafnan East	SH 34261 93143	✓	-	✓	-	✓	✓	-
	Pont Cafnan Wetland	SH 34077 93158	✓	-	-	-	-	-	✓
	Felin Gafnan West	SH 34301 93218	✓	-	-	-	-	-	-
	Felin Gafnan Confluence	SH 34491 93361	✓	-	-	-	✓	✓	✓
	Tregele Pond	SH 35361 92575	✓	-	-	✓	✓	✓	-
	Rhwng Dau Fynydd	SH 35052 92810	-	-	-	-	-	✓	✓
	Tan-yr-allt Pond	SH 34963 93047	✓	-	-	-	-	✓	✓
Tre'r Gof	Power Station Junction	SH 35542 93189	✓	-	✓	-	✓	✓	✓
	Wylfa Hall Pond	SH 35542 93751	✓	-	-	-	-	✓	✓
	Tyddyn-Goronwy	SH 35915 93316	✓	-	-	-	-	✓	-
	Power Station Pond	SH 35495 93113	✓	✓	-	✓	✓	✓	✓
	Porth Wylfa Pond	SH 35792 93489	✓	-	-	✓	-	✓	✓
	Porth Wylfa	SH 35936 93700	✓	✓	✓	-	✓	✓	✓
	Tre'r Gof SSSI	SH 35896 93567	✓	-	-	-	✓	✓	✓
Cemaes	Fowl Fawr	SH 35580 92209	✓	-	✓	-	✓	✓	✓
	Gwyddelyn Bach	SH 35948 92672	✓	✓	✓	-	✓	✓	✓
	Tre'r-gof-isaf	SH 36861 93613	✓	-	✓	-	✓	✓	✓
Other minor watercourses	Porth-pistyll	SH 34808 93645	✓	✓	✓	-	✓	✓	✓
	Penrhyn	SH 36624 93750	✓	-	-	-	✓	✓	✓
	Tan-yr-allt ditch (site 2)	SH 34909 93222	✓	-	✓	-	-	✓	✓
	Tan-yr-allt ditch (site 3)	SH 34889 93342	✓	-	✓	-	-	✓	✓
Other ponds	National Trust Pools	SH 34215 93569	✓	-	-	-	-	✓	

Catchment	Site	NGR	Physical Habitat Characterisation	Fish	Macrophytes	Pond Habitat (PSYM <sup>3</sup> )	Diatom	Water Quality	Macroinvertebrates
	Wylfa Head Pools	SH 35418 94549	✓	-	-	-	-	-	✓
	The Firs Pond	SH 35227 92976	✓	-	-	-	-	-	✓
	Bwlch Pond	SH 35246 91598	✓	-	-	-	-	-	-
	Nantorman Pond	SH 36231 93325	✓	-	-	-	-	-	✓

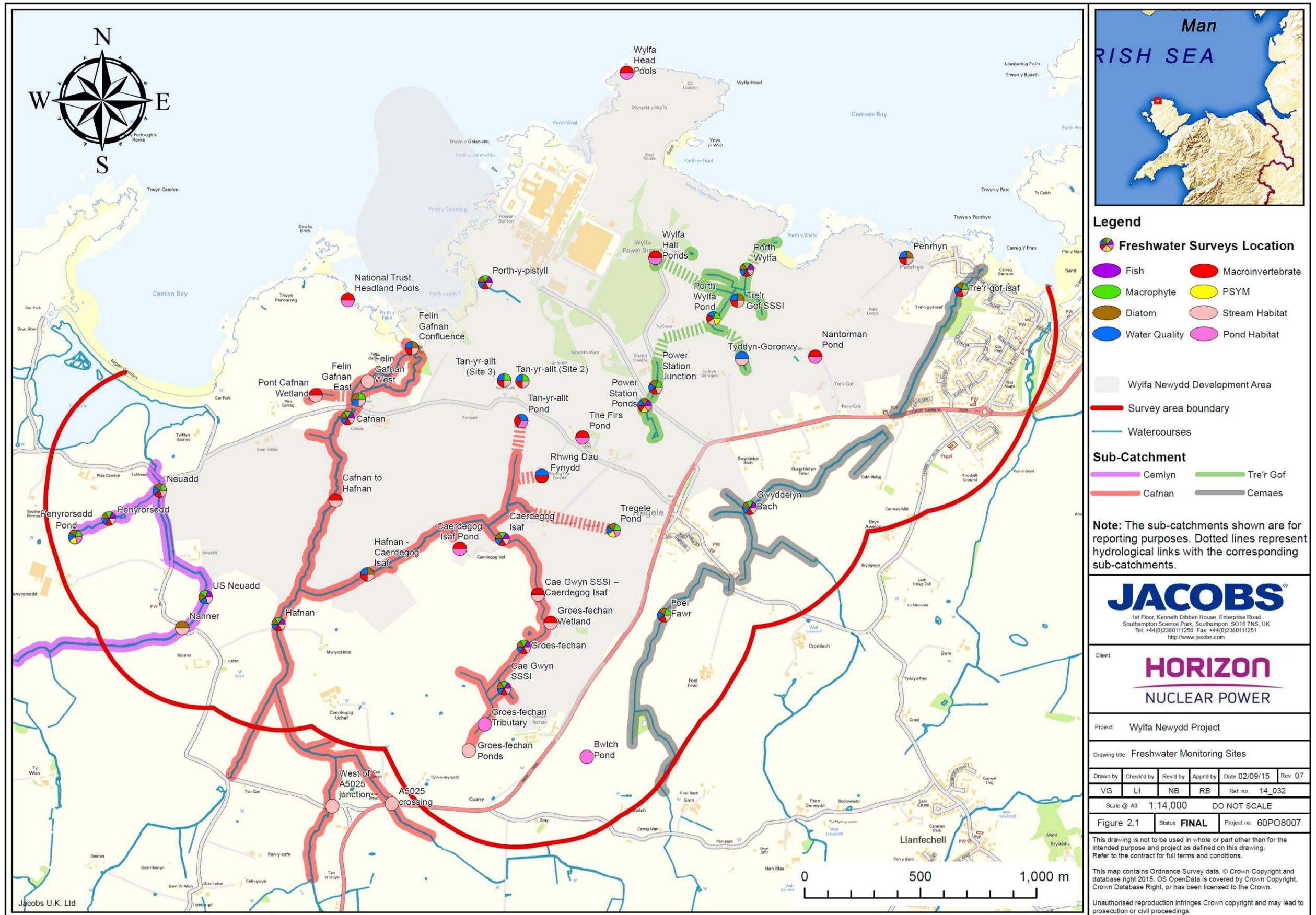


Figure 2-1: Outline plan of Wylfa Newydd Development Area site, with catchment delineations, site locations and details of survey type undertaken at each site.

## 2.3 Methods

### 2.3.1 Habitat Characterisation

Physical habitat surveys were carried out on key reaches within watercourses to characterise the physical habitat and associated biotopes present. These habitat characterisation surveys outlined the physical processes within the channel and riparian zone that may influence aquatic habitat function and species distribution. The surveys also increased understanding of the hydromorphological pressures and potential impacts exerted on the waterbodies.

Appendix A provides details and photographs of the habitat characteristics of each of the survey sites. Further details on the geomorphology of the channels and catchment characteristics within the Wylfa Newydd Development Area can be found in the Jacobs Fluvial Geomorphology Report (Jacobs, 2015f).

### 2.3.2 Water Quality

Spot-water quality sampling has been undertaken in accordance with Environment Agency methods (Environment Agency, 2010) with samples analysed by the National Laboratory Service since 2012. Over the three-year sampling period, the number of sites has increased as further access has been secured. Table 2-2 outlines sampling occasions and the number of sites sampled on each occasion. Samples for physico-chemical determinands and specific pollutants, nutrients and priority substances were taken on a quarterly basis in 2013 to encompass seasonal variations. For full water quality results refer to Appendix B.

**Table 2-2: Water quality sampling programme including season, sample date and number of sites.**

Season	Sample date	Number of sites sampled
Winter 2012	28/02/2012	5
Spring 2012	09/05/2012	5
Summer 2012	07/08/2012	5
Winter 2013	12/03/2013	10
Spring 2013	24/04/2013 – 25/04/2013	14
Summer 2013	15/08/2013	13
Autumn 2013	29/10/2013 – 30/10/2013	16
Winter 2014	18/02/2014 – 19/02/2014	14
Spring 2014	6/05/2014 – 8/05/2014	21
Summer 2014	26/08/2014	2
Autumn 2014	14/10/2014 - 15/10/2014	22

Field measurements were collected using a YSI 556 MPS (Multiprobe System) handheld meter calibrated to manufacture specifications. Physico-chemical data collected *in situ* included temperature, conductivity, pH and dissolved oxygen (percent saturation and mg L<sup>-1</sup>) at each site.

The original determinands list in 2012 (Jacobs, 2013) included numerous total petroleum hydrocarbons, polychlorinated biphenyls and polycyclic aromatic hydrocarbons. These were recorded at low levels and the majority were recorded below the Minimum Reported Values (MRV) during the initial surveys; as a result, the determinand list was revised and reduced for the following surveys.

### 2.3.3 Phytobenthos (Diatoms)

Phytobenthos as noted under the WFD refers to a mostly microscopic group of organisms called algae found attached to submerged surfaces such as stones and plant stems (WFD-UKTAG, 2014a). For the purpose of this assessment, focus has been placed on diatoms as a tool to assess the ecological status of phytobenthos.

At each site, a scrape sample was taken from submerged rocks or plant stems. In the majority of cases, stems of *Typha* sp. or *Juncus* sp. were used. Permanently wetted, unshaded sites with clear water were chosen. Methods followed the Diatoms for Assessing River and Lake Ecological Quality (DARLEQ2) methodology (Kelly *et al.*, 2005; Environment Agency, 2007a; WFD-UKTAG, 2014a).

Samples were fixed using Lugol's Iodine Solution in a sample bottle covered with foil to avoid light penetration. Samples were transported to the laboratory for sample preparation and subsequent analysis.

Diatoms were collected over three seasons for 2014, with 12 samples collected in winter (February), 21 in spring (May) and 15 in autumn (October). Results were analysed using the updated DARLEQ2 classification, which uses known tolerances of diatom species to nutrients.

Previous diatom data from 2011 to 2013 were also used to detect annual trends in diatom communities. Results were updated by entering them into DARLEQ2 software to allow inter-annual variation to be compared. Annual averages (encompassing four seasons where possible) have been calculated in-line with standard WFD classifications, and results calculated using annual average alkalinity where possible.

### 2.3.4 Macroinvertebrates

Between 2011 and 2013, macroinvertebrate surveys were undertaken by Rachel Hacking Ecology Ltd using an exhaustive sampling approach where ponds are netted until no new macroinvertebrates are caught (Rachel Hacking Ecology, 2011; 2012 and 2013). Sampling was carried out in accordance with the guidelines in the Natural England Research Report 'Surveying terrestrial and freshwater invertebrates for conservation evaluation' (Drake *et al.*, 2007). Samples were analysed to species level. Results were used to report species richness and identify species of conservation concern under the Community Conservation Index (CCI) (but not to calculate conservation scores) (Chadd and Extence, 2004).

In 2014, surveys followed standard kick- and sweep-sampling (BS EN ISO 10870:2012) used to obtain macroinvertebrate samples from waterbodies in addition to the collection of environmental and habitat data (Environment Agency, 2008; 2012). Samples were analysed to species level and data were used to calculate the following macroinvertebrate indices (see the glossary for explanation of indices acronyms):

- **Biological Monitoring Working Party (BMWP)-derived indices (see Hawkes, 1997):** BMWP score is based on the tolerance of different freshwater macroinvertebrates to organic pollution. The **BMWP score** is the sum of all the scores from a given sample, where 1 is tolerant and 10 is the most sensitive. This score is divided by the Number of scoring Taxa (**NTAXA**) to give the Average Score per Taxon (**ASPT**). NTAXA is therefore

a measure of taxa richness and ASPT is a measure of average pollution tolerance.

- The minimum of the NTAXA and ASPT Ecological Quality Ratios (EQR) (**MINTA**) classification is used to attribute an EQR classification to the study site in question.
- **The Community Conservation Index (see Chadd and Extence, 2004):** CCI represents the national rarity and diversity of species identified at a site and designates a conservation value to the sampled community based upon both a species rarity and the overall community richness.
- **Lotic-invertebrate Index for Flow Evaluation (LIFE) (see Extence *et al.*, 1999):** Each species or family within a sample is assigned to a flow group depending on their flow/velocity preference, giving two indices: LIFE (sp) and LIFE (F). A high LIFE score represents a higher number of taxa with a preference for high velocity habitats and vice versa.
- **Proportion of Sediment-sensitive Invertebrates (PSI) (see Extence *et al.* 2011):** Each macroinvertebrate family is assigned a score based on their sensitivity to sediment. The resulting PSI scores indicate how sedimented the watercourse is from Minimally Sedimented to Heavily Sedimented.

Where applicable, the ecological quality of the macroinvertebrate communities was inferred using the River Invertebrate Classification Tool (RICT) (see SNIFFER, 2008). This tool generates classifications and EQRs to allow comparison of observed site data to reference sites and expected standards. There are limitations with its application: it does not hold reference sites for man-made, non-flowing or ephemeral waterbodies (such as ditches), it holds few coastal reference sites nor reference sites for watercourses within 2.5km of their headwater and it is optimised for data collected in both spring and autumn.

Ponds were also surveyed for macroinvertebrates as part of a separate assessment outlined in Section 2.3.7.

### 2.3.5 Macrophytes

Macrophyte surveys were completed along 100m reaches of each watercourse with species lists and Taxon Cover Values (TCVs) recorded alongside data on the local environment. Results were used to calculate a number of macrophyte indices (see glossary for explanation of indices acronyms):

- River Macrophyte Nutrient Index (RMNI), which indicates nutrient enrichment;
- Number of scoring Taxa (NTAXA) which indicates species richness;
- Number of Functional Groups (NFG) which is a measure of how truly aquatic the community is; and
- percentage algal cover (ALG).

In flowing watercourses, the classification method LEAFPACS2 was used to characterise ecological condition. This standard method for the characterisation of watercourses using macrophytes (WFD-UKTAG, 2014b) was used as an indicator of eutrophication within a given watercourse.

### 2.3.6 Fish

Electric fishing surveys were conducted to identify the presence and species of fish. Fish surveys were conducted using a standard electric fishing technique (E-fish back pack unit with single anode) following guidelines developed by the

Environment Agency (Beaumont *et al.*, 2002; Environment Agency, 2001; Environment Agency, 2007b) and in accordance with British Standard (BS) EN 14011:2003 (water quality – sampling of fish with electricity) (British Standards Institution, 2003). All electric fishing surveys were conducted under an FR2 licence from Natural Resources Wales by trained members of staff.

Where conditions allowed, a three-run catch-depletion survey was conducted over a 100m stretch of each watercourse. Where a clear 100m stretch could not be accessed, qualitative spot checks were carried out, giving an indication of the species present within the watercourse.

### **2.3.7 Pond Habitat Assessment**

Still waters and ponds differ significantly in their hydrology, morphology and ecology from riverine habitats and as such require specific ecological consideration. Two methods have been used to gather the baseline dataset for ponds: an exhaustive macroinvertebrate survey and the Predictive SYstem for Multimetrics (PSYM).

Between 2011 and 2013, macroinvertebrate surveys were undertaken by Rachel Hacking Ecology Ltd (Rachel Hacking Ecology, 2011; 2013 and 2013) using an exhaustive sampling approach where ponds are netted until no new macroinvertebrates are caught (Drake *et al.*, 2007). Samples were analysed to species level. Results were used to report species richness and identify species of conservation concern under the CCI (but not to calculate conservation scores) (Chadd and Extence, 2004).

The second method, the PSYM, evaluates the macroinvertebrate and aquatic plant communities in ponds (Pond Action, 2002) and was used to assess eligible ponds in 2012 and 2014. Plants were identified in the field (taking samples for later identification where necessary), and macroinvertebrate samples were taken and analysed to species level as above. Results were processed using the following PSYM indices (see glossary for explanation of indices acronyms):

Plant metrics:

- **number of submerged and marginal (not floating) species (SM)** – indicates species richness of a site;
- **number of uncommon plant species (U)** – measures conservation value of a community; and
- **Trophic Ranking Score (TRS)** – indicates nutrient tolerance on a scale of 1 to 10 (10 = very tolerant).

Macroinvertebrate metrics:

- **Average Score per Taxon** – indicates average pollution tolerance of macroinvertebrates within a community;
- **number of Odonata and Megaloptera families (OM)** – indicate long-term quality of a pond as larvae have a long aquatic life stage; and
- **number of Coleoptera families (CO)** – indicate the habitat quality and diversity of a pond.

Observed data were compared with predicted values generated by analysts at Freshwater Habitats (formerly Pond Conservation) to calculate Ecological Quality Indices (EQIs). These EQIs are then used to inform the Index of Biological Integrity (IBI), which is interpreted as an overall percentage and quality class. Ponds meeting Good quality or above qualify as Priority Ponds, as do those which contain species

of conservation concern. Data were also used to calculate CCI scores and identify species of conservation importance.

### **2.3.8 Limitations**

The aquatic sampling regime is in part dictated by seasonal constraints, either due to optimum seasons for sampling, avoiding species-specific sensitive periods and climatic influences on water level and flow types.

Surveys required for each aquatic receptor were identified prior to the field campaign. Where necessary, additional sampling has been undertaken outside of optimum monitoring period either to increase the resolution of data collected or as a result of other limitations such as the preceding weather conditions. Resulting data should be treated with caution. Regulator consent was granted, enabling fisheries survey work to be undertaken outside of standard survey periods.

A number of watercourses within the study area were not permanently wetted (ephemeral) throughout the survey period. Standard analytical tools are poorly equipped to deal with temporary waterbodies and care is required in interpretation of resulting data; however, they contain species unique to this habitat type and therefore their inclusion in the baseline assessment is necessary.

Sampling locations were accessed on agreement with landowners, and through the use of public footpaths to reach the majority of sites. Where possible, sites without land access agreements in place were assessed at distance from public ground to gain an understanding of physical habitat.

For diatom sampling, a minimum number of diatoms are required per sample for impact assessment baseline purposes. A minimum of 300 valves is generally needed for statistically robust analysis. Minimum sample requirements were met for most of the samples with the exception of three sites in 2013.

**3.1 Habitat Characterisation**

The Cemlyn Tributary is where the Neuadd, Penyrorsedd and Nanner sites are located. Evidence of livestock poaching has been noted along the watercourse and some siltation of gravels is evident. Channel straightening has been implemented in sections to follow field/road boundaries; however, some areas with good gravel substrate and a diverse range of macrophytes were observed. The catchment is dominated by improved pasture resulting in agricultural runoff entering the watercourse. Refer to Appendix A for habitat characterisation descriptions.

**3.2 Water Quality**

The following section summarises water quality data collected between 2013 and 2014 within the Cemlyn catchment. Table 3-1 presents ranges for selected physico-chemical, biochemical and nutrient parameters. For full results, refer to Appendix B (note this section refers to results from Cemlyn catchment only).

Physico-chemical and biochemical results can be summarised as follows:

- The highest temperatures were recorded in summer 2013 at the Neuadd and U/S Neuadd sites, recording 20.36°C and 17.59°C respectively. During spring, autumn and winter, temperatures ranged between 9.12°C and 13.4°C. All water temperature results were within the expected range of values for the waterbody types sampled.
- Conductivity readings were within expected values for the type of waterbodies sampled, ranging between 0.240mS cm<sup>-3</sup> (U/S Neuadd winter 2014) and 0.513mS cm<sup>-3</sup> (U/S Neuadd spring 2014).
- Dissolved oxygen (percent saturation) at the running water sites ranged between 57.7% in autumn 2014 at Penyrorsedd and 104% at Neuadd in spring 2014. Penyrorsedd Pond recorded the highest dissolved oxygen of all sites, reaching 124.9% in spring 2014.
- pH ranged from 6.41 to 8.02 and was within the expected range of values for the watercourse types sampled.
- Suspended sediment concentrations varied between sites with the majority of the measurements below 20mg L<sup>-1</sup>. Two elevated concentrations were recorded at the Penyrorsedd Pond site in spring 2014 (91.10mg L<sup>-1</sup>) and the Penyrorsedd site in autumn 2014 (72.70mg L<sup>-1</sup>).
- Biological oxygen demand was generally low with many sites below MRV (see glossary for acronyms definitions). The highest biological oxygen demand was recorded at Penyrorsedd Pond in spring 2014 (18.1 mg L<sup>-1</sup>).

Nutrient results can be summarised as follows:

- Orthophosphate concentrations were low although an elevated measurement was noted at Penyrorsedd Pond in spring 2014 (0.824mg L<sup>-1</sup>). All other measurements ranged between 0.02mg L<sup>-1</sup> and 0.337mg L<sup>-1</sup> over the sampling period.
- Ammoniacal nitrogen concentrations were low across all sites with the exception of Penyrorsedd where two elevated measurements were recorded in spring and autumn 2014 (0.313mg L<sup>-1</sup> and 0.491mg L<sup>-1</sup> respectively).

**Table 3-1: Maximum and minimum physico-chemical, biochemical and nutrient results for the Cemlyn Catchment over the 2013-2014 sampling period.**

Parameter	Range	Penyrsedd Pond	Penyrsedd	U/S Neuadd	Neuadd
Temperature °C	Max	13.4	12.6	17.6	20.4
	Min	9.2	9.7	9.1	10.7
Conductivity mS cm <sup>-3</sup>	Max	0.513	0.452	0.407	0.310
	Min	0.358	0.326	0.240	0.242
Dissolved oxygen %	Max	124.9	90.8	101.1	104.0
	Min	92.6	57.7	68.1	80.0
pH	Max	7.6	6.5	7.7	8.0
	Min	6.7	6.4	6.7	6.8
Suspended solids mg L <sup>-1</sup>	Max	91.1	72.7	11.3	22.0
	Min	5.2	18.6	3.5	3.3
Biological oxygen demand mg L <sup>-1</sup>	Max	18.1	2.9	1.1	2.0
	Min	<1.0	<1.0	<1.0	<1.0
Orthophosphate (reactive as P) mg L <sup>-1</sup>	Max	0.824	0.146	0.038	0.098
	Min	0.247	0.076	<0.02	<0.02
Ammoniacal nitrogen as N mg L <sup>-1</sup>	Max	0.245	0.491	0.052	0.067
	Min	<0.03	0.062	0.042	<0.03

Metals can be summarised as follows:

- Cadmium, nickel, lead, chromium and mercury concentrations were near or below MRV across all sites.
- Arsenic readings were generally low with the majority of the measurements below laboratory MRV. Values ranged between <1µg L<sup>-1</sup> to 3.23µg L<sup>-1</sup>.
- Copper was highest at Penyrsedd Pond with concentrations ranging between 3.56µg L<sup>-1</sup> and 10.40µg L<sup>-1</sup>. All other sites were below 3.30µg L<sup>-1</sup>.
- Zinc concentrations were below MRV across all sites with the exception of Neuadd in autumn in 2013, when a measurement of 8.77µg L<sup>-1</sup> was recorded.
- Iron concentrations ranged between <30µg L<sup>-1</sup> and 273µg L<sup>-1</sup> and varied between sites and sampling years.
- Manganese concentrations ranged between 14µg L<sup>-1</sup> and 438µg L<sup>-1</sup> and varied between sites and sampling years.

Selected other compounds can be summarised as follows:

- Toluene and trichloroethylene levels were low across all sites with reading below the laboratory MRV of 0.1µg L<sup>-1</sup>.
- Di(-2-ethylhexyl) phthalate (DEHP) levels were low across all sites with levels below or close to the laboratory MRV of 0.2µg L<sup>-1</sup>. Values ranged between a maximum of 0.73µg L<sup>-1</sup> and <0.2µg L<sup>-1</sup> at Neuadd.
- Hydrocarbon Screens (C5 - C44) levels were low across all sites with levels below or close to the laboratory MRV of 0.2µg L<sup>-1</sup>.
- Chloride levels were low across the catchment.

Water quality conditions reported for the Cemlyn catchment are typical of a catchment dominated by rural land use, including agricultural land for grazing.

### 3.3 Diatoms

Diatom surveys have been undertaken between 2011 and 2014, with at least one sample taken from the main Cemlyn waterbody or the Penyrorsedd tributary. The diatoms reported from the diatom surveys are typical of lowland coastal streams, demonstrating a dominance of common species with tolerances to low or moderate nutrient enrichment.

Table 3-2 lists the diatom EQR (observed/expected diatom community – see glossary for definitions) in each of the sampling years and is colour coded to indicate WFD classification. As per the DARLEQ2 guidance, EQR values >1.00 for rivers and >1.25 for lakes (and ponds) have been reported as 1.00 and 1.25 respectively.

**Table 3-2: Diatom EQRs and ecological status 2011 - 2014 (blue= high, green = good, yellow= moderate, orange = poor).**

Site	2011	2012	2013	2014
Nanner	0.69			
U/S Neuadd			0.83	0.6
Penyrorsedd Pond				0.28
Penyrorsedd				0.66
Neuadd		0.62	0.83	0.75

With the exception of Penyrorsedd Pond in 2014, diatom EQRs indicate that phytoplankton communities are similar to those predicted at near reference condition, based upon physical habitat attributes. The main Cemlyn waterbody sites in 2013 reached reference condition, indicating no environmental stress on phytobenthic communities, with minor deviations observed in the preceding and following years.

It is likely that all of the watercourses within the Cemlyn catchment are prone to nutrient enrichment as a result of land management practices such as the application of fertilisers on grazing/arable land. Stock access was not restricted from the watercourse at any of the sample sites. There were also no appreciable buffer zones observed on the limited arable land in the catchment. Mild nutrient enrichment can be identified in the taxonomic composition of diatoms, with the presence of species such as *Planothidium lanceolatum* and *Reimeria sinuata* indicative of mild to moderate enrichment conditions. Variability between years is considered minor, and likely to be a facet of improved surface drainage facilitating increased nutrient release into the watercourses.

The value of diatom features in the Cemlyn catchment is considered negligible, with the species present typical of a lowland coastal stream. The Cemlyn catchment is anticipated to provide a minor resource to diatom across the Wylfa Newydd Development Area.

### 3.4 Macroinvertebrates

Three sites have been sampled for macroinvertebrates within the Cemlyn catchment, two on the main stem of the river and a single site on the tributary (Table 3-3). Sites within the Cemlyn catchment were not sampled for macroinvertebrates until 2014 following the extension of the site buffers.

Sixty-nine invertebrate taxa were reported from the Cemlyn catchment: 41 from Neuadd, 35 from Penyrsedd and 29 from U/S Neuadd. Biological scores from the Cemlyn catchment indicate the sites support macroinvertebrate communities which are relatively sensitive to organic pollution (BMWP) and exhibit species diversity (NTAXA) typical for this river type.

**Table 3-3: Macroinvertebrate indices for three sites on the Cemlyn catchment. See the glossary and section 2.3.4 for explanation of indices acronyms.**

Site	BMWP	NTAXA (scoring)	ASPT	PSI (F) interpretation	PSI (F) EQR	LIFE (sp)	LIFE (F)	LIFE (F) EQR
Neuadd	112	23	4.9	Moderately sedimented	0.85	7.4	6.7	0.89
U/S Neuadd	109	23	4.7	Moderately sedimented	0.87	7.5	6.7	0.89
Penyrsedd Stream	87	20	4.4	Sedimented	-	5.9	5.7	-

The Cemlyn catchment was reported as sedimented or moderately sedimented. A significant proportion of taxa present in these watercourses are tolerant of sedimentation. EQRs indicate that the sediment sensitivity of the communities exceeded expected levels when compared with reference sites (EQR >0.82).

Analysis of the invertebrate community indicates taxa sensitive to flow within the main Cemlyn watercourse (LIFE (F) EQR >0.89). This includes relatively high numbers of freshwater shrimp (*Gammarus pulex*), riffle beetles (*Elmis aenea* and *Limnius volckmari*), cased caddisfly larvae (*Sericostoma personatum* and *Hydropsyche angustipennis*) and mayfly larvae (*Serratella ignita*). The Penyrsedd Stream demonstrates a community typical of a lower energy flow environment, with evidence of species potentially dropping out of the pond at the head of the stream.

In general, the macroinvertebrates recorded across the Cemlyn catchment consisted of widespread and common species. Community conservation scores ranged from Low to Moderate, with the lowest scoring community at Penyrsedd Stream (4.1), and the highest at U/S Neuadd (7.4). Despite the Moderate CCI values on the Neuadd tributary, no species of conservation importance (local or above) were identified in 2014 (Table 3-4).

**Table 3-4: Macroinvertebrate indices for 2014 sites in the Cemlyn catchment. See glossary for acronym definitions.**

Site	CCI score	CCI value	Species of conservation importance (Local or above)
Neuadd	6.6	Moderate	None
Penyrsedd Stream	4.1	Low	None
U/S Neuadd	7.4	Moderate	None

RICT classification was possible for two of the sample sites on the Cemlyn watercourse, with both sites reaching Moderate status (Table 3-5). Both sites were classified as reaching High status based upon predicted diversity, while the reduction in overall status was as a result of water quality variables.

**Table 3-5: RICT classifications for two compliant sites in the Cemlyn catchment. Highlighted cells represent the overall classification for the site in question.**

Site	Index	EQR	Class	Probability of Class (%)
Neuadd	ASPT	0.82	Moderate	77.57
	NTAXA	0.95	High	72.95
	MINTA	-	<b>Moderate</b>	77.57
U/S Neuadd	ASPT	0.80	Moderate	66.03
	NTAXA	0.95	High	74.33
	MINTA	-	<b>Moderate</b>	66.03

The Moderate status observed at the Neuadd and U/S Neuadd sites indicates that the community observed is significantly different from that predicted (based upon physical habitat characteristics). The difference between observed and predicted class is anticipated to be due to a combination of factors, including agricultural pressures and modified river habitat. Penryrsedd Stream was particularly stagnant and poached by grazing livestock, which has the potential to result in fine sediments entering a watercourse and affecting the macroinvertebrate community. Neuadd and U/S Neuadd offered some good habitat with a variety of flow types and substrate sizes.

The value of macroinvertebrate features in the Cemlyn catchment is considered low, with the species present typical of lowland streams in coastal plains. The absence of species of conservation interest is indicative of its generally low value and habitat quality.

### 3.5 Macrophytes

Three sites on the Cemlyn catchment were suitable for macrophyte survey in 2014 and could be assessed using the LEAFPACS2 tool. Of these, Neuadd and U/S Neuadd were also surveyed in 2013. Due to an update in assessment tool, the outputs from these surveys are not directly comparable; however, data can be used to assess trends.

Sixteen taxa were recorded in total from the Cemlyn catchment. Fool’s watercress (*Apium nodiflorum*), hemlock water dropwort (*Oenanthe crocata*) and water-starwort (*Callitriche* spp.) were the only taxa recorded at all three sites within the Cemlyn catchment. Several species of macroalgae were also present including blanket weed (*Cladophora glomerata/Rhizoclonium hieroglyphicum*). There were no species of conservation importance identified in the surveys.

Table 3-6 shows the individual indices calculated from LEAFPACS2.

**Table 3-6: Macrophyte indices for sites along the Cemlyn watercourse prior to LEAFPACS2 classification (RMNI, NTAXA, non-scoring taxa, NFG and ALG). See glossary for acronym definitions.**

Site	Observed RMNI	Observed NTAXA (scorers)	Total NTAXA (inc. non-scores)	Observed NFG	Observed ALG
U/S Neuadd	6.89	3	6	2	0
Neuadd	7.16	3	8	2	0

Penyrorsedd	7.18	6	10	4	1.00
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The RMNI gives an indication of nutrient enrichment with scores ranging from 1 (low) to 10 (high). The RMNI scores do not vary considerably between the sites, suggesting that there is a moderate degree of nutrient enrichment throughout all sites. This would be expected given the connectivity between agricultural land use and the riverine environment and is typical of watercourses within this landscape.

The NTAXA gives an indication of diversity within the macrophyte community, with Penyrorsedd having the highest (six) of the surveyed watercourses within the catchment.

LEAFPACS2 classification was performed on the three sites within the Cemlyn watercourse, with all sites classified as Good or Moderate (Table 3-7). The macrophyte community at U/S Neuadd and Penyrorsedd Stream exhibit only a small deviation from reference conditions, whilst the Neuadd site may be affected by an environmental stress, such as variable flow or elevated nutrient condition.

**Table 3-7: The results of LEAFPACS2 classification at the Cemlyn sites in 2014. Highlighted cells represent the overall EQR classification for the site in question**

Site	EQR	Status
U/S Neuadd	0.606	Good
Neuadd	0.591	Moderate
Penyrorsedd	0.692	Good

The Neuadd and U/S Neuadd sites were sampled in 2013 using the previous iteration of LEAFPACS2. Although not directly comparable due to changes in the application of the tool, Neuadd was classified as Moderate, scoring a slightly lower EQR to the 2013 result, whilst U/S Neuadd was given Poor status, with a very low EQR. This indicates an inherent degree of variability between sampling seasons, and suggests that short-term factors, such as seasonal differences in channel shading, poaching by cattle or the application of fertilisers on adjacent agricultural land may play a role in determining macrophyte communities. Habitats are unlikely to have undergone significant change between survey years.

The value of macrophyte receptors on the Cemlyn catchment is considered low due chiefly to the absence of species of conservation interest. The Cemlyn catchment is anticipated to provide a minor resource to macrophytes across the Wylfa Newydd Development Area.

### 3.6 Fish

Fish surveys were undertaken at U/S Neuadd during 2013 and Penyrorsedd during 2014 (Appendix E).

Low numbers of European eel and three-spined stickleback have been recorded at U/S Neuadd during the study period. The watercourse at this site is shallow with glide and pool flow types dominant. The riverbed substrate is a mix of unconsolidated gravels and silt, with marginal vegetation heavily shading both banks. The presence of European eel indicates connectivity of the watercourse between the sea and this site. During 2013, a grey heron (*Ardea cinerea*) was

disturbed from fishing at the shallow upstream end of this site, indicating the potential presence of fish within this site.

Spot checks were carried out at Penyrsedd Stream in 2014. No fish were caught and eel was the only species observed. During the spring macroinvertebrate kick sampling, three-spined stickleback were observed at this site; however, this species was not recorded during the electric fishing surveys. This may have been due to the use of the spot check methodology and the heavy macrophyte cover at the time of survey affecting efficiency. No cyprinid or salmonid species were observed at this site during any of the surveys. The habitat is unlikely to support salmonids due to its shallow depth and silt substrate. There is very limited marginal habitat providing cover to the stream, resulting in poor instream habitat for fish species.

The value of fish receptors on the Cemlyn catchment is considered low due to the low density of fish, including European eel. The Cemlyn catchment is anticipated to provide a small overall resource to freshwater fish within the Wylfa Newydd Development Area.

### 3.7 Pond Quality Assessment

A single pond was assessed in the Cemlyn catchment using the PSYM methodology. Penyrsedd Pond forms the head of Penyrsedd Stream and lies within improved pastureland. Macroinvertebrates recorded during the 2014 pond survey were characteristic of standing waters with a high coverage of macrophytes, fine sediments and decomposing organic matter.

#### 3.7.1 PYSM

The PSYM plant index indicates that Penyrsedd Pond supports commonly occurring, nutrient tolerant species, which confirms the observed elevated phosphorus and ammonia levels.

The PSYM classifications, along with observed indices and EQIs for Penyrsedd Pond are summarised in Table 3-8.

Beetles are an indicator of habitat quality and the Coleoptera index is only slightly lower than expected, suggesting that Penyrsedd Pond provides acceptable resources for macroinvertebrates. The Odonata index shows that the pond is limited by variation in water level and ephemeral effects, because ponds fell significantly short of the expected number of dragon/damselfly and alderfly families.

The Community Conservation Index for Penyrsedd Pond was 9.6, indicating Moderate conservation value owing to the presence of *Erpobdella testacea* (leech), *Notonecta maculata* (backswimmer) and *Corixa panzeri* (water boatman), all of which are of Local conservation importance.

**Table 3-8: PSYM results and classification of Penyrsedd Pond. Observed indices in unshaded rows, and EQIs in shaded rows below (PSYM quality category = IBI >75%=Good, 51-75%=Moderate, 25-50%=Poor, <25%=V Poor). See glossary / methods for explanation of acronyms.**

Penyrsedd Pond	
No. of submerged + marginal plant species (SM)	11
EQI (SM)	0.73
Number of uncommon plant species (U)	2

<b>Penyrsedd Pond</b>	
EQI (U)	0.79
Trophic Ranking Score (TRS)	10
EQI (TRS)	1.25
Average Score Per Taxon	3.8
EQI (ASPT)	0.74
Odonata + Megaloptera (OM) families	0
EQI (OM)	0
Coleoptera families (CO)	2
EQI (CO)	0.53
Index of Biotic Integrity (%)	50%
PSYM quality category	Moderate
Priority species	0
Meet Priority Pond criteria?	No

Penyrsedd Pond does not meet the criteria for Priority Pond status recognised under the UK Post-2010 Biodiversity Framework (formerly the UK Biodiversity Action Plan).

Water quality data for the pond is summarised in the water quality section (Section 3.2). *In situ* water quality data varied as expected between seasons. The maximum orthophosphate measurement recorded over the three-year sampling period was 0.824mg L<sup>-1</sup>.

Pond habitats are considered of low value in the Cemlyn catchment. Monitoring of Penyrsedd Pond did not identify receptors of conservation interest and as such, pond habitats are considered to provide a minor resource to the overall pond habitat across the Wylfa Newydd Development Area.

### **3.8 Summary**

Sites surveyed within the Cemlyn catchment indicate biological and water quality scores typical of lowland coastal streams, receiving variable seasonal discharge in close connectivity with surrounding land management.

Beyond the obvious historic channel modification that have allowed streams to take on land boundaries and local road lay out, land use appears to apply the greatest environmental stress on the Cemlyn watercourses. Flowing through a rural catchment, used primarily for livestock grazing and low intensity agriculture, the aquatic habitats are influenced by low levels of nutrient enrichment via diffuse pollution as demonstrated in the diatom and macrophyte community analysis.

Water levels within the catchment are influenced by prevailing climatic conditions; however, both the main watercourse and tributary sustain permanent flows, albeit with localised declines in flow energy during dry periods. There is no evidence to suggest that the decreases in flow type are affecting the significance of the aquatic habitats or the communities they support.

Despite seasonal variation in flow, the Cemlyn watershed supports a functioning ecological community, including European eel, which received legal protection to promote connectivity through the catchment and habitat suitability. The presence of the European eel indicates connectivity of the Cemlyn freshwater catchment with the

downstream lagoon (and coastal environment). No invasive species were recorded within the catchment.

Aquatic habitats and species identified within the Cemlyn catchment are of low quality and reflect existing and historical rural land management practices in the area. Species found within the catchment are common and widespread, and include low numbers of the nationally important European eel.

#### 4.1 Habitat Characterisation

The Cafnan watercourse exhibited mainly natural planform and stream cross-sections, with moderate sinuosity, good flow diversity and a dominant gravel-cobble substrate. The tributary stream exhibited some sectioning and over-deepening. However, discrete areas of good flow diversity, gravel substrate and riparian vegetation provide habitat potential. Areas of channel modification through channelisation and realignment are present within the mid to upper catchment.

The tributary stream that joins the main stem channel at Hafnan is an over-deepened gravel bed stream that is largely tree or shrub lined. The riparian vegetation creates a shaded waterway for most of its length between Groes-fechan and Caerdegog Isaf. A straightened section runs between Caerdegog Isaf and Hafnan which has also been deepened to increase channel capacity and conveyance. This section of the tributary is very silted in places.

The Cae Gwyn SSSI is located in the head reaches of this tributary which joins the main stem channel near Hafnan. The SSSI comprises a large, botanically species-rich wetland area bordered by improved grassland and gorse scrub. The two basin mires associated with the wetland held water throughout most of the survey season.

The northern basin mire comprises botanical species such as meadowsweet (*Filipendula ulmaria*), common spike-rush (*Eleocharis palustris*), cross-leaved heath (*Erica tetralix*), common cottongrass (*Eriophorum angustifolium*), water mint, broad-leaved pondweed (*Potamogeton natans*), marsh St. John's-wort (*Hypericum elodes*) and creeping willow (*Salix repens*). The southern basin mire comprises all of the above species plus others including cranberry (*Vaccinium oxycoccos*) and marsh fern (*Thelypteris palustris*).

The main stem channel from Hafnan to Cafnan exhibits a medium gravel bed substrate with good flow diversity. The gravel substrate, relatively natural channel planform and occasional shading provide good habitat opportunities for fish and other wildlife and potential spawning habitat for the native brown trout. Refer to Appendix A for habitat characterisation descriptions.

#### 4.2 Water Quality

The following section summarises the water quality data collected between 2012 and 2014 within the Cafnan catchment. Table 4-1 presents ranges for selected physico-chemical, biochemical and nutrient parameters. For full results, refer to Appendix B (note this section refers to results from the Cafnan catchment only).

Physico-chemical and biochemical results can be summarised as follows:

- The highest temperature of 20.08°C was recorded in summer 2013 at Cafnan. The lowest temperature of 3.13°C was recorded at the same site in winter 2013. All water temperature readings were within the expected range of values for the waterbody types sampled.
- Conductivity readings were within the expected values for the waterbody types sampled, ranging between 0.112mS cm<sup>-3</sup> (Tan-yr-allt Pond spring 2014) and 0.492mS cm<sup>-3</sup> (Cafnan summer 2013).

- Dissolved oxygen (percent saturation) was generally lower at the pond sites compared to the stream sites. Rhwng Dau Fynydd, Treglele Pond, Tan-yr-allt Pond and Cae Gwyn SSSI recorded levels <50%. Dissolved oxygen at the stream sites ranged between 55.0% and 108.0%, the majority falling between 80.0% and 100.0%.
- pH levels were within the expected range of values for the habitat types sampled. pH ranged from 5.37 at Tan-yr-allt Pond to 8.55 at Felin Gafnan confluence. Lower pH levels were generally recorded at pond sites.
- Suspended sediment concentrations varied between sites with concentrations generally below 20mg L<sup>-1</sup>. Higher concentrations were recorded at the pond sites, with Tan-yr-allt Pond recording 88mg L<sup>-1</sup> in spring 2014.
- Biological oxygen demand was generally low with many sites below MRV. The highest measurements recorded were at Rhwng Dau Fynydd Pond and Tan-yr-allt Pond in autumn 2014 (>18.7mg L<sup>-1</sup> and 17.3mg L<sup>-1</sup> respectively).

Nutrient results can be summarised as follows:

- Orthophosphate concentrations were low at the stream/river sites. Elevated measurements were recorded at Rhwng Dau Fynydd Pond and Tan-yr-allt Pond (1.08mg L<sup>-1</sup> and 1.12mg L<sup>-1</sup> respectively). All other measurements ranged between approximately 0.02mg L<sup>-1</sup> and 0.382mg L<sup>-1</sup> over the course of the sampling period.
- Ammoniacal nitrogen concentrations were low across most sites (<0.311mg L<sup>-1</sup>), although elevated measurements were recorded at Rhwng Dau Fynydd Pond and Tan-yr-allt Pond (1.78mg L<sup>-1</sup> and 1.08mg L<sup>-1</sup> respectively).

Metals can be summarised as follows:

- Cadmium concentrations were all below the MRV with the exception of levels recorded at Rhwng Dau Fynydd Pond and Treglele Pond in autumn 2014 (0.389µg L<sup>-1</sup> and 0.125µg L<sup>-1</sup> respectively).
- Chromium concentrations were near or just above the MRV across most sites. In spring 2014, an elevated reading of 7.79µg L<sup>-1</sup> was recorded at Tan-yr-allt Pond.
- Arsenic concentrations were generally near or below the MRV. In autumn 2014, Rhwng Dau Fynydd Pond, Treglele Pond and Tan-yr-allt Pond recorded levels of 8.18µg L<sup>-1</sup>, 2.73µg L<sup>-1</sup> and 2.04µg L<sup>-1</sup> respectively.
- Copper concentrations were highest at Rhwng Dau Fynydd Pond and Treglele Pond, with levels reaching between 33.2µg L<sup>-1</sup> and 8.46µg L<sup>-1</sup>. All other sites recorded levels below 5.85µg L<sup>-1</sup>.
- Lead concentrations were all below the MRV with the exception of levels at Rhwng Dau Fynydd Pond and Tan-yr-allt Pond in autumn 2014 (9.75µg L<sup>-1</sup> and 2.42µg L<sup>-1</sup> respectively).
- Nickel concentrations ranged between <1µg L<sup>-1</sup> and 2.06µg L<sup>-1</sup> at all stream/river sites. Rhwng Dau Fynydd Pond, Treglele Pond and Tan-yr-allt Pond all had slightly elevated levels in autumn 2014 (9.88µg L<sup>-1</sup>, 2.14µg L<sup>-1</sup> and 5.72µg L<sup>-1</sup> respectively).
- Zinc concentrations ranged between 31.7µg L<sup>-1</sup> recorded at Rhwng Dau Fynydd (autumn 2014) and <5µg L<sup>-1</sup> (MRV).
- Mercury concentrations were near or below the MRV across all sites with the exception of Rhwng Dau Fynydd Pond in autumn 2014 (0.088 µg L<sup>-1</sup>).
- Iron concentrations ranged between 67µg L<sup>-1</sup> and 401µg L<sup>-1</sup> at the stream/river sites. Elevated levels of iron were reported at Rhwng Dau

Fynydd Pond and Tan-yr-allt Pond ( $24,400\mu\text{g L}^{-1}$  and  $23,900\mu\text{g L}^{-1}$  respectively) in autumn 2014. Levels reported for all ponds ranged between  $348\mu\text{g L}^{-1}$  and  $2,680\mu\text{g L}^{-1}$ .

- Manganese concentrations varied between sites and sampling years, levels ranging between  $25\mu\text{g L}^{-1}$  and  $1,470\mu\text{g L}^{-1}$ .

Selected other compounds can be summarised as follows:

- Toluene and trichloroethylene concentrations were low across all sites, with levels below the MRV ( $0.1\mu\text{g L}^{-1}$ ).
- DEHP concentrations were generally low across all sites, with levels below or close to the MRV ( $0.2\mu\text{g L}^{-1}$ ). Elevated levels were noted at Felin Gafnan East in summer 2012 ( $1.37\mu\text{g L}^{-1}$ ), and at Felin Gafnan Confluence ( $2.04\mu\text{g L}^{-1}$ ) and Groes-fechan ( $1.77\mu\text{g L}^{-1}$ ) in winter 2013.
- Hydrocarbon Screens (C5 - C44) concentrations were low across all sites with levels below or close to the MRV ( $0.2\mu\text{g L}^{-1}$ ).
- Chloride concentrations were low across the site.

Water quality conditions varied between the pond and stream/lake sites in the catchment, with conditions generally poorer in the ponds. Rhwng Dau Fynydd Pond had generally poor water quality with elevated concentrations of metals and low dissolved oxygen levels. This site is a small pond located along a farm track with limited inflow, which is reflected in the poor water quality conditions.

Elevated nutrient concentrations in the watercourses are considered to be attributable to the rural setting, with land use practices such as the use of fertilizers and management of livestock contributing to the nutrient loads entering ponds and watercourses.

Table 4-1: Maximum and minimum physico-chemical, biochemical and nutrient results for the Cafnan Catchment over the 2012-2014 sampling period.

Parameter	Range	Rhwng Dau Fynydd	Tregele Pond	Tan-yr-allt Pond	Cae Gwyn SSSI	Groes-fechan	Caerdegog Isaf	Caerdegog Isaf - Hafnan	Hafnan	Cafnan	Felin Gafnan East	Felin Gafnan confluence
Temperature °C	Max	12.50	11.90	11.90	11.60	17.04	17.53	19.66	17.81	20.08	17.59	17.53
	Min	12.50	7.28	6.70	5.94	4.27	10.14	8.12	9.54	3.13	3.59	3.55
Conductivity mS cm <sup>-3</sup>	Max	0.366	0.38	0.45	0.27	0.445	0.487	0.422	0.4	0.492	0.412	0.411
	Min	0.366	0.266	0.112	0.218	0.153	0.268	0.134	0.223	0.212	0.214	0.208
Dissolved oxygen %	Max	29.1	45.6	57.8	79.7	113.7	104.8	96	104.2	105.8	103.9	108.0
	Min	29.1	32.3	45.9	39.5	55.0	77.5	69.5	72.9	62.4	69.5	88.0
pH	Max	-	6.09	5.69	7.22	7.45	7.82	7.58	7.54	7.45	7.51	8.55
	Min	-	5.74	5.37	5.82	6.44	6.42	6.43	6.16	6.23	6.54	6.73
Suspended solids mg L <sup>-1</sup>	Max	26.9	52.0	88.0	9.42	13.1	11.2	12	35.2	73.1	54.2	23.1
	Min	26.9	16.7	60.4	<3.0	<3.0	<3.0	4.7	8.0	8.8	5.2	6..
Biological oxygen demand mg L <sup>-1</sup>	Max	>18.7	6.74	17.3	2.04	1.16	1.54	6.45	1.84	2.57	1.78	<1.6
	Min	>18.7	3.2	<2.92	<1.0	<1.0	<1.0	<1.0	1.11	<1.0	<1.0	<1.0
Orthophosphate (reactive as P) mg L <sup>-1</sup>	Max	1.080	0.382	1.120	0.077	0.043	0.120	0.118	0.152	0.079	0.118	0.108
	Min	1.080	0.126	0.031	<0.02	<0.02	<0.02	<0.02	0.042	0.020	0.020	0.020
Ammoniacal nitrogen as N mg L <sup>-1</sup>	Max	1.780	0.092	1.080	0.068	0.038	0.066	0.311	0.068	0.084	0.147	0.072
	Min	1.780	0.048	0.053	<0.03	<0.03	<0.03	<0.03	0.044	<0.03	<0.03	<0.03

### 4.3 Diatoms

Table 4-2 lists the diatom EQR (observed/expected diatom community) in each of the sampling years and is colour coded to indicate WFD classification. As per the DARLEQ2 guidance, EQR values >1.00 for rivers and >1.25 for lakes (and ponds) have been reported as 1.00 and 1.25 respectively.

**Table 4-2: Cafnan catchment diatom EQRs and ecological status 2011–2014 (blue = high, green = good, yellow = moderate, orange = poor).**

Site	2011	2012	2013	2014
Cafnan	0.46	0.5	0.56	0.57
Hafnan			0.77	0.69
Caerdegog - Hafnan			0.78	1.00
Caerdegog Isaf			0.81	0.67
Groes-fechan			0.86	0.94
Cae Gwyn SSSI				0.82
Felin Gafnan East	0.57	0.55	0.71	0.59
Felin Gafnan Confluence	0.46	0.49	0.61	0.8
Tregele Pond				0.5

The number of sites sampled increased between 2011 and 2014. In 2014, six of the nine sites sampled achieved EQRs of good or above. Cafnan, Felin Gafnan and Feline Gafnan Confluence, which are geographically close to one another, recorded the lowest scores. This may be attributable to high nutrient loading and road runoff in the immediate vicinity of the watercourses. The land use immediately upstream of these sites was grazing pasture, where livestock have free access to the river at certain points and there was evidence of extensive bank poaching.

Tregele Pond showed a moderate EQR result which is in line with the other ponds in the area, which also tended to score low to moderate on the EQR scale.

Some annual variability was observed in the diatom index scores with the biggest change seen at Felin Gafnan Confluence. The variability in EQR scores between years may result from seasonal flows affecting the channel's wetted area, flow and aquatic habitat. Additionally, the effect of low flows during one year has the potential to affect ecological communities in following years.

Sample failures where not enough diatoms could be collected in the field for further analysis, occurred on three occasions during the 2013 monitoring period. This was as a result of a lack of diatoms being present despite suitable substrate being available. No differences in the physical characteristics of the sites which could account for the lack of diatoms were observed during sample collection. The most likely cause for this result is thought to be high flows prior to sampling.

Overall, the Cafnan catchment diatom community is characteristic of a lowland rural area with some evidence of mild to moderate nutrient input.

## 4.4 Macroinvertebrates

### 4.4.1 Exhaustive Surveys 2011 to 2013

During 2011 to 2013, sampling was undertaken using the exhaustive survey method, whilst in 2014, sites were sampled using the standard kick-sample methodology. Data from qualifying sites in 2014 were assessed using the RICT analysis tool, but all other sites were not assessed due to limitations in the RICT methodology.

The exhaustive number of species recorded at the Cafnan watercourse is shown in Table 4-3. The exhaustive number of species is not directly comparable between sites as the number of visits differed due to seasonal variation, weather and access constraints. Some of the sites had multiple sampling locations from which data were pooled into one exhaustive number of species (e.g. Cafnan to Hafnan). Data provides an indication of the diversity of species recorded within a survey area each year. This exhaustive methodology is not consistent with use of the RICT tool but provides information on general species diversity and the presence of species of conservation interest.

**Table 4-3: Exhaustive number of species per year at nine sites within the Cafnan catchment in varying seasons, 2011-2013, adapted from Jacobs' (2013) Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2013.**

Site	Exhaustive number of species		
	2011	2012	2013
Caerdegog Isaf Pond	-	32	9
Tan-yr-allt Pond	-	33	21
The Firs Pond	1	-	-
Cae Gwyn SSSI	-	-	66
Groes-fechan Wetland*	-	-	79
Caerdegog Isaf	-	16	9
Cafnan to Hafnan*	26	31	26
Felin Gafnan Confluence	3	6	5
Pont Cafnan Wetland	3	29	36

\* marks a site where multiple locations were surveyed and results pooled.

The majority of macroinvertebrates identified during these surveys belonged to families of beetles, molluscs, crustaceans and true bugs with moderate pollution tolerance.

There is significant variation in the number of species across sites, with the lowest diversity recorded at sites very close to the coast such as Felin Gafnan Confluence. The Cae Gwyn SSSI and Groes-fechan Wetland areas in the south-west of the study area are particularly species rich, with 66 and 79 species recorded, respectively, in 2013.

In 2011, the beetles *Agabus bipustulatus* and *Helophorus brevipalpis* occurred in more than half of sites along with the flatworm *Polycelis nigra/tenuis*, shrimps (*Gammarus* spp.) and the hognouse (*Asellus aquaticus*). The most widespread species recorded in 2012 were *Planorbis planorbis* (snail), *Polycelis nigra/tenuis* (flatworm) and *Asellus aquaticus*, all occurring in more than half of the sites.

In 2013, the most widespread species were again *Planorbis planorbis* (snail), *Polycelis nigra/tenuis* (flatworm) and *Asellus aquaticus*, with the addition of the beetles *Gyrinus substriatus* and *Agabus bipustulatus*.

In all years, a good diversity of true bugs (mainly water-boatman species) and snails occurred. Most of the species recorded were characteristic of slow-flowing waters with good macrophyte cover and fine sediments, and are generally tolerant of organic pollution.

In all years, there were a few isolated records of pollution sensitive mayflies, stoneflies and occasionally caddisflies, mainly occurring at the faster flowing stream sites.

#### 4.4.2 Macroinvertebrate Species and Conservation Value

There were a number of beetles, leeches, snails and true bugs of conservation importance recorded using the exhaustive survey method (see Table 4-4). Cae Gwyn SSSI recorded the highest number of conservation species. The site was particularly rich in beetles, supporting 12 species of conservation importance. The water scavenger beetle *Coelostoma orbiculare* (Regionally Notable), and predaceous diving beetle *Ilybius guttiger* (Nationally Scarce), occurred in four out of six sites. Half of the sites surveyed supported snails of Local conservation importance, and a third contained a leech of Local conservation importance.

**Table 4-4: Years where species of conservation importance (under CCI) were recorded at six sites within the Cafnan catchment, collected in 2011-2013 by using the exhaustive method; 2014 data collected using standard kick-sample methodology is also presented.**

Species	Conservation status	Cae Gwyn SSSI	Groes-fechan Wetland*	Caerde gog Isaf	Cafnan to Hafnan*	Pont Cafnan Wetland	Cafnan
<i>Ilybius chalconatus</i>	Nationally Scarce <sup>^</sup>					2013	
<i>Agabus unguicularis</i>	Nationally Scarce <sup>^</sup>					2012, 2013	
<i>Coelostoma orbiculare</i>	Regionally Notable <sup>^</sup>	2013	2013	2011	2012		
<i>Enochrus coarctatus</i>	Nationally Scarce <sup>^</sup>	2013			2012		
<i>Enochrus ochropteras</i>	Nationally Scarce <sup>^</sup>	2013					
<i>Graptodytes granularis</i>	Nationally Scarce <sup>^</sup>	2013					
<i>Helochares lividus</i>	Nationally Scarce <sup>^</sup>		2013				
<i>Helochares punctatus</i>	Nationally Scarce	2013	2013				

Species	Conservation status	Cae Gwyn SSSI	Groesfechan Wetland*	Caerde gog Isaf	Cafnan to Hafnan*	Pont Cafnan Wetland	Cafnan
<i>Hydroglyphus pusillus</i>	Nationally Scarce^	2013					
<i>Hydroporus obscurus</i>	Local	2013				2013	
<i>Hydroporus tristis</i>	Local	2013					
<i>Hygrotus impressopunctatus</i>	Local					2012, 2013	
<i>Ilybius guttiger</i>	Nationally Scarce^	2013	2013		2012	2012, 2013	
<i>Ilybius montanus</i>	Local	2013					
<i>Ilybius quadriguttatus</i>	Local					2012	
<i>Rhantus grapii</i>	Nationally Scarce^	2013				2012, 2013	
<i>Rhantus suturalis</i>	Nationally Scarce^		2013				
<i>Erpobdella testacea</i>	Local		2013				
<i>Haemopsis sanguisuga</i>	Local		2013			2013	
<i>Anisus leucostoma</i>	Local	2013					
<i>Aplexa hypnorum</i>	Local	2013	2013			2012, 2013	
<i>Hesperocorixa moesta</i>	Regionally Notable	2013					
<i>Microvelia reticulata</i>	Local	2013			2012	2013	
<i>Paracymus scutellaris</i> (Beetle)	Notable	2014					
<i>Sigara semistriata</i> (Water boatman)	Local						2014
<b>Total number of CCI ≥ Local species found across four years</b>		<b>16</b>	<b>8</b>	<b>1</b>	<b>4</b>	<b>10</b>	<b>1</b>

\*denotes a site where multiple locations were surveyed and results pooled. ^denotes beetle species which are designated a lower conservation classification in Foster (2010).

There were several occurrences of the pollution sensitive cased caddisflies (Beraeidae and Sericostomatidae), whilst a caseless caddisfly (Hydropsychidae) was recorded at Felin Gafnan Confluence, which exhibits fast flowing water conditions.

CCI scores ranged from Low to Fairly High (Table 4-5), with the lowest scoring community at Caerdegog Isaf (3.3) and the highest at Cae Gwyn SSSI (12.2). The majority of sites were of Low conservation importance. Cae Gwyn SSSI qualifies for Fairly High conservation value due to the presence of the Notable water scavenger beetle, *Paracymus scutellaris*, supported by a wider species-rich community. The water boatman, *Sigara semistriata*, was present at Cafnan, which is of Local conservation importance.

**Table 4-5: Macroinvertebrate CCI scores for 2014 sites within the Cafnan catchment.**

Site	CCI score	CCI value	Species of conservation importance (Local or above)
Cae Gwyn SSSI	12.2	Fairly High	<i>Paracymus scutellaris</i> (Beetle, Notable)
Caerdegog Isaf	3.3	Low	None
Cafnan	6.8	Moderate	<i>Sigara semistriata</i> (Water boatman, Local)
Felin Gafnan Confluence	7.2	Moderate	None
Groes-fechan	3.6	Low	None
Hafnan	4.3	Low	None
Hafnan – Caerdegog Isaf	4.6	Low	None

**4.4.3 Macroinvertebrate Indices**

Hafnan - Caerdegog Isaf had a low BMWP score of 56, while the Cafnan and Felin Gafnan sites scored 93 and 106 respectively (Table 4-6). The Felin Gafnan Confluence had the highest ASPT score of 5.0, suggesting the community is less tolerant to pollution compared with the other sites. The number of taxa recorded was variable across sites, ranging from 14 taxa at Hafnan - Caerdegog Isaf to 21 taxa at both Cafnan and Felin Gafnan.

PSI (F) was interpreted as ranging from Slightly Sedimented to Heavily Sedimented across the catchment. The Caerdegog Isaf tributary site indicated that a significant proportion of taxa present in this watercourse were more tolerant of sedimentation. Ditch-like sites such as Hafnan – Caerdegog Isaf were assessed as being Heavily Sedimented.

LIFE (F) scores varied between sites. Felin Gafnan Confluence (7.3) and Caerdegog Isaf (6.6) appear least impacted by flow stress. Cae Gwyn SSSI (5.4) recorded an invertebrate community characteristic of slow flowing or standing water, which reflected the fen/wetland nature of the site. EQR scores of 0.78 or above were generated for three sites, suggesting there are few flow-stressors at these sites (all along the main stem Cafnan watercourse) that would not be present in pristine reference conditions.

**Table 4-6: Macroinvertebrate indices for seven sites on the Cafnan catchment. \* denotes spring only**

Site	BMWP	NTAXA	ASPT	PSI (F)	PSI (F) interp.	PSI (F) EQR	LIFE (sp)	LIFE (F)	LIFE (F) EQR
Cae Gwyn SSSI*	83	20	4.2	19.0	Heavily sedimented	-	5.7	5.4	-
Caerdegog Isaf*	72	16	4.5	62.1	Slightly sedimented	-	7.9	6.6	-
Cafnan*	93	21	4.4	24.1	Sedimented	0.34	6.4	6	0.78
Felin Gafnan Confluence	106	21	5.0	71.1	Slightly sedimented	1.04	8.0	7.3	0.99
Groesfechan *	68	15	4.5	60.0	Moderately sedimented	-	7.4	6.3	-
Hafnan*	61	15	4.1	50.0	Moderately sedimented	0.91	7.1	6.3	0.87
Hafnan – Caerdegog Isaf*	56	14	4.0	16.0	Heavily sedimented	-	5.7	5.5	-

Three sites within the catchment were candidates for RICT classification (Table 4-7). Hafnan, Cafnan and Felin Gafnan Confluence were classified as Poor, Poor and Moderate respectively.

**Table 4-7: RICT classifications for three sites in the Cafnan catchment. The highlighted cells represent the overall EQR classification for the given site.**

Site	Index	EQR	Class	Probability of Class (%)
Cafnan	ASPT	0.73	Poor	71.47
	NTAXA	1.07	High	90.51
	MINTA	-	<b>Poor</b>	71.47
Felin Gafnan Confluence	ASPT	0.84	Moderate	79.29
	NTAXA	0.94	High	68.10
	MINTA	-	<b>Moderate</b>	79.29
Hafnan	ASPT	0.75	Poor	60.80
	NTAXA	0.76	Moderate	38.72
	MINTA	-	<b>Poor</b>	60.80

Both Cafnan and Felin Gafnan Confluence achieved an individual NTAXA classification of High, which indicates that the overall MINTA classification of moderate is being influenced by the ASPT score (Table 4-7). The low ASPT is normally indicative of water quality issues rather than habitat availability, because the community pollution tolerance is higher than would be expected.

#### 4.5 Macrophytes

Four of the six macrophyte surveys carried out on the Cafnan catchment were suitable for LEAFPACS2 classification (Appendix D). The remaining two were unsuitable either because they were not visible on a 1:50,000 ordnance survey map (a prerequisite of LEAFPACS2) or the sites had a survey length of less than 40m.

Fool’s watercress (*Apium nodiflorum*), water mint (*Mentha aquatica*), hemlock water dropwort (*Oenanthe crocata*), reed canary grass (*Phalaris arundinacea*) and watercress (*Rorippa nasturtium-aquaticum* agg.) are LEAFPACS2 scoring taxa and were present at the majority of the sites surveyed. The taxon cover values (TCVs) varied between sites.

Willowherb (*Epilobium hirsutum*), meadowsweet (*Filipendula ulmaria*), common rush (*Juncus effuses*) and the greater birds-foot trefoil (*Lotus pedunculatus*) are all non-scoring LEAFPACS2 taxa and were present at the majority of sites.

One species of macroalgae, *Vaucheria* sp., was also recorded at Cafnan. It is particularly tolerant of elevated nutrient levels. There were no species of conservation importance identified in the surveys.

Table 4-8 shows the individual indices calculated from LEAFPACS2 prior to classification (four were suitable for classification).

**Table 4-8: Macrophyte indices for sites along the Cafnan watercourse prior to LEAFPACS2 classification (RMNI, NTAXA, non-scoring taxa, NFG and ALG). Refer to glossary for acronym definitions.**

Site	Observed RMNI	Observed NTAXA (scorers)	Total NTAXA (inc. non-scores)	Observed NFG	Observed ALG
Groes-fechan	6.78	6	20	5	0
Cafnan	7.83	5	13	5	17.50
Hafnan A	6.51	4	7	3	0
Cae Gwyn SSSI	6.44	4	16	4	0
Caerdegog Isaf	6.61	3	12	2	0
Hafnan B	7.31	2	8	2	0

The RMNI score gives an indication of nutrient enrichment, with scores ranging from 1 (low) to 10 (high). The RMNI scores did not vary considerably between the sites suggesting a moderate degree of nutrient enrichment across all sites.

The NTAXA score gives an indication of diversity within the macrophyte community. Groes-fechan recorded the highest score (six), whilst Hafnan B the lowest score (2).

Observed algal cover gives a percentage cover value of green filamentous algae. The whole survey area, with the exception of Cafnan (17.5%), recorded an algal percentage cover of less than 1%. The NFG scores were poor across all sites.

LEAFPACS2 classification was performed on four sites within the Cafnan catchment, with all sites except for Cafnan (Moderate) scoring Good status (Table 4-9).

**Table 4-9: The results of LEAFPACS2 classification at the Cafnan catchment sites. Highlighted cells represent the EQR status category defined.**

Site	EQR	Status
Groes-fechan	0.660	Good

Cafnan	0.428	Moderate
Hafnan	0.699	Good
Cae Gwyn SSSI	0.663	Good

There was one record of the non-native species *Gunnera manicata* at the Felin Gafnan Confluence.

#### 4.6 Fish

The Cafnan site has been surveyed on seven occasions over the 2011-2014 period. Brown trout, European eel, three-spined stickleback and nine-spined stickleback have been recorded. A single nine-spined stickleback was recorded in autumn 2011; however, it has not been observed since. All other species were present between 2011 and 2014 with the number of individuals varying over time. Brown trout ranged from single individuals caught in summer and autumn 2013 to eight individuals caught in autumn 2011. European eel ranged from two individuals in autumn 2013 to 14 individuals in spring 2012. The three-spined stickleback was the most numerous species with up to 57 individuals recorded in autumn 2011.

The Hafnan site was surveyed three times during 2013 and once in 2014. Over this period, brown trout and European eel have been recorded in addition to a large number of three-spined stickleback and three nine-spined sticklebacks. In 2013, all of the eel recorded were over 200mm in length whereas in 2014 only two of the 10 eels caught were over 200mm (the remainder 70mm–120mm). In 2014, a single brown trout (200mm) was recorded. Hafnan provides limited suitable habitat for brown trout with large sections being too shallow for adults over a silt substrate, in addition to little cover. Stickleback and European eels are able to utilise the cover provided by macrophytes or by burying into the silt (eels only).

The Caerdegog Isaf site was surveyed twice in 2013, with a single three-spined stickleback being recorded. No fish were recorded during the 2014 survey. Available data suggest that the low water levels at the site do not facilitate a permanent fish population. It is likely that under high flow conditions stickleback and eel may temporarily enter the site.

The Groes-fechan site was surveyed once in spring 2013 and once in summer 2014: no fish were caught or observed on either occasion. The channel is heavily vegetated, so it is possible that fish are present but have not been encountered during the surveys. The Groes-fechan site is upstream of Caerdegog Isaf, which does not appear to support a population of fish either. Hence, it is possible that this upstream section of the catchment as a whole does not support a viable fish population.

The fish fauna observed on the Cafnan catchment is typical of a small coastal stream, with connectivity to the marine environment allowing eel to move freely into and within the catchments. Given the size of watercourses, with many prone to choking from macrophytes or seasonal drying, many sites are not suitable for cyprinid species of fish. However, the larger watercourses have been shown to support populations of brown trout. Sticklebacks were been recorded at most sites. Their tolerance of reduced oxygen conditions and very shallow water environments provide them with the greatest potential range of the species encountered. Habitat suitability for fish varied between sites, although areas of mixed substrates, varying flow types and riparian and in-stream cover provide some good habitat diversity within the catchment.

## 4.7 Pond Quality Assessment

Pond Quality Assessments were carried out at four ponds within the catchment (see Appendix A). Exhaustive macroinvertebrate surveys were carried out at two ponds in 2012 and 2013 to identify species richness and conservation value. A PSYM survey was undertaken at one pond (Tregele Pond) in 2014. The PSYM survey was undertaken to classify the pond using a series of indices while assessing the quality and conservation importance of the macroinvertebrate and aquatic plant communities. The remaining pond site (Groes-fechan ponds 1 and 2) was found to be ephemeral and was not considered further.

### 4.7.1 Macroinvertebrates

#### (a) Exhaustive surveys 2011–2013

The number of species recorded at each pond is detailed in Table 4-10. The exhaustive number of species is not directly comparable between sites as the number of visits differed due to ponds drying out, access constraints or adverse weather; however, data provides an indication of the diversity of species recorded each year.

**Table 4-10: Exhaustive number of species per year at two ponds in varying seasons, 2011-2013**

Site	Exhaustive number of species		
	2011	2012	2013
Caerdegog Isaf Pond	-	32	9
Tan-yr-allt Pond	-	33	21

Caerdegog Isaf Pond and Tan-yr-allt Pond recorded a species list of over 30 taxa during 2012. The majority of macroinvertebrates identified during these surveys belonged to pollution tolerant families of beetles, molluscs, crustaceans and true bugs. The most common species recorded in the ponds were the water beetle (*Agabus bipustulatus*), the flatworm (*Polycelis nigra/tenuis*) and the hoglouse (*Asellus aquaticus*). All three species were recorded in more than half of ponds surveyed. In 2011, the beetles *Agabus bipustulatus* and *Helophorus* spp. were recorded in more than half of the sites surveyed, along with the flatworm *Polycelis nigra/tenuis*, the water skaters *Gerris* spp. and the hoglouse *Asellus aquaticus*. These species are characteristic of standing waters with a high coverage of macrophytes, fine sediments and decomposing organic matter.

#### (b) Species of Conservation Importance

A number of beetles, leeches, snails and true bugs of conservation importance were recorded between 2011 and 2014 (see Table 4-11). Caerdegog Isaf Pond was particularly rich in beetles, supporting seven species of conservation importance, out of a total of 13 recorded from the entire study area. Caerdegog Isaf pond had the highest number of rare species across the study period, with four considered Nationally Scarce, two Regionally Notable and the remainder in the Local conservation category. Tan-yr-allt Pond had three Nationally Scarce species, with two of Local significance. *Omphiscola glabra* was found in Tregele Pond in 2014. *Omphiscola glabra* is declining in range in the UK and is named as a priority species under Section 42 of the Natural Environment and Rural Communities (NERC) Act, Wales, 2006. *O. glabra* is also on the Red List International Union for Conservation

of Nature (IUCN) as Near Threatened. In total, 42 individuals were recorded in the sample, indicating that there is a significant population living in the pond.

CCI conservation scores were not calculated for 2011–2013 data because the exhaustive survey method does not provide a quantitative sample collection.

**Table 4-11: Years where species of conservation importance (under CCI) were recorded at three ponds within the Cafnan catchment, collected in 2011–2013 by using exhaustive method; 2014 data collected using standard kick-sample methodology is also presented.**

Species	Conservation Importance (Local or above)	Caerdegog Isaf Pond	Tan-yr-allt Pond	Tregele Pond
<i>Coelostoma orbiculare</i>	Regionally Notable*	2012		
<i>Cymbiodyta marginella</i>	Local		2012, 2013	2014
<i>Dytiscus circumflexus</i>	Nationally Scarce*		2012	
<i>Enochrus coarctatus</i>	Nationally Scarce*	2012, 2013		
<i>Enochrus ochropterus</i>	Nationally Scarce*	2013		
<i>Helochares punctatus</i>	Nationally Scarce	2012		
<i>Ilybius guttiger</i>	Nationally Scarce*	2013	2012	
<i>Ilybius quadriguttatus</i>	Local	2012		
<i>Ochthebius marinus</i>	Nationally Scarce*		2012	
<i>Haemopsis sanguisuga</i>	Local	2012		
<i>Anisus leucostoma</i>	Local		2012	
<i>Aplexa hypnorum</i>	Local	2012		
<i>Hesperocorixa moesta</i>	Regionally Notable	2012		
<i>Omphiscola glabra</i>	Near Threatened			2014
<b>Total number of CCI ≥Local species found across four years</b>		<b>9</b>	<b>5</b>	<b>2</b>

\*denotes beetle species which are designated a lower conservation classification in Foster (2010).

#### 4.7.2 PSYM

Tregele Pond was assessed using the PYSM method (indicator results detailed in Table 4-12). The composition of the macroinvertebrates community was similar across the study period. The Coleoptera index was only slightly lower than expected, suggesting that the pond provide acceptable habitat for beetle species. The Odonata index indicated that the pond community was limited by variations in water level and ephemeral effects. Numbers of dragon/damselfly and alderfly

families (which require permanently wetted sites for the long larval stage of their life cycle) were below expected.

**Table 4-12: PSYM results and classification of Tregle Pond. Observed indices in unshaded rows, and EQIs below in shaded rows (PSYM quality category = IBI >75%=Good, 51-75%=Moderate, 25-50%=Poor, <25%=V Poor). Refer to glossary for acronym definitions.**

Index	Tregle Pond
No. of submerged + marginal plant species (SM)	8
EQI (SM)	0.41
Number of uncommon plant species (U)	1
EQI (U)	0.23
Trophic Ranking Score (TRS)	9.25
EQI (TRS)	1.59
Average Score Per Taxon (ASPT)	3.6
EQI (ASPT)	0.70
Odonata + Megaloptera (OM) families	0
EQI (OM)	0.00
Coleoptera families (CO)	3
EQI (CO)	0.80
Index of Biotic Integrity (%)	28%
PSYM quality category	Poor
Priority species	1
Meet Priority Pond criteria?	Yes

The low ASPT (3.6) was largely due to the absence of high BMWP-scoring families such as caddisflies and mayflies. This potentially reflects the water quality pressures from agricultural land use which mainly consists of improved pastures, where livestock often have access to the waterbodies).

Tregle Pond recorded the highest scoring macroinvertebrate community within the Wylfa Newydd Development Area (Very High, 29.6) due to the presence of the mud snail (Table 4-13).

**Table 4-13: CCI scores and results from data collected during PSYM surveys in 2014 (and one survey in 2012).**

Pond	CCI score	CCI value	Species of conservation importance (Local or above)
Tregle Pond	29.6	Very High	<i>Omphiscola glabra</i> (Mud snail, Red List IUCN Near Threatened) <i>Cymbiodyta marginella</i> (beetle, Local)

The PSYM plant indices indicate that Tregle Pond supports commonly occurring, nutrient tolerant species, which supports the observed elevated phosphorus and ammonia levels. In addition, the TRS (9.25) indicates that the communities within the pond have a very high tolerance to elevated nutrient levels.

Overall, Tregle Pond is classed as Poor under the PSYM methodology, largely due to its relatively low diversity (macroinvertebrates and macrophyte) and poor trophic ranking score. However, the presence of Red List IUCN Near Threatened species in 2014 led to the classification of the site as of Very High conservation value and consequently achieved Priority Status.

## 4.8 Summary

The Cafnan data are indicative of a rural catchment with mild to moderate nutrient enrichment as evidenced by the water quality, diatom and macrophyte indices. General habitat quality is good along the main stem stream between the Hafnan and Cafnan sites. Habitat quality is generally lower along the tributary stream where the Caerdegog Isaf site is located.

Macroinvertebrate indices indicated a range of habitats of between low and good quality. The ditch-like habitat around Caerdegog Isaf was typical of low habitat quality. The wetland areas around Groes-fechan and Cae Gwyn exhibited high species diversity and were indicative of higher habitat quality. There was one record of the no-native species *Gunnera manicata* at the Felin Gafnan Confluence.

Fish data indicates that trout are the dominant species within the main stem of the Cafnan. European eel was also present at the main stem sites. The reaches upstream of Caerdegog exhibited poorer habitat for fish, with extensive siltation and low water levels. Habitat suitability for fish is varied between the sites, although areas of mixed substrates, varying flow types and riparian and in-stream cover provide some good habitat diversity.

Species found within the catchment are common and widespread and reflect existing and historical rural land management practices in the area. The national important European eel was present within the catchment although in low numbers, along with the near threatened mud sail found in Tregle Pond. As a result, aquatic habitats and species within the Cafnan catchment can be considered of moderate quality.

**5.1 Habitat Characterisation**

The Tre'r Gof catchment is located to the south-east of the Existing Power Station. The catchment includes four pond sites and three running water sites. The Tre'r Gof SSSI is located within the catchment and is recognised for its rich-fen habitat. The SSSI wetland area is wetted all year round and ensures a permanently wetted channel around its margin.

The catchment land use is largely agricultural with evidence of livestock access to the watercourse noted in some areas. There is evidence of historical channel modification to allow the watercourse to flow along field boundaries. Some sections of the upper catchment are ephemeral, drying out during the summer months. Refer to Appendix A for habitat characterisation descriptions.

**5.2 Water quality**

The following section summarises water quality data collected between 2012 and 2014 within the Tre'r Gof catchment. Table 5-1 details the results for selected physico-chemical, biochemical and nutrient parameters. For full results, refer to Appendix B (note this section refers to results from the Tre'r Gof catchment only).

Physico-chemical and biochemical results can be summarised as follows:

- Water temperatures ranged between 1.94°C (Power Station Pond, winter 2013) to 18.5°C (Porth Wylfa Pond, spring 2014). All water temperature results were within the expected range of values for the waterbody types and time of the year.
- Conductivity readings ranged between 0.185mS cm<sup>-3</sup> (Power Station Pond, winter 2013) and 0.640mS cm<sup>-3</sup> (Tre'r Gof SSSI, autumn 2014), and were within the expected range of values for the waterbody type.
- Dissolved oxygen (percent saturation) varied significantly across the catchment and across sampling years. Values ranged between 20%, recorded in spring 2013 (Power Station Pond), and 135%, recorded in winter 2014 (Porth Wylfa Pond).
- pH ranged from 5.58 to 8.57, with all results within the expected range of values for the habitat types sampled.
- Suspended sediment concentrations varied between sites and sampling occasions. The highest suspended solid concentration (307mg L<sup>-1</sup>) was recorded in autumn 2014 at Tyddyn-Goronwy, which was characterised as an ephemeral stream. Water levels at the time of sampling were low, resulting in the possible resuspension of sediment during the collection of the sample.
- Biological oxygen demand was generally low. The highest level (18.8mg L<sup>-1</sup>) was recorded at Wylfa Hall Pond in autumn 2014.

Nutrient results can be summarised as follows:

- Orthophosphate concentrations were generally low across the site. Concentrations ranged between MRV (<0.01mg L<sup>-1</sup>) and 0.595mg L<sup>-1</sup> over the sampling period.

- Ammoniacal nitrogen concentrations were generally low, varying slightly between sites. Elevated readings were noted at Porth Wylfa Pond (1.59mg L<sup>-1</sup>) and Power Station Pond (0.385mg L<sup>-1</sup>) in spring 2014, and Power Station Junction (0.509mg L<sup>-1</sup>) in autumn 2014.

**Table 5-1: Maximum and minimum physico-chemical, biochemical and nutrient results for the Tre'r Gof catchment over the 2012-2014 sampling period.**

Parameter	Range	Power Station Junction	Wylfa Hall Pond	Tyddyn-Goronwy	Power Station Pond	Porth Wylfa Pond	Porth Wylfa	Tre'r Gof SSSI
Temperature °C	Max	11.90	13.30	12.10	13.60	18.50	15.60	12.70
	Min	5.80	8.03	12.10	1.94	10.20	2.55	8.62
Conductivity mS cm <sup>-3</sup>	Max	0.336	0.632	0.495	0.361	0.501	0.595	0.640
	Min	0.266	0.219	0.495	0.185	0.372	0.349	0.356
Dissolved oxygen %	Max	83.2	104.9	52.6	65.9	135	81	73.5
	Min	45.6	37.8	52.6	20.0	68.0	52.7	55.8
pH	Max	6.48	8.15	-	6.07	8.57	8.57	8.46
	Min	6.09	5.58	-	5.58	6.7	6.13	6.38
Suspended solids mg L <sup>-1</sup>	Max	27.2	22.4	307.0	173.0	69.6	52.5	121.0
	Min	<3.0	5.9	307.0	3.0	13.9	5.1	6.9
Biological oxygen demand mg L <sup>-1</sup>	Max	5.55	18.80	12.20	7.91	3.79	2.50	4.64
	Min	<1.0	<1.0	12.20	1.45	<1.0	<1.0	<1.0
Orthophosphate (reactive as P) mg L <sup>-1</sup>	Max	0.595	0.221	0.061	0.09	0.178	<0.02 0	<0.0 20
	Min	<0.020	0.022	0.061	0.021	0.035	<0.01 0	<0.0 10
Ammoniacal nitrogen as N mg L <sup>-1</sup>	Max	0.509	0.218	0.209	0.385	1.590	0.063	0.037
	Min	<0.030	0	0.209	0.081	0.108	<0.03 0	<0.0 30

Metals can be summarised as follows:

- Cadmium, nickel, lead, chromium and mercury concentrations were low or below the MRV across all sites.
- Arsenic was generally low, with values ranging between MRV (<1.0µg L<sup>-1</sup>) and 1.81µg L<sup>-1</sup>.
- Copper concentrations were generally below 4.51µg L<sup>-1</sup>, although a level of 6.41µg L<sup>-1</sup> was recorded at Wylfa Hall Pond in autumn 2014.
- Zinc concentrations varied across the catchment and sampling season. Levels ranged between 22µg L<sup>-1</sup> recorded at Power Station Pond in autumn 2013 and below the MRV (5µg L<sup>-1</sup>).
- Iron concentrations varied between sites and sampling years, and ranged between <30µg L<sup>-1</sup> and 7470µg L<sup>-1</sup>.
- Manganese concentrations varied between sites and sampling years, and ranged between 58µg L<sup>-1</sup> and 4240µg L<sup>-1</sup> (Tre'r Gof SSSI, spring 2014).

Selected other compounds can be summarised as follows:

- Toluene and trichloroethylene levels were low across all sites with levels below the MRV (0.1µg L<sup>-1</sup>).
- DEHP levels were elevated at Porth Wylfa in winter 2012 (1.05µg L<sup>-1</sup>) and summer 2012 (0.65µg L<sup>-1</sup>). All other sites recorded low levels below or close to the MRV (0.2µg L<sup>-1</sup>).
- Hydrocarbon Screens (C5 - C44) levels were low across all sites with levels below or close to the MRV (0.2µg L<sup>-1</sup>).

- Chloride levels were low across the site. Water quality conditions within the Tre'r Gof catchment are typical of a catchment dominated by rural land use, including livestock grazing. Occasional elevated metal concentrations have been detected over the 2012–2014 sampling period.

### 5.3 Diatoms

Diatom surveys were undertaken between 2011 and 2014. Table 5-2 lists the diatom EQR (observed/expected diatom community) in each of the sampling years and is colour coded to indicate WFD classification. As per the DARLEQ2 guidance, EQR values >1.00 for rivers and >1.25 for lakes (and ponds) have been reported as 1.00 and 1.25 respectively.

**Table 5-2: Diatom EQRs and ecological status 2011–2014 for the Tre'r Gof catchment (blue= high, green = good, yellow= moderate, orange = poor).**

Site	2011	2012	2013	2014
Porth Wylfa	0.89	0.96	1.00	1.00
Power Station Pond		0.55	0.8	0.73
Power Station Junction			0.8	0.56
Wylfa Hall Pond				0.69
Tre'r Gof SSSI				1.00
Porth Wylfa Pond				0.63

As a key indicator of elevated nutrients, the diatoms indices indicate that environmental stressors (including nutrients) are having a small impact upon the observed communities at Power Station Pond, Power Station Junction, Wylfa Hall Pond and Porth Wylfa Pond. The indices indicate that the phytoplankton communities are similar to those predicted for the watercourse typologies, based upon physical habitat attributes. The indices indicate that Porth Wylfa and Tre'r Gof SSSI are at High quality.

The variability in the diatom community at Power Station Pond and Power Station Junction indicates a degree of environmental stress. Low flows through the catchment may be affecting the diatom community. In addition, the heavy channel shading present through most of the catchment may also be contributing to the diatom EQR scoring.

The diatom taxa reported from the 2011 and 2014 sampling of the Tre'r Gof catchment are generally common taxa, with low to medium nutrient tolerance. As a result, the value of diatom communities in the Tre'r Gof catchment are considered low, with the species present forming a small resource when considering the wider Wylfa Newydd Development Area.

### 5.4 Macroinvertebrates

Macroinvertebrate samples have been collected between 2011 and 2014 in the Tre'r Gof catchment. During 2011 to 2013, two sites were sampled using the exhaustive survey method; whilst in 2014, three sites were sampled using the standard kick-sample methodology. No samples were collected at Tyddyn-Goronwy, as the site is ephemeral and was dry at the time of sampling.

### 5.4.1 Exhaustive Surveys 2011 to 2013

The resulting is not directly comparable between sites as the number of visits differed due to seasonal variation, weather and access constraints. Both sites had multiple sampling locations from which data was pooled. Data provides an indication of the diversity of species recorded each year (Table 5-3).

**Table 5-3: Exhaustive number of species per year at two sites within the Tre'r Gof catchment in varying years and seasons, 2011-2013, adapted from Jacobs' (2013) Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2013.**

Site	Exhaustive number of species		
	2011	2012	2013
Porth Wylfa/Tre'r Gof SSSI*	33	46	45
Power Station Pond/Junction*	-	28	10

\*marks a site where multiple locations were surveyed and results pooled.

The lowest diversity was recorded at Power Station Pond/Junction (10 species) in 2013. Porth Wylfa/Tre'r Gof SSSI recorded 46 and 45 species respectively in 2012 and 2013. The majority of macroinvertebrates identified during these surveys were individuals from the families of beetles, molluscs, crustaceans and true bugs with moderate pollution tolerance (see Rachel Hacking Ecology, 2011, 2012 and 2013 for species lists).

### 5.4.2 Macroinvertebrate Species and Conservation Value

There were a number of beetles, leeches, snails and true bugs of conservation importance recorded using the exhaustive survey method in all years (see Table 5-4). The highest number of CCI species found was at the Porth Wylfa site (15 species). The Tre'r Gof SSSI, which was only sampled as a site in its own right in 2014, had a low species count, largely as a result of changes in the sampling methodology.

**Table 5-4: Years when species of conservation importance (under CCI) were recorded at three sites within the Tre'r Gof catchment, collected in 2011-2013 by using exhaustive method; 2014 data collected using standard kick-sample methodology is also presented.**

Species	Conservation Importance (Local or above)	Porth Wylfa/Tre'r Gof SSSI*	Tre'r Gof SSSI	Power Station Pond/Junction *
<i>Cercyon tristis</i>	Nationally Scarce <sup>^</sup>	2012, 2013		
<i>Coelostoma orbiculare</i>	Regionally Notable <sup>^</sup>	2011, 2012, 2013		2012, 2013
<i>Cymbiodyta marginella</i>	Local	2011		2011
<i>Enochrus coarctatus</i>	Nationally Scarce <sup>^</sup>	2012, 2013		2011, 2012, 2013
<i>Enochrus ochropteras</i>	Nationally Scarce <sup>^</sup>	2012		
<i>Helochaeres lividus</i>	Nationally Scarce <sup>^</sup>			2011, 2012
<i>Helochaeres punctatus</i>	Nationally Scarce	2013		2011

Species	Conservation Importance (Local or above)	Porth Wylfa/ Tre'r Gof SSSI*	Tre'r Gof SSSI	Power Station Pond/Junction *
<i>Hydroporus tristis</i>	Local			2012
<i>Hygrotus impressopunctatus</i>	Local	2013		
<i>Ilybius guttiger</i>	Nationally Scarce <sup>^</sup>	2011, 2012		
<i>Ilybius quadriguttatus</i>	Local	2011		
<i>Rhantus frontalis</i>	Nationally Scarce	2013		
<i>Rhantus grapii</i>	Nationally Scarce <sup>^</sup>	2013		
<i>Erpobdella testacea</i>	Local	2012, 2013	2014	2011
<i>Haemopsis sanguisuga</i>	Local	2013		
<i>Anisus leucostoma</i>	Local	2011, 2012, 2013		2012
<i>Aplexa hypnorum</i>	Local	2012, 2013		2012
<i>Sigara limitata</i>	Local			
<i>Microvelia reticulata</i>	Local			2011
<b>Total number of CCI ≥ Local species found across four years</b>		<b>15</b>	<b>1</b>	<b>10</b>

\*denotes a site where multiple locations were surveyed and results pooled. <sup>^</sup>denotes beetle species which are designated a lower conservation classification in Foster (2010).

In general, the macroinvertebrates recorded across the site consisted of common crustaceans, true flies, leeches, beetles and molluscs, all of which are tolerant to sedimentation, slow flow and some pollutants (see Appendix C for 2014 species lists). Stoneflies were recorded at the Porth Wylfa site.

CCI scores which could be calculated for 2014 data ranged from Low to Moderate (Table 5-5), with the lowest scoring community at Porth Wylfa (4.6) and the highest at Tre'r Gof SSSI (8.6). The locally important leech, *Erpobdella testacea*, was present at Tre'r Gof SSSI.

**Table 5-5: Macroinvertebrate indices for 2014 at sites within the Tre'r Gof catchment.**

Site	CCI score	CCI value	Species of conservation importance (Local or above)
Porth Wylfa	4.6	Low	None
Tre'r Gof SSSI	8.6	Moderate	<i>Erpobdella testacea</i> (Leech, Local)

**5.4.3 Macroinvertebrate Indices**

The BMWP score (53) for the Power Station Junction site (Table 5-6) was significantly lower than the score (84) for the Porth Wylfa site. The number of taxa recorded was also variable, with 14 recorded in the ditch-like habitats of Power Station Junction compared to 19 at Porth Wylfa.

PSI (F) was interpreted as Sedimented or Heavily Sedimented, indicating that a significant proportion of taxa present in these watercourses are tolerant of sedimentation. Ditch-like sites such as Power Station Junction were Heavily Sedimented.

LIFE (F) scores were similar between sites with scores of 5.1 to 5.8 indicating that these invertebrate communities are characteristic of slow flowing or standing waters, reflecting the fen/wetland nature of these sites.

**Table 5-6: Macroinvertebrate indices for Tre'r Gof catchment sites.**

Site	BMWP	NTAXA	ASPT	PSI (F)	PSI (F) interp.	PSI (F) EQR	LIFE (sp)	LIFE (F)	LIFE (F) EQR
Porth Wylfa	84	19	4.4	31.6	Sedimented	-	6.0	5.8	-
Power Station Junction*	53	14	3.8	16.1	Heavily sedimented	-	5.8	5.6	-
Tre'r Gof SSSI	65	16	4.1	24.3	Sedimented.	-	5.7	5.1	-

\*autumn only.

**5.5 Macrophytes**

Two sites were suitable for macrophyte survey with individual indices shown in Table 5-7. The RMNI (measure of nutrient enrichment) does not vary considerably between the sites, implying there may be a moderate degree of nutrient enrichment across the sites.

The NTAXA gives an indication of diversity within the macrophyte community. Porth Wylfa recorded the highest NTAXA score (4), compared to the Power Station Junction site score (2). The NFG was poor at both sites.

Several species of macroalgae were also present at Porth Wylfa including the blanket weed (*Cladophora glomerata/Rhizoclonium hieroglyphicum*) and *Vaucheria* sp., both of which are particularly tolerant of elevated nutrient levels.

**Table 5-7: Macrophyte indices for two sites within the Tre'r Gof catchment (RMNI, NTAXA, non-scoring taxa, NFG and ALG).**

Site	Observed RMNI	Observed NTAXA (scorers)	Total NTAXA (inc. non-scores)	Observed NFG	Observed ALG
Porth Wylfa	6.68	4	13	4	0.05
Power Station Junction	7.68	2	6	2	0

## 5.6 Fish

Fish surveys have been undertaken at two sites within the Tre'r Gof catchment between 2012 and 2013 (Appendix E). Spot sampling was undertaken at Power Station Pond and at Porth Wylfa. No fish were captured at either site during the surveys.

In 2013 and 2014, incidental records were made of European eel at Porth Wylfa. In 2014, an additional incidental record of European eel was made at the Tre'r Gof SSSI.

Given the natural head drop between the Porth Wylfa site and beach, there is limited access for fish to the catchment. There is limited potential to sample other fish species via the electro-fishing method in this watercourse due to the shallow water, limited connectivity under normal flow conditions and choked nature of the watercourse during the macrophyte-growing season.

The value of fish receptors in the Tre'r Gof catchment is considered low.

## 5.7 Pond Quality Assessment

PSYM surveys were undertaken in 2012 (one pond) and 2014 (two ponds) in order to assess the quality and conservation importance of macroinvertebrate and aquatic plant communities, and to classify each pond using a series of indices.

### 5.7.1 Macroinvertebrates

#### (a) Exhaustive surveys 2011–2013

The exhaustive survey methodology is not directly comparable between sites as the number of visits differed due to ponds drying out, access constraints or adverse weather; however, data provides an indication of the diversity of species recorded within the particular survey area each year (Table 5-8).

**Table 5-8: Exhaustive number of species score per year at two ponds within the Tre'r Gof catchment in varying seasons, 2011-2013.**

Site	Exhaustive number of species		
	2011	2012	2013
Porth Wylfa Pond	-	21	-
Power Station Pond	39	28	28

Power Station Pond recorded 39 taxa in 2011, with slightly lower diversities being recorded in other years (28 species). Porth Wylfa Pond recorded 21 species in 2012. The majority of macroinvertebrates identified during these surveys were of the pollution tolerant families of beetles, molluscs, crustaceans and true bugs (see Rachel Hacking Ecology, 2011, 2012 and 2013 for species lists).

#### (b) Species of Conservation Importance

There were a number of beetles, leeches, snails and true bugs of conservation importance recorded using the exhaustive survey methodology (Table 5-9). Power Station Pond was particularly rich in beetles. The water scavenger beetles, *Coelostoma orbiculare* (Regionally Notable) and *Cymbiodyta marginella* (Local), and

the snail species, *Anisus leucostoma* and *Aplexa hypnorum*, occurred in both ponds. Power Station Pond recorded the highest number of rare species across all years (14). The remaining species were all of Local conservation categorisation. The lowest number of rare species was identified at Wylfa Hall Pond.

**Table 5-9: Years where species of conservation importance (under CCI) were recorded at three ponds, collected in 2011-2014.**

Species	Conservation Importance (Local or above)	Porth Wylfa Pond	Power Station Pond/Junct.*	Wylfa Hall Pond
<i>Coelostoma orbiculare</i>	Regionally Notable^	2012	2012, 2013	
<i>Cymbiodyta marginella</i>	Local	2012, 2014	2011	
<i>Enochrus coarctatus</i>	Nationally Scarce^		2011, 2012, 2013	
<i>Helochares lividus</i>	Nationally Scarce^	2014	2011, 2012	
<i>Helochares punctatus</i>	Nationally Scarce		2011	
<i>Hydroporus tristis</i>	Local		2012	
<i>Hygrotus impresso-punctatus</i>	Local	2012, 2014		
<i>Erpobdella testacea</i>	Local		2011	
<i>Haemopis sanguisuga</i>	Local	2012	2014	2013
<i>Anisus leucostoma</i>	Local	2012	2012	2013
<i>Aplexa hypnorum</i>	Local	2012, 2013	2012	2012, 2013
<i>Microvelia reticulata</i>	Local		2011	
<i>Sigara scotti</i> (water-boatman, Local)	Local		2014	
<i>Gyraulus laevis</i> (snail, Local)	Local	2014	2014	
<i>Hydraena palustris</i>	Near Threatened (Foster, 2010)		2014	
<i>Rhantus grapii</i>	Notable	2014		
<b>Total number of CCI ≥Local species found across four years</b>		<b>9</b>	<b>14</b>	<b>3</b>

\*denotes a site where multiple locations were surveyed and results pooled. ^denotes beetle species which are designated a lower conservation classification in Foster (2010).

CCI conservation scores were not calculated for 2011–2013 data because the exhaustive survey method does not provide a quantitative sample, thus excluding Wylfa Hall Pond. CCI scores varied from Fairly High to Very High across the other ponds (Table 5-10).

The highest CCI score was from Power Station Pond in 2014 (Very High, 28.4), owing to presence of the minute moss beetle (*Hydraena palustris*). In 2014, Porth

Wylfa Pond had the greatest number of species of Local conservation importance or above, with four beetle species and a one species of snail.

**Table 5-10: CCI scores and results from data collected during PSYM surveys in 2014 (and one survey in 2012).**

Pond	CCI score	CCI value	Species of conservation importance (Local or above)
Power Station Pond (2012)	10.3*	Fairly High*	<i>Haemopsis sanguisuga</i> (leech, Local) <i>Sigara scotti</i> (water-boatman, Local)
Power Station Pond	28.4	Very High	<i>Gyraulus laevis</i> (snail, Local) <i>Hydraena palustris</i> (beetle, Near Threatened) <i>Sigara scotti</i> (water-boatman, Local)
Porth Wylfa Pond	16.2	High	<i>Gyraulus laevis</i> (snail, Local) <i>Rhantus grapii</i> (beetle, Notable) <i>Helochares lividus</i> (beetle, Notable) <i>Hygrotus impressopunctatus</i> (beetle, Local) <i>Cymbiodyta marginella</i> (beetle, Local)

\* denotes limitations to score and value (only selected taxa were analysed to species level/abundance counted)

### 5.7.2 PSYM

The majority of the macroinvertebrates identified during the PSYM surveys belonged to pollution tolerant families of beetles, molluscs, true flies, crustaceans and true bugs. This type of community is characteristic of standing waters with a high coverage of macrophytes, fine sediments and decomposing organic matter. The macroinvertebrates recorded in 2014 were very similar in composition to those of 2011-2013.

Beetles are an indicator of habitat quality and the Coleoptera index was only slightly lower than expected, suggesting that the ponds provide a good habitat resource for macroinvertebrates. The Odonata index indicates that the pond communities are limited by fluctuations in water level and ephemeral effects, as the ponds fell significantly short of the expected number of dragon/damselfly and alderfly families (which require permanently wetted sites for the long larval stage of their life cycle).

The ASPT scores ranged from 3.8 to 3.9 due to the absence of high BMWP-scoring families such as caddisflies and mayflies, which reflects the water quality pressures from agricultural land use mainly consisting of improved pastures, where livestock often have access to the waterbodies). Dragonflies, damselflies and alderflies (Odonata and Megaloptera (OM)) were largely absent, with the exception of one family being recorded at the Power Station Pond and Porth Wylfa Pond sites. Beetles (Coleoptera (CO)) were present in every pond surveyed.

The PSYM plant indices indicate that the ponds are supporting commonly occurring, nutrient tolerant species, which ties in with the observed elevated phosphorus and ammonia levels.

The plant communities were characteristic of slow flowing/standing, slightly enriched waterbodies (see species lists in Appendix F). The most commonly observed species typically exhibited a high TRS under the PSYM methodology.

The number of submerged and marginal plant species (SM) ranged from seven to 16 within the Tre'r Gof catchment, indicating that a variety of depths and habitats were present. Few uncommon species were recorded. The TRS was greater than

9.0 at all sites, which on a scale of 1 to 10 indicates that the communities across the ponds have a very high tolerance to elevated nutrient levels.

The invasive water fern (*Azolla filiculoides*) was present at Power Station Pond. The presence of water fern at the Power Station Pond may be having a detrimental effect on water quality, as the species forms thick layers on the water surface, suffocating other plant growth and limiting sunlight penetration. It also has a nutrient fixing ability, which could be further enriching the ponds and leading to anoxia particularly in summer months.

The PSYM classifications, along with observed indices and EQIs, are summarised in Table 5-11. The full output (including predicted values for indices and IBI values) is provided in Appendix F. Power Station Pond achieved Poor status based on comparison to pristine reference sites, whilst Porth Wylfa Pond achieved Moderate status.

The SM-EQIs indicate that the number of plant species present was poor at Power Station Pond and the communities were considerably less diverse than expected. The U-EQIs are generally low, with no uncommon species recorded in Porth Wylfa Pond. TRS-EQIs are well above 1.0 across all of the sites, indicating that significantly more nutrient-tolerant species are present than would be expected under reference conditions.

ASPT-EQIs are similar across all of the ponds, and suggest that the pollution tolerance of the macroinvertebrate communities is slightly higher than would be expected under reference conditions. The OM-EQI is particularly low across the sites, with the Power Station Pond sites having none of the predicted number of families, suggesting that the ponds are not suitable for these taxa. The CO-EQIs indicate that the number of beetle families observed across the ponds is slightly fewer than would be expected under reference conditions.

**Table 5-11: PSYM results and classification of ponds within the Tre'r Gof catchment. Observed indices in unshaded rows, and EQIs in shaded rows below (PSYM quality category = IBI >75%=Good, 51-75%=Moderate, 25-50%=Poor, <25%=V Poor).**

Index	Power Station Pond 2012	Power Station Pond 2014	Porth Wylfa Pond 2014
No. of submerged + marginal plant species (SM)	7	11	16
EQI (SM)	0.38	0.59	0.86
Number of uncommon plant species (U)	0	1	0
EQI (U)	0	0.24	0.00
Trophic Ranking Score (TRS)	9.25	10.00	9.33
EQI (TRS)	1.51	1.74	1.63
Average Score Per Taxon (ASPT)	3.9	3.9	3.8
EQI (ASPT)	0.76	0.76	0.73
Odonata + Megaloptera (OM) families	1	0	1
EQI (OM)	0.29	0.00	0.29
Coleoptera families (CO)	3	3	3
EQI (CO)	0.8	0.79	0.80
Index of Biotic Integrity (%)	39%	39%	50%

Index	Power Station Pond 2012	Power Station Pond 2014	Porth Wylfa Pond 2014
PSYM quality category	Poor		Moderate
Priority species	0	1	0
Meet Priority Pond criteria?	Yes		No

The Power Station Pond met the criteria for Priority Pond status due to the presence of species of conservation importance, despite being classed as Poor quality under PSYM. Power Station Pond qualified due to the presence of the minute moss beetle (*Hydraena palustris*). There was only one individual recorded in 2014, suggesting the population is small and probably vulnerable to changes in the pond's quality. Priority Ponds are recognised under the UK Post-2010 Biodiversity Framework (formerly the UK Biodiversity Action Plan), which aims to continue the monitoring and conservation of species and habitats of priority conservation value.

Water quality data for the ponds are summarised in the water quality chapter (Table 5-1). *In situ* water quality data varied as expected between seasons. Of particular note are the nutrient levels, which are generally much higher in ponds across the site than in flowing watercourses.

**5.8 Summary**

The biological and water quality condition of the sites surveyed within the Tre'r Gof catchment indicate a typical lowland coastal stream and wetland environment, receiving variable seasonal discharge in close connectivity with the rural land use.

Flowing through a rural catchment, used primarily for livestock grazing and low intensity agriculture, the aquatic habitats are influenced by low levels of nutrient enrichment via diffuse pollution, as demonstrated in diatom and macrophyte community analysis. Although no fish were recorded in the catchment, incidental observations were made of European eel.

Pond habitats are considered of low value in the Tre'r Gof catchment with pond quality typically classed as Moderate to Low. The survey at Power Station Pond identified the minute moss beetle and has therefore met the criteria for a Priority Pond with Very High conservation value. A number of Nationally Scarce macroinvertebrates were also identified in the watercourses and ponds across the catchment.

Aquatic habitats and species identified within the Tre'r Gof catchment are of low quality and reflect existing and historical rural land management practices in the area. Typically, species found within the catchment are common and widespread. Species include the nationally important European eel and near threatened minute moss beetle which was identified in Power Station Pond.

### 6.1 Habitat Characterisation

The Cemaes watercourse exhibited the most managed and historically altered planform and cross-sections. The main sites on this watercourse showed evidence of realignment around either field boundaries or urban development, with evidence of over deepening in some reaches. Improved flow diversity and substrate was observed towards the lower sections of the catchment, despite evidence of historical channel realignment. The watercourse receives runoff from improved pasture and suburban settlements in Cemaes Bay. Refer to Appendix A for habitat characterisation descriptions.

### 6.2 Water Quality

The following section summarises water quality data collected between 2012 and 2014 within the Cemaes catchment. Table 6-1 presents data for selected physico-chemical, biochemical and nutrient parameters for the Cemaes catchment. For full results, refer to Appendix B (note this section refers to results from the Cemaes catchment only).

Physico-chemical and biochemical results can be summarised as follows:

- Water temperature ranged between 4.65°C (Tre'r-gof-isaf, winter 2013) to 16.95°C (Gwyddelyn Bach, summer 2013). All of the water temperatures recorded were within the expected range of values for the waterbody types sampled.
- Conductivity readings ranged between 0.228mS cm<sup>-3</sup> (Fowl Fawr, winter 2014) and 0.591mS cm<sup>-3</sup> (Gwyddelyn Bach, autumn 2013) and were within the expected range of values for the waterbody type sampled.
- Dissolved oxygen (percent saturation) varied significantly across sites and across sampling years. Values ranged between 53.1% (Gwyddelyn Bach, summer 2013) and 106.5% (Tre'r-gof-isaf, spring 2014).
- pH vales ranged from 6.27 to 8.59 and were within the expected range of values for the habitat types sampled.
- Suspended sediment concentrations varied between sample sites and sample occasions. The highest suspended solid concentration was recorded in autumn 2014 at Fowl Fawr (102mg L<sup>-1</sup>).
- Biological oxygen demand was generally low, with most sites recording values below the MRV. The highest value was recorded at the Fowl Fawr site in autumn 2014 (4.12mg L<sup>-1</sup>).

Nutrient results can be summarised as follows:

- Orthophosphate concentrations were generally low across the Cemaes catchment. Concentrations ranged between 0.032mg L<sup>-1</sup> and 0.17mg L<sup>-1</sup>.
- Ammoniacal nitrogen concentrations were low ranging between MRV (<0.03mg L<sup>-1</sup>) and 0.163mg L<sup>-1</sup>.

**Table 6-1: Maximum and minimum physico-chemical, biochemical and nutrient results for the Cemaes catchment over the 2012-2014 sampling period.**

Parameter	Range	Fowl Fawr	Gwyddelyn Bach	Tre'r-gof-isaf
Temperature °C	Max	11.90	16.95	16.48

Parameter	Range	Fowl Fawr	Gwyddelyn Bach	Tre'r-gof-isaf
	Min	8.64	5.03	4.65
Conductivity mS cm <sup>-3</sup>	Max	0.271	0.591	0.516
	Min	0.228	0.292	0.305
Dissolved oxygen %	Max	89.3	84.4	106.5
	Min	58.6	53.1	78.5
pH	Max	8.00	8.04	8.59
	Min	6.27	6.82	7.07
Suspended solids mg L <sup>-1</sup>	Max	102.00	28.10	106.00
	Min	5.95	5.98	4.47
Biological oxygen demand mg L <sup>-1</sup>	Max	3.22	1.51	4.12
	Min	<1.00	<1.00	<1.00
Orthophosphate (reactive as P) mg L <sup>-1</sup>	Max	0.100	0.17	0.134
	Min	0.032	0.059	0.049
Ammoniacal nitrogen as N mg L <sup>-1</sup>	Max	0.052	0.146	0.163
	Min	0.03	0.057	<0.03

Metals can be summarised as follows:

- Arsenic, cadmium, nickel, lead, chromium and mercury concentrations were all low or below the MRV across all sites.
- Copper concentrations were generally below 5.13µg L<sup>-1</sup>, with the highest levels recorded at the Gwyddelyn Bach site in autumn 2013 (6.60µg L<sup>-1</sup>).
- Zinc concentrations were below the MRV (5µg L<sup>-1</sup>), with the exception of autumn 2013 where levels ranged between 5.27µg L<sup>-1</sup> and 7.65µg L<sup>-1</sup>.
- Iron ranged between 73µg L<sup>-1</sup> and 483µg L<sup>-1</sup>, and varied between sites and sampling years.
- Manganese ranged between 52µg L<sup>-1</sup> and 986µg L<sup>-1</sup>, and varied between sites and sampling years. The highest reading was recorded at Tre'r-gof-isaf in spring 2014.

Selected other compounds can be summarised as follows:

- Toluene and trichloroethylene levels were low across all sites with levels below the MRV (0.1µg L<sup>-1</sup>).
- DEHP levels were generally below the MRV (0.2µg L<sup>-1</sup>) although in summer 2013 the Gwyddelyn Bach and Tre'r-gof-isaf sites recorded levels of 0.38µg L<sup>-1</sup> and 0.34µg L<sup>-1</sup> respectively.
- Hydrocarbon Screens (C5 - C44) levels were low across all sites with levels below the MRV (0.2µg L<sup>-1</sup>).
- Chloride levels were low across the site.

Water quality conditions within the Cemaes catchment are typical of waterbody types sampled.

### 6.3 Diatoms

Table 6-2 lists the diatom EQR (observed/expected diatom community) output for the Cemaes catchment and is colour coded to indicate WFD status.

**Table 6-2: Diatom EQRs and ecological status 2013–2014 (blue=high, green=good, yellow=moderate).**

Site	2013	2014
Tre'r-gof-isaf	0.87	0.65
Gwyddelyn Bach	0.74	0.68

Site	2013	2014
Foel Fawr	0.54	0.61

As a key indicator of elevated nutrients, the diatoms indices indicate that environmental stressors (including nutrients) are having a small impact upon the observed community. The indices indicate that the phytoplankton communities are similar to those predicted for these watercourse typologies, based upon physical habitat attributes. Diatoms at both the Tre'r-gof-isaf and Gwyddelyn Bach sites demonstrate only a minor deviation from reference conditions. The variability in the diatom community at Foel Fawr indicates a degree of environmental stress. Low flows through the catchment may be affecting the diatom community, as will the heavy channel shading present through most of the catchment.

The diatom taxa reported from the 2013 and 2014 sampling of the Cemaes catchment are generally common taxa, with low to medium nutrient tolerance. As a result, the value of the diatom communities on the Cemaes catchment are considered low, with the species recorded forming a small resource when considering the wider Wylfa Newydd Development Area.

## 6.4 Macroinvertebrates

Tre'r-gof-isaf and Gwyddelyn Bach were surveyed in 2013 for the first time. During 2014, samples were not collected from the Gwyddelyn Bach site as water levels were too low to obtain a representative sample.

### 6.4.1 Exhaustive Surveys 2011 to 2013

The exhaustive number of species recorded at each watercourse is shown in Table 6-3. The output of the exhaustive surveys is not directly comparable between sites as the number of visits differed due to seasonal variation, weather and access constraints. Both sites had multiple sampling locations from which data were pooled into one exhaustive number of species. Results provide an indication of the diversity of species recorded for each representative year.

**Table 6-3: Exhaustive number of species per year at two sites within the Cemaes catchment in varying seasons, 2011-2013, adapted from Jacobs' (2013) Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2013.**

Site	Exhaustive number of species		
	2011	2012	2013
Gwyddelyn Bach	-	-	21
Tre'r-gof-isaf	-	-	6

Six species were recorded at Tre'r-gof-isaf and 21 species were recorded at Gwyddelyn Bach. The majority of macroinvertebrates identified during these surveys were assigned to families of beetles, molluscs, crustaceans and true bugs, and indicate moderate pollution tolerance (see Rachel Hacking Ecology, 2011, 2012 and 2013 for species lists).

### 6.4.2 Macroinvertebrate Species and Conservation Value

In 2014, no species of conservation interest were recorded at the Foel Fawr site resulting in a Low conservation status being assigned. Two species of conservation interest were reported from the lower catchment: a Nationally Scarce whirligig beetle (*Gyrinus urinator*) and a Local caddisfly larvae (*Tinodes assimilis*). The presence of

these two species elevates the conservation value of the Tre'r-gof-Isaf site to Fairly High (Chadd and Extence, 2004). In 2013, four species of local importance were reported from the Gwyddelyn Bach site (Table 6-4).

**Table 6-4: Years where species of conservation importance (under CCI) were recorded at two sites within the Cemaes catchment, collected in 2011-2013 by using exhaustive method; 2014 data collected using standard kick-sample methodology is also presented.**

Species	Conservation importance	Tre'r-gof-Isaf	Gwyddelyn Bach
<i>Hygrotes impressopunctatus</i>	Local		2013
<i>Erpobdella testacea</i>	Local		2013
<i>Anisus leucostoma</i>	Local		2013
<i>Aplexa hypnorum</i>	Local		2013
<i>Gyrinus urinator</i>	Nationally Scarce*	2014	
<i>Tinodes assimilis</i>	Local	2014	
<b>Total number of CCI ≥Local species found across four years</b>		<b>2</b>	<b>4</b>

\*denotes beetle species which are designated a lower conservation classification in Foster (2010).

CCI scores calculated from 2014 data ranged from Low to Fairly High (Table 6-5), with the lowest scoring community at Foel Fawr (3.4) and the highest at Tre'r-gof-Isaf (10.7).

**Table 6-5: Macroinvertebrate indices for 2014 Cemaes catchment sites.**

Site	CCI score	CCI value	Species of conservation importance (Local or above)
Foel Fawr	3.4	Low	None
Tre'r-gof-isaf	10.7	Fairly High	<i>Gyrinus urinator</i> (beetle, Nationally Scarce) <i>Tinodes assimilis</i> (caddisfly, Local)

### 6.4.3 Macroinvertebrate Indices

In both 2013 and 2014, the macroinvertebrates recorded across the Cemaes catchment consisted of widespread and common species, all of which are tolerant to sedimentation, sluggish flows and organic pollution (Table 6-6).

**Table 6-6: Macroinvertebrate indices for Cemaes catchment sites sampled in 2014.**

Site	BMWP	NTAXA	ASPT	PSI (F)	PSI (F) interp.	PSI (F) EQR	LIFE (sp)	LIFE (F)	LIFE (F) EQR
Foel Fawr	61	14	4.4	50.0	Moderately Sedimented	-	7.1	5.8	-
Tre'r-gof-isaf	111	23	4.8	59.5	Moderately Sedimented	0.92	7.8	6.8	0.9

In 2014, only the Tre'r-gof-isaf site was considered suitable for assessment using current WFD classification tools (SNIFFER, 2008). The upper catchment was not

deemed suitable for assessment due to non-compliant physical habitat parameters, making any assessment of the site prone to significant error. The macroinvertebrate community at the Tre'r-gof-isaf site was reported as failing to meet predicted reference conditions, indicating potential environmental stress on the faunal community (Table 6-7). Interrogation of the metrics indicate that water quality is not considered a limiting factor at this site; however, the diversity or richness of the community, often used as an indicator of habitat, is not matching the predicted metrics.

**Table 6-7: RICT classifications for seven sites at Tre'r-gof-isaf. The highlighted cell indicates the overall EQR classification for the site.**

Site	Index	EQR	Class	Probability of Class (%)
Tre'r-gof-isaf	ASPT	0.81	Moderate	73.15
	NTAXA	0.94	High	70.19
	MINTA	-	<b>Moderate</b>	73.15

Macroinvertebrates within the Cemaes catchment are considered of low value, with the macroinvertebrates contributing a minor resource to macroinvertebrates across the wider Wylfa Newydd Development Area.

## 6.5 Macrophytes

All three sites on the Cemaes catchment were assessed for macrophytes in 2013, with a repeat survey carried out at the Foel Fawr site in 2014 (Table 6-8). Full surveys were possible at both Foel Fawr and Gwyddelyn Bach, whilst the heavy shading at Tre'r-gof-isaf only allowed spot sampling to be undertaken. Previously, macrophyte surveys on the Cemaes catchment demonstrated poor diversity, largely attributed to the historic modification of the channel, heavy riparian shading and low flows.

In 2014, no species of conservation value were reported at the Foel Fawr site and, as in 2013, the macrophyte community exhibited limited diversity and a dominance of common species. A single invasive (Giant rhubarb, *Gunnera tinctoria*) species was recorded at Tre'r-gof-isaf in 2013.

**Table 6-8: Macrophyte indices for Foel Fawr within the Cemaes catchment in 2014.**

Site	Observed RMNI	Observed NTAXA (scorers)	Total NTAXA (inc. non-scorers)	Observed NFG	Observed ALG	EQR	Status
Foel Fawr	7.69	3	8	2	0	0.407	<b>Moderate</b>

Based upon physical habitat and physico-chemical conditions, the observed macrophyte community at Foel Fawr does not meet the community composition expected. The failure of the Foel Fawr site to match the expected conditions indicates there are environmental stresses affecting macrophyte condition.

The value of macrophyte communities within the Cemaes catchment is considered low with the species present typical of lowland coastal streams. The Cemaes catchment is anticipated to provide a minor resource to macrophytes across the wider Wylfa Newydd Development Area.

## 6.6 Fish

Fish surveys have been undertaken at two sites on the Cemaes catchment between 2011 and 2014 (Appendix E). Spot sampling was undertaken at Gwyddelyn Bach, in the middle of the catchment, and at Tre'r-gof-isaf above the tidal limit at Cemaes Bay.

Low numbers of eel and stickleback were recorded at Gwyddelyn Bach in 2013, with no fish reported from the Tre'r-gof-isaf site. The low abundance of fish from the Cemaes catchment is likely to be a result of the low water levels experienced throughout the catchment during the survey periods. Visits to Foel Fawr and Gwyddelyn Bach indicated very low water levels unlikely to sustain fish populations; although, under high flows it may provide a resource for migratory species, depending on connectivity through the lower catchment.

Macrophyte growth at Gwyddelyn Bach was dense, with very shallow water depths observed on each visit. Soft sediments provide sub-optimal habitats for fish, although sticklebacks may persist in deeper pooled sections during low-flow periods. At the Tre-gof-isaf site, water depths generally remained stable throughout the year, supporting largely suboptimal habitat for fish with homogenous flow and substrate types.

A single European eel was observed at the Tre-gof-isaf site in 2013. This indicates that migratory species are able to enter the lower catchment and utilise available habitats. Above Gwyddelyn Bach, water depth and dense macrophyte growth is likely to restrict access to the higher parts of the catchment by migratory species.

The value of fish receptors on the Cemaes catchment is considered low. The presence of eel is important; however, there is limited habitat for this species within the upper catchment due to channel modification and low flows.

## 6.7 Pond Quality Assessment

No ponds were identified within the Cemaes catchment, either online or within the floodplain. As a result, pond quality has not been given an indicative value within the Cemaes catchment.

## 6.8 Summary

Sites surveyed within the Cemaes catchment indicate biological and water quality scores typical of a lowland coastal stream, receiving variable seasonal discharge affected by riparian land management and use.

Land management appears to be having the greatest influence on the Cemaes catchment. Flowing through a predominantly rural upper catchment, and a semi-urban lower catchment, the watercourses are influenced by low levels of nutrient enrichment via diffuse pollution, low flows and variable water quality.

Water levels within the catchment are influenced by prevailing climatic conditions, with the channel only remaining flowing as a functional aquatic feature through its lower reaches. The mid to upper catchment demonstrates localised reductions in flow during drier periods, which may affect the quality and distribution of aquatic habitats. Despite seasonal variation in flow, the Cemaes catchment supports a functioning ecological community, including European eel. Although ubiquitous to similar aquatic habitats, the presence of the European eel indicates connectivity of

the Cemaes catchment with Cemaes Bay. The degree of connectivity within the catchment is likely to rely on seasonal flow variation.

Aquatic habitats and species identified within the Cemaes catchment are of low quality and reflect existing and historical rural land management practices in the area. Species found within the catchment are common and widespread, and include low numbers of the nationally important European eel.

## 7.1 Habitat Characterisation

### 7.1.1 Porth-y-pistyll

The stream at Porth-y-pistyll runs in a northerly direction along the western boundary of the Existing Power Station through boggy wet grassland. The stream first emerges to the surface from a culvert structure adjacent to the Existing Power Station gates, where a drain cover suggests a modified subterranean watercourse. The channel is wetted for approximately 200m south of the shoreline in autumn, drying in the upper reaches over summer. A tributary 75m upstream from the shoreline and flowing from elevated gorse and tall shrub contributes a significant proportion of total summer flow.

With the exception of the lower 75m of the watercourse there is no defined channel, with an increase in wetland species (emergent rush and reed) marking the extent of the channel. The channel appears unmodified, following an undefined channel form. Wetland species dominate the left hand bank margins.

The lower section of the watercourse deepens, but heavy vegetation (95% cover) results in flow types being limited to slack and very low energy, depositional glides. The channel is choked year round by terrestrial grasses and a mix of wetland and semi-aquatic plant species throughout its length. Wetted depth is less than 10cm and channel width variable, but rarely more than 50cm. The stream discharges over the shingle foreshore into Porth-y-pistyll bay.

The ditch at Tan yr Allt, (sites 2 and 3) runs into the Porth-y-pistyll watercourse. Sites 2 and 3 are located approximately 100m apart and consist of a short drainage channel which is fed by a ditch and pond upstream of an unnamed access road. It is an ephemeral waterbody which changes from a shaded, shallow field boundary channel to an undefined watercourse. It apparently flows over and through the ground before reforming as a channel near its confluence with Porth-y-pistyll.

### 7.1.2 Penrhyn

The Penrhyn site consists of a wetland area into which groundwater emerges from a concreted spring on the Penrhyn coastal headland. A small pool has formed and is surrounded by wetland vegetation; water then flows down towards the scree and rocks, where it joins the beach. The flush is well vegetated with abundant brooklime (*Veronica beccabunga*), marsh arrow-grass (*Triglochin palustris*), cuckooflower (*Cardamine palustris*) and watercress (*Nasturtium officinale*).

The water depth at the time of survey was approximately 10cm. No directional flow was perceived and no defined channel exists within the site area.

## 7.2 Water Quality

Table 7-1 presents data for selected physico-chemical, biochemical and nutrient parameters for the Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites. For full results, refer to Appendix B (note this section refers to results from Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites only).

Physico-chemical and biochemical results can be summarised as follows:

- Water temperature ranged between 7.75°C (Porth-y-pistyll, winter 2013) to 14.79°C (Porth-y-pistyll, summer 2013). All of the water temperatures recorded were within the expected range of values for the waterbody types sampled.
- Conductivity readings were within the expected range of values for the waterbody type, ranging between 0.231mS cm<sup>-3</sup> and 0.603mS cm<sup>-3</sup>.
- Dissolved oxygen (percent saturation) levels varied significantly across sites. Lower concentrations were recorded at Penrhyn (40% - 98.4%) compared to Tan-yr-allt ditch (75% - 92.5%) and Porth-y-pistyll (71.8% - 117.3%).
- pH ranged from 6 to 7.57, with all readings within the expected range of values for the waterbody types sampled.
- Suspended sediment concentrations varied between sample sites and sample occasions, with the highest levels recorded in autumn 2013 at Penrhyn (65.7mg L<sup>-1</sup>).
- Biological oxygen demand levels were generally low across the sites.

Nutrient results can be summarised as follows:

- Orthophosphate concentrations were generally low across the sites, ranging between MRV (<0.0100mg L<sup>-1</sup>) and 0.022mg L<sup>-1</sup>.
- Ammoniacal nitrogen concentrations were low ranging between MRV (<0.03mg L<sup>-1</sup>) and 0.062mg L<sup>-1</sup>.

**Table 7-1: Maximum and minimum physico-chemical, biochemical and nutrient results for the Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites over the 2012-2014 sampling period.**

Parameter	Range	Penrhyn	Tan-yr-allt Ditch (Site 2)	Tan-yr-allt Ditch (Site 3)	Porth-y-pistyll
Temperature °C	Max	11.80	14.20	11.70	14.79
	Min	10.10	12.20	11.70	7.75
Conductivity mS cm <sup>-3</sup>	Max	0.578	0.388	0.27	0.603
	Min	0.442	0.333	0.27	0.231
Dissolved oxygen %	Max	98.4	92.5	75.0	117.3
	Min	40.0	83.3	75.0	71.8
pH	Max	7.57	7.25	6.53	7.57
	Min	6.0	6.95	6.53	6.63
Suspended solids mg L <sup>-1</sup>	Max	65.7	55.8	16.2	32.6
	Min	3.47	11.0	16.2	3.32
Biological oxygen demand mg L <sup>-1</sup>	Max	<2.92	2.92	2.26	2.74
	Min	<1.00	1.35	2.26	<1.00
Orthophosphate (reactive as P) mg L <sup>-1</sup>	Max	<0.020	0.030	0.020	0.022
	Min	<0.010	0.020	0.020	<0.010
Ammoniacal nitrogen as N (total ammonia as Nitrogen) mg L <sup>-1</sup>	Max	0.030	0.030	<0.030	0.062
	Min	<0.030	<0.030	<0.030	<0.030

Metals can be summarised as follows:

- Arsenic, cadmium, nickel, lead and mercury concentrations were low or below the MRV across all sites.
- Chromium levels were below the MRV, with the exception of Tan-yr-allt ditch (Site 2), which recorded a level of 1.24µg L<sup>-1</sup> in summer 2014.
- Copper at Penrhyn was below the laboratory MRV on all sample occasions.

Copper at Porth-y-pistyll varied between 1.69µg L<sup>-1</sup> and 4.52µg L<sup>-1</sup>. Tan-yr-allt ditch Sites 1 and 2 ranged between 3.42µg L<sup>-1</sup> and 5.91µg L<sup>-1</sup>.

- Zinc concentrations were generally below the MRV (5µg L<sup>-1</sup>). A level of 11.1µg L<sup>-1</sup> was recorded at Porth-y-pistyll in summer 2013 and 10.1µg L<sup>-1</sup> at Tan-yr-allt ditch (Site 2) in summer 2014.
- Iron concentrations were generally below the MRV (<30 µg L<sup>-1</sup>). An elevated measurement was recorded at Tan-yr-allt ditch (Site 2) in summer 2014 (2,130µg L<sup>-1</sup>).
- Manganese concentrations at Penrhyn were below the MRV. Levels ranged between 17µg L<sup>-1</sup> and 79µg L<sup>-1</sup> at Porth-y-pistyll, and a level of 293µg L<sup>-1</sup> was recorded at Tan-yr-allt (Site 2) in summer 2014.

Selected other compounds can be summarised as follows:

- Toluene levels were low across all sites with levels generally below the MRV (0.1µg L<sup>-1</sup>).
- Trichloroethylene levels were below the MRV (0.1µg L<sup>-1</sup>) at all sites except Porth-y-pistyll. Levels at Porth-y-pistyll ranged between <0.1µg L<sup>-1</sup> and 3.33µg L<sup>-1</sup>.
- DEHP levels were generally below the MRV. On occasion, DEHP reached a detectable level at Porth-y-pistyll, Tan-yr-allt ditch site 2 and Penrhyn. The highest level recorded was 1.71µg L<sup>-1</sup> at Porth-y-pistyll in summer 2012.
- Hydrocarbon Screens (C5 - C44) levels were low across all sites with levels below or close to the MRV (0.2µg L<sup>-1</sup>).
- Chloride levels were low across the site.

Water quality conditions at the Penrhyn, Tan-yr-allt ditch (Site 1 and 2) and Porth-y-pistyll sites were typical of a catchment dominated by rural land use.

### 7.3 Diatoms

Diatom surveys were undertaken between 2011 and 2014 at Porth-y-pistyll and between 2013 and 2014 at Penrhyn. No diatom surveys have been completed at Tan-yr-allt ditch. Table 7-2 details the diatom EQR (observed/expected diatom community) in each of the sampling years and is colour coded to indicate WFD classification. As per the DARLEQ2 guidance, EQR values >1.00 for rivers and >1.25 for lakes (and ponds) have been reported as 1.00 and 1.25 respectively.

**Table 7-2: Diatom EQRs and ecological status 2011 – 2014 for the Penrhyn and Porth-y-pistyll (blue=high, green=good, yellow=moderate, orange=poor).**

Site	2011	2012	2013	2014
Porth-y-pistyll	0.95	0.95	0.92	0.93
Penrhyn			1.00	1.00

As a key indicator of elevated nutrients, the diatoms indices indicate high quality diatom communities. The high quality diatom communities are representative of ‘reference’ conditions and therefore indicate little evidence of environmental stress. The indices indicate that the phytoplankton communities are similar to those predicted for these watercourse typologies, based upon physical habitat attributes.

## 7.4 Macroinvertebrates

Macroinvertebrate samples have been collected between 2011 and 2014 at the other minor watercourses. Between 2011 and 2013, two sites were sampled using the exhaustive survey methodology. In 2014, three sites were sampled using standard kick-sample methodology.

### 7.4.1 Exhaustive Surveys 2011 to 2013

The exhaustive number of species is not directly comparable between sites as the number of visits differed due to seasonal variation, weather and access constraints. The results provide an indication of the diversity of the species recorded each year (Table 7-3).

**Table 7-3: Exhaustive number of species per year at Penrhyn and Porth-pistyll in varying years and seasons, 2011-2013, adapted from Jacobs' (2013) Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2013.**

Site	Exhaustive number of species		
	2011	2012	2013
Penrhyn	-	6	9
Porth-y-pistyll	21	10	13

The lowest diversity was recorded at Penrhyn in 2012 (six species), and the highest at Porth-y-pistyll in 2011 (21 species). The majority of the macroinvertebrate species identified during the surveys belonged to families of beetles, molluscs, crustaceans and true bugs, with moderate pollution tolerance (see Rachel Hacking Ecology, 2011, 2012 and 2013 for species lists).

### 7.4.2 Macroinvertebrate Species and Conservation Value

There were two beetles and a water boatman of conservation importance recorded at Porth-y-pistyll using the exhaustive survey method (see Table 7-4). No species of conservation importance were identified during the 2014 survey. CCI conservation scores were not calculated for the exhaustive number of species data, due to the exhaustive survey method not providing a standardised dataset (as opposed to BMWP or PSYM).

**Table 7-4: Years where species of conservation importance (under CCI) were recorded at Porth-y-pistyll, collected in 2011-2013 by using exhaustive method; 2014 data collected using standard kick-sample methodology for Tan-yr-allt ditch (Site 3) is also presented.**

Species	Conservation Importance (Local or above)	Porth-y-pistyll	Tan-yr-allt ditch (Site 3)
<i>Coelostoma orbiculare</i>	Regionally Notable*	2011, 2012	
<i>Ilybius quadriguttatus</i>	Local	2011	
<i>Sigara limitata</i>	Local	2011	
<i>Beraea pullata</i>	Occasional		2014
<b>Total number of CCI ≥Local species found across four years</b>		<b>3</b>	<b>1</b>

\*denotes beetle species which are designated a lower conservation classification in Foster (2010).

In general, the macroinvertebrate species recorded across the sites consisted of widespread and common crustaceans, true flies, leeches, beetles and molluscs, all of which are tolerant to sedimentation, sluggish flows and some pollutants (see Appendix C for species lists).

Both parts of the Tan-yr-allt ditch, despite being surveyed in different seasons, were very similar. Site 2 had similar taxa to that of the downstream stretch, sharing populations of silt-tolerant dipteran larvae, molluscs and crustaceans. Many of the snails and pea-mussels in the samples were encrusted with silt deposits.

CCI scores calculated from 2014 data ranged from Low to Moderate (Table 7-5), with the lowest scoring community at Tan-yr-allt ditch (Site 2) (4.7), and the highest at Porth-y-pistyll (8.1). The CCI classification for Tan-yr-allt ditch (Site 3) is Moderate due to presence of a caddisfly (*Beraea pullata*). The other species recorded across both of the sites were common or occur frequently. One species of Local conservation importance, the leech, *Erpobdella testacea*, was recorded in autumn at Porth-y-pistyll. This has resulted in a Fairly High CCI classification for autumn, and Moderate overall for the year.

**Table 7-5: Macroinvertebrate indices for 2014 sites for the Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites.**

Site	CCI score	CCI value	Species of conservation importance (Local or above)
Penrhyn	6.4	Moderate	None
Porth-y-pistyll	8.1	Moderate	<i>Erpobdella testacea</i> (leech, Local)
Tan-yr-allt ditch (Site 2)	4.7	Low	None
Tan-yr-allt ditch (Site 3)	7.2	Moderate	<i>Beraea pullata</i> (caddisfly, Occasional)

### 7.4.3 Macroinvertebrate Indices

Tan-yr-allt ditch recorded low BMWP scores of 45 and 42 (Table 7-6). In contrast, Porth-y-pistyll recorded a score of 118. The number of taxa recorded was also variable, with 10 recorded in the ditch-like habitats of Tan-yr-allt compared to 24 at Porth-y-pistyll.

PSI (F) was interpreted as sedimented or moderate sedimented, indicating that a significant proportion of the taxa present in the watercourses are tolerant of sedimentation.

LIFE (F) scores were similar between Penrhyn and Porth-y-pistyll with scores of 5.7 and 6.7, respectively, indicating that the macroinvertebrate communities are characteristic of slow flowing or standing waters, reflecting the fen/wetland nature of these sites.

**Table 7-6: Macroinvertebrate indices for the Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites.**

Site	BMWP	NTAXA	ASPT	PSI (F)	PSI (F) interp.	PSI (F) EQR	LIFE (sp)	LIFE (F)	LIFE (F) EQR
Penrhyn	45	10	4.5	6.4	Moderate	0.67	5.7	6.4	0.89
Tan-yr-allt ditch (Site 2)	42	10	4.2	4.7	Low	0.59	5.7	4.7	0.83
Tan-yr-allt ditch (Site 3)	42	10	4.2	7.2	Moderate	0.90	6.7	7.2	1.07
Porth-y-pistyll	118	24	11.8	8.1	Moderate	1.01	6.7	8.1	1.21

Penrhyn	84	17	4.9	35.7	Sedimented	-	6.2	5.7	-
Porth-y-pistyll*	118	24	4.9	42.1	Moderately Sedimented	0.82	6.7	6.1	0.86
Tan-yr-allt ditch (site 2)	45	10	4.5	26.9	Sedimented	N/A	N/A	N/A	N/A
Tan-yr-allt ditch (site 3)	42	10	4.2	25.0	Sedimented	N/A	N/A	N/A	N/A

\* denotes spring, summer and autumn.

RICT classification was carried out on Porth-y-pistyll data owing to the good quality habitat which incorporates macrophyte-rich running and standing waters, with bog mire and clean flushes (Table 7-7). Species typical of cleaner waters such as stoneflies and some caddisflies were recorded, contributing to the achievement of Good status.

**Table 7-7: RICT classifications for Porth-y-pistyll. The highlighted cell indicates the overall EQR classification for the site.**

Site	Index	EQR	Class	Probability of Class (%)
Porth-y-pistyll	ASPT	0.90	Good	52.64
	NTAXA	0.98	High	85.18
	MINTA	-	<b>Good</b>	52.64

The value of the macroinvertebrate features varied between the other sites, with Porth-y-pistyll recording Good quality communities compared to the Tan-yr-allt ditch site, which recorded macroinvertebrate features of low to moderate quality.

## 7.5 Macrophytes

Porth-y-pistyll and Tan y Allt ditch were suitable for macrophyte survey. Table 7-8 details the individual indices calculated.

**Table 7-8: Macrophyte indices for Porth-y-pistyll and Tan y Allt ditch (RMNI, NTAXA, non-scoring taxa, NFG and ALG).**

Site	Observed RMNI	Observed NTAXA (scorers)	Total NTAXA (inc. non-scores)	Observed NFG	Observed ALG
Porth-y-pistyll	7.51	5	13	4	0.05
Tan-yr-allt ditch	7.66	2	3	2	0

The RMNI gives an indication of nutrient enrichment with scores ranging from 1 (low) to 10 (high). The RMNI scores do not vary considerably between the sites, and indicate that there may be a moderate degree of nutrient enrichment.

The NTAXA gives an indication of diversity within the macrophyte community. The site with the highest NTAXA was Porth-y-pistyll (5), compared to the Tan-yr-allt ditch site (2). The NFG was particularly poor at all sites surveyed.

## 7.6 Fish

Spot check surveys were undertaken in 2013 at Porth-y-pistyll. The site was located immediately upstream of the shoreline where water was deep enough to allow fishing and macrophyte cover sufficiently reduced to allow efficient fishing. Further upstream, fishing was impossible due to macrophytes choking the stream and restricting. European eel were present within the watercourse with eight individuals found in summer 2013 and five individuals in autumn 2013. Eel are likely to have entered the stream over the shoreline at Porth-y-pistyll. Due to the small size of the watercourse, and since connectivity to the sea across the beach at Porth-y-pistyll is limited, other migratory fish species would not be expected.

## 7.7 Summary

Monitoring at the Penrhyn, Tan-yr-allt ditch and Porth-y-pistyll sites has been carried out intermittently between 2012 and 2014. The biological and water quality condition of sites surveyed indicate a typical lowland coastal stream and wetland environment.

The diatom condition at Penrhyn and Porth-y-pistyll show the presence of communities similar to reference condition, indicating little environmental stress. This is also reflected in the low nutrient levels observed during the water quality sampling.

Macroinvertebrate communities at Porth-y-pistyll represent Good quality under the RICT classification. Tan-yr-allt ditch and Penrhyn have CCI values of Low to Moderate. European eel has been identified at Porth-y-pistyll.

Aquatic habitats and species identified within the other minor watercourses are of low quality and reflect existing and historical rural land management practices in the area. Species found within the catchment are common and widespread, and include low numbers of the nationally important European eel.

### 8.1 Habitat Characterisation

Individual ponds and wetland areas that were not considered to be part of the predefined catchments were classed as other ponds. These included the National Trust Pools, Wylfa Head Pools, The Firs Pond and Bwlch Pond. Of the four ponds listed, the National Trust Pools and Wylfa Head Pools are brackish coastal ponds. All four of the ponds were considered to be temporary or ephemeral in nature, and were dropped from the survey programme at the end of 2012 due to their temporary nature and low species diversity. A description of the individual waterbodies is provided in Appendix A.

### 8.2 Macroinvertebrates

Macroinvertebrates have been assessed at the other pond sites in 2011 and 2012 using the exhaustive survey methodology. The total number of species recorded at each pond over the sampling period is shown in Table 8-1. The exhaustive survey methodology is not directly comparable between sites as the number of visits differed due to ponds drying out, access constraints or adverse weather. Data provides an indication of the diversity of species recorded each year.

**Table 8-1: Exhaustive number of species per year at four ponds in varying seasons, 2011-2012, adapted from Jacobs' (2013) Consultancy Report: Wylfa Freshwater Baseline Surveys 2011-2013.**

Site	Exhaustive number of species	
	2011	2012
Nantorman Pond	13	-
National Trust Pools	1	4
The Firs Pond	1	-
Wylfa Head Pools	6	2

Very low species diversity was observed at The Firs Pond and National Trust Pools. National Trust Pools and Wylfa Head Pools are both located in very close proximity to the shoreline. These four monitoring sites were dropped from the survey programme at the end of 2012 as sufficient data had been collected.

The majority of the macroinvertebrates species identified during these surveys belonged to pollution tolerant families of beetles, molluscs, crustaceans and true bugs (see Rachel Hacking Ecology, 2011 and 2012 for species lists).

### 8.3 Summary

Data collected indicates low biological value at all of the other pond sites. The ponds are typical of sites within a rural, agricultural land-use dominated catchment.

Many of the watercourses in the study area have undergone a varying degree of human intervention. Interventions include areas of channel straightening, over-deepening or realignments, as well as changes to the riparian habitat through agricultural activities such as provision of livestock access to the watercourse.

There are a high proportion of ephemeral watercourses found across the study area. These have the potential to support diverse macrophyte and macroinvertebrate communities, but due to insufficient water depth and/or their isolated nature, they are unlikely to support large populations of fish. Where watercourses remain wetted year round, a diverse mix of aquatic habitats can be observed across the study area, including wetlands, ditches, ponds and free flowing variable depth watercourses. These habitats also support a variety of fish, macroinvertebrate and macrophyte species.

The best quality freshwater habitats are generally located towards the western and central part of the study area, in and around the Cafnan watercourse, where water depths are greater. Porth Wylfa, downstream of Tre'r Gof SSSI, also provides good quality freshwater habitat with wetland characteristics.

The characterisation of the four main watercourses within the study area can be summarised as follows:

The Cemlyn Tributary watercourse is where the Neuadd, Penyrorsedd and Nanner sites are located. Evidence of poaching has been noted along the watercourse and some siltation of gravels is evident. Channel straightening has been implemented in sections to follow field/road boundaries; however, some areas with good gravel substrate and a diverse range of macrophytes were observed. The catchment is dominated by improved pasture resulting in agricultural runoff entering the watercourse.

Macrophytes at the downstream Neuadd site were of moderate quality, using current WFD tools; while further upstream at Penyrorsedd, they were of good quality. Diatoms were representative of good quality across the catchment. The condition of macroinvertebrate communities within the Cemlyn tributary achieved moderate quality. The only fish species found to be present within the Cemlyn watercourse were European eel. Water quality conditions were within the expected range of values for the waterbody type sampled.

The Afon Cafnan exhibited a mainly natural planform and stream cross-sections, with moderate sinuosity, good flow diversity and a dominant gravel-cobble substrate. The tributary stream exhibited some sectioning and over-deepening. However, some discrete areas of good flow diversity, gravel substrate and riparian vegetation provide good habitat potential. Some areas of channel modification through channelisation and realignment are present within the mid to upper catchment.

Macrophytes and diatoms were present within the Cafnan watercourse with some areas of dense growth. The results of the macrophyte and diatom assessments for the Cafnan watercourse are typical for a watercourse of this size flowing through pasture land. Ecological condition was observed to improve in the higher areas of the catchment. The condition of macroinvertebrate communities within the Cafnan watercourse was poor overall due to the absence of pollution intolerant species. The diversity of fish within the Cafnan watercourse was the highest of all surveyed

watercourses and included brown trout, European eel, three-spined stickleback and nine-spined stickleback. Water quality conditions were within the expected range of values for the waterbody type sampled.

The Tre'r Gof catchment was found to be influenced by low levels of nutrient enrichment via diffuse pollution, as demonstrated in the diatom and macrophyte community analysis. Although no fish were caught in the catchment, incidental observations were made of the presence of European eel. Pond habitat within the Tre'r Gof catchment was typically classed as Moderate to Low. The survey at Power Station Pond identified the minute moss beetle and thus met the criteria for Priority Pond status.

The condition of the macroinvertebrate communities within the Cemaes watercourse achieved Moderate ecological status in 2014. Diatoms at this site in 2013 were consistent with High status decreasing to Good status in 2014. The only fish species found to be present within the Cemaes watercourse was European eel. Water quality conditions were within the expected range of values for the waterbody type sampled.

For the other sites that were not included within the main catchment areas, Penrhyn and Porth-y-pistyll scored favourably for water quality and diatom communities, which were close to reference condition.

Macroinvertebrate communities at Porth-y-pistyll represent Good quality using the RICT classification methodology. CCI values of Low to Moderate were found at Tan-yr-allt ditch and Penrhyn sites. European eel was recorded at the Porth-y-pistyll site.

Aquatic habitats within the other minor watercourses can be considered of generally low value, as can the ecological flora and fauna they support.

Habitat quality at the other ponds not deemed part of a major catchment was generally Low. Very low species diversity was observed at The Firs Pond and National Trust Pools. The National Trust Pools and Wylfa Head Pools are both located in very close proximity to the shoreline and thus are not representative of typical freshwater environments. The majority of macroinvertebrates identified during these surveys belonged to pollution tolerant families of beetles, molluscs, crustaceans and true bugs.

The watercourses within the Wylfa Newydd Development Area footprint contain a range of aquatic habitats. The majority are typical of rural coastal streams, most of which demonstrate evidence of modification to some extent to serve as drainage to the predominantly rural landscape. Stream substrate varies spatially dependant on flow type, between sites and seasons, with a number of the sites being ephemeral in nature. Therefore, the quality of habitat across the whole study area is closely related to the amount and duration of water flow each watercourse receives. Permanently wetted watercourses may also be influenced by seasonal variation in flow type, which conversely affects both water quality (dilution or transmission of pollutants and nutrients from surrounding land) and aquatic habitats.

Of the four main catchments, the Cafnan catchment was shown to exhibit the highest quality habitat in terms of fish and macroinvertebrates. There were trout and European eel caught during the surveys and potential spawning habitat was identified along the main stem of the river. Habitat for trout and European eel within the Cafnan catchment is anticipated to form only a small component of the overall available resource on Anglesey. The tributary stream exhibited lower habitat quality, with the exception of the wetland areas at Cae Gwyn SSSI and Groes-fechan wetland where some species of conservation interest were found.

The Cemlyn catchment showed evidence of historical realignment, with some sedimentation stress and low levels of nutrient enrichment via diffuse pollution. Apart from European eel, no other species of conservation interest were found here.

The Tre'r Gof catchment had little available fish habitat – although eel were sighted incidentally. Moderate to low quality habitat was observed, as evident from macrophyte, diatom and macroinvertebrate surveys, although the moss beetle *Hydraena palustris* was found in 2014 and is a Near Threatened species.

Aquatic habitats in the Cemaes catchment were influenced by low levels of nutrient enrichment via diffuse pollution, low flows and variable water quality. Apart from the European eel, no other species of conservation interest were found during the surveys.

Habitat variation supports a range of species, which is evident from the fish, macrophyte, diatom and macroinvertebrate surveys. A number of key species of conservation interest have been recorded during baseline data collection. These include:

- European eel – Cafnan, Hafnan, Porth-y-pistyll, Tre'r-gof-isaf, Tre'r Gof SSSI, Felin Gafnan Confluence, Porth Wylfa.
- mud snail – Tregele Pond.
- minute moss beetle – Power Station Pond.

The majority of sites contained species of Local or greater conservation importance, including three Nationally Scarce species of aquatic beetle (Coleoptera) (*Enochrus coarctatus*, *Helochares punctatus* and *Rhantus frontalis*) and two Regionally Notable species: the aquatic beetle (Coleoptera) *Coelostoma orbiculare* and the true bug (Hemiptera) *Hesperocorixa moesta*. Caerdegog Isaf Pond and Power Station Pond

were particularly rich in beetles, each supporting seven species of conservation importance, out of a total of 13 recorded from the study area.

Water quality overall was moderate to good, with evidence of possible nutrient input linked to the use of agricultural land for livestock grazing. Occasional elevated metal concentrations were also detected. Diatom analysis revealed variability in environmental condition and species diversity throughout the study area between 2011 and 2014. There was evidence of localised nutrient enrichment, principally at some of the pond sites.

The 2011 to 2014 monitoring programme has developed a good baseline for the use in assessing any potential impacts that the development of the Project may have on the freshwater environment. The baseline dataset can be used to detect impacts from the construction and operational phases of the development and determine suitable mitigation should this be deemed necessary.

## References

Beaumont, W.R.C., Taylor, A.A.L., Lee, M.J. and Welton, J.S. (2002). *Guidelines for Electric-fishing Best Practice*. Environment Agency R and D Technical Report W2-054/TR. Bristol, Environment Agency.

British Standards Institution. (2003). BS EN 14011:2003 *Water Quality Sampling of Fish with Electricity*. London, BSI.

British Standards Institution. (2012). BS EN ISO 10870:2012. Water quality. Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters. London, BSI.

Chadd, R. and Extence, C. (2004). The conservation of freshwater macro-invertebrate populations: a community based classification scheme. *Aquatic Conservation: Mar Beaumont ne and Freshwater Ecosystems*. 14: pp. 597–624.

Department of Energy and Climate Change. 2011. National Policy Statement for Nuclear Power Generation (EN-6). Presented to Parliament by the Secretary of State for Energy and Climate Change pursuant to section 5(9) of the Planning Act 2008. ISBN: 9780108510823.

Drake, C.M., Lott, D.A., Alexander, K.N.A. and Webb, J. (2007). *Surveying terrestrial and freshwater invertebrates for conservation evaluation*. Natural England Research Report NERR005. Natural England, Peterborough.

Environment Agency. (2001). *Electric-fishing Code of Practice*. EAS/6100/4/02. Environment Agency. Bristol.

Environment Agency. (2007a). *Technical reference material: sampling diatoms from rivers and lakes. Operational instruction*.

Environment Agency (2007b) *Technical reference material: WFD electric-fishing in rivers. Operational instruction*. Document no. 144\_03

Environment Agency. (2008). *Freshwater macro-invertebrate analysis of riverine samples*. Document no. 024\_08.

Environment Agency. (2010). *Chemical and microbiological sampling of water*. Operational instruction 19\_09. [Online]. [Accessed 19 December 2014]. Available from: [http://www.environment-agency.gov.uk/static/documents/Business/19\\_09\(1\).pdf](http://www.environment-agency.gov.uk/static/documents/Business/19_09(1).pdf).

Environment Agency. (2012). *Freshwater macro-invertebrate sampling in rivers. Operational instruction*. Document no. 018\_08.

Extence, C., Balbi, D. and Chadd, R. (1999). River flow indexing using British benthic macroinvertebrates: a framework for setting hydroecological objectives. *Regulated Rivers: Research & Management*. 15 (6). pp 545–574.

Extence, C.A. Chadd, R.P. England, J. Dunbar, M.J. Wood, P.J. Taylor, E.D. (2011). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. *River Research and Applications* 29, (1). pp. 17–55, January 2013.

Foster, G.N. (2010). A review of the scarce and threatened Coleoptera of Great Britain Part (3): Water beetles of Great Britain. *Species Status* 1. Joint Nature Conservation Committee, Peterborough.

Hawkes, H.A. (1997). Origin and development of the biological monitoring working party score system. *Water Resources* 23: pp. 964-968.

Institute of Ecology and Environmental Management (IEEM). (2006). *Guidelines for ecological impact assessment in the United Kingdom*. [Online]. [Accessed 19 December 2014]. Available from [http://www.cieem.net/data/files/Resource\\_Library/Technical\\_Guidance\\_Series/EcIA\\_Guidelines/TGSEcIA-EcIA\\_Guidelines-Terrestrial\\_Freshwater\\_Coastal.pdf](http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/EcIA_Guidelines/TGSEcIA-EcIA_Guidelines-Terrestrial_Freshwater_Coastal.pdf).

IUCN. (2015). *The IUCN Red List of Threatened Species*. Version 2015.1. [Online] [Accessed on 22 June 2015]. Available from: <http://www.iucnredlist.org>.

Jacobs. (2013). *Consultancy Report: Wylfa Freshwater Baseline Surveys (Year 1)*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: w202.01-s5-pac-rep-00011.

Jacobs. (2015a). *Consultancy Report: Great Crested Newt Survey Report 2014*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: wn03.01.01-s5-pac-rep-00007.

Jacobs. (2015b). *Consultancy Report: Bat Monitoring 2013*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: wn03.01.01-s5-pac-rep-00011.

Jacobs. (2015c). *Consultancy Report: Reptile Technical Summary Report*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: WN034-JAC-PAC-REP-00007.

Jacobs. (2015d). *Consultancy Report: Breeding Birds Surveys 2014*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: WN03.01.01-S5-PAC-REP-00012.

Jacobs. (2015e). *Consultancy Report: Otter and Water Vole Surveys 2014*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: wn03.01.01-s5-pac-rep-00008.

Jacobs. (2015f). *Consultancy Report: Wylfa Newydd Fluvial Geomorphology Baseline Report - 2014*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: WN03.03.01-S5-PAC-REP-00021.

Jacobs. (2016). *Consultancy Report: Wylfa Newydd Development Area Hydrological Baseline Report*, unpublished report on behalf of Horizon Nuclear Power Wylfa Limited. Document reference: in draft.

JNCC and Defra (on behalf of the Four Countries' Biodiversity Group). 2012. *UK Post-2010 Biodiversity Framework*. July 2012. Available from: <http://jncc.defra.gov.uk/page-6189>.

Kelly, M.G., Yallop, M.L., Hirst, H. and Bennion, H. (2005). Sample collection. Version 2.1. Unpublished DARES/DALES protocol. [Online]. [Accessed: 20 October 2014]. Available from: <http://craticula.ncl.ac.uk/dares/methods.htm>.

Natural Environment and Rural Communities (NERC) Act (2006) Available from: <http://www.legislation.gov.uk/ukpga/2006/16/contents>.

Planning Act 2008. Available from: <http://www.legislation.gov.uk>.

Pond Action. (2002). *A guide to monitoring the ecological quality of ponds and canals using PSYM*. Pond Conservation Trust, Oxford Brookes University, Oxford and the Environment Agency, West Midlands.

Rachel Hacking Ecology. (2011). *Wylfa Invertebrate Survey 2011 – Interim Report, Freshwater Invertebrates*. Issued by Ove Arup & Partners Limited, to Horizon Nuclear Power.

Rachel Hacking Ecology. (2012) *Wylfa Invertebrate Survey 2012 – Interim Report, Freshwater Invertebrates*. Issued by Ove Arup & Partners Limited, to Horizon Nuclear Power.

Rachel Hacking Ecology. (2013). *Wylfa Invertebrate Survey 2013 – Freshwater Invertebrates*. Issued by Ove Arup & Partners Limited, to Horizon Nuclear Power.

SNIFFER. (2008). *River Invertebrate Classification tool*. SNIFFER Project WFD72C. Scotland. United Kingdom.

Water Framework Directive – United Kingdom Technical Advisory Group (WFD-UKTAG). (2014a). *UKTAG Rivers Assessment Methods*. Macrophytes and Phytobenthos. Phytobenthos – Diatom Assessment for River and Lake Ecological Status (River DARLEQ2). WFD-UKTAG. Edinburgh. United Kingdom.

Water Framework Directive – United Kingdom Technical Advisory Group (WFD-UKTAG). (2014b). *UKTAG River Assessment Method Macrophytes and Phytobenthos: Macrophytes* (River LEAFPACS2). WFD-UKTAG. Stirling. United Kingdom.

Wildlife and Countryside Act 1981 Schedule 9. Available from: <http://www.legislation.gov.uk/ukpga/1981/69/schedule/9>.

Appendix A Physical Habitat Reach Descriptions

<b>Site ref</b>	<b>A5025 Crossing (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34405 91396
<b>Access</b>	No
<b>Wetted</b>	Yes

**Reach Characteristics and Management Issues**

Upstream of the A5025 the watercourse was damp, with no water observed or perceivable flow (top photo). Aquatic and semi-aquatic macrophytes dominate the channel form. The channel runs alongside improved pasture and bordered along the left bank by the field margin. It is expected that this channel will fill in wetter months and contribute to the flow observed downstream.

The watercourse is culverted under the A5025, the stream then flows north through woodland which heavily shades the channel. The dominant flow types were run and glide. The substrate is silt deposited over coarser substrate. Diverse substrate composition results in habitat heterogeneity despite the low energy flow recorded. The stream follows field boundaries (stone walls); other than the road culvert there is no evidence of recent management or modifications.

The downstream reach appeared suitable for fisheries, macrophyte and water quality assessment but no access has been granted and this survey site is now outside of the Wylfa Newydd Development Area and 500m buffer boundary.

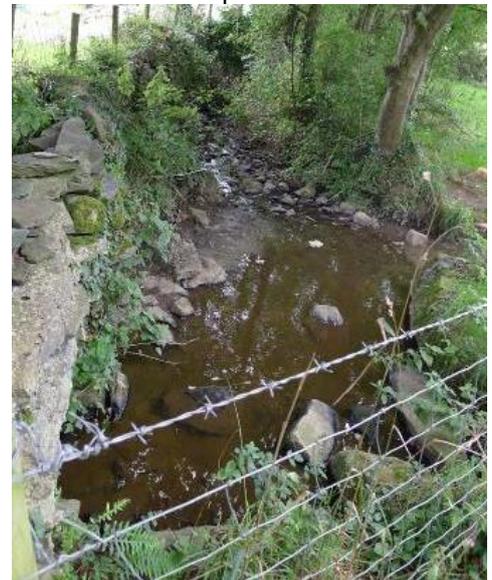
**Surveys:**

**Habitat Characterisation**

Summer 2011 – undertaken from public access areas only.



Summer 2011 upstream of A5025



Summer 2011 downstream of A5025

<b>Site ref</b>	<b>Cae Gwyn SSSI (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34749 91786
<b>Access</b>	Yes (except autumn 2014)
<b>Wetted</b>	Seasonal
<b>Reach Characteristics and Management Issues</b>	
<p>Cae Gwyn is a large, botanically species-rich wetland area bordered by improved grassland and gorse scrub. The basin mires held water throughout most of the survey seasons.</p> <p>The northern basin mire comprises botanical species such as meadowsweet (<i>Filipendula ulmaria</i>), common spike-rush (<i>Eleocharis palustris</i>), cross-leaved heath (<i>Erica tetralix</i>), common cottongrass (<i>Eriophorum angustifolium</i>), water mint, broad-leaved pondweed (<i>Potamogeton natans</i>), marsh St. John's-wort (<i>Hypericum elodes</i>) and creeping willow (<i>Salix repens</i>). The southern basin mire comprises all of the above species plus others including cranberry (<i>Vaccinium oxycoccos</i>) and marsh fern (<i>Thelypteris palustris</i>).</p> <p>A small area of marsh was also surveyed at the northern limit of Cae Gwyn. This had a similar floristic composition to the northern basin. This area was dry by late summer.</p>	
<p><b>Surveys:</b>  <b>Habitat Characterisation</b>          Winter 2014  <b>Macroinvertebrates</b>          April 2013, June/July 2013, August 2013, Spring 2014  <b>Diatom</b>          Feb 2014, May 2014  <b>Water Quality</b>          Feb 2014, May 2014  <b>Macrophytes</b>          July 2014</p>	



2013 Northern basin mire



2013 Southern basin mire

<b>Site ref</b>	<b>Cae Gwyn SSSI to Caerdegog Isaf including Groes-fechan (Cafnan watercourse)</b>	
<b>Grid ref</b>	SH 34993 92084 to SH 34897 92525	
<b>Access</b>	Yes (except autumn 2014)	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>The stream at the Groes-fechan site is narrow with steep, high (approximately 2m) channel banks. The stream marks a field boundary with sheep pasture on the right bank and gorse scrub on the left bank. The channel is heavily shaded in its uppermost reaches with a cobble-gravel substrate. The flow is mainly run-riffle and is typically very shallow (&lt;20cm). Upstream, the stream passes through a short culvert.</p> <p>Around 50m downstream, the channel broadens and the gradient decreases, with silt deposits and slower flow. In-stream macrophytes, predominantly fool's watercress, are present.</p> <p>Mid-reach, the channel is open with little shading. Both banks are pasture with some arable land use. Flow is slow and the reach process is depositional. Substrate consists of silt and fine gravels. The mid-section has unfenced sections open to poaching. Macrophytes are more prevalent in this section, with fool's watercress and water forget-me-not (<i>Mysotis scorpiodes</i>) covering up to 60% of the water surface.</p> <p>Further downstream, the channel continues to be slow-flowing and depositional, contained within dry stone walls in places. This reach is almost entirely shaded under dense gorse. A small weir (approximately 40cm) exists towards the lower end of the reach as the channel approaches a track near the Caerdegog Isaf site.</p> <p>Throughout the entire reach, there is evidence of channel realignment around field boundaries and channelisation with dry stone walls. Over-deepening was also evident in places.</p> <p>The channel passes under a small road bridge and into the Caerdegog Isaf site where the flow increases and the substrate consists of fine and coarse gravels under overhanging trees.</p>		 <p>Spring 2013 upstream</p> <p>Spring 2013 upstream, facing upstream</p>  <p>Spring 2013 downstream, facing downstream</p>  <p>Spring 2013 downstream end</p>
<p><b>Surveys:</b></p> <p><b>Fish</b> Spring 2013, August 2014</p> <p><b>Diatom</b> Quarterly since Spring 2013</p> <p><b>Water Quality</b> Quarterly since Spring 2013</p> <p><b>Habitat Characterisation</b> Winter 2012/2013</p> <p><b>Macroinvertebrates</b> May 2014, April 2013, June/July 2013, August 2013, May 2014</p> <p><b>Macrophytes</b> – July 2014</p>		

<b>Site ref</b>	<b>Caerdegog Isaf and Hafnan - Caerdegog Isaf (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34897 92525 to SH 34005 92318
<b>Access</b>	Yes (except autumn 2014)
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Caerdegog Isaf - The stream at the Caerdegog Isaf site is narrow (approximately 1m) and steep-sided, with high channel banks, a straight planform and evidence of realignment and re-sectioning. The substrate consists of coarse and fine gravels and the channel is heavily shaded by bramble and hawthorn for the first 100m of the reach. Flow type in the section is run/riffle with very shallow depths (approximately 5cm).</p> <p>The channel turns west along a field boundary and becomes increasingly depositional, with a wider cross-section and a slower flow due to the reduced gradient. Channelisation (and possibly dredging) is evident here and the channel is contained in places by dry stone walls. Land use along both banks is cattle pasture allowing stock access to the watercourse in places. Macrophytes, predominantly fool's watercress, are present mid-stream.</p> <p>Hafnan - Caerdegog Isaf - Further downstream, through the Hafnan - Caerdegog Isaf site, macrophyte growth becomes denser and more diverse with water-starwort, unbranched bur-reed (<i>Sparganium emersum</i>), water forget-me-not and marginal reeds all present. Poaching is evident in the unfenced sections further downstream. The channel retains its ditch-like nature with deep silt deposits down to the confluence.</p> <p>At the confluence, the channel is completely obscured by vegetation.</p>	
<p><b>Caerdegog Isaf surveys:</b></p> <p><b>Fish</b> Spring 2013, autumn 2013, August 2014</p> <p><b>Diatom</b> Quarterly since spring 2013</p> <p><b>Water Quality</b> Quarterly since spring 2013</p> <p><b>Habitat Characterisation</b> Winter 2012/2013</p> <p><b>Macroinvertebrates</b> May 2012, June/July 2013, May 2014</p> <p><b>Macrophytes</b> – July 2014</p> <p><b>Hafnan – Caerdegog Isaf surveys:</b></p> <p><b>Diatom</b> Quarterly since spring 2013</p> <p><b>Water Quality</b> Quarterly since spring 2013</p> <p><b>Habitat Characterisation</b></p>	



Spring 2013 upstream



Spring 2013 mid-reach (looking downstream)



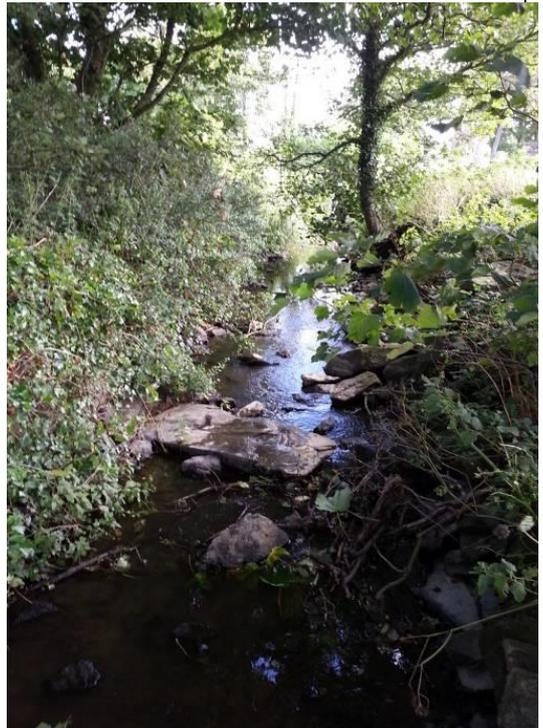
Autumn 2013 downstream of Hafnan - Caerdegog Isaf, looking downstream



Spring 2013 downstream towards confluence

Winter 2012/2013 <b>Macroinvertebrates</b> May 2014																
<table border="1"> <tr> <td><b>Site ref</b></td> <td><b>Caerdegog Isaf Pond</b></td> </tr> <tr> <td><b>Grid ref</b></td> <td>SH 34698 92496</td> </tr> <tr> <td><b>Access</b></td> <td>Yes (until 2014)</td> </tr> <tr> <td><b>Wetted</b></td> <td>Yes</td> </tr> <tr> <td colspan="2"><b>Reach Characteristics and Management Issues</b></td> </tr> <tr> <td colspan="2">                     This small pond is surrounded by scrub and grassland and is largely unshaded.                       The pond has recently been created by the landowners but has established high macrophyte coverage.                       Aquatic plant species include marsh pennywort (<i>Hydrocotyle vulgaris</i>), water horsetail (<i>Equisetum fluviatile</i>), lesser spearwort (<i>Ranunculus flammula</i>), water-plantain (<i>Alisma plantago-aquatica</i>) and common duckweed (<i>Lemna minor</i>).                 </td> </tr> <tr> <td colspan="2"> <b>Surveys:</b>  <b>Habitat Characterisation</b>                      Spring 2012  <b>Macroinvertebrates</b>                      April 2012, May 2012, July 2012, June/July 2013.                 </td> </tr> </table>		<b>Site ref</b>	<b>Caerdegog Isaf Pond</b>	<b>Grid ref</b>	SH 34698 92496	<b>Access</b>	Yes (until 2014)	<b>Wetted</b>	Yes	<b>Reach Characteristics and Management Issues</b>		This small pond is surrounded by scrub and grassland and is largely unshaded.  The pond has recently been created by the landowners but has established high macrophyte coverage.  Aquatic plant species include marsh pennywort ( <i>Hydrocotyle vulgaris</i> ), water horsetail ( <i>Equisetum fluviatile</i> ), lesser spearwort ( <i>Ranunculus flammula</i> ), water-plantain ( <i>Alisma plantago-aquatica</i> ) and common duckweed ( <i>Lemna minor</i> ).		<b>Surveys:</b> <b>Habitat Characterisation</b> Spring 2012 <b>Macroinvertebrates</b> April 2012, May 2012, July 2012, June/July 2013.		 <p>Spring 2012</p>
<b>Site ref</b>	<b>Caerdegog Isaf Pond</b>															
<b>Grid ref</b>	SH 34698 92496															
<b>Access</b>	Yes (until 2014)															
<b>Wetted</b>	Yes															
<b>Reach Characteristics and Management Issues</b>																
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<b>Surveys:</b> <b>Habitat Characterisation</b> Spring 2012 <b>Macroinvertebrates</b> April 2012, May 2012, July 2012, June/July 2013.																

<b>Site ref</b>	<b>Cafnan (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34155 93015 to SH 34252 93096
<b>Access</b>	Yes (until autumn 2014)
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>The watercourse flows north through the grounds of Cafnan Farmhouse. This includes an area of improved grassland on the right hand bank utilised as a caravan and camping area, with broadleaf woodland along the left bank.</p> <p>The watercourse displays historic channel modification through this reach, especially along the right bank with the section adjacent to the farmyard exhibiting tipped material in the bank and a straightened planform. A small footbridge crosses the watercourse at the downstream end of the reach before the watercourse flows under the access road and north towards Felin Gafnan East and Porth-y-pistyll Bay.</p> <p>Substrates within this reach are a mix of consolidated cobble and gravel with isolated areas of bedrock through the middle section. Sediment deposition was recorded throughout the reach, particularly at the upstream end where silt deposits are deep.</p> <p>Macrophytes were absent from the middle section due to high levels of shading, trees in the riparian strip providing shade, exposed tree roots and leaf litter. Macrophytes were more abundant at the up and downstream ends of the reach.</p>	
<p><b>Surveys:</b></p> <p><b>Fish</b> Autumn 2011 &amp; 2013, Spring 2012 &amp; 2013, Summer 2012 &amp; 2013, summer 2014</p> <p><b>Macrophytes</b> Annually since summer 2012</p> <p><b>Diatom</b> Summer 2011 and quarterly since spring 2012</p> <p><b>Water Quality</b> Quarterly since winter 2011/2012</p> <p><b>Habitat Characterisation</b> Summer 2011</p> <p><b>Macroinvertebrates</b> Spring 2014</p>	



Summer 2013 mid-reach facing downstream



Summer 2013 upstream facing downstream

<b>Site ref</b>	<b>Felin Gafnan Confluence (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34491 93361
<b>Access</b>	Yes
<b>Wetted</b>	Yes

**Reach Characteristics and Management Issues**

The Felin Gafnan tributaries flow through private land and re-join each other before flowing into Porth-y-pistyll above the beach. Immediately above the beach, the watercourse flows through a private ornamental garden, with large, herbaceous riparian species shading the left bank and ferns dominating the steeper right bank. Large stands of non-native *Gunnera sp.* are present. Substrates are compacted bedrock and cobbles, whilst flow types are high energy run and cascade from the steep gradient discharge onto the foreshore.

The watercourse flows out of the tall herb and woodland area behind the beach and over the rock foreshore into the bay. Tidal intrusion up to the footbridge is evident with fucoid macroalgae *Enteromorpha sp.* observed from the bridge; however, physico-chemical analysis of the water indicates a dominant freshwater source. Despite this, some marine invertebrates have been recorded in the macroinvertebrate surveys such as brackish-water shrimps and marine isopods.

**Surveys:**

**Diatom**

Quarterly since summer 2011

**Water Quality**

Quarterly since winter 2011/2012

**Macroinvertebrates**

September 2011, May 2012, June/July 2013, spring and autumn 2014

**Habitat Characterisation**

Summer 2011



Summer 2011 downstream near beach, facing upstream



Autumn 2013 upstream, facing upstream



Autumn 2013 downstream, facing downstream

<b>Site ref</b>	<b>Felin Gafnan East (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34253 93109 to SH 34354 93194
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Immediately downstream of the Cemlyn road bridge, the channel is very shallow with run flow types over a gravel, cobble and silt bed. There is evidence of poaching along the right bank where cattle have access to the watercourse. The channel appears largely unmodified below the road crossing and follows a sinuous path north. Heavy shading is evident along the wooded and shrub dominated left bank whilst the right bank is open to pasture providing sufficient sunlight for macrophyte growth. The stream flows north into dense woodland where macrophyte cover reduces due to riparian shading.</p> <p>The channel demonstrates good flow and substrate diversity and supports a varied macrophyte assemblage.</p>	
<p><b>Surveys (none in 2014):</b>  <b>Macrophytes</b>          Annually since summer 2012  <b>Diatom</b>          Quarterly since autumn 2011  <b>Water Quality</b>          Quarterly since winter 2011/2012  <b>Macroinvertebrates</b>          Included in Cafnan to Hafnan stretch  <b>Habitat Characterisation</b>          Summer 2011</p>	



Summer 2011 upstream at road bridge, facing downstream

<b>Site ref</b>	<b>Felin Gafnan West (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34234 93151
<b>Access</b>	Yes
<b>Wetted</b>	Barely
<b>Reach Characteristics and Management Issues</b>	
<p>This channel runs adjacent to the Felin Gafnan access road down to nature reserve. Upstream, the watercourse splits into two just south of the Cemlyn road. However, all of the flow appears to continue through Felin Gafnan East. The Felin Gafnan West watercourse is likely to have been a historic modification to allow milling in the lower catchment. There is evidence of a mill on this site since 1352, although the present mill house is thought to date back to the 1840s. The watercourse is dry throughout its length, although in the autumn 2013 survey, the channel was damp in isolated patches due to recent heavy rainfall.</p> <p>The upstream end is shallower, shaded along the right bank with trees, the left bank open to a grass verge and access road. The stream bed is predominantly terrestrial grasses and herb (bottom photo).</p> <p>The downstream end is over-deepened and straightened and dominated by a terrestrial grass sward (top photo).</p> <p>No further access for habitat assessment was possible before the channel re-joined the Felin Gafnan East tributary.</p>	
<p><b>Surveys (none in 2014):</b>  <b>Habitat Characterisation</b>                  Summer 2011</p>	



Summer 2011 downstream end facing upstream



Summer 2011 upstream end facing upstream



Summer 2013 upstream end facing upstream

<b>Site ref</b>	<b>Foel Fawr (Cemaes watercourse)</b>	
<b>Grid ref</b>	SH 35459 91910 - SH 35748 92410	
<b>Access</b>	Yes	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>The stream at the Foel Fawr site is narrow (approximately 1m) and steep-sided with high channel banks, a straight planform and evidence of realignment and re-sectioning.</p> <p>Substrate consists of fine-medium gravels overlain by silt and the channel is heavily shaded by bramble and hawthorn from the right bank, and overhanging marginal vegetation, for the entire 100m of the reach. Flow type in the section is slow glide with low depths of approximately 10cm.</p> <p>Land use along both banks is cattle pasture, but the watercourse is fenced which prevents stock accessing the channel. Macrophytes (dominated by fool's watercress, reed sweet-grass and great willow herb) are present mid-stream, but overall, macrophyte cover is limited due to heavy shading. In-channel habitats are limited due to the low macrophyte cover and low of substrate and flow heterogeneity.</p> <p>Fencing is present along the left bank and managed hawthorn-hedge runs the length of the stream along the right hand bank. The stream flows through grazed pasture and continues north where it becomes heavily realigned as it passes to the east of Treglele village.</p>		
<p><b>Surveys:</b>  <b>Macrophytes</b>                  Summer 2013 &amp; 2014  <b>Diatom</b>                  Since Autumn 2013  <b>Water Quality</b>                  Since Autumn 2013  <b>Habitat Characterisation</b>                  Summer 2013  <b>Macroinvertebrates</b>                  Spring and autumn 2014</p>		
		

Summer 2013 upstream (looking downstream)

Summer 2013 mid-reach (looking upstream)

Summer 2013 downstream (looking upstream).

<b>Site ref</b>	<b>Groes-fechan Tributary (Cafnan watercourse)</b>	A wide view of a grassy field with a narrow drainage channel running through it. There are some trees in the background under a cloudy sky.
<b>Grid ref</b>	SH 34833 91641 – SH 34778 91634	
<b>Access</b>	Yes	
<b>Wetted</b>	Slight	
<b>Reach Characteristics and Management Issues</b>		
<p>The field drain at Groes-fechan runs in a westerly direction, alongside the southern side of a field boundary. The drain arises via a culvert and the channel is approximately 50m long in total. At the downstream end, the field drain enters a culvert that takes it north into another field. Here it loses its defined channel and forms an area of wetland.</p>		A close-up view of tall, dry, brown grasses growing in a drainage channel.
<p>The drain is narrow with banks approximately 1m high at the upstream end and 0.5m high towards the mid-reach and downstream end. The bed consists of silt/clay with some medium to coarse gravel and cobbles. The water depth was extremely shallow at the time of survey, approximately 1cm deep. At the upstream end, a very small amount of flow could be seen, but the rest of the drain had no perceivable flow.</p>		A view of a drainage channel with a large, spreading tree on the left bank and a fence on the right.
<p>The channel has little shading from bankside trees. However, soft-rush covers approximately 80% of the channel.</p>		
<p>Sheep pasture is present on both sides of the drain and sheep access is possible from the southern side, although no evidence of poaching was observed.</p>		
<p>The channel appears to be a former stream that has been straightened to form a field drain. During wetter periods, the channel may have a greater flow.</p>		A view of a drainage channel with a large tree on the left bank and a fence on the right.
<p><b>Surveys:</b> <b>Habitat Characterisation</b> Summer 2013</p>		Summer 2013 downstream (looking northwest)

<b>Site ref</b>	<b>Groes-fechan Ponds (Cafnan watercourse)</b>	
<b>Grid ref</b>	SH 34923 91667 and SH 34737 91625	
<b>Access</b>	Yes	
<b>Wetted</b>	Pond 1 – dry. Pond 2 – damp	
<b>Reach Characteristics and Management Issues</b>		
<p>Pond 1 (SH 34923 91667) was entirely dry. The presence of soft-rush indicates that the pond may become wetter during winter and spring. Terrestrial grasses comprised the rest of the flora within the dry pond, indicating prolonged periods of drying of this feature. An adult common frog (<i>Rana temporaria</i>) was recorded within the dry pond; frogs are typically terrestrial, residing in or near damp areas outside the breeding season. Due to the annual drying, the pond is unlikely to be of any significant ecological value.</p> <p>Pond 2 (SH 34737 91625) had no open standing water but was boggy in places. Species included bog bean (<i>Menyanthes trifoliata</i>), water forget-me-not, horsetail, northern bedstraw (<i>Galium boreale</i>), sedges <i>Carex</i> spp., lesser bulrush (<i>Typha angustifolia</i>), buttercup (<i>Ranunculus</i> sp.), water mint, marsh cinquefoil (<i>Potentilla palustris</i>), marsh pennywort, ragged robin (<i>Lychnis flos-cuculi</i>) and willow. This pond is likely to be wetter in the winter and, given the greater proportion of aquatic or water dependent species, this pond may hold water longer than Pond 1.</p> <p>Pond 1 is unlikely to be of any significant aquatic ecological value due to its prolonged annual drying. Pond 2 was slightly wetted and had a large variety of semi-aquatic and aquatic macrophytes, none of which are unique to this site or of conservation value. If, as expected, the pond became wetter during winter, further surveys in winter are unlikely to increase the understanding of the ecology of this location due to macrophyte die back and macroinvertebrate population decline during colder months. The ecological value of these drying ponds could be characterised by studying other ephemeral aquatic features on site.</p> <p>It was noted that the areas of wetland surrounding Pond 2 and the main Groes-fechan watercourse supported a wide variety of wetland flora species and may form an important terrestrial habitat area.</p>		
<b>Surveys:</b>		Summer 2013 pond 1
<b>Habitat Characterisation</b>		Summer 2013 pond 2
Summer 2013		

<b>Site ref</b>	<b>Groes-fechan Tributary (Cafnan watercourse)</b>	A photograph showing a dense thicket of green ferns and other vegetation on a hillside, with a utility pole visible in the background under an overcast sky.
<b>Grid ref</b>	SH 34758 91686 to SH 34842 91800	
<b>Access</b>	No; observed from Mr Biddlecombe's land	
<b>Wetted</b>	Slight	
<b>Reach Characteristics and Management Issues</b>		
<p>The stream at the Groes-fechan site runs in a north-easterly direction, joining the main stream that drains from Groes-fechan towards Caerdegog Isaf.</p> <p>It is narrow with steep, high (approximately 1.5m) channel banks. The stream runs along a field boundary with sheep pasture on the left bank and wetland vegetation and scrub on the right bank. A fence runs alongside the stream, which prevents sheep access into the channel. At the upstream end, there is no defined channel, but an area of wetland is present. Where the channel becomes defined, the substrate is peaty. Towards the downstream end of the surveyed reach, where visible, the channel comprises a bedrock or boulder cobble substrate. There was no flow at the time of survey, although the substrate was damp. Water depth was less than 1cm.</p> <p>The channel is almost entirely shaded, predominately by gorse but also willow, bracken, bramble and hawthorn (<i>Crataegus monogyna</i>). Water mint is present in places and horsetail is abundant. Towards the upstream section where the channel turns into wetland, horsetail, bulrush and smooth rush are abundant.</p> <p>Throughout the reach, there is evidence of channel realignment alongside the field boundary.</p>		<p>Summer 2013 upstream (looking west)</p> A photograph showing a dense thicket of green ferns and other vegetation on a hillside, with a utility pole visible in the background under an overcast sky.
		<p>Summer 2013 mid-reach (looking southwest)</p> A photograph showing a dense thicket of green ferns and other vegetation on a hillside, with a utility pole visible in the background under an overcast sky.
		<p>Summer 2013 mid-reach (looking south)</p> A photograph showing a dense thicket of green ferns and other vegetation on a hillside, with a utility pole visible in the background under an overcast sky.
<p><b>Surveys:</b> <b>Habitat Characterisation</b> Summer 2013</p>		<p>Summer 2013 downstream (looking north)</p>

<b>Site ref</b>	<b>Groes-fechan Wetland Area (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 35090 92176
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Whilst examining the pre-planned Groes-fechan site, a water-body was observed entering the main watercourse from the right bank. Largely obscured by emergent reed and rush species in the surrounding wetland and rough pasture, this tributary appears to be a wide and shallow wetland area. While wetted during winter, the tributary was supporting wildfowl and significant submerged and emergent macrophyte growth.</p> <p>The planform of the channel suggest artificial straightening (see photo); however, the wide channel is unlikely to have been cut for drainage or wet fencing.</p> <p>The habitat assessment could not determine whether this side channel was flowing (no perceivable flow) or identify a source. This wetland area may be a backwater or low lying wetland that had become submerged with winter rainfall.</p> <p>This could provide an important resource for aquatic ecology (especially invertebrates and plants), particularly if it remains wetted throughout the drier months. This represents a habitat not widely reported from the survey area (potentially present at the Tre'r Gof SSSI).</p>	
<p><b>Surveys (none in 2014):</b>  <b>Habitat Characterisation</b>          Winter 2012/2013  <b>Macroinvertebrates</b>          April 2013, June/July 2013, August 2013.</p>	



Winter 2013



Spring 2013

<b>Site ref</b>	<b>Gwyddelyn Bach (Cemaes watercourse)</b>
<b>Grid ref</b>	SH 35922 92646 – SH 35980 92694
<b>Access</b>	Yes (except spring and summer 2014)
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Downstream of Foel Fawr is Gwyddelyn Bach. This section also receives water from a tributary 200m upstream, arising from the west of Llanfechell village. Gwyddelyn Bach forms a field boundary between improved pasture land and shows signs of historic straightening. The watercourse is bordered by reed and emergent rush, which in summer choke the watercourse. Shading is minimal although overhanging trees and shrubs are present both up and downstream of the survey site. The watercourse is fenced along the right bank and the left bank is open to grazing; however, there were no signs of poaching.</p> <p>The channel was 1m wide and up to 0.15m deep over a soft silt substrate. Flow types were slow glides with marginal slacks giving the watercourse a ditch typology. The silt substrate and ditch like character limits habitat types; however, the presence of macrophytes provide suitable refuge for invertebrates and small fish species.</p>	
<b>Surveys:</b>	
<b>Fish</b>	
Spring 2013, autumn 2013	
<b>Macrophytes</b>	
July 2013	
<b>Diatom</b>	
Quarterly since winter 2012/2013 (except spring and summer 2014)	
<b>Water Quality</b>	
Quarterly since winter 2012/2013 (except spring and summer 2014)	
<b>Habitat Characterisation</b>	
Winter 2012/2013	
<b>Macroinvertebrates</b>	
April 2013, June/July 2013	



Spring 2013 facing downstream



Spring 2013 facing downstream



Spring 2013 looking upstream at Llanfechell tributary

<b>Site ref</b>	<b>Hafnan, and Cafnan – Hafnan (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 33936 92212 - SH 34014 92361 (Hafnan) and SH 34014 92361 - SH 34155 93015 (Cafnan to Hafnan)
<b>Access</b>	Yes (except autumn 2014)
<b>Wetted</b>	Yes

**Reach Characteristics and Management Issues**

Hafnan - The watercourse runs in a south to north direction and is connected to a network of field ditches along its length on both banks. The site at Hafnan sits just downstream of the access track to Mynydd Ithel and flows through grazing pasture. It displays a natural planform with cobble-gravel bed and marginal silt deposits in the upper 100m. Channel width varies between 2m and 3m-4m (where poaching was also evident) with water depths up to 1m in pools. The banks are steep, approximately 1m in height; the right bank is vegetated with scrub and the left bank is sheep and cattle pasture with no fencing. Bank collapse is evident in places, which may be exacerbated by poaching. Tree cover and shading is largely absent; despite this, macrophyte growth is also very limited, perhaps due to disturbance by livestock. In-stream macrophytes consist chiefly of sparse water-starwort with some emergent branched bur-reed in the margins. Areas of extensive common duckweed cover were recorded in the area sampled for macroinvertebrates in 2011 but this was not seen in subsequent visits. The dominant flow type along this section is a glide.

Cafnan – Hafnan - Downstream of the Hafnan site, a tributary joins from the east, creating a slightly wider channel. Downstream towards the Cafnan – Hafnan site, the slope increases slightly through the mid-section, with increased flow diversity and some riffle-run flow types between pools. However, the issue of poaching, associated bank collapse and sediment input to the stream persists, with high siltation of gravels. The channel may have been deepened historically and an embankment of 1m height was recorded along the right bank from this mid-section down to the Cafnan site. The stream forms a border between two landowners. This border appears to switch banks down the length of the watercourse and the ecological functioning of the channel is significantly influenced by which bank access is open. Sections open to the left bank demonstrate considerable maintenance and a regular maintenance regime with the watercourse open (over-widened, deepened and clear of macrophyte growth). It appears that riparian cover has also been removed from the left bank and banks modified to allow cattle access to the stream. Where the watercourse is accessed from the right bank, the watercourse is unmodified, appearing significantly narrower and shallower than the managed sections. In the non-managed sections, the watercourse is choked throughout its length, with submerged and



Spring 2013 upstream at Hafnan (looking downstream)



Spring 2013 mid-reach (looking downstream)



Spring 2013 downstream of Cafnan – Hafnan (looking upstream)



Spring 2013 at Cafnan facing downstream (end of reach)

emergent macrophytes covering the channel. Areas of extensive common duckweed cover were recorded in 2011.

The lower end of the reach, towards Cafnan, is straighter and deeper, suggesting historical channel realignment and re-sectioning. Flow is slow and silt substrate dominates. Land use remains as cattle pasture along both banks. Emergent branched bur-reed occupies the marginal areas here.

**Surveys:**  
**Fish (Hafnan only)**  
 Quarterly since spring 2013 (only summer in 2014)  
**Macrophytes(Hafnan only)**  
 Summer 2013 & 2014  
**Diatom (Hafnan only)**  
 Quarterly since spring 2013 (except autumn 2014)  
**Water Quality (Hafnan only)**  
 Quarterly since spring 2013 (except autumn 2014)  
**Habitat Characterisation**  
 Autumn 2011, spring 2013  
**Macroinvertebrates (Cafnan to Hafnan)**  
 September 2011, May 2012, June/July 2013. May 2014

<b>Site ref</b>	<b>Nanner (Cemlyn tributary stream)</b>
<b>Grid ref</b>	SH 33477 92132 to SH 33501 92154
<b>Access</b>	No
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>The stream flows west to east before flowing through a culvert under Cemlyn Road at the Nanner site (SH 33497 92147). It then turns north towards the U/S Neuadd site.</p> <p>During 2011, the stream was barely flowing, with approximately 15m wetted immediately upstream of the road culvert. Upstream of this point, the channel appeared damp, but not wetted and heavily obscured by hedgerow and bramble shading the channel. Where wetted, the channel was 50cm wide and 5cm deep, dominated by soft silt indicative of a low energy, depositional habitat. Submerged and floating macrophytes cover the stream up to the road culvert, where water deepens slightly.</p> <p>Surrounding land use is low intensity grazing land and there is no indication of channel or planform modification</p>	
<p><b>Surveys:</b>  <b>Diatom</b>                  Summer 2011  <b>Habitat Characterisation</b>                  Autumn 2011</p>	



Summer 2011 taken upstream of road culvert, facing downstream

<b>Site ref</b>	<b>Nantorman Pond</b>	
<b>Grid ref</b>	SH 36231 93325	
<b>Access</b>	Yes	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>The pond at Nantorman is a lined garden pond with submerged and emergent aquatic vegetation</p> <p>The water surface is covered in common duckweed. Two Wildlife and Countryside Act 1981 Schedule 9 plants were recorded: curly waterweed (<i>Lagarosiphon major</i>) and New Zealand pigmy weed (<i>Crassula helmsii</i>).</p>		<p>June 2011</p>
<p><b>Surveys:</b>  <b>Habitat Characterisation</b>                  Summer 2011  <b>Macroinvertebrates</b>                  June 2011</p>		

<b>Site ref</b>	<b>National Trust Headland Pools</b>	
<b>Grid ref</b>	SH 34215 93569	
<b>Access</b>	Yes	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>Numerous brackish pools are present on the headland owned by the National Trust north of Felin Gafnan.</p> <p>The pools are above high tide mark and appear to be fed by freshwater flushes, but will be affected at times by sea spray. The ponds are within the rocky outcrops on the cliffs.</p> <p>The majority of the pools did not contain any macrophytes, although some contained sea rush (<i>Juncus maritimus</i>).</p>		<p>Spring 2012</p>
<p><b>Surveys:</b>  <b>Habitat Characterisation</b>                  Summer 2011  <b>Macroinvertebrates</b>                  September 2011 and April 2012</p>		

<b>Site ref</b>	<b>Neuadd (Cemlyn tributary stream)</b>
<b>Grid ref</b>	SH 33408 92762 to SH 33449 92453
<b>Access</b>	Variable
<b>Wetted</b>	Partial
<b>Reach Characteristics and Management Issues</b>	
<p>At Neuadd, the stream is straightened and split alongside the east and west sides of the Cemlyn Road. Most of the flow is in the westerly channel, which supports a small covering of macrophytes. The westerly channel is confined to the right bank by a field boundary and dry stone wall. It is no more than 0.75m wide and 10cm deep, and flows in riffles and runs over a predominantly gravel substrate. It is bordered and shaded by gorse shrub in a few places, particularly in the downstream reach just before its confluence with the Penyrsedd Stream.</p> <p>Both east and west channels lie adjacent to improved pasture, with little stream shading.</p> <p>Further upstream, the watercourse turns east under the Cemlyn Road, broadens and flows through improved grassland fields.</p>	
<b>Surveys:</b>	
<b>Diatom</b>	
Winter 2011/2012 and quarterly since winter 2012/2013	
<b>Water Quality</b>	
Quarterly since winter 2012/2013	
<b>Habitat Characterisation</b>	
Autumn 2011	
<b>Macroinvertebrates</b>	
Spring and autumn 2014	
<b>Macrophytes</b>	
Summer 2014	



Winter 2013 eastern channel facing upstream



Winter 2013 western channel facing upstream

<b>Site ref</b>	<b>Penrhyn</b>
<b>Grid ref</b>	SH 36617 93767
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>The Penrhyn site consists of a wetland area into which groundwater emerges from a concreted spring on the Penrhyn coastal headland. A small pool has formed and is surrounded by wetland vegetation; water then flows down towards scree and rocks to join the beach.</p> <p>The flush is well vegetated with abundant brooklime (<i>Veronica beccabunga</i>), marsh arrow-grass (<i>Triglochin palustris</i>), cuckooflower (<i>Cardamine palustris</i>) and watercress (<i>Nasturtium officinale</i>).</p> <p>The water depth is approximately 10cm. No directional flow was perceived and no defined channel exists within the site area.</p>	



Summer 2013

**Surveys:**

**Diatom**  
Autumn 2013, winter/spring/autumn 2014

**Water Quality**  
Summer 2013, autumn 2013, winter/spring/autumn 2014

**Habitat Characterisation**  
Summer 2013

**Macroinvertebrates**  
May 2012, April 2013, June/July 2013, May and October 2014



Winter 2014

<b>Site ref</b>	<b>Pont Cafnan Wetland</b>
<b>Grid ref</b>	SH 34077 93158
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>An area of fen and marshy grassland is present to the west of Pont Cafnan. The fen is fed by a small, temporary stream.</p> <p>Water levels in the fen are variable; during wetter periods, the area has areas of shallow open water but can dry out.</p> <p>The fen is similar to Tre'r Gof SSSI, with common reed and a similar flora in the low-lying marshy areas, albeit not as species-rich. Species include gipsywort, marsh cinquefoil and marsh bedstraw.</p>	
<b>Surveys (no survey programme 2014):</b>	
<b>Habitat Characterisation</b>	
September 2011	
<b>Macroinvertebrates</b>	
September 2011, April 2012, July 2012, June/July 2013, August 2013.	



Spring 2012



Summer 2013

<b>Site ref</b>	<b>Porth Wylfa, Porth Wylfa Pond, Tre'r Gof SSSI)</b>
<b>Grid ref</b>	SH 35994 93798 to SH 35698 93695
<b>Access</b>	Yes
<b>Wetted</b>	Yes

**Reach Characteristics and Management Issues**

**Porth Wylfa:**

This watercourse flowing into Porth Wylfa runs through the Tre'r Gof SSSI. The SSSI wetland area is wetted all year round and ensures a permanently wetted channel around its margin. The watercourse flows from west to east across the south of the SSSI before turning north to Porth Wylfa.

The watercourse is silt dominated, approximately 80cm wide and 10cm deep in summer 2012. Previous visits have seen significant variation in the wetted channel width and depth, with corresponding change in macrophyte cover, both aquatic and semi-aquatic. Rush and reed dominate the aquatic flora and extend into the terrestrial environments of the wetland area along the left bank. Tree shading is particularly obvious along the right bank, shading out much of the channel for long periods, which reduces in-channel macrophyte growth. The channel is well defined at the upstream and downstream ends, but the central part is less defined with very shallow ditch flow types (slack/backwater) and areas of marshy grassland.

It is likely that the watercourse has been historically modified to follow the field boundary, with evidence in summer 2011 of channel maintenance (weed cut/dredge) at the downstream end. During 2011, a hydrometry station was positioned in the stream, and a cutting regime undertaken on the higher ground beyond the wetland SSSI. Although not observed, the riparian zone may be affected by grazing as, during the course of 2012, several dead sheep were recorded in, or adjacent to, the channel.

The sampling site was moved from the 2011 site during the 2012 and 2013 monitoring due to a more representative and deeper water site being identified which would aid sample collection. This should have no impact on the validity of data collected. The 2011 samples (SH 35698 93695) were taken approximately 200m upstream of the 2012/2013 site (SH 35994 93798).

**Tre'r Gof SSSI:** Comprises many freshwater habitats including a number of ditches, a stream, pond and marshy area.

The stream flows from east to west across the centre of the site. The marshy area is in the western part of the SSSI. Aquatic macrophytes species included bog pondweed (*Potamogeton polygonifolius*), marsh marigold (*Caltha palustris*), yellow iris (*Iris pseudacorus*), water mint, lesser water-parsnip (*Berula erecta*) and marsh pennywort.



Summer 2013 facing upstream



Winter 2013 facing upstream



Spring 2012 Marshy area at Tre'r Gof SSSI



Spring 2012 Porth Wylfa Pond in Tre'r Gof SSSI

<p><b>Porth Wylfa Pond:</b> A large pond is present within the western boundary of the SSSI. The pond is fed by a ditch and is retained as an open area of shallow water by cattle poaching. Macrophytes included soft-rush, floating sweet-grass and yellow iris.</p>	
<p><b>Porth Wylfa surveys:</b>  <b>Fish</b>  Autumn 2013  <b>Macrophytes</b>  Summer 2012 &amp; 2013  <b>Diatom</b>  Quarterly since summer 2011  <b>Water Quality</b>  Quarterly since winter 2011/2012  <b>Habitat Characterisation</b>  Summer 2011  <b>Macroinvertebrates</b>  Spring and autumn 2014</p> <p><b>Tre'r Gof SSSI surveys:</b>  <b>Habitat Characterisation</b>  Winter 2014  <b>Macroinvertebrates</b>  June 2011, April 2012, May 2012, July 2012, April 2013, June/July 2013, Aug 2013, spring and autumn 2014  <b>Diatom</b>  Spring and autumn 2014  <b>Water Quality</b>  Spring and autumn 2014</p> <p><b>Porth Wylfa Pond surveys:</b>  <b>Habitat Characterisation</b>  Winter 2014  <b>PSYM</b> – summer 2014  <b>Macroinvertebrates</b>  April 2012, June/July 2013.  <b>Diatom</b>  Spring and autumn 2014  <b>Water Quality</b>  Spring and autumn 2014</p>	

<b>Site ref</b>	<b>Porth-y-pistyll</b>
<b>Grid ref</b>	SH 34786 93651 to SH 34967 93555
<b>Access</b>	Yes
<b>Wetted</b>	Ephemeral
<b>Reach Characteristics and Management Issues</b>	
<p>The stream runs northerly along the western boundary of the Existing Power Station through boggy wet grassland. The stream originates from a culvert structure adjacent to the Existing Power Station gates, where a drain cover suggests a modified subterranean watercourse. In summer, this part of the stream is dry and covered in dense bramble and gorse.</p> <p>The channel is wetted for approximately 200m south of the shoreline in autumn, drying in the upper reaches over summer. A tributary 75m upstream from the shoreline and flowing from elevated gorse and tall shrub contributes a significant proportion of total summer flow.</p> <p>With the exception of the downstream 75m there is no defined channel, with an increase in wetland species (emergent rush and reed) marking the extent of the channel. The channel appears unmodified, following an undefined channel form. Wetland species dominate the left hand bank margin.</p> <p>The downstream end of the watercourse deepens but heavy vegetation (95% cover) causes flow types to be limited to slack and very low energy, depositional glides. The channel is choked year round by terrestrial grasses and a mix of wetland and semi-aquatic plant species throughout its length. Wetted depth is less than 10cm and channel width variable, but rarely more than 50cm. The stream disappears into a culvert immediately above the beach and runs over the shingle foreshore lower down.</p> <p>Signage present in summer 2011 warned of the presence of the invasive species <i>Azolla filiculoides</i>. The sign was taken down by autumn 2012 and no evidence of this species was observed during any of the surveys.</p>	
<p><b>Surveys:</b></p> <p><b>Fish</b> Summer and autumn 2013</p> <p><b>Macrophytes</b> Annually since summer 2012 (not 2014)</p> <p><b>Diatom</b> Quarterly since summer 2011</p> <p><b>Water Quality</b> Quarterly since winter 2011/2012</p> <p><b>Habitat Characterisation</b> Summer 2011</p> <p><b>Macroinvertebrates</b> June 2011, August 2011, May 2012, April 2013, spring/summer/autumn 2014</p>	



Autumn 2011 facing upstream



Winter 2012 facing upstream



Spring 2013

<b>Site ref</b>	<b>Power Station Junction</b>
<b>Grid ref</b>	SH 35542 93189
<b>Access</b>	Yes
<b>Wetted</b>	Ephemeral
<b>Reach Characteristics and Management Issues</b>	
<p>On previous surveys, this site had been recorded as dry. During the winter 2012/2013 surveys of Power Station Pond, an outflow was seen to flow (via a culvert) under the Existing Power Station access road resulting in flow (north to south) at the Power Station Junction site.</p> <p>This site is a very shallow ephemeral field drain. There was evidence that the watercourse has been wetted over winter; silt was observed mid channel, as well as the semi-aquatic rush <i>Juncus</i> sp. and isolated reed species. Terrestrial grasses and rush still dominate the stream flora and the watercourse was sampled for diatoms from submerged reed bases.</p> <p>The wetted width was &lt;1m whilst water depth was &lt;0.1m with a silt bed. Slow glide and slack flow types were recorded resulting in deposition of silt. The site is unlikely to support species of conservation interest.</p> <p>Grazing and poaching pressure from sheep was evident along the improved grassland on the right bank. The left bank was constrained by a low brick wall and tarmac road.</p>	
<p><b>Surveys:</b></p> <p><b>Diatom</b> Winter 2012/2013, spring 2013, autumn 2014</p> <p><b>Water Quality</b> Winter 2012/2013, spring 2013, autumn 2014</p> <p><b>Habitat Characterisation</b> Winter 2012</p> <p><b>Macroinvertebrates</b> April 2012, May 2012, April 2013, autumn 2014</p> <p><b>Macrophytes</b> August 2014</p>	



Summer 2011 downstream, facing upstream



Summer 2011 upstream, facing downstream



Winter 2012 upstream, facing downstream

<b>Site ref</b>	<b>Power Station Ponds</b>
<b>Grid ref</b>	SH 35495 93113
<b>Access</b>	Yes
<b>Wetted</b>	One wet, one dry

**Reach Characteristics and Management Issues**

Two ponds (1 and 2) were identified to the west of the main road leading to the Existing Power Station.

The pond nearest the station (1) was wetted in all seasons and covered in submerged macrophytes (see photo). The pond was surrounded by tall herb and rough grassland, leading to marginal stands of rush and reed. In summer, the pond margins show evidence of seasonal reduction in water levels and the exposure of soft sediments. There were no obvious signs of modification to the pond or recent management and, other than the linkage to the second pond, this water-body appeared offline from a riverine input.

Shallow through the margins (0.1m) the pond deepens to 1.5m in its centre over a soft silt bed. In summer, submerged macrophytes choke (>90%) of the pond. The presence of water fern *Azolla filiculoides*, a non-native invasive species, was noted throughout the survey period (2011–2013), which had seasonal changes in coverage.

The second pond (2), linked to the first by a ditch both of which were dry in 2011, is dominated by terrestrial grasses and rush *Juncus* sp., associated with damp ground and marginal aquatic habitats. The pond, ditch and marshy area were wetted in 2012 and included in the macroinvertebrate survey area. In 2014, the pond was 20cm deep and thickly grown over with duckweed *Lemna minuta* and *Azolla filiculoides*. Pale galingale *Cyperus eragrostis* was also present – a non-native (but not invasive) species.

**Surveys (Power Station Pond 1):**

**Fish**

Spring 2012, summer 2012

**Diatom**

Spring 2012 & 2013, winter 2012/2013, autumn 2013

**Water Quality**

Winter 2012/2013, spring 2013, autumn 2013

**Habitat Characterisation**

Summer 2012

**Macroinvertebrates**

June 2011, August 2011, April 2012, May 2012, April 2013, Aug 2013

**PSYM surveys (Pond 1)**

Summer 2012 and 2014

**PSYM surveys (Pond 2)**

Summer 2014



Summer 2011 Pond 1



Spring 2013 marshy area



Summer 2013 Pond 1



Autumn 2013 Pond 1



August 2014 Pond 2

<b>Site ref</b>	<b>Tan-yr-allt Ditch</b>	
<b>Grid ref</b>	SH 34909 93222 (site 2) SH 34889 93342 (site 3)	
<b>Access</b>	Yes	
<b>Wetted</b>	Seasonally	
<b>Reach Characteristics and Management Issues</b>		
<p>The Tan-yr-allt ditch is a short drainage channel, which is fed by a ditch and pond upstream of an unnamed access road. It is an ephemeral waterbody (it flows seasonally and is dry for much of the year). Approximately 100m upstream from its confluence with Porth-y-pistyll (the main watercourse flowing into Porth-y-pistyll Bay), it changes from a shaded, shallow field boundary channel to an undefined course. It is suspected to flow over and through ground before reforming as a channel near its confluence with Porth-y-pistyll.</p>		
<b>Surveys:</b>		
<p><b>Habitat Characterisation</b> August 2014 <b>Water Quality</b> Summer and autumn 2014 <b>Macroinvertebrates</b> October 2014. <b>Macrophytes</b> Summer 2014</p>		
		<p>Tan-yr-allt ditch - site 3 (100m downstream of site 2)</p>

<b>Site ref</b>	<b>Tan-yr-allt Pond</b>	
<b>Grid ref</b>	SH 34963 93047	
<b>Access</b>	Yes	
<b>Wetted</b>	Seasonally	
<b>Reach Characteristics and Management Issues</b>		
<p>A large pond situated at a topographical low on a field boundary between two pasture fields.</p> <p>An ephemeral ditch bordered by a hedge runs along the field boundary. The ditch spills over into the depression during wet periods, forming the pond. It is also hydrologically connected to the Tan-yr-allt ditch downhill to the north (under the road) during high water levels, which ultimately flows into Porth-y-pistyll.</p> <p>The pond is generally species-poor, dominated by floating sweet-grass <i>Glyceria fluitans</i>. Prior to summer 2014, it was heavily poached by cattle and often had a completely earthen/mud substrate. Since the cattle were removed (due to construction of haulage roads), the pond has been fully vegetated.</p>		
<p><b>Surveys:</b></p> <p><b>Water Quality</b> Spring and autumn 2014</p> <p><b>Habitat characterisation</b> Summer 2014</p> <p><b>Diatom</b> Winter and summer 2014</p> <p><b>Macroinvertebrates</b> April 2012, July 2012, June/July 2013</p>		

Spring 2012

Summer 2013

<b>Site ref</b>	<b>Tre'r-Gof-Isaf (Cemaes watercourse)</b>
<b>Grid ref</b>	SH 36860 93614 to SH 36918 93668 and SH 36596 93084 to SH 36641 93167
<b>Access</b>	Yes
<b>Wetted</b>	Yes

**Reach Characteristics and Management Issues**

The watercourse is a modified straightened channel. At the upstream end, the right bank is heavily shaded by shrub backing onto residential properties, contributing some leaf litter to the stream. The left bank is open to improved grassland and a private track. Upstream of this, the watercourse runs alongside the A5025, with a small weir structure and is culverted beneath the road. Further downstream, the marginal scrub prevents access to the stream whilst the private road crosses the watercourse by a clear span bridge.

The mid section of the reach has not been assessed due to lack of land access.

The downstream section of the reach, towards Cemaes Bay, is over-deepened, straightened and situated within residential land-use. The channel is heavily shaded by riparian scrub. Large stands of non-native *Gunnera* sp. are present at the downstream end.

The channel is approximately 1m wide, with 0.15m water depth. The flow types recorded were predominantly run and glide. The watercourse is erosional and has a semi-consolidated cobble and pebble bed material.

In spring 2014, there was a large quantity of residential debris (sofa cushions) in the waterbody.

**Surveys** (At the downstream end):

**Macrophytes**

Summer 2013 & 2014

**Diatom**

Quarterly since winter 2012/2013

**Water Quality**

Quarterly since winter 2012/2013

**Habitat Characterisation**

Ongoing since winter 2012/2013

**Macroinvertebrates**

June/July 2013, spring and autumn 2014



Winter 2013 facing upstream towards road



Winter 2013 100m downstream from A5025, facing upstream



Spring 2013 100m upstream from Cemaes Bay discharge, facing downstream



Spring 2013 100m upstream from Cemaes Bay discharge, facing upstream

<b>Site ref</b>	<b>West of A5025 junction with Cemlyn road (Cafnan watercourse)</b>
<b>Grid ref</b>	SH 34148 91385
<b>Access</b>	No
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Upstream of the access road, the watercourse appears wetted and characteristic of lowland Welsh rivers with run and pool flow types. Aquatic and semi-aquatic macrophytes dominate the channel form.</p> <p>The channel runs alongside improved pasture and bordered along the left bank by the field margin. It is expected that this channel will fill in wetter months and contribute to the flow observed downstream.</p> <p>Bridged over the access road, the stream disappears into residential garden with the channel heavily shaded by marginal and ornamental plants. Access was not permitted; however, the modified nature of this watercourse through this garden section would make it unsuitable for further survey.</p> <p>This survey site is now out of the Wylfa Newydd Development Area and 500m buffer boundary.</p>	
<p><b>Surveys:</b>  <b>Habitat Characterisation</b>                  Summer 2011 – undertaken from public access areas only</p>	

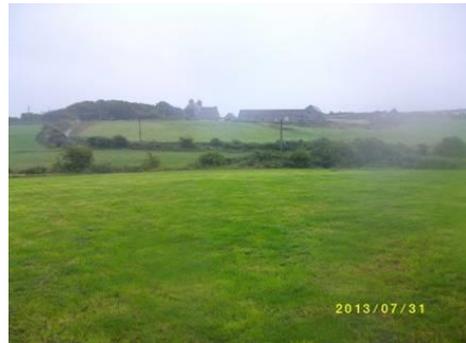


Summer 2011 looking south of Cemlyn road, facing downstream



Summer 2011 looking north of Cemlyn road, facing downstream

<b>Site ref</b>	<b>U/S Neuadd (Cemlyn tributary stream)</b>
<b>Grid ref</b>	SH 33467 92440 to SH 33588 92242
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>The stream at the U/S Neuadd site is narrow with channel banks of approximately 1m–2m in height. The stream forms a field boundary with rough pasture on the right bank and improved grassland (hay meadow) on the left bank side. The channel is heavily shaded throughout and has a cobble-gravel substrate. Flow is mainly run-riffle and was very shallow (&lt;20cm) at time of survey (summer 2013).</p> <p>Throughout the entire reach, there is evidence of channel realignment around field boundaries and channelized with dry stone walls on one or other bank. Over-deepening was also evident in places.</p> <p>Both banks are steep for most of the reach (except at the downstream end) and realignment and over-deepening has probably taken place to increase stream capacity and defend against flooding of farmland.</p> <p>The reach is unfenced along the right bank but bordered by hawthorn hedges and is fenced along the left bank. A dry stone wall is present along the left bank at the downstream end of the reach. Macrophytes are present throughout, covering up to 10% of the water surface.</p> <p>Towards the downstream end of the reach, the channel broadens slightly and there is a decrease in marginal cover. The channel continues to be shallow with a gravel-cobble substrate and continues to run through pasture.</p>	
<b>Surveys:</b>	
<b>Fish</b>	
Summer 2013, autumn 2013	
<b>Macrophytes</b>	
Summer 2013	
<b>Diatom</b>	
Summer 2013, autumn 2013, winter/spring/autumn 2014	
<b>Water Quality</b>	
Summer 2013, autumn 2013, winter/spring/autumn 2014	
<b>Habitat Characterisation</b>	
Summer 2013	
<b>Macroinvertebrates</b>	
Spring and autumn 2014	



Summer 2013 general view of channel location



Summer 2013 upstream, looking downstream

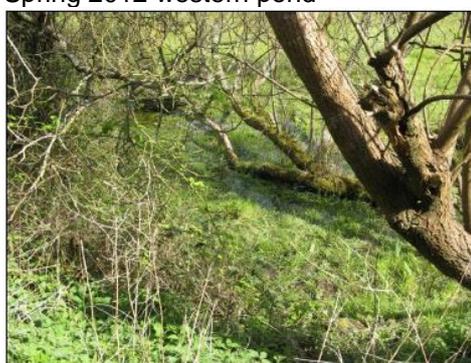


Summer 2013 mid-reach, looking upstream

<b>Site ref</b>	<b>Wylfa Hall Pond</b>
<b>Grid ref</b>	SH 35542 93751
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Two temporary ponds are situated either side of the road leading to Wylfa Hall car park.</p> <p>The ponds appear to be fed from the network of ditches leading from Tre'r Gof SSSI. Both ponds are shaded.</p> <p>The western pond has a mud substrate and supports great willow herb. This pond has a low macrophyte cover.</p> <p>The eastern pond has high macrophyte coverage with yellow iris, common water-starwort and floating sweet-grass.</p>	
<p><b>Surveys:</b>  <b>Macroinvertebrates</b>            April 2012 and April 2013.  <b>Habitat Characterisation</b>            Winter 2014  <b>Water quality</b>            Winter/spring/autumn 2014  <b>Diatom</b>            Winter/spring 2014</p>	



Spring 2012 western pond



Spring 2012 eastern pond

<b>Site ref</b>	<b>Wylfa Head Pools</b>
<b>Grid ref</b>	SH 35418 94549
<b>Access</b>	Yes
<b>Wetted</b>	Yes
<b>Reach Characteristics and Management Issues</b>	
<p>Numerous brackish pools are present on the rocky outcrops on the Wylfa headland.</p> <p>These are small, shallow, temporary pools situated above the high tide mark but will be affected at times by sea spray.</p> <p>The pools are mostly unshaded and do not support aquatic macrophytes.</p>	
<p><b>Surveys:</b>  <b>Macroinvertebrates</b>            September 2011 and April 2012  <b>Habitat Characterisation</b>            Winter 2014</p>	



Spring 2012

<b>Site ref</b>	<b>Bwlch Pond</b>	
<b>Grid ref</b>	SH 35246 91598	
<b>Access</b>	From summer 2014	
<b>Wetted</b>	No	
<b>Reach Characteristics and Management Issues</b>		
<p>This is a 20m x 10m depression at the boundary of an arable field and pasture. At the time of characterisation, it was dry with boggy areas. The substrate is composed of silt/earth/organic matter. The landowner confirms that the area is wetted in winter, and the waterline is roughly indicated by the rush-border in the pasture.</p>		
<p>The topography of the land is sloping, and the pond is likely to receive run-off principally from the arable land use due to bare soils (barley, in summer 2014).</p>		
<p>The pond was largely dominated by floating sweet-grass <i>Glyceria fluitans</i>, with borders and patches of rushes <i>Juncus effusus</i> and <i>J. acutiflorus</i>. There was a small patch of water fern <i>Azolla filiculoides</i> growing on bare mud near the field boundary, near to isolated plants of watercress <i>Rorippa nasturtium-aquaticum</i> and fool's watercress <i>Apium nodiflorum</i>.</p>		
<p>The pond has no particular riparian buffer, and is likely to be affected by poaching by livestock when wetted.</p>		
<b>Surveys:</b>		
<b>Habitat characterisation</b>		
Summer 2014		

Summer 2014 (*Azolla* below)

<b>Site ref</b>	<b>Tyddyn-Goronwy</b>	
<b>Grid ref</b>	SH 35915 93316	
<b>Access</b>	From May 2014	
<b>Wetted</b>	Ephemeral	
<b>Reach Characteristics and Management Issues</b>		
<p>This is an ephemeral ditch, which runs alongside a banked field boundary. It begins in an adjacent field to the east, and halfway down the bank it crosses into the pasture on the west.</p> <p>The channel is up to 1.5m wide, with low banks where it borders pasture. Its substrate is earth and plant matter, and the channel is well bordered by tall rush margins and gorse in places. The land use on both sides is rough sheep pasture. The connectivity with the floodplain is good; after rainfall events, boggy patches would form in the rush areas. OS maps suggest the ditch is fed by a small pond, but this was not obvious in the field and, as such, the ditch is more likely to receive drainage from the gently sloping pastures.</p> <p>There is very little riparian buffer apart from rush margins and the high-shrub bank running down the first half of the field.</p> <p>The channel vegetation consists largely of rushes <i>Juncus sp.</i>, and patches of fool's watercress <i>Apium nodiflorum</i> amongst terrestrial grasses and willowherb <i>Epilobium sp.</i></p>		<p>Spring 2014</p> 
<p><b>Surveys:</b>  <b>Habitat characterisation</b>          May 2014  <b>Water quality</b>          October 2014</p>		

<b>Site ref</b>	<b>Penyrorsedd (Cemlyn tributary stream)</b>	
<b>Grid ref</b>	SH 33184 92626	
<b>Access</b>	From Feb 2014	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>This is a permanently wetted ditch, which runs alongside a dry stone wall field boundary. It is fed by Penyrorsedd Pond (in an adjacent field) and drains the surrounding pastures.</p> <p>The channel is up to 2m wide, and 40cm deep, with 30cm–40cm high banks where it borders the pasture. In places, the banks are heavily poached and slope gently to the watercourse. In the middle of the reach, there is a large ponded area with stands of <i>Typha latifolia</i> and tall rushes. Throughout there is a very soft silt and organic matter substrate, and the water is usually turbid with few plants except patches of rushes <i>Juncus sp.</i> and starwort <i>Callitriche sp.</i></p> <p>Towards the end of the reach, near its confluence with the Cemlyn tributary stream, it becomes narrower and heavily shaded by gorse, with a firmer substrate of gravel and cobbles. The stream is then culverted under the road before discharging to Cemlyn lagoon.</p>		<p>Winter 2014 looking downstream</p> 
<p><b>Surveys:</b>  <b>Habitat characterisation</b>  Feb 2014  <b>Diatom</b>  Feb, May &amp; October 2014  <b>Water quality</b>  Feb, May &amp; October 2014  <b>Macroinvertebrates</b>  May &amp; October 2014  <b>Fish</b>  Summer 2014  <b>Macrophytes</b>  Summer 2014</p>		<p>Winter 2014 widened ponded area of Penyrorsedd ditch</p>

<b>Site ref</b>	<b>Penyrorsedd Pond (Cemlyn tributary stream)</b>	
<b>Grid ref</b>	SH 33039 92547	
<b>Access</b>	From May 2014	
<b>Wetted</b>	Yes	
<b>Reach Characteristics and Management Issues</b>		
<p>This is a large 15m x 8m permanently wetted pond, bordered by a high dry stone wall for 55% of its margin and improved pasture for the remainder. The earthen banks are roughly 25cm high and heavily poached, as it is a watering hole for cattle. The pond is unshaded and very turbid, with high levels of suspended green algae, and the depth is greater than 45cm. The substrate is mostly silt and mud with small marginal areas of gravel.</p> <p>There were sparse macrophytes present at the water edges – mainly <i>Callitriche</i> sp. and marginal <i>Juncus</i> sp. with small patches of <i>Lemna minuta</i>.</p> <p>It has a small outflow under the dry stone wall which feeds the Penyrorsedd Stream.</p>		
<p><b>Surveys:</b>  <b>Habitat characterisation</b>                  May 2014  <b>Diatom</b>                  May &amp; October 2014  <b>Water quality</b>                  May &amp; October 2014  <b>PSYM</b>                  August 2014</p>		<p>May 2014 PSYM survey</p>

<b>Site ref</b>	<b>Tregele Pond</b>
<b>Grid ref</b>	SH 35361 92575
<b>Access</b>	From Feb 2014
<b>Wetted</b>	Ephemeral
<b>Reach Characteristics and Management Issues</b>	
<p>This pond is roughly 15m x 3m, rectangular and dominated by greater reedmace <i>Typha latifolia</i> and duckweed <i>Lemna minuta</i>. It is at the top of a hillock and is bordered by shrubs and a rubble road/recently demolished property. The substrate is made up of silt and decayed plant matter, and the water depth has varied from 5cm to 20cm. It is partly shaded in summer by overhanging trees/shrubs.</p> <p>It does not appear to have any in/outflows, but the water level seems to be very responsive: the pond fills quickly after rainfall, drying out to puddles in summer.</p>	
<p><b>Surveys:</b>  <b>Habitat characterisation</b>  Feb 2014  <b>Diatom</b>  May &amp; October 2014  <b>Water quality</b>  May &amp; October 2014  <b>PSYM</b>  August 2014</p>	



Feb 2014



**Appendix B Water Quality**

**Table AB-1: Water temperature (°C) data from freshwater sites surveyed, 2012-2014**

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	5.8	9.77	-	-	-	-	-	11.90
	Wylfa Hall Pond	-	-	-	-	-	-	-	8.03	13.30	-	11.50
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	12.10
	Power Station Pond	-	-	-	1.94	10.48	-	10.74	-	10.50	-	13.60
	Porth Wylfa Pond	-	-	-	-	-	-	-	10.20	18.50	-	13.50
	Porth Wylfa	9.62	10.07	15.6	2.55	6.66	-	10.23	-	14.10	-	11.80
	Tre'r Gof SSSI	-	-	-	-	-	-	-	8.62	12.70	-	11.80
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	12.50
	Tregele Pond	-	-	-	-	-	-	-	7.28	-	-	11.90
	Tan-yr-allt Pond	-	-	-	-	-	-	-	6.7	11.30	-	11.90
	Cae Gwyn SSSI	-	-	-	-	-	-	-	5.94	11.60	-	-
	Groes-fechan	-	-	-	4.27	10.91	17.04	10.60	6.02	10.60	-	-
	Caerdegog Isaf	-	-	-	-	10.14	17.53	10.90	-	11.30	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	12.70	19.66	10.6	8.12	12.50	-	-
	Hafnan	-	-	-	-	11.74	17.81	9.54	-	12.60	-	-
	Cafnan	9.86	12.79	13.42	3.13	9.86	20.08	10.23	7.64	10.40	-	-
	Felin Gafnan East	9.65	11.19	16.86	3.59	13.44	17.59	9.76	-	-	-	-
Felin Gafnan Confluence	9.75	10.74	16.24	3.55	12.14	17.53	9.67	-	10.60	-	11.10	
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	9.21	12.80	-	13.40
	Penyrsedd	-	-	-	-	-	-	-	9.72	11.20	-	12.60
	US Neuadd	-	-	-	-	-	17.59	10.60	9.12	12.70	-	12.10
	Neuadd	-	-	-	-	13.19	20.36	10.70	-	11.60	-	12.00
Cemaes	Foel Fawr	-	-	-	-	-	-	10.13	8.64	11.60	-	11.90
	Gwyddelyn Bach	-	-	-	5.03	12.06	16.95	9.81	-	-	-	11.50
	Tre'r-gof-isaf	-	-	-	4.65	6.42	16.48	10.98	-	10.50	-	12.10
Other	Penrhyn	-	-	-	-	-	10.83	11.4	10.60	10.10	-	11.80
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	14.20	12.20
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	11.70
	Porth-y-pistyll	10.12	10.86	13	7.75	9.86	14.79	12.23	-	10.70	13.70	12.90

Table AB-2: Conductivity (mS cm<sup>-3</sup>) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	0.286	0.336	-	-	-	-	-	0.266
	Wylfa Hall Pond	-	-	-	-	-	-	-	0.632	0.347	-	0.219
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	0.495
	Power Station Pond	-	-	-	0.185	0.361	-	0.298	-	0.319	-	0.272
	Porth Wylfa Pond	-	-	-	-	-	-	-	0.372	0.443	-	0.501
	Porth Wylfa	0.381	0.466	0.595	0.349	0.443	-	0.380	-	0.539	-	0.514
	Tre'r Gof SSSI	-	-	-	-	-	-	-	0.356	0.582	-	0.640
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	0.366
	Tregele Pond	-	-	-	-	-	-	-	0.380	-	-	0.266
	Tan-yr-allt Pond	-	-	-	-	-	-	-	0.242	0.112	-	0.45
	Cae Gwyn SSSI	-	-	-	-	-	-	-	0.270	0.218	-	-
	Groes-fechan	-	-	-	0.245	0.283	0.445	0.228	0.153	0.337	-	-
	Caerdegog Isaf	-	-	-	-	0.285	0.487	0.268	-	0.325	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	0.353	0.422	0.293	0.134	0.365	-	-
	Hafnan	-	-	-	-	0.251	0.400	0.223	-	0.300	-	-
	Cafnan	0.250	0.281	-	0.217	0.252	0.492	0.212	0.217	0.294	-	-
	Felin Gafnan East	0.251	0.273	0.362	0.223	0.280	0.412	0.214	-	-	-	-
	Felin Gafnan Confluence	0.252	0.273	0.364	0.221	0.271	0.411	0.208	-	0.297	-	0.229
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	0.358	0.513	-	0.486
	Penyrsedd	-	-	-	-	-	-	-	0.326	0.382	-	0.452
	US Neuadd	-	-	-	-	-	0.407	0.246	0.240	0.320	-	0.304
	Neuadd	-	-	-	0.242	0.310	-	0.244	-	0.308	-	0.302
Cemaes	Foel Fawr	-	-	-	-	-	-	0.23	0.228	0.271	-	0.268
	Gwyddelyn Bach	-	-	-	0.292	0.311	0.498	0.591	-	-	-	0.340
	Tre'r-gof-isaf	-	-	-	0.310	0.363	0.516	0.319	-	0.393	-	0.305
Other	Penrhyn	-	-	-	-	-	0.475	0.578	0.442	0.459	-	0.484
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	0.388	0.333
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	0.270
	Porth-y-pistyll	0.438	0.231	0.603	0.446	0.451	0.526	0.412	-	0.412	0.440	0.425

Table AB-3: Dissolved oxygen (%) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	83.2	80.5	-	-	-	-	-	45.6
	Wylfa Hall Pond	-	-	-	-	-	-	-	53.5	104.9	-	37.8
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	52.6
	Power Station Pond	-	-	-	51.8	20.0	-	49.6	-	65.9	-	53.0
	Porth Wylfa Pond	-	-	-	-	-	-	-	135.0	68.0	-	97.7
	Porth Wylfa	69.8	65.1	52.7	78.2	65.6	-	66.8	-	81.0	-	68.8
	Tre'r Gof SSSI	-	-	-	-	-	-	-	73.5	61.3	-	55.8
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	29.1
	Tregele Pond	-	-	-	-	-	-	-	32.3	-	-	45.6
	Tan-yr-allt Pond	-	-	-	-	-	-	-	45.9	57.8	-	53.2
	Cae Gwyn SSSI	-	-	-	-	-	-	-	39.5	79.7	-	-
	Groes-fechan	-	-	-	79.6	76.9	77.2	55.0	79.2	113.7	-	-
	Caerdegog Isaf	-	-	-	-	77.5	80.4	82.0	-	104.8	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	89.7	71.3	69.5	86.1	96.0	-	-
	Hafnan	-	-	-	-	91.7	72.9	87.1	-	104.2	-	-
	Cafnan	88.6	104.4	62.4	96.6	99.3	81.4	80.9	95.6	105.8	-	-
	Felin Gafnan East	92.5	102.0	70.7	97.4	103.9	69.5	79.1	-	-	-	-
	Felin Gafnan Confluence	90.1	103.8	93.9	102.3	96.6	93.0	88.0	-	108.0	-	102.0
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	92.6	124.9	-	94.9
	Penyrsedd	-	-	-	-	-	-	-	90.8	86.8	-	57.7
	US Neuadd	-	-	-	-	-	71.0	74.8	101.0	101.1	-	68.1
	Neuadd	-	-	-	102.0	99.9	-	89.8	-	104.0	-	80.0
Cemaes	Foel Fawr	-	-	-	-	-	-	70.6	86.2	89.3	-	58.6
	Gwyddelyn Bach	-	-	-	84.4	81.8	53.1	61.5	-	-	-	71.2
	Tre'r-gof-isaf	-	-	-	91.0	96.4	78.7	87.3	-	106.5	-	78.5
Other	Penrhyn	-	-	-	-	-	47.5	40.0	69.5	98.4	-	63.6
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	92.5	83.3
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	75.0
	Porth-y-pistyll	94.6	99.5	81.1	96.2	104.5	89.4	87.3	-	117.3	71.8	87.7

Table AB-4: pH data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	6.48	6.26	-	-	-	-	-	6.09
	Wylfa Hall Pond	-	-	-	-	-	-	-	5.58	6.85	-	8.15
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	-
	Power Station Pond	-	-	-	5.50	6.07	-	5.95	-	5.97	-	5.87
	Porth Wylfa Pond	-	-	-	-	-	-	-	6.70	6.89	-	8.57
	Porth Wylfa	6.79	6.9	7.13	6.13	6.66	-	7.27	-	7.03	-	8.57
	Tre'r Gof SSSI	-	-	-	-	-	-	-	6.38	6.39	-	8.46
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	-
	Tregele Pond	-	-	-	-	-	-	-	5.74	-	-	6.09
	Tan-yr-allt Pond	-	-	-	-	-	-	-	5.37	5.69	-	5.59
	Cae Gwyn SSSI	-	-	-	-	-	-	-	7.22	5.82	-	-
	Groes-fechan	-	-	-	6.66	6.50	7.45	7.02	7.16	6.44	-	-
	Caerdegog Isaf	-	-	-	-	6.42	7.82	6.98	-	7.25	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	6.85	7.58	6.68	6.43	7.15	-	-
	Hafnan	-	-	-	-	6.89	7.54	6.16	-	7.20	-	-
	Cafnan	6.93	7.33	7.09	6.45	6.23	7.45	6.96	6.52	6.75	-	-
	Felin Gafnan East	6.92	7.25	7.10	6.54	7.05	7.51	7.18	-	-	-	-
	Felin Gafnan Confluence	7.06	7.28	7.48	6.73	7.22	8.55	7.42	-	7.24	-	8.41
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	6.74	7.60	-	7.48
	Penyrsedd	-	-	-	-	-	-	-	6.48	6.48	-	6.41
	US Neuadd	-	-	-	-	-	7.69	6.91	6.68	7.07	-	6.78
	Neuadd	-	-	-	6.75	7.54	8.02	7.1	-	7.74	-	7.05
Cemaes	Foel Fawr	-	-	-	-	-	-	6.88	6.27	6.83	-	8.00
	Gwyddelyn Bach	-	-	-	6.82	7.00	7.47	7.51	-	-	-	8.04
	Tre'r-gof-isaf	-	-	-	7.07	7.42	8.59	7.32	-	7.22	-	8.50
Other	Penrhyn	-	-	-	-	-	6.68	6.42	6.04	6.00	-	7.57
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	7.25	6.95
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	6.53
	Porth-y-pistyll	6.91	7.57	7.01	6.63	6.69	6.93	7.16	-	6.86	6.9	7.14

Table AB-5: Suspended solid concentrations (mg L<sup>-1</sup>) from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<3.00	4.85	-	-	-	-	-	27.20
	Wylfa Hall Pond	-	-	-	-	-	-	-	5.85	22.40	-	7.93
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	307.00
	Power Station Pond	-	-	-	3.03	6.75	-	173.00	-	81.80	-	46.90
	Porth Wylfa Pond	-	-	-	-	-	-	-	13.90	69.60	-	15.10
	Porth Wylfa	-	21.30	6.18	19.90	29.70	52.50	26.60	-	13.40	-	5.13
	Tre'r Gof SSSI	-	-	-	-	-	-	-	121.00	81.20	-	6.93
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	26.90
	Tregele Pond	-	-	-	-	-	-	-	52.00	-	-	16.70
	Tan-yr-allt Pond	-	-	-	-	-	-	-	63.40	88.00	-	60.40
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<3.00	9.42	-	-
	Groes-fechan	-	-	-	<3.00	13.10	10.10	4.32	3.05	<3.00	-	-
	Caerdegog Isaf	-	-	-	-	11.20	7.52	8.18	-	<3.00	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	7.60	-	4.68	7.55	12.00	-	-
	Hafnan	-	-	-	-	18.70	35.20	7.95	-	12.60	-	-
	Cafnan	-	19.60	8.83	21.30	36.60	17.20	11.40	11.00	73.10	-	-
	Felin Gafnan East	-	5.17	7.18	13.80	54.20	5.77	18.80	-	-	-	-
	Felin Gafnan Confluence	-	10.40	6.38	21.50	23.10	7.07	8.42	-	7.70	-	6.28
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	5.15	91.10	-	18.40
	Penyrsedd	-	-	-	-	-	-	-	18.60	20.00	-	72.70
	US Neuadd	-	-	-	-	-	6.77	3.53	4.05	8.30	-	11.30
	Neuadd	-	-	-	21.20	11.40	22.00	3.28	-	9.05	-	6.20
Cemaes	Foel Fawr	-	-	-	-	-	-	7.42	5.95	9.17	-	102.00
	Gwyddelyn Bach	-	-	-	13.70	28.10	13.70	9.02	-	-	-	5.98
	Tre'r-gof-isaf	-	-	-	7.50	13.60	4.47	7.33	-	106.00	-	17.90
Other	Penrhyn	-	-	-	-	-	3.47	65.70	6.60	5.62	-	28.00
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	55.80	11.00
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	16.20
	Porth-y-pistyll	-	22.00	5.18	3.33	32.60	17.30	3.32	-	7.85	3.70	22.60

Table AB-6: Biological oxygen demand (mg L<sup>-1</sup>) at freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<2.92	<1.0	-	-	-	-	-	5.55
	Wylfa Hall Pond	-	-	-	-	-	-	-	<1.00	3.22	-	18.80
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	12.20
	Power Station Pond	-	-	-	<2.92	1.45	-	6.79	-	7.91	-	4.90
	Porth Wylfa Pond	-	-	-	-	-	-	-	<1.00	3.79	-	3.42
	Porth Wylfa	<1.00	2.50	1.00	<2.92	1.54	1.46	1.86	-	1.21	-	<1.00
	Tre'r Gof SSSI	-	-	-	-	-	-	-	2.68	4.64	-	<1.00
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	>18.70
	Tregele Pond	-	-	-	-	-	-	-	3.20	-	-	6.74
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<2.92	8.19	-	17.30
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<1.00	2.04	-	-
	Groes-fechan	-	-	-	<2.92	<1.00	<1.00	1.16	<1.00	<1.00	-	-
	Caerdegog Isaf	-	-	-	-	1.22	1.54	<2.92	-	<1.00	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	1.05	4.43	<2.92	<1.00	6.45	-	-
	Hafnan	-	-	-	-	1.35	1.84	<2.92	-	1.11	-	-
	Cafnan	<1.00	1.50	1.30	<2.92	1.26	1.89	1.20	1.01	2.57	-	-
	Felin Gafnan East	<1.00	<1.0	1.30	<2.92	1.78	1.20	1.78	-	-	-	-
	Felin Gafnan Confluence	<1.00	1.20	1.40	<2.92	1.48	1.12	1.44	-	1.10	-	1.60
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<1.0	18.10	-	4.63
	Penyrsedd	-	-	-	-	-	-	-	<1.0	1.46	-	2.93
	US Neuadd	-	-	-	-	-	<1.00	<2.92	<1.00	<1.00	-	1.05
	Neuadd	-	-	-	<2.92	1.15	2.00	<2.92	-	<1.00	-	1.4
Cemaes	Foel Fawr	-	-	-	-	-	-	1.26	<1.00	<1.00	-	3.22
	Gwyddelyn Bach	-	-	-	<2.92	1.04	1.51	1.42	-	-	-	<1.00
	Tre'r-gof-isaf	-	-	-	<2.92	<1.00	1.00	<2.92	-	4.12	-	2.26
Other	Penrhyn	-	-	-	-	-	<1.00	<2.92	<1.00	<1.00	-	1.28
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	2.92	1.35
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	2.26
	Porth-y-pistyll	<1.00	<1.00	1.10	<2.92	<1.00	<1.00	<1.00	-	2.74	1.14	2.04

Table AB-7: Orthophosphate (reactive as P) (mg L<sup>-1</sup>) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.020	0.022	-	-	-	-	-	0.595
	Wylfa Hall Pond	-	-	-	-	-	-	-	0.022	0.035	-	0.221
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	0.061
	Power Station Pond	-	-	-	0.021	0.069	-	0.066	-	0.09	-	0.048
	Porth Wylfa Pond	-	-	-	-	-	-	-	0.035	0.178	-	0.123
	Porth Wylfa	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	-	<0.02	-	<0.010
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.02	<0.02	-	<0.010
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	1.080
	Tregele Pond	-	-	-	-	-	-	-	0.126	-	-	0.382
	Tan-yr-allt Pond	-	-	-	-	-	-	-	0.031	0.189	-	1.120
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.020	0.077	-	-
	Groes-fechan	-	-	-	<0.020	<0.020	0.043	<0.020	<0.020	<0.020	-	-
	Caerdegog Isaf	-	-	-	-	<0.020	0.120	0.037	-	<0.02	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.020	0.118	0.038	0.024	<0.02	-	-
	Hafnan	-	-	-	-	0.043	0.152	0.091	-	0.042	-	-
	Cafnan	-	0.033	0.079	0.020	0.030	0.046	0.065	0.054	0.030	-	-
	Felin Gafnan East	-	0.118	0.090	0.020	0.034	0.105	0.073	-	-	-	-
	Felin Gafnan Confluence	-	0.031	0.088	0.020	0.028	0.108	0.069	-	0.039	-	0.043
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	0.247	0.824	-	0.337
	Penyrsedd	-	-	-	-	-	-	-	0.146	0.077	-	0.076
	US Neuadd	-	-	-	-	-	0.038	0.023	<0.020	0.029	-	0.031
	Neuadd	-	-	-	<0.020	<0.020	0.098	0.027	-	0.027	-	0.052
Cemaes	Foel Fawr	-	-	-	-	-	-	0.100	0.063	0.032	-	0.048
	Gwyddelyn Bach	-	-	-	0.059	0.100	0.139	0.170	-	-	-	0.091
	Tre'r-gof-isaf	-	-	-	0.049	0.079	0.124	0.107	-	0.134	-	0.094
Other	Penrhyn	-	-	-	-	-	<0.020	<0.020	<0.020	<0.020	-	<0.010
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	0.030	0.020
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	0.020
	Porth-y-pistyll	-	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	0.021	-	<0.020	<0.010

Table AB-8: Ammoniacal Nitrogen as N (total ammonia as Nitrogen mg L<sup>-1</sup>) from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.030	<0.030	-	-	-	-	-	0.509
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.030	0.117	-	0.218
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	0.209
	Power Station Pond	-	-	-	0.092	0.092	-	0.095	-	0.385	-	0.081
	Porth Wylfa Pond	-	-	-	-	-	-	-	0.108	1.59	-	0.112
	Porth Wylfa	<0.030	<0.030	<0.030	0.035	<0.030	<0.03	<0.03	-	0.063	-	0.037
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.030	0.037	-	<0.03
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	1.780
	Tregele Pond	-	-	-	-	-	-	-	0.048	-	-	0.092
	Tan-yr-allt Pond	-	-	-	-	-	-	-	0.053	0.08	-	1.08
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.030	0.068	-	-
	Groes-fechan	-	-	-	0.038	0.033	<0.03	<0.030	0.036	0.030	-	-
	Caerdegog Isaf	-	-	-	-	<0.030	0.066	<0.030	-	0.030	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	0.034	0.311	0.041	<0.030	0.128	-	-
	Hafnan	-	-	-	-	0.063	0.044	0.045	-	0.068	-	-
	Cafnan	0.045	0.083	0.037	0.084	0.053	<0.03	0.045	0.076	<0.030	-	-
	Felin Gafnan East	0.039	0.121	<0.030	0.080	0.147	0.081	0.066	-	-	-	-
	Felin Gafnan Confluence	<0.030	0.072	0.037	0.065	0.043	<0.03	0.055	-	<0.030	-	0.039
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.030	0.18	-	0.245
	Penyrsedd	-	-	-	-	-	-	-	0.062	0.313	-	0.491
	US Neuadd	-	-	-	-	-	<0.03	0.042	<0.030	0.048	-	0.052
	Neuadd	-	-	-	0.057	0.036	<0.03	<0.030	-	<0.03	-	0.067
Cemaes	Foel Fawr	-	-	-	-	-	-	0.052	0.032	0.03	-	0.043
	Gwyddelyn Bach	-	-	-	0.146	0.057	0.108	0.077	-	-	-	0.079
	Tre'r-gof-isaf	-	-	-	0.084	<0.030	<0.03	<0.030	-	0.104	-	0.163
Other	Penrhyn	-	-	-	-	-	<0.03	<0.030	<0.030	0.030	-	<0.030
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	0.030	<0.030
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.030
	Porth-y-pistyll	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	-	0.044	0.030

Table AB-9: Toluene ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.1	<0.1	-	-	-	-	-	<0.1
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.1
	Power Station Pond	-	-	-	<0.1	<0.1	-	<0.5	-	<0.1	-	<0.1
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Porth Wylfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	<0.1
	Tregele Pond	-	-	-	-	-	-	-	<0.1	-	-	<0.1
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.1	0.11	-	<0.1
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.1	<0.1	-	-
	Groes-fechan	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	Caerdegog Isaf	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	Hafnan	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1	-	-
	Cafnan	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	Felin Gafnan East	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-
	Felin Gafnan Confluence	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Penyrsedd	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	US Neuadd	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1
	Neuadd	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1
	Gwyddelyn Bach	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	<0.1
	Tre'r-gof-isaf	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
Other	Penrhyn	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<0.1	<0.1
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.1
	Porth-y-pistyll	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1

Table AB-10: Trichloroethylene ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.10	<0.10	-	-	-	-	-	<0.10
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.10
	Power Station Pond	-	-	-	<0.10	<0.10	-	<0.50	-	<0.10	-	<0.10
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
	Porth Wylfa	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	<0.10
	Tregele Pond	-	-	-	-	-	-	-	<0.10	-	-	<0.10
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.10	<0.10	-	-
	Groes-fechan	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
	Caerdegog Isaf	-	-	-	-	<0.10	<0.10	<0.10	-	<0.10	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
	Hafnan	-	-	-	-	<0.10	<0.10	<0.10	-	<0.10	-	-
	Cafnan	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
	Felin Gafnan East	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
	Felin Gafnan Confluence	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
	Penyrsedd	-	-	-	-	-	-	-	<0.10	<0.10	-	<0.10
	US Neuadd	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	<0.10
	Neuadd	-	-	<0.1	<0.1	<0.1	<0.10	<0.10	-	<0.10	-	<0.10
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.10	<0.10	<0.10	-	<0.10
	Gwyddelyn Bach	-	-	-	<0.1	<0.1	<0.10	<0.10	-	-	-	<0.10
	Tre'r-gof-isaf	-	-	-	<0.1	<0.1	<0.10	<0.10	-	<0.10	-	<0.10
Other	Penrhyn	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10	-	<0.10
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<0.10	<0.10
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.10
	Porth-y-pistyll	1.27	2.02	1.45	1.44	1.83	3.33	0.94	-	0.57	<0.10	0.18

Table AB-11: DEHP ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.20	<0.20	-	-	-	-	-	0.21
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.20	<0.20	-	<0.20
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.20
	Power Station Pond	-	-	-	<0.20	<0.20	-	<0.20	-	<0.20	-	0.32
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.20	<0.20	-	0.32
	Porth Wylfa	1.05	<0.20	0.65	<0.20	<0.20	<0.20	<0.20	-	0.24	-	<0.20
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.20	<0.20	-	<0.20
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	<0.20
	Tregele Pond	-	-	-	-	-	-	-	<0.20	-	-	<0.20
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.20	<0.20	-	0.42
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.20	<0.20	-	-
	Groes-fechan	-	-	-	1.77	0.44	<0.20	<0.20	<0.20	<0.20	-	-
	Caerdegog Isaf	-	-	-	-	<0.20	0.42	<0.20	-	<0.20	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.20	0.33	<0.20	<0.20	<0.20	-	-
	Hafnan	-	-	-	-	0.80	<0.20	<0.20	-	<0.20	-	-
	Cafnan	0.45	<0.20	<0.20	<0.20	<0.20	0.52	<0.20	<0.20	<0.20	-	-
	Felin Gafnan East	1.14	<0.20	1.37	<0.20	0.39	0.34	<0.20	-	-	-	-
	Felin Gafnan Confluence	0.42	1.28	0.36	2.04	<0.20	<0.20	<0.20	-	<0.20	-	<0.20
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.20	<0.20	-	0.50
	Penyrsedd	-	-	-	-	-	-	-	<0.20	<0.20	-	<0.20
	US Neuadd	-	-	-	-	-	0.22	<0.20	<0.20	<0.20	-	0.22
	Neuadd	-	-	0.73	<0.20	<0.20	-	<0.20	-	<0.20	-	0.25
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.20	<0.20	<0.20	-	<0.20
	Gwyddelyn Bach	-	-	-	<0.20	<0.20	0.38	<0.20	-	-	-	<0.20
	Tre'r-gof-isaf	-	-	-	<0.20	<0.20	0.34	<0.20	-	<0.20	-	<0.20
Other	Penrhyn	-	-	-	-	-	0.23	<0.20	<0.20	<0.20	-	<0.20
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	-	<0.20
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	0.22
	Porth-y-pistyll	0.53	<0.20	1.71	<0.20	<0.20	<0.20	<0.20	-	<0.20	-	0.25

Table AB-12: Arsenic Dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<1	<1	-	-	-	-	-	<1
	Wylfa Hall Pond	-	-	-	-	-	-	-	<1	<1	-	1.02
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<1
	Power Station Pond	-	-	-	<1	<1	-	<1	-	<1	-	<1
	Porth Wylfa Pond	-	-	-	-	-	-	-	<1	1.81	-	<1
	Porth Wylfa	<1	<1	<1	<1	<1	-	<1	-	<1	-	<1
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<1	<1	-	<1
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	8.18
	Tregele Pond	-	-	-	-	-	-	-	<1	-	-	2.73
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<1	<1	-	2.04
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<1	<1	-	-
	Groes-fechan	-	-	-	<1	<1	<1	-	<1	<1	-	-
	Caerdegog Isaf	-	-	-	-	<1	1.1	<1	-	<1	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<1	1.45	<1	<1	<1	-	-
	Hafnan	-	-	-	-	<1	1.04	<1	-	<1	-	-
	Cafnan	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-
	Felin Gafnan East	<1	<1	<1	-	<1	<1	<1	-	-	-	-
Felin Gafnan Confluence	<1	<1	<1	-	<1	<1	<1	-	<1	-	<1	
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<1	3.23	-	1.31
	Penyrsedd	-	-	-	-	-	-	-	<1	<1	-	<1
	US Neuadd	-	-	-	-	-	1.09	<1	<1	<1	-	<1
	Neuadd	<1	-	-	<1	<1	1.23	<1	-	<1	-	<1
Cemaes	Foel Fawr	-	-	-	-	-	-	<1	<1	<1	-	<1
	Gwyddelyn Bach	-	-	-	<1	<1	<1	<1	-	-	-	<1
	Tre'r-gof-isaf	-	-	-	<1	<1	<1	<1	-	<1	-	<1
Other	Penrhyn	-	-	-	-	-	<1	<1	<1	<1	-	<1
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<1	<1
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<1
	Porth-y-pistyll	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1

Table AB-13: Cadmium dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.1	<0.1	-	-	-	-	-	<0.1
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.1
	Power Station Pond	-	-	-	<0.1	<0.1	-	0.106	-	<0.1	-	<0.1
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Porth Wylfa	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	-	<0.1
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	0.389
	Tregele Pond	-	-	-	-	-	-	-	<0.1	-	-	0.125
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.1	<0.1	-	-
	Groes-fechan	-	-	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	-
	Caerdegog Isaf	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	Hafnan	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1	-	-
	Cafnan	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	Felin Gafnan East	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	-	-	-
Felin Gafnan Confluence	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	Penyrsedd	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1
	US Neuadd	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1
	Neuadd	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1
	Gwyddelyn Bach	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	<0.1
	Tre'r-gof-isaf	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1
Other	Penrhyn	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<0.1	<0.1
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.1
	Porth-y-pistyll	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1

Table AB-14: Chromium dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<0.5	<0.5	-	-	-	-	-	<0.5
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.5	<0.5	-	<0.5
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.5
	Power Station Pond	-	-	-	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.5	<0.5	-	<0.5
	Porth Wylfa	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.5	<0.5	-	<0.5
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	2.19
	Tregele Pond	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.5	7.79	-	1.72
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.5	<0.5	-	-
	Groes-fechan	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	-	-
	Caerdegog Isaf	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.5	<0.5	0.58	<0.5	<0.5	-	-
	Hafnan	-	-	-	-	<0.5	<0.5	0.71	-	<0.5	-	-
	Cafnan	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
	Felin Gafnan East	<0.5	<0.5	<0.5	-	<0.5	<0.5	0.53	-	-	-	-
	Felin Gafnan Confluence	<0.5	<0.5	<0.5	-	<0.5	<0.5	0.52	-	<0.5	-	<0.5
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.5	<0.5	-	<0.5
	Penyrsedd	-	-	-	-	-	-	-	<0.5	<0.5	-	<0.5
	US Neuadd	-	-	-	-	-	<0.5	0.53	<0.5	<0.5	-	<0.5
	Neuadd	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5
	Gwyddelyn Bach	-	-	-	<0.5	<0.5	<0.5	0.74	-	-	-	0.58
	Tre'r-gof-isaf	-	-	-	<0.5	<0.5	<0.5	0.88	-	<0.5	-	0.53
Other	Penrhyn	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	<0.5
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	1.24	0.52
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.5
	Porth-y-pistyll	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5



Table AB-15: Copper dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	1.52	1.59	-	-	-	-	-	4.41
	Wylfa Hall Pond	-	-	-	-	-	-	-	2.09	2.19	-	6.41
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	1.03
	Power Station Pond	-	-	-	1.09	<1	-	4.02	-	<1	-	3.12
	Porth Wylfa Pond	-	-	-	-	-	-	-	1.79	<1	-	4.51
	Porth Wylfa	1.09	1.23	<1	<1	<1	-	1.23	-	<1	-	<1
	Tre'r Gof SSSI	-	-	-	-	-	-	-	1.34	<1	-	<1
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	33.20
	Tregele Pond	-	-	-	-	-	-	-	1.79	-	-	8.46
	Tan-yr-allt Pond	-	-	-	-	-	-	-	2.15	<1	-	5.85
	Cae Gwyn SSSI	-	-	-	-	-	-	-	1.23	1.29	-	-
	Groes-fechan	-	-	-	3.52	3.83	2.06	-	4.15	3.24	-	-
	Caerdegog Isaf	-	-	-	-	2.60	2.20	3.22	-	1.64	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	1.37	1.78	5.40	2.04	2.99	-	-
	Hafnan	-	-	-	-	1.82	1.94	3.13	-	1.46	-	-
	Cafnan	1.62	1.46	1.49	1.26	1.58	1.43	2.53	1.71	1.50	-	-
	Felin Gafnan East	1.73	1.46	1.66	-	1.65	1.56	3.12	-	-	-	-
	Felin Gafnan Confluence	1.84	1.69	1.66	-	1.55	1.66	3.04	-	1.66	-	2.10
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	5.21	3.56	-	10.40
	Penyrsedd	-	-	-	-	-	-	-	3.30	1.28	-	1.79
	US Neuadd	-	-	-	-	-	<1	2.78	1.82	1.09	-	2.05
	Neuadd	1.93	-	-	1.24	1.71	1.21	3.27	-	1.14	-	2.07
Cemaes	Foel Fawr	-	-	-	-	-	-	5.13	2.66	1.80	-	4.20
	Gwyddelyn Bach	-	-	-	1.50	1.69	1.96	6.60	-	-	-	3.70
	Tre'r-gof-isaf	-	-	-	1.32	1.63	2.08	4.47	-	2.09	-	3.24
Other	Penrhyn	-	-	-	-	-	<1	<1	<1	<1	-	<1
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	5.91	3.42
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	3.62
	Porth-y-pistyll	2.33	1.69	3.12	2.03	2.11	1.77	3.35	-	2.52	2.11	4.52

Table AB-16: Lead dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<2	<2	-	-	-	-	-	<2
	Wylfa Hall Pond	-	-	-	-	-	-	-	<2	<2	-	<2
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<2
	Power Station Pond	-	-	-	<2	<2	-	<2	-	<2	-	<2
	Porth Wylfa Pond	-	-	-	-	-	-	-	<2	<2	-	<2
	Porth Wylfa	<2	<2	<2	<2	<2	-	<2	-	<2	-	<2
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<2	<2	-	<2
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	9.75
	Tregele Pond	-	-	-	-	-	-	-	<2	-	-	<2
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<2	<2	-	2.42
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<2	<2	-	-
	Groes-fechan	-	-	-	<2	<2	<2	-	<2	<2	-	-
	Caerdegog Isaf	-	-	-	-	<2	<2	<2	-	<2	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<2	<2	<2	<2	<2	-	-
	Hafnan	-	-	-	-	<2	<2	<2	-	<2	-	-
	Cafnan	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	-
	Felin Gafnan East	<2	<2	<2	-	<2	<2	<2	-	-	-	-
	Felin Gafnan Confluence	<2	<2	<2	-	<2	<2	<2	-	<2	-	<2
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<2	<2	-	<2
	Penyrsedd	-	-	-	-	-	-	-	<2	<2	-	<2
	US Neuadd	-	-	-	-	-	<2	<2	<2	<2	-	<2
	Neuadd	<2	-	-	<2	<2	<2	<2	-	<2	-	<2
Cemaes	Foel Fawr	-	-	-	-	-	-	<2	<2	<2	-	<2
	Gwyddelyn Bach	-	-	-	<2	<2	<2	<2	-	-	-	<2
	Tre'r-gof-isaf	-	-	-	<2	<2	<2	<2	-	<2	-	<2
Other	Penrhyn	-	-	-	-	-	<2	<2	<2	<2	-	<2
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<2	<2
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<2
	Porth-y-pistyll	<2	<2	<2	<2	<2	<2	<2	-	<2	<2	<2

Table AB-17: Nickel dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	<1	<1	-	-	-	-	-	1.95
	Wylfa Hall Pond	-	-	-	-	-	-	-	<1	1.17	-	1.56
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<1
	Power Station Pond	-	-	-	<1	<1	-	1.54	-	1.18	-	1.14
	Porth Wylfa Pond	-	-	-	-	-	-	-	1.55	1.06	-	2.32
	Porth Wylfa	<1	<1	<1	<1	<1	-	<1	-	<1	-	<1
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<1	<1	-	<1
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	9.88
	Tregele Pond	-	-	-	-	-	-	-	1.05	-	-	2.14
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<1	1.3	-	5.72
	Cae Gwyn SSSI	-	-	-	-	-	-	-	1.04	1.19	-	-
	Groes-fechan	-	-	-	1.09	1.16	<1	-	1.2	<1	-	-
	Caerdegog Isaf	-	-	-	-	1.2	1.19	1.08	-	<1	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<1	1.62	1.46	<1	<1	-	-
	Hafnan	-	-	-	-	1.2	1.2	2.06	-	<1	-	-
	Cafnan	1.2	1.03	1.4	1.17	1.18	<1	1.44	1.28	<1	-	-
	Felin Gafnan East	1.05	1.25	1.39	-	1.1	1.13	1.76	-	-	-	-
	Felin Gafnan Confluence	1.13	1.1	1.44	-	1.09	1.12	1.77	-	<1	-	1.33
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	1.38	2.88	-	2.43
	Penyrsedd	-	-	-	-	-	-	-	1.35	<1	-	1.26
	US Neuadd	-	-	-	-	-	<1	1.2	<1	<1	-	1.07
	Neuadd	<1	-	-	<1	<1	<1	1.16	-	<1	-	1.02
Cemaes	Foel Fawr	-	-	-	-	-	-	1.61	1.18	<1	-	1.19
	Gwyddelyn Bach	-	-	-	1.46	1.32	1.48	1.98	-	-	-	1.57
	Tre'r-gof-isaf	-	-	-	1.27	1.05	<1	1.95	-	<1	-	1.23
Other	Penrhyn	-	-	-	-	-	<1	<1	<1	<1	-	<1
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	1.93	<1
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<1
	Porth-y-pistyll	<1	<1	<1	<1	<1	2.64	<1	-	<1	<1	<1

Table AB-18: Zinc dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	5.38	<5	-	-	-	-	-	19.70
	Wylfa Hall Pond	-	-	-	-	-	-	-	6.07	<5	-	17.40
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<5
	Power Station Pond	-	-	-	6.22	<5	-	22.00	-	<5	-	21.80
	Porth Wylfa Pond	-	-	-	-	-	-	-	<5	<5	-	<5
	Porth Wylfa	<5	<5	<5	<5	<5	-	<5	-	10.50	-	<5
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<5	<5	-	<5
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	31.70
	Tregele Pond	-	-	-	-	-	-	-	5.52	-	-	15.10
	Tan-yr-allt Pond	-	-	-	-	-	-	-	11.70	5.90	-	21.40
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<5	<5	-	-
	Groes-fechan	-	-	-	<5	<5	<5	-	<5	<5	-	-
	Caerdegog Isaf	-	-	-	-	<5	<5	<5	-	<5	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<5	<5	5.63	<5	29.90	-	-
	Hafnan	-	-	-	-	5.24	<5	8.10	-	<5	-	-
	Cafnan	<5	<5	<5	<5	<5	5.28	<5	<5	24.50	-	-
	Felin Gafnan East	<5	<5	<5	-	<5	<5	<5	-	-	-	-
	Felin Gafnan Confluence	<5	<5	<5	-	<5	<5	<5	-	<5	-	<5
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<5	<5	-	<5
	Penyrsedd	-	-	-	-	-	-	-	<5	<5	-	<5
	US Neuadd	-	-	-	-	-	<5	<5	<5	<5	-	<5
	Neuadd	-	-	-	<5	<5	<5	8.77	-	<5	-	<5
Cemaes	Foel Fawr	-	-	-	-	-	-	6.38	<5	<5	-	<5
	Gwyddelyn Bach	-	-	-	<5	<5	<5	7.65	-	-	-	<5
	Tre'r-gof-isaf	-	-	-	<5	<5	<5	5.27	-	<5	-	<5
Other	Penrhyn	-	-	-	-	-	<5	<5	<5	<5	-	<5
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	10.10	<5
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<5
	Porth-y-pistyll	<5	<5	6.26	<5	<5	11.10	<5	-	8.55	<5	6.43

Table AB–20: Iron ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	45	144	-	-	-	-	-	7470
	Wylfa Hall Pond	-	-	-	-	-	-	-	<30	332	-	197
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	45
	Power Station Pond	-	-	-	85	330	-	787	-	1840	-	373
	Porth Wylfa Pond	-	-	-	-	-	-	-	33	637	-	337
	Porth Wylfa	81	98	95	87	170	-	154	-	143	-	130
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<30	68	-	86
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	24400
	Tregele Pond	-	-	-	-	-	-	-	706	-	-	370
	Tan-yr-allt Pond	-	-	-	-	-	-	-	348	2680	-	23900
	Cae Gwyn SSSI	-	-	-	-	-	-	-	383	579	-	-
	Groes-fechan	-	-	-	250	401	221	-	233	277	-	-
	Caerdegog Isaf	-	-	-	-	193	189	236	-	80	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	347	381	315	165	88	-	-
	Hafnan	-	-	-	-	122	215	185	-	89	-	-
	Cafnan	124	92	269	106	144	135	212	113	78	-	-
	Felin Gafnan East	128	82	322	-	123	188	217	-	-	-	-
	Felin Gafnan Confluence	124	73	321	-	129	153	216	-	67	-	142
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<30	273	-	72
	Penyrsedd	-	-	-	-	-	-	-	76	62	-	157
	US Neuadd	-	-	-	-	-	188	154	141	174	-	120
	Neuadd	110	-	-	118	186	41	104	-	127	-	78
Cemaes	Foel Fawr	-	-	-	-	-	-	368	252	163	-	206
	Gwyddelyn Bach	-	-	-	424	483	193	369	-	-	-	185
	Tre'r-gof-isaf	-	-	-	161	270	73	262	-	137	-	109
Other	Penrhyn	-	-	-	-	-	<30	<30	<30	<30	-	<30
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	2130	<30
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	38
	Porth-y-pistyll	<30	<30	<30	30	53	<30	<30	-	<30	123	<30

Table AB-21: Manganese ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	83	170	-	-	-	-	-	-
	Wylfa Hall Pond	-	-	-	-	-	-	-	105	58	-	-
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	-
	Power Station Pond	-	-	-	251	260	-	1520	-	785	-	-
	Porth Wylfa Pond	-	-	-	-	-	-	-	70	753	-	-
	Porth Wylfa	-	575	125	971	923	-	374	-	505	-	-
	Tre'r Gof SSSI	-	-	-	-	-	-	-	108	4240	-	-
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	-
	Tregele Pond	-	-	-	-	-	-	-	231	-	-	-
	Tan-yr-allt Pond	-	-	-	-	-	-	-	109	1470	-	-
	Cae Gwyn SSSI	-	-	-	-	-	-	-	178	675	-	-
	Groes-fechan	-	-	-	165	188	407	-	83	201	-	-
	Caerdegog Isaf	-	-	-	-	67	169	78	-	25	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	333	1140	155	85	36	-	-
	Hafnan	-	-	-	-	143	584	73	-	171	-	-
	Cafnan	-	235	258	150	156	688	95	98	131	-	-
	Felin Gafnan East	-	84	93	-	152	189	65	-	-	-	-
	Felin Gafnan Confluence	-	74	140	-	144	138	62	-	54	-	-
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	14	438	-	-
	Penyrsedd	-	-	-	-	-	-	-	128	175	-	-
	US Neuadd	-	-	-	-	-	357	58	77	305	-	-
	Neuadd	-	-	-	188	101	333	17	-	137	-	-
Cemaes	Foel Fawr	-	-	-	-	-	-	52	122	109	-	-
	Gwyddelyn Bach	-	-	-	261	223	230	76	-	-	-	-
	Tre'r-gof-isaf	-	-	-	176	93	124	93	-	986	-	-
Other	Penrhyn	-	-	-	-	-	<10	<10	<10	<10	-	-
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	293	-
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	-
	Porth-y-pistyll	-	44	18	41	79	61	28	-	17	21	-

Table AB-22: Mercury dissolved ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012-2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	0.265	0.012	-	-	-	-	-	<0.01
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.01
	Power Station Pond	-	-	-	0.023	<0.01	-	<0.01	-	<0.01	-	0.010
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01
	Porth Wylfa	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	0.088
	Tregele Pond	-	-	-	-	-	-	-	<0.01	-	-	<0.01
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.01	<0.01	-	0.022
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.01	<0.01	-	-
	Groes-fechan	-	-	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	-
	Caerdegog Isaf	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
	Hafnan	-	-	-	-	<0.01	<0.01	<0.01	-	<0.01	-	-
	Cafnan	<0.01	<0.01	<0.01	0.019	<0.01	<0.01	0.028	<0.01	<0.01	-	-
	Felin Gafnan East	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-
	Felin Gafnan Confluence	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01
	Penyrsedd	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01
	US Neuadd	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	0.063
	Neuadd	<0.01	-	-	0.195	<0.01	<0.01	<0.01	-	<0.01	-	<0.01
Cemaes	Foel Fawr	-	-	-	-	-	-	0.013	<0.01	<0.01	-	<0.01
	Gwyddelyn Bach	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	<0.01
	Tre'r-gof-isaf	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01	-	<0.01
Other	Penrhyn	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<0.01	<0.01
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.01
	Porth-y-pistyll	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01

Table AB-23: Hydrocarbons Screen (C5 - C44) ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	0.31	<0.2	-	-	-	-	-	<0.2
	Wylfa Hall Pond	-	-	-	-	-	-	-	<0.2	<0.2	-	<0.2
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	<0.2
	Power Station Pond	-	-	-	<0.2	<0.2	-	<0.2	-	<0.2	-	<0.2
	Porth Wylfa Pond	-	-	-	-	-	-	-	<0.2	<0.2	-	<0.2
	Porth Wylfa	-	0.233	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	<0.2
	Tre'r Gof SSSI	-	-	-	-	-	-	-	<0.2	0.22	-	<0.2
Afon Cefn	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	<0.2
	Tregele Pond	-	-	-	-	-	-	-	<0.2	-	-	<0.2
	Tan-yr-allt Pond	-	-	-	-	-	-	-	<0.2	0.24	-	<0.2
	Cae Gwyn SSSI	-	-	-	-	-	-	-	<0.2	<0.2	-	-
	Groes-fechan	-	-	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	-
	Caerdegog Isaf	-	-	-	-	<0.2	<0.2	<0.2	-	<0.2	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	-
	Hafnan	-	-	-	-	<0.2	<0.2	<0.2	-	<0.2	-	-
	Cafnan	-	0.277	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	-
	Felin Gafnan East	-	0.23	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-
	Felin Gafnan Confluence	-	0.25	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	<0.2
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	<0.2	<0.2	-	<0.2
	Penyrsedd	-	-	-	-	-	-	-	<0.2	<0.2	-	<0.2
	US Neuadd	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	-	<0.2
	Neuadd	-	-	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	<0.2
Cemaes	Foel Fawr	-	-	-	-	-	-	<0.2	<0.2	<0.2	-	<0.2
	Gwyddelyn Bach	-	-	-	<0.2	<0.2	<0.2	-	-	-	-	<0.2
	Tre'r-gof-isaf	-	-	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	<0.2
Other	Penrhyn	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	-	<0.2
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	<0.2	<0.2
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	<0.2
	Porth-y-pistyll	-	0.271	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2

Table AB-22: Chloride ( $\mu\text{g L}^{-1}$ ) data from freshwater sites surveyed, 2012–2014.

Catchment	Site	Winter 2012	Spring 2012	Summer 2012	Winter 2013	Spring-2013	Summer 2013	Autumn 2013	Winter 2014	Spring 2014	Summer 2014	Autumn 2014
Tre'r Gof	Power Station Junction	-	-	-	63.8	72.3	-	-	-	-	-	52.6
	Wylfa Hall Pond	-	-	-	-	-	-	-	64.5	59.8	-	30.2
	Tyddyn-Goronwy	-	-	-	-	-	-	-	-	-	-	82.4
	Power Station Pond	-	-	-	67.3	58.4	-	21.4	-	54.6	-	49.3
	Porth Wylfa Pond	-	-	-	-	-	-	-	45.1	43.4	-	53.4
	Porth Wylfa	66.5	59.5	51.7	53.3	57.4	57.3	47.9	-	58	-	72.9
	Tre'r Gof SSSI	-	-	-	-	-	-	-	65.8	93	-	119
Afon Cafnan	Rhwng Dau Fynydd	-	-	-	-	-	-	-	-	-	-	-
	Tregele Pond	-	-	-	-	-	-	-	136	-	-	40.5
	Tan-yr-allt Pond	-	-	-	-	-	-	-	56.1	28.3	-	45.0
	Cae Gwyn SSSI	-	-	-	-	-	-	-	50.5	35.0	-	-
	Groes-fechan	-	-	-	51.0	48.8	53.2	40.1	46.4	51.7	-	-
	Caerdegog Isaf	-	-	-	-	50.1	48.0	45.4	-	47.9	-	-
	Hafnan - Caerdegog Isaf	-	-	-	-	40.9	53.3	39.4	40.6	37.4	-	-
	Hafnan	-	-	-	-	37.5	53.9	35.3	-	42.1	-	-
	Cafnan	45.2	43.9	42.6	42.1	37.5	64.7	35.0	40.1	40.6	-	-
	Felin Gafnan East	45.7	44.3	42.2	42.7	37.8	47.5	34.2	-	-	-	-
	Felin Gafnan Confluence	45.6	45.7	41.5	43.2	40.0	48.2	37.6	-	41.1	-	38.6
Cemlyn	Penyrsedd Pond	-	-	-	-	-	-	-	49.6	95.2	-	68.9
	Penyrsedd	-	-	-	-	-	-	-	53.7	48.2	-	79.4
	US Neuadd	-	-	-	-	-	38.7	34.4	39.9	35.0	-	42.1
	Neuadd	44.8	-	-	37.2	37.1	39.7	34.2	-	34.5	-	41.9
Cemaes	Foel Fawr	-	-	-	-	-	-	36.4	39.3	34.5	-	40.4
	Gwyddelyn Bach	-	-	-	40.6	37.8	50.6	38.4	-	-	-	44.9
	Tre'r-gof-isaf	-	-	-	42.5	38.8	47.9	41.2	-	39.3	-	37.1
Other	Penrhyn	-	-	-	-	-	62.7	118	88.5	66.4	-	78.2
	Tan-yr-allt Ditch (Site 2)	-	-	-	-	-	-	-	-	-	35.1	35.7
	Tan-yr-allt Ditch (Site 3)	-	-	-	-	-	-	-	-	-	-	40.2
	Porth-y-pistyll	95.4	83.4	82.2	101	97.8	97.7	67.9	-	71.2	68.8	68.1

Appendix C Macroinvertebrates

Table AC-1: List of macroinvertebrate species recorded across survey sites, 2014

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Felin Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerd Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wyifa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Agabus bipustulatus</i>																	1					1							
<i>Agabus sp.</i>																				8						10			
<i>Agabus sturmii</i>																	1												
<i>Agapetus fuscipes</i>		11		10	257			4			7									3			101	26			46		
<i>Agapetus sp.</i>				1								1																	
<i>Alainites muticus</i>					1																								
<i>Anacaena globulus</i>	9		1				1																1						
<i>Ancylus fluviatilis</i>		14	5	1					2															4			33		
<i>Asellus aquaticus</i>	442	4	177	10		4	12	148	15	130		3			1		60	138					2	10	211	425	4	17	
Asellidae									2	74							79								87				
Baetidae								1				4								1									
<i>Baetis rhodani</i>		100		676	5	1		5	45		618	15								114			143	4			34		
<i>Baetis sp.</i>					7																								
<i>Bathymphalus contortus</i>	68									52								2				2				53	134		
<i>Beraea pullata</i>														6															
<i>Caenis luctuosa</i>											133	103									1								
<i>Caenis sp.</i>																					1								
<i>Callicorixa praeusta</i>															1														
Ceratopogoninae	3					1					5	1	1		2					24		3	6			1			

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Fein Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Chaetopteryx villosa</i>									1																				
<i>Chelifera</i> sp.										1																			
Chironomidae	230	8	469	144	4	181	159	139	121	1396	40	488	99	344	240	14	142	7	306	1703	169	76	29	10	256	53	153		
<i>Cloeon dipterum</i>															24														
Coenagrionidae	5												2					1									3		
<i>Coleoptera</i>																						1							
COLYMBETINAE	16														10											1			
<i>Copelatus haemorrhoidalis</i>																											1		
<i>Copepoda</i> sp.																					5								
Corixidae															31														
<i>Crangonyx pseudogracilis</i>																	2	2							17	69			
Culicidae																		28				183				2			
Curculionidae																1													
<i>Dicranota</i> sp.		26	3	1		27		4	35		18												24	3			11		
Diptera	3		1	2									1		24		1	1					1		3		2		
<i>Dixella aestivalis</i>																					1								
<i>Dixella</i> sp.																					11				1	23			
Dolichopodidae																				1									
<i>Drusus annulatus</i>			1																										
Dytiscidae	2									5					1											1			
<i>Elmis aenea</i>		175	8	138	30	24	1	9	6		242	41					1	10				2	410	40			377	18	
<i>Elodes</i> sp.	21	5	1			41		91	1	1	6		11		1												13		

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Fein Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Eloeophila</i> sp.		16				7		8			1												2				4		
Empididae																				6									
Ephydriidae																			3				1						
<i>Erpobdella octoculata</i>	1		9	6						3	2	21	1			2	3	29	3	5	36		6	1	5	3	1	2	
<i>Erpobdella</i> sp.																		7						14					
<i>Erpobdella testacea</i>																					10					13			
<i>Ferrissia walteri</i>	2																												
<i>Galba truncatula</i>	1									1	2	1		1	4			7	3							2	2		
<i>Gammarus duebeni</i>				100	52																								
<i>Gammarus pulex</i>	41	698	94			1174	167	448	1636	10	701	696				260	1141	215	52	743	112	713		901	180	98	6	987	228
<i>Gammarus</i> sp.					35									1												178			
<i>Gammarus zaddachi</i>				620	433																								
<i>Gerris lacustris</i>										1																			
<i>Glossiphonia complanata</i>	2	7	1			3	1	4	2		4	3			1	1	2	1	3	72	12		6	29	2	2		4	
Glossiphoniidae																										1			
Glossosomatidae		14									3																		
<i>Gyraulus albus</i>			21								1																		
<i>Gyraulus crista</i>	7		2		1					2										7							38		
Gyrinidae			2							1					6														
<i>Gyrinus urinator</i>																							1						
<i>Halesus radiatus</i>								2	1														2						
Halplidae														2															

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Fein Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Haliphus lineatocollis</i>													3									1							
<i>Haliphus</i> sp.															2														
<i>Helius</i> sp.	5																1	1				1				3		1	
<i>Helobdella stagnalis</i>			1								18	2				4	6	5	4	1	156	4		1		6	2		
<i>Helophorus aequalis</i>																				1									
<i>Helophorus brevipalpis</i>	1						5							18	3		2					1	2			1		1	
<i>Helophorus grandis</i>											8				2														
<i>Helophorus</i> sp.																				4									
<i>Hemiclepsis marginata</i>																									1				
Hydracarina	1		16			1		1	1	1	1	1		4						74	9	12	4	5					
Hydroporinae	1														2														
Hydroptilidae																				9									
<i>Hydropsyche angustipennis</i>					1						111	15													4				
<i>Hydropsyche siltalai</i>				54																			158	43					
<i>Hydropsyche</i> sp.											6																		
Hydrophilidae							1									1									1				
<i>Hydroporus angustatus</i>															2														
<i>Hydroporus incognitus</i>																	2												
<i>Hydroporus nigrita</i>														2															
<i>Hydroporus palustris</i>											1																		
<i>Hydroporus</i> sp.														1			2									1			
<i>Hydroporus tessellatus</i>											1			7			1									1			

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Felin Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Hydroptila</i> sp.														1															
<i>Ilybius ater</i>																									1				
<i>Ischnura elegans</i>	3		2										1		1										1				
Janiridae					78																								
Leuctridae																				1									
Limnephilidae		4					1		1				11	2	3			14		1	11	15			10	3		1	
<i>Limnephilus hirsustus</i>													4																
<i>Limnephilus lunatus</i>	8	2	6			7		1	2	3	25		27		6		9		5				4		18				
<i>Limnephilus</i> sp.	11					16																	1			3			
<i>Limnius volckmari</i>				19	12						23	1	1										156	29					
Limoniidae				1								1																	
Lonchopteridae																					1								
<i>Lymnaea</i> sp.																									2				
Lymnaeidae															1														
<i>Lype reducta</i>																												3	
<i>Microcara</i> sp.	28																												
<i>Micropterna sequax</i>		10																							3				
<i>Neolimnophila</i> sp.		3				7		1			1								15				2						
Nemouridae																	4												
<i>Nemurella pictetii</i>																		3				34							
<i>Notonecta</i> sp.															2														
<i>Nepa cinerea</i>	1																												
Oligochaeta	131	34	8	12	3	1		8	27	6	13	77	9	105	146	678	92	214	70	122	25	155	28	36	17	2			

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Fein Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
Ostracoda													1		42	19	6	5	2	57	8						1		
<i>Oulimnius tuberculatus</i>											1																		
<i>Oxyethira</i> sp.															1														
<i>Paracymus scutellaris</i>	13																												
<i>Paracymus</i> sp.	44																												
Pediciidae																				1									
<i>Pericoma</i> sp.	1	1					1						1		2														
<i>Physa fontinalis</i>																						38							
<i>Pisidium</i> sp.	103	61	20	4	1	155	1	26	12	9	93	46	12	167	1	22	6	23	4			12	4	15				71	
Planariidae																						22							
Planorbidae																									2				
<i>Planorbis carinatus</i>			12							4													2						
<i>Planorbis planorbis</i>	59																					1			5	3			
<i>Platambus maculatus</i>	3																1												
<i>Plectrocnemia conspersa</i>		2		2				38			6		1				1				1		1	1	8			1	
<i>Plectrocnemia</i> sp.											2																		
<i>Polycelis felina</i>			1										3							112		49		12	18		1	1	
<i>Polycelis nigra/tenuis</i>	137	11	12	2		1		3	2	25	2	1			94	14	22	13	3	30	77		2		34			1	
<i>Polycelis</i> sp.							2															6				16		1	
Polycentropodidae						1													1										
<i>Potamopyrgus antipodarum</i>	1	1348	2	48	1207						689	6	1774	458						1243	75	1023	74	2578	825	3		3	
<i>Proasellus meridianus</i>							3			15	23	28			198	105		150	42	34	26	56			2			4	

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Felin Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrose dd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd	
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au
Psychodidae												2	1			1				1	14	13						
Psychomyiidae			1																									
<i>Ptychoptera</i> sp.						1						5								1								3
<i>Pyrrhosoma nymphula</i>																		1										
<i>Radix balthica</i>																					6	12						
<i>Rhyacophila dorsalis</i>				17																								
Rhyacophilidae				2																								
Scirtidae							85							4					7									6
<i>Sericostoma personatum</i>				1	2						8	5												6				1
<i>Serratella ignita</i>				2							43																	
<i>Sialis lutaria</i>	5		1																									
<i>Sigara dorsalis</i>			32													3												
<i>Sigara semistriata</i>			6																									
<i>Silo pallipes</i>					8																							
Simuliidae				96	2			7			13	3						1		2	12			1				
<i>Simulium lundstomi</i>																					5							
<i>Sphaerium</i> sp.										1																		10
<i>Stagnicola palustris</i>	1																											
<i>Succinea</i> sp.	46		1							6								4		2	3				4			
<i>Sympetrum striolatum</i>																					1							
<i>Tinodes assimilis</i>																							1					
Tipulidae	1													7				4			3				3			

Species	Cae Gwyn SSSI	Caerdegog Isaf	Cafnan	Fein Gafnan Conf.		Foel Fawr		Groesfechan	Hafnan	Hafnan-Caerdegog Isaf	Neuadd		Penrhyn		Penyrorsedd Stream		Porth Wylfa		Porth-y-pistyll			Power St. Junct.	Tre'r-gof-isaf		Tre'r-Gof SSSI		U/S Neuadd		
	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Sp	Sp	Sp	Au	Sp	Au	Sp	Au	Sp	Au	Sp	Su	Au	Au	Sp	Au	Sp	Au	Sp	Au	
<i>Valvata cristata</i>					1																					172	30		
<i>Velia caprai</i>											1			1															
<i>Velia</i> sp.			2							2	2		3						3				2		1				
<b>Total annual species number (not NTAXA)</b>	<b>38</b>	<b>22</b>	<b>31</b>	<b>30</b>		<b>26</b>		<b>20</b>	<b>20</b>	<b>27</b>	<b>41</b>		<b>34</b>		<b>35</b>		<b>39</b>		<b>50</b>			<b>23</b>	<b>39</b>		<b>47</b>		<b>29</b>		

Appendix D Macrophyte Raw Data

Table AD-1: List of macrophyte species recorded across survey sites, Summer 2014.

Date	Summer 2014								Summer 2014						
	Viable for LEAFPACS2								Not viable for LEAFPACS2						
Site	Groes-fechan	U/S Neuadd	Neuadd	Cafnan	Hafnan A	Penyrsedd	Cae Gwyn SSSI	Foel Fawr	Pyp-Wylfa	Tan-yr-allt ditch	Caerdegog Isaf	Tre'r Gof	Hafnan B	Porth Wylfa	Power Station Junction
Total vegetative cover (%)	100	100	100	80	55	95	100	99	99	100	100	95	99	99	100
Taxon Cover Value (TCV)	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV	TCV
<i>Alisma plantago-aquatica</i>	2			1			1								
<i>Apium nodiflorum</i>	8	2	7	1	1	7	6	6	7		7	4		4	9
<i>Butomus umbellatus</i>				3											
<i>Callitriche</i> spp.	2	1	5	5	7	5	2								
<i>Caltha palustris</i>														2	
<i>Carex aquatilis</i>														6	
<i>Carex riparia</i>	1														
<i>Carex rostrata</i>	3						2								
<i>Catabrosa aquatica</i>									2					5	3
<i>Cladophora glomerata/Rhizoclonium hieroglyphicum</i>						2			1			1		1	
<i>Eleocharis palustris</i>	2														
<i>Equisetum fluviatile</i>	2					2	4		2		7			5	
<i>Glyceria fluitans</i> agg	2					5			4	6	3		2		4
<i>Glyceria maxima</i>			1												
<i>Hildenbrandia rivularis</i>					1							1			
<i>Iris pseudoacorus</i>			2			4	1					2		3	
<i>Juncus articulatus</i>	3				1		5				2				
<i>Juncus bulbosus</i>	1														
<i>Lemna gibba</i>	2					4									

<i>Lemna minor</i>							2		3					
<i>Lemna minuta</i>										5			1	2
<i>Lythrum salicaria</i>	2			1				4			3	1	4	2
<i>Mentha aquatica</i>	4	1		2	2		7	2			6	1	3	
<i>Myosotis laxa</i>	2		5	1			3		2		5	1		1
<i>Nitella sp.</i>														1
<i>Oenanthe crocata</i>	2	9	7		1	7		6	6		5	5	5	
<i>Pelia epiphylla</i>												1		
<i>Persicaria amphibia</i>	2			2			1	4	4	6	4		3	
<i>Persicaria hydropiper</i>				2	3							1	3	
<i>Phalaris arundinacea</i>	7	3		3			7	6	5		5	2	7	
<i>Ranunculus flammula</i>	2						2							
<i>Ranunculus hederaceus</i>														4
<i>Rorippa nasturtium-aquaticum agg.</i>		1	6	5			3	7	7		3	1		1 2
<i>Sparganium erectum</i>	3			8			3	2	4		5	4	8	
<i>Typha latifolia</i>	8						3							6
<i>Vaucheria sp(p)</i>				6										
<i>Veronica beccabunga</i>			6			5			4					
<i>Zygnematalean alga</i>						2						1		

**Additional Species (P = present)**

<i>Agrostis semiverticillata</i>	2										3			
<i>Agrostis stolonifera</i>									2				1	
<i>Alopecurus geniculatus</i>				3	2				2					1
<i>Angelica sylvestris</i>							2							
<i>Carex hirsuta</i>									1					
<i>Carex otrubae</i>									1					
<i>Cardamine flexuosa</i>					2						1			
<i>Cirsium palustre</i>							1							

<i>Conacephalum conicum</i>		3										2			
<i>Deschampsia cespitosa</i>											2				
<i>Epilobium hirsutum</i>	3	5	6	2		2		5	3	1	5	5	5	6	
<i>Epilobium palustre</i>							2								1
<i>Epilobium tetragonum</i>	1		2		2	2	2	2			2	3	1		
<i>Eranthemum roseum</i>									1						
<i>Equisetum arvense</i>								2				2			
<i>Eupatorium cannabinum</i>														4	
<i>Filipendula ulmaria</i>	2	2		2	3		3	4	1		6	5	4	5	
<i>Hypericum tetraerum</i>							1				1	2			
<i>Galeopsis tetrahit</i>										1					
<i>Galium palustre</i>	2	1	5				4				3			2	
<i>Galium mollugo</i>											4				
<i>Geranium robertianum</i>												1			
<i>Glechoma hederacea</i>			2												
<i>Gnaphalium uliginosum</i>				1											P
<i>Juncus acutiflorus</i>										<1					
<i>Juncus bufonius</i>				2											2
<i>Juncus effusus</i>	6		6	1	4	4	6		2	6	7		2		3
<i>Juncus subnudulosus</i>														2	
<i>Lotus pedunculatus</i>	2		1		2	1	2	3	P	4	2	1	2	1	2
<i>Lunularia cruciata</i>				2	3							1			
<i>Lychnis flos-cuculi</i>							1								
<i>Lycopus europaeus</i>												2			
<i>Mentha sp.</i>		1		4					2						
<i>Mentha spicata</i>				4											
<i>Persicaria maculosa</i>															2
<i>Phleum pratense</i>											1				
<i>Polygonum aviculare</i>					1										
<i>Potentilla anserina</i>							1		4	3	2			2	
<i>Potentilla repens</i>										5					

<i>Prunella vulgaris</i>									<1					
<i>Ranunculus lingua</i>										3				
<i>Ranunculus repens</i>	1		3		3	2	2	3	1		2	2		1
<i>Rumex conglomeratus</i>	3	1	2			2	2	1	1		5	4		2
<i>Rumex crispus</i>	1			1					1		3	1		1
<i>Sagina procumbens</i>					3							1		
<i>Salix cinerea sub. Oleifolia</i>											3			
<i>Salix sp.</i>												4		
<i>Samolus valerandi</i>									<1					
<i>Solanum dulcamara</i>				6								3		1
<i>Solanum nigra</i>					1								4	
<i>Sonchus arvensis</i>									1					
<i>Stachys palustris</i>		1										1		
<i>Stellaria alsine</i>					1									2
<i>Stellaria graminea</i>						3		2						
<i>Stellaria holostea</i>				1										
<i>Torilis japonica</i>												1		
<i>Ulva lactuca</i>									1					

**Appendix E Fish Results**

**Table AD-1: Routine monitoring electric-fishing results 2011 to 2014. Table shows total abundance from each survey (runs are combined to give a total) and survey method used including run length (Q = quantitative, SC = spot check). 3-SS = three-spined stickleback. 9-SS = nine-spined stickleback.**

Site	Grid Reference	Species	Abundance (range of lengths (mm))						Summer 2014
			Autumn 2011	Spring 2012	Summer 2012	Spring 2013	Summer 2013	Autumn 2013	
Porth-y-pistyll	SH 34785 93652	Survey method					SC (30m)	SC (30m)	
	-	European eel					8 (110–210)	5 (140–275)	
	SH 34834 93613	Brown trout					-	-	
		3-SS					-	-	
Porth Wylfa	SH 35922 92647	Survey method						SC (5m)	
	-	European eel						1 (200)	
	SH 35941 93689	Brown trout						-	
		3-SS						-	
Power Station Pond	SH 35497 93109	Survey method			SC	SC			
		European eel			-	-			
		Brown trout			-	-			
		3-SS			-	-			
Gwyddelyn Bach	SH 35927 92645	Survey method				Q (70m)		Q (20m)	
	-	European eel				5 (260–590)		-	
	SH 35974 92691	Brown trout				-		-	
		3-SS				13 (35–60)		-	
Cafnan	SH 34159 93035	Survey method	Q (65m)	Q	Q (80m)	Q (90m)	Q (90m)	Q (65m)	Q (90m)
	-	European eel	3 (110–650)	14 (130–650)	4 (350–550)	8 (100-640)	10 (105–550)	2 (330–400)	9 (65-500)
	SH 34227 93081	Brown trout	8 (100–380)	7 (160–270)	6 (170–240)	3 (160-300)	1 (165)	1 (90)	6 (194 - 257)
		3-SS	57 (20–55)	30 (25–55)	3 (45)	2 (40-45)	35 (15–50)	11 (20–45)	5(23-54)
		9-SS	1 (25)	-	-	-	-	-	-
Hafnan	SH 33930 92212	Survey method				Q (100m)	Q (100m)	Q (100m)	Q (100m)
	-	European eel				2 (250–320)	3 (205-500)	-	10 (70-400)
	SH 33984 92274	Brown trout				1 (135)	-	-	-
		3-SS				2 (25-55)	76 (15–70)	115 (20–50)	-
		9-SS				-	3 (30–45)	-	-
U/S Neuadd	SH 33517 92157	Survey method					SC (290m)	SC (150m )	
	-	European eel					10 (110–500)	4	
	SH 33603 92295	Brown trout					-	-	

Site	Grid Reference	Species	Abundance (range of lengths (mm))						
			Autumn 2011	Spring 2012	Summer 2012	Spring 2013	Summer 2013	Autumn 2013	Summer 2014
		3-SS					2 (35-40)	1 (35)	
Caerdego g Isaf	SH 34876 92546	Survey method				SC (50m)		SC (30m)	SC (30m)
	-	European eel				-		-	-
	SH 34864 92545	Brown trout				-		-	-
		3-SS				-		1 (40)	-
Groesfechan	SH 35071 92163	Survey method				SC (125m)			SC (125m)
	-	European eel				-			-
	SH 34997 92087	Brown trout				-			-
		3-SS				-			-
Penyrrors edd	SH 33184 92626	Survey method							SC (100m)
		European eel							-
		Brown trout							-
		3-SS							-

**Appendix F PSYM Classification Output, and Raw Data**

**Table AF-1: PSYM raw output: results and classification of ponds (PSYM quality category = IBI >75%=Good, 51-75%=Moderate, 25-50%=Poor, <25%=V Poor).**

Site name	Power Station Pond 2012	Power Station Pond 2014	Penyrsedd Pond	Tregele Pond	Porth Wylfa Pond
No. of submerged + marginal plant species (SM)	7	11	11	8	16
Predicted (SM)	18.5	18.7	15.1	19.5	18.6
EQI (SM)	0.38	0.59	0.73	0.41	0.86
IBI (SM)	1	2	2	1	3
Number of uncommon plant species (U)	0	1	2	1	0
Predicted (U)	3.9	4.1	2.5	4.3	4.1
EQI (U)	0	0.24	0.79	0.23	0.00
IBI (U)	0	0	3	0	0
Trophic Ranking Score (TRS)	9.25	10.00	10.00	9.25	9.33
Predicted (TRS)	6.14	5.76	8.02	5.83	5.72
EQI (TRS)	1.51	1.74	1.25	1.59	1.63
IBI (TRS)	0	0	0	0	0
Average Score Per Taxon (ASPT)	3.88	3.89	3.79	3.56	3.75
Predicted (ASPT)	5.11	5.12	5.11	5.10	5.10
EQI (ASPT)	0.76	0.76	0.74	0.70	0.73
IBI (ASPT)	2	2	2	1	2
Odonata + Megaloptera (OM) families	1	0	0	0	1
Predicted (OM)	3.47	3.46	3.35	3.50	3.49
EQI (OM)	0.29	0.00	0.00	0.00	0.29
IBI (OM)	1	0	0	0	1
Coleoptera families (CO)	3	3	2	3	3
Predicted (CO)	3.76	3.78	3.75	3.75	3.75
EQI (CO)	0.8	0.79	0.53	0.80	0.80
IBI (CO)		3	2	3	3
Sum of Individual Metrics	7	7	9	5	9
Index of Biotic Integrity (%)	39%	39%	50%	28%	50%
PSYM quality category	Poor	Poor	Moderate	Poor	Moderate
Priority species	0	1	0	1	0
Meets Priority Pond Criteria?	Yes		No	Yes	No

**PSYM Macroinvertebrate Species List**

**Table AF-2: Raw species abundance data from PSYM macroinvertebrate surveys in 2012 and 2014. \* denotes sites where only selected taxa were analysed and counted in laboratory**

Species	Site				
	Power Station Pond 2012*	Power Station Pond 2014	Penyrsedd Pond	Tregele Pond	Porth Wylfa Pond
<i>Agabus bipustulatus</i>		2	1	1	2
<i>Agabus nebulosus</i>		1			
<i>Agabus</i> sp.		2			
<i>Agabus sturmii</i>		3			
<i>Anacaena globulus</i>	1			24	
<i>Asellus aquaticus</i>		55	160	34	10
Asellidae					3
Baetidae		5			
<i>Bathyomphalus contortus</i>		23			
Ceratopogonidae					10
Chironomidae	1	151	15	4	36
<i>Cloeon dipterum</i>	3				
<i>Colymbetes fuscus</i>	1				
Corixidae		1	8		
<i>Corixa</i> sp.	2				1
<i>Corixa panzeri</i>			1		
Cucurlionidae		2			
Culicidae					32
<i>Cymbiodyta marginella</i>				1	37
<i>Erpobdella testacea</i>			3		
<i>Erpobdella octoculata</i>		1	3		7
Erpobdellidae			52		
<i>Galba truncatula</i>		7		3	
Gerridae					2
<i>Gerris</i> sp.	1	1			
<i>Gerris lacustris</i>					1
<i>Glossiphonia complanata</i>	1		4		
Glossiphonidae			23		
<i>Gyraulus crista</i>		9			
<i>Gyraulus laevis</i>		258			1496
<i>Gyrinus substriatus</i>					
<i>Haemopsis</i>	1				

Species	Site				
	Power Station Pond 2012*	Power Station Pond 2014	Penyrsedd Pond	Tregele Pond	Porth Wylfa Pond
<i>sanguisuga</i>					
<i>Haliphus confinis</i>					5
<i>Haliphus fluviatilis</i>				7	
<i>Haliphus lineatocollis</i>					3
<i>Haliphus ruficollis</i>	2			11	
<i>Haliphus</i> sp.		3		38	
<i>Helobdella stagnalis</i>		2	28		2
<i>Helochares lividus</i>					1
<i>Helophorus brevipalpis</i>		4	3		7
<i>Helophorus</i> sp.			25		
<i>Hydracarina</i>		1			
<i>Hydraena palustris</i>		1			
<i>Hydrobius fuscipes</i>	2		1	2	1
Hydrophilidae				2	
<i>Hydroporus planus</i>			1		
<i>Hydroporus</i> sp.	1				
Hydroporinae	2				
<i>Hydrometra</i> sp.		1			
<i>Hydrophilus</i> sp.		2			
<i>Hydroporus</i> sp.		12			
<i>Hydroporus angustatus</i>				8	
<i>Hydroporus memnonius</i>				2	
<i>Hydroporus nigrita</i>				1	
<i>Hydroporus palustris</i>				6	
<i>Hydroporus striola</i>				3	
<i>Hydroporus tessellatus</i>		1			
<i>Hygrotus inaequalis</i>		3			30
<i>Hygrotus impressopunctatus</i>					5
<i>Laccobius bipunctatus</i>		1			2
<i>Laccobius</i>	1				2

Species	Site				
	Power Station Pond 2012*	Power Station Pond 2014	Penyrsedd Pond	Tregele Pond	Porth Wylfa Pond
<i>minutus</i>					
<i>Laccophilus</i> sp.			1		
<i>Libellula quadrimaculata</i>					
Lymaeidae	1			61	
<i>Noterus clavicornis</i>					12
<i>Notonecta glauca</i>		2	2		1
<i>Notonecta maculata</i>			1		
Oligochaeta	1	46	777	303	24
<i>Omphiscola glabra</i>				42	
Ostracoda			8		2
<i>Paracorixa concinna</i>			6		
<i>Pericoma</i> sp.			2		
<i>Physa fontinalis</i>					4
<i>Planorbis carinatus</i>			52		
<i>Planorbis planorbis</i>	2				204
<i>Planorbis</i> sp.	1				
<i>Plea leachi</i>	1	4			
<i>Polycelis nigra/tenuis</i>	2				
<i>Polycelis</i> sp.		3			
<i>Potamopyrgus antipodarum</i>	1	3		175	2
<i>Proasellus meridianus</i>	2	195			2
<i>Pyrrhosoma nymphula</i>	2				
Psychodidae		5			
<i>Radix balthica</i>		18	171		14
<i>Rhantus grapii</i>					1
<i>Sigara lateralis</i>					2
<i>Sigara</i> sp.			16		10
<i>Sigara scotti</i>	1	1			
Syrphidae		3			1
Tipulidae			2	1	
<i>Theromyzon tessulatum</i>	1	1			
<i>Tricladida</i>		5			
Veliidae			1		

## PSYM Aquatic Plant Species List

Table AF-3: Raw species presence data from PSYM aquatic plant surveys at four ponds (species in bold with a rarity score of 2 or more).

Site	Porth-y-Wylfa Pond	Tregele Pond	Penyrsedd Pond	Power Station Pond
<i>Agrostis stolonifera</i>	✓		✓	✓
<i>Alopecurus geniculatus</i>			✓	
<i>Angelica sylvestris</i>	✓			
<i>Apium nodiflorum</i>	✓			✓
<i>Azolla filiculoides</i>				✓
<i>Callitriche</i> sp.		✓	✓	✓
<i>Cardamine pratensis</i>		✓		
<b>Carex eurta/hirta</b>				✓
<i>Eleocharis palustris</i>	✓			
<i>Epilobium hirsutum</i>		✓		
<i>Erpilobium palustre</i>	✓			
<i>Equisetum fluviatile</i>	✓			
<i>Filipendula ulmaria</i>	✓			
<i>Galium palustre</i>				✓
<b>Glyceria declinata</b>		✓	✓	✓
<i>Glyceria fluitans</i> agg	✓		✓	
<i>Glyceria maxima</i>				✓
<i>Gnaphalium uliginosum</i>				
<i>Iris pseudacorus</i>	✓			
<i>Juncus bufonius</i>	✓		✓	
<i>Juncus effusus</i>	✓	✓	✓	✓
<i>Lemna minuta</i>	✓	✓	✓	✓
<i>Lotus pedunculatus</i>	✓			✓
<i>Mentha aquatica</i>	✓			
<i>Persicaria hydropiper</i>	✓			
<i>Ranunculus hederaceus</i>			✓	
<i>Ranunculus</i> sp. (+ <i>Batrachium</i> sp.)	✓			
<i>Rorippa nasturtium-aquaticum</i> agg.		✓		✓
<i>Sagina procumbens</i>			✓	
<i>Solanum dulcamara</i>	✓			
<i>Typha latifolia</i>		✓		
<i>Veronica beccabunga</i>			✓	

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**Site Preparation and Clearance  
Environmental Statement  
Volume 3 – Appendix 14-18  
HNP Wylfa SPC: Environmental Impact  
Assessment Scoping Report**

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## HNP WYLFA SPC

### *Environmental Impact Assessment Scoping Report*

DCRM Ref Number: WN034-S5-PAC-REP-00009

Revision: 1.0

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## Glossary of Terms and Abbreviations

Full Title	Acronym	Description
Above Ordnance Datum	AOD	Above the mean sea level at Newlyn in Cornwall calculated between 1915 and 1921, taken as a reference point for the height data on Ordnance Survey maps.
Annual Average Daily Traffic	AADT	A traffic flow measure used in transportation planning and modelling.
Annual Average Weekday Traffic	AAWT	A traffic flow measure used in transportation planning and modelling.
Agricultural Land Classification	ALC	A system to categorise agricultural land according to versatility and suitability for growing crops. The top three grades, Grade 1, 2 and 3a, are referred to as 'Best and Most Versatile' land, (Agricultural Land Classification of England and Wales MAFF 1988).
Air Quality Objective	AQO	The concentration of a pollutant, over a specified period, above which adverse effects on health and/or the environment may occur and which should not be exceeded, or may be exceeded a permitted number of times over a specified period. The Air Quality Objectives are specified in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007.
Ancillary Structures	-	Buildings and other structures, necessary to support the construction, operation and management of the Power Station, (note that these are different to Associated Development, see below).
Animal and Plant Health Agency	APHA	A Government agency working to safeguard animal and plant health for the benefit of people, the environment and the economy.
Application Site		The area of land subject to Site Preparation and Clearance proposals.
Appropriate Assessment	-	An assessment in accordance with the Stage 2 of the Habitats Regulations Assessment process.
Area of Outstanding Natural Beauty	AONB	Areas designated under the Countryside and Rights of Way Act 2000 for the purpose of conserving and enhancing the natural beauty of the designated area.

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Full Title	Acronym	Description
Areas of Potential Concern	APC	Made ground within the Application Site, typically been found to comprise re-worked natural material, in some areas comprising man-made materials such as brick and concrete. In addition areas of made ground comprise 'waste' or 'fill' materials that contained plastic, pipe, wire and glass as well as asbestos and asbestos-containing materials.
Associated Development	-	Development to support delivery of the Power Station, for example highway improvements along the A5025, Park and Ride facilities for construction workers, at least one Logistics Centre and Off-Site Temporary Workers Accommodation.
Basic Noise Level	BNL	The BNL is a measure of source noise at a reference distance of 10m from the nearside carriageway edge. It is determined from obtaining the estimated noise level from the 18 hour flow and then applying corrections for vehicle speed, percentage of heavy vehicles, gradient and road surface as described in CRTN.
British Geological Survey	BGS	The UK's premier provider of objective and authoritative geoscientific data, information and knowledge.
Cadw	-	Statutory body charged with protecting the Historic and Built Environment of Wales (part of Welsh Government).
Calculation of Road Traffic Noise	CRTN	The technical memorandum issued by the Department of Transport and Welsh Office that describes the procedures for calculating noise from road traffic.
Cofnod - North Wales Environmental Information Service	-	One of four local record centres in Wales who support the observation and recording of wildlife.
Controlled Waters	-	Waters defined in section 104 of the Water Resources Act 1991 and which include all groundwater, freshwaters and estuaries.
Conservation Area	-	An area designated under section 69 of the Planning (Listed Building and Conservation Areas) Act 1990 being areas of special architectural or historic interest.
Cumulative Impact (or effect)	-	Effects that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the SPC Proposals
Decibel	dB	This is the unit of measurement used for sound pressure levels. Noise levels are usually quoted in decibels (dB). The decibel scale is logarithmic rather than linear. The threshold of hearing is zero decibels while, at the other extreme, the threshold of pain is about 130 decibels.

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Full Title	Acronym	Description
Department for Energy and Climate Change	DECC	The Government Department with responsibility for Energy issues.
Design Manual for Roads and Bridges	-	A set of 15 volumes of documents prepared by the Highways Agency that provide a comprehensive manual system that accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways). Originally produced in 1992, the volumes are regularly updated and subsequent minor updates are also included in interim advice notes.
Detailed Assessment	-	Method applied to gain an in-depth appreciation of the beneficial and adverse consequences of the SPC Proposals and to inform project decisions. Detailed Assessments are likely to require detailed field surveys and/or quantified modelling techniques.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Effect	-	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Directive	-	Council Directive 2011/92/EU.
EIA Regulations	-	The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended).
Enabling Works		The works required to remove and clear parts of the Wylfa Newydd Development Area of vegetation, top soil, existing services, utilities and other features and structures, in order to allow the earthworks and Main Construction stage activities to commence. This work would also include the installation of any new services or utilities required to support the Main Construction stage activities.
EN-6 - National Policy Statement for Nuclear Power Generation	NPS EN-6	The National Policy Statement designated by the Secretary of State for Energy and Climate Change in July 2011 which sets out national policy on new nuclear power stations and against which an application for a Development Consent Order for a nuclear power station is assessed.

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Full Title	Acronym	Description
Environmental Impact Assessment	EIA	The process in which the likely significant effects of a development on the environment are identified and assessed.
Environmental Management Plan	EMP	A document that sets out the key environmental and planning/consenting considerations that must be taken into account for any works taking place. There will be more than one plan and the development of these plans is an iterative process.
Environmental Quality Standards	EQS	Directive 2008/105/EC sets out environmental quality standards concerning the presence in surface water of certain pollutants and substances or groups of substances identified as priority, on account of the substantial risk they pose to or via the aquatic environment. Priority substances are defined by Directive 2000/60/EC (the Water Framework Directive).
Environmental Statement	ES	The document in which the results of an Environmental Impact Assessment are presented.
European Protected Species	-	Animals and plants protected under The Conservation of Habitats and Species Regulations 2010.
European Commission	EC	The European Commission is an executive body which represents the interests of the European Union.
European Union	EU	An economic and political partnership between 28 European countries.
Evaluation	-	The determination of the significance of effects. Evaluation involves making judgements as to the value of the receptor/resource that is being affected and the consequences of the effect on the receptor/resource based on the magnitude of the effect.
Existing Power Station	-	The existing Magnox nuclear power station.
Flood Consequence Assessment	FCA	An assessment of the risk of flooding in any given area, usually associated with a particular development. Consideration is given to the potential for the development to increase the risk of flooding and particular attention is given to areas already identified as being at risk from flooding. Flood Consequence Assessments may assess the risk of flooding from fluvial sources, groundwater, surface water runoff and sewer water and are a requirement of Planning Policy Wales Technical Advice Note (TAN) 15.
Generating Station		The proposed new Nuclear Power Station, including two UK ABWRs, associated plant and Ancillary Structures and features, to be constructed and operated at Wylfa, Anglesey.

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Full Title	Acronym	Description
Geopark	-	A GeoPark is a territory which includes a particular geological heritage and a sustainable territorial development strategy. In November 2015, Anglesey was identified as one of the first UNESCO Global GeoParks.
Groundwater		Water present beneath the earth's surface, within soil pore spaces and in the fractures and voids of rock formations.
Habitats Regulations Assessment	HRA	The process by which plans and projects are assessed for their likely significant effects on European Designated Sites, pursuant to the Habitats Directive and the Conservation of Habitats and Species Regulations 2010.
Health Impact Assessment	HIA	The process by which the SPC Proposals will be assessed to determine its health effects on a population, particularly vulnerable or disadvantaged groups. It will make recommendations seeking to minimise negative health effects as well as identifying opportunities to maximise positive health effects.
Heavy Goods Vehicle	HGV	A truck with a mass of over 3,500kg.
Historic Environment Record	HER-	Detailed record on historic assets in Wales, including protected monuments, structures, landscapes and marine sites, to provide information to owners, statutory bodies and others about what is protected and whether this protection is statutory or not. Information held by Cadw and Gwynedd Archaeological Trust.
Historic Parks and Gardens	-	Historic Parks and Gardens in Wales are those sites thought to be of national importance and which have been included on the Cadw/ICOMOS (International Council of Monuments and Sites) Register of Parks and Gardens of Special Historic Interest in Wales.
Institute of Environmental Management and Assessment:	IEMA	Professional body for environmental practitioners in the United Kingdom and worldwide.
Institute of Air Quality Management	IAQM	The professional body for air quality practitioners.
Isle of Anglesey County Council	IACC	The local authority governing the area within which the Power Station is intended to be constructed. IACC has a number of functions, including the granting of planning permission as Local Planning Authority.

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Full Title	Acronym	Description
Joint Nature Conservation Committee	JNCC	Statutory adviser to UK Government and devolved administrations.
Land Information System	LandIS	A soils-focussed information system for England and Wales
Landscape Character Areas	LCA	Single, unique areas which are the discrete geographical areas of a particular landscape type.
Language Impact Assessment	LIA	The systematic, criteria-based assessment of the likely effects of a development or project on language and culture.
Local Air Quality Management	LAQM	A process that requires local authorities across the UK to review assess and manage the air quality within their geographical areas.
Lower Super Output Areas	LSOAs	Geographic area designed to improve the reporting of small area statistics in England and Wales.
Mitigation	-	Measures intended to avoid, reduce and where possible, remedy significant adverse environmental effects.
National Trail		Long distance walking, cycling and horse riding routes in England and Wales.
Natural Environment and Rural Communities Act 2006	NERC	Natural Environment and Rural Communities Act (NERC) 2006
National Policy Statements	NPS	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for nationally significant infrastructure projects including energy, transport and water, waste water and waste, and against which applications for development consent orders are assessed.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order (DCO). The construction of a generating station is an NSIP.
Natural Resources Wales	NRW	The public body whose stated purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future. In April 2013, it absorbed the regulatory and advisory duties of the Environment Agency, Countryside Council for Wales and the Forestry Commission in Wales. It is the regulatory authority in Wales for a wide range of environmental legislation including environmental permitting (under the Environmental Permitting (England and Wales) Regulations 2010) and is a statutory consultee for development consent orders.

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Full Title	Acronym	Description
Non-Technical Summary	NTS	Information for the non-specialist reader to enable them to understand the main predicted environmental effects of the proposal without reference to the main Environmental Statement.
Particulate matter	PM <sub>10</sub> and PM <sub>2.5</sub>	An air quality pollutant measured in respect to Defra's Air Quality Objectives for the protection of human health.
Planning Inspectorate	PINS	The body that accepts and examines applications for development consent orders and makes recommendations to the Secretary of State in support of determining whether to grant consent.
Planning Policy Wales	PPW	Guidance prepared by the Welsh Government setting out the current land use planning policy for Wales, to be taken into account by Local Planning Authorities when preparing Development Plans.
Power Station	-	The proposed new nuclear power station, including two UK Advanced Boiling Water Reactors (ABWRs), associated plant and ancillary structures and features, to be constructed and operated near Wylfa Head on Anglesey.
Power Station Site	-	The indicative area of land and sea within which the majority of the permanent Power Station buildings, plant and structures would be situated.
Preferred Option	-	The chosen design option that most successfully achieves the project objectives and becomes subject to further design and assessment.
Project		The Power Station and Associated Development.
Public Rights of Way	PRoW	Public footpaths, public bridleways or public byways.
Receptor	-	A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Regionally Important Geological sites	RIGS	Sites of importance for geodiversity designated by relevant local authorities which in this case is the IACC.
Scheduled Monuments	-	Scheduled Monuments are protected by law under the Ancient Monuments and Archaeological Areas Act 1979 and are, by definition, of national importance. Scheduled Monument Consent (SMC) is required for any works affecting a Scheduled Monument and is obtained from Cadw, the Welsh Assembly Government's historic environment service.

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Full Title	Acronym	Description
Scoping	-	The process of identifying the issues to be addressed by the environmental impact assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant. Process defined within the Environmental Impact Assessment Regulations.
Scoping Opinion	-	An opinion provided by a competent authority in accordance with the Environmental Impact Assessment Regulations that indicates the issues an Environmental Impact Assessment of a project should consider.
Scoping Report		The Report that presents the information required by the Scoping process to enable the competent authority to give a Scoping Opinion.
Screening	-	The formal process undertaken to determine whether it is necessary to carry out a statutory Environmental Impact Assessment and publish an Environmental Statement in accordance with the EIA Regulations.
Secretary of State (for Energy and Climate Change)	SoS-	The cabinet minister in charge of Department for Energy and Climate Change (DECC) and who (among other things) ultimately determines applications for development consent orders (DCO).
Significance of Effect	-	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Site Preparation and Clearance	SPC	A suite of activities to be carried out in order to prepare the site for the major development associated with the Wylfa Newydd Project.
Sites of Special Scientific Interest	SSSI	Sites designated for their flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981.
Sulphur dioxide	SO <sub>2</sub>	An air quality pollutant measured in Defra's Local Air Quality Management (LAQM) process.
Special Area of Conservation	SAC	Areas that have been identified as being important for a range of vulnerable habitats, plant and animal species within the European Union and are designated under the Habitats Directive.

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Special Landscape Area	SLA	A non-statutory designation applied by the local planning authority to define areas of high landscape importance within their administrative boundary. Areas of high landscape importance may be designated for their intrinsic physical, environmental, visual, cultural and historical value in the contemporary landscape. Landscapes designated as a Special Landscape Area may be unique, exceptional or distinctive to the local authority area.
Special Protection Areas	SPA	Sites designated under the Birds Directive due to their international importance for the breeding, feeding, wintering or migration of rare and vulnerable species of birds.
Stakeholder	-	An organisation or individual with a particular interest in the project.
Statutory Consultee	-	Organisations that the relevant determining authority is required to consult by virtue of the EIA Regulations.
Study Area	-	The spatial area within which environmental effects are assessed (i.e. extending a distance from the SPC Proposals footprint in which significant environmental effects are anticipated to occur). This may vary between the topic areas.
Technical Advice Note	TAN	Technical Advice Notes provide specific topic-based material to support land use planning policy that is set out in Planning Policy Wales, which is the document that must be used by local planning authorities in Wales for the effective preparation of their local planning policy documents.
Town and Country Planning Act 1990	TCPA	The Act that forms part of the land use planning regime in the UK and (among other things) establishes the legal framework in respect of applications for, and determination of, planning permissions.
Travel to Work Areas	TTWA	Travel to Work Areas for the Power Station are considered to be Holyhead and Bangor, Caernarfon & Llangefni with particular focus upon the communities present within proximity of the existing A5025.
UK Advanced Boiling Water Reactor	UK ABWR	The UK advanced boiling water reactor to be supplied by Hitachi-GE Nuclear Energy, Ltd., as part of the Power Station.
Wales Coast Path	WCP	An 870 mile network of public footpaths and other routes around much of Wales' coastline.

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Full Title	Acronym	Description
Water Framework Directive	WFD	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. The overarching objective is to get all water bodies in Europe to attain good or high ecological status.
Welsh Government	-	The devolved Government for Wales.
Wylfa Newydd Development Area	WNDA	The indicative area of land including the Power Station Site and the surrounding areas that would be used for the construction and operation of the Power Station.
Wylfa Newydd Project	-	See the Project.
Wylfa NPS Site	-	The Wylfa site designated by NPS EN-6 as potentially suitable for the deployment of a new nuclear power station.
Zone of Theoretical Visibility	ZTV	Visibility of an object in the surrounding landscape.

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# 1 Introduction

## 1.1 *The Wylfa Newydd Project*

1.1.1 The Wylfa Peninsula on Anglesey, North Wales has been identified as an approved site for the construction of a new nuclear facility in the National Policy Statement for Nuclear Power Generation (NPS EN-6), published in 2011. The approved site (termed the Wylfa NPS Site) comprises a 254 hectare area of land to the south of the existing Magnox Nuclear Power Station (the Existing Power Station).

1.1.2 Horizon Nuclear Power Limited is a UK energy company developing a new generation of nuclear power stations to help meet the country's need for stable and sustainable low carbon energy.

1.1.3 Horizon Nuclear Power Wylfa Limited (Horizon) is a subsidiary of Horizon Nuclear Power Limited and is proposing to construct and operate the Wylfa Newydd Project, which comprises:

- **the Wylfa Newydd Generating Station** - the proposed new nuclear Power Station including two UK Advanced Boiling Water Reactors (UK ABWR) to be supplied by Hitachi-GE Nuclear Energy, Ltd., associated plant and ancillary structures and Off-Site Power Station facilities. Off-Site Power Station facilities, which are an integral part of the Generating Station, comprise the Alternative Emergency Control Centre, the Environmental Survey Laboratory and the Mobile Emergency Equipment Garage; and
- **Associated Development** – development to support the delivery of the Power Station, for example highways improvements along the A5025, Park and Ride facilities for construction workers, Logistics Centre, Temporary Workers' Accommodation and Horizon's Visitor Centre.

1.1.4 The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to a number of regulators. A nuclear power station is a nationally significant infrastructure project under the Planning Act 2008. Horizon must therefore obtain a development consent order (DCO), which is granted by the Secretary of State for the Department of Energy and Climate Change.

## 1.2 *The Proposed Development*

1.2.1 As part of the initial activities to realise the construction of the Project, various preparatory works are required. These are designed to help facilitate subsequent activities which will be included within the DCO application and which are required prior to the main activities associated with the provision of infrastructure, formation of site platforms and construction of a range of buildings. Further information on the Site Preparation and Clearance (SPC) Proposals is provided in section 2.

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- 1.2.2 The Power Station is proposed to be developed on land west of Cemaes, on the north coast of Anglesey. The following areas are used when describing the Project:
- **Power Station Site** – the indicative area of land and sea within which the majority of the permanent Power Station buildings, plant and structures would be situated. It would include the two nuclear reactors, steam turbines, the cooling water system (CWS) intake and pumphouse, outfall structures and breakwaters and the marine off-loading facility (MOLF), as well as other ancillary structures;
  - **Wylfa NPS Site** – the Government has issued a National Policy Statement for Nuclear Power Generation EN-6 (NPS EN-6) that identifies a small number of sites in the UK as being potentially suitable for the deployment of a new nuclear power station. NPS EN-6 identifies one such site on Anglesey. Horizon refers to this site as the Wylfa NPS Site (see figure 1.1);
  - **Wylfa Newydd Development Area** – the indicative areas of land and sea, including the Power Station Site, the Wylfa NPS Site and the surrounding areas that would be used for the construction and operation of the Power Station. This area is representative of the maximum area that would be physically affected by Power Station main construction activities and used to form the setting and features of the operational Power Station; and
  - **Off-Site** – the areas of land needed for components of the Project that fall outside the Wylfa Newydd Development Area. Project components that would be Off-Site include most of the Associated Development needed for both construction and operation of the Power Station for which planning applications would be made, as well as the Off-Site Power Station facilities that would be included within the application for a DCO for the Generating Station.
- 1.2.3 The Wylfa Newydd Development Area is located on the north coast of Anglesey and covers approximately 380 hectares of land. It is bounded to the north by the Existing Power Station. To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 road and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregle. To the south and west, the Wylfa Newydd Development Area abuts agricultural land. To the west it adjoins the coastal hinterland and includes part of Cestyll Garden, beyond which lies Cemlyn Bay.
- 1.2.4 The development of the Project will require a number of applications to be made under different legislation to different regulators. As the Power Station constitutes a Nationally Significant Infrastructure Project, Horizon intends to make an application for a DCO to the Secretary of State under the Planning Act 2008 to authorise its construction and operation.
- 1.2.5 A number of separate applications to other consenting bodies including the Isle of Anglesey County Council (IACC) will also be submitted to authorise the Associated Development, which includes various SPC activities to which this EIA Scoping Report specifically relates.

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### **1.3 *Consenting and Environmental Impact Assessment***

- 1.3.1 Planning Act 2008 and so an application to the Secretary of State for the Department of Energy and Climate Change for a development consent order (DCO) under that Act to authorise it will be required. The Generating Station will be subject to mandatory EIA procedures as it is a Schedule 1 development, as defined by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. An Environmental Statement for this component of the Wylfa Newydd Project will form an integral part of the DCO application documentation.
- 1.3.2 Horizon has taken the decision to undertake site preparation and clearance works prior to DCO submission to facilitate earlier delivery of the Power Station. This is in line with the guidance given to Local Authorities by the Department of Communities and Local Government and the Department of Energy and Climate Change letter (16 July 2009). In Wales development which is not part of the DCO will be subject to the Town and Country Planning Act 1990 and will require the submission of separate planning application, triggering the requirements of the Environmental Impact Assessment (EIA) Regulations.
- 1.3.3 The SPC Proposals are not specifically identified within any of the schedules of the EIA Regulations. Horizon has taken the view that, in the absence of any specific description within the EIA Regulations, the activities to be carried out could give rise to the potential for significant environmental effects. Accordingly Horizon has decided to voluntarily provide a formal assessment of the activities in terms of the EIA Regulations.

### **1.4 *Purpose of this Scoping Report***

- 1.4.1 As the nature, size and location of the SPC Proposals could give rise to significant environmental effects, Horizon is subjecting this part of the Wylfa Newydd Project to a formal process of Environmental Impact Assessment (EIA). As part of the formal EIA procedures set out within the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 as amended, Horizon is seeking a scoping opinion from the Isle of Anglesey County Council (IACC).
- 1.4.2 An Environmental Statement will be prepared by Horizon to report the baseline data and findings of an impact assessment carried out in accordance with EIA requirements. This will accompany a planning application to be submitted to the IACC for the SPC Proposals.
- 1.4.3 In line with the EIA Regulations this Scoping Report has been prepared by Horizon to accompany a request for a formal Scoping Opinion from the IACC. The Scoping Report outlines the scope of the proposed activity, describes the main receptor groups that will potentially be impacted by the proposals and therefore assessed within the Environmental Statement and the form and nature of the assessments that will be undertaken as part of the impact assessment and subsequently reported in the Environmental Statement.

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## 2 The site preparation and clearance proposals

### 2.1 Introduction

2.1.1 The area of land subject to SPC Proposals, herein referred to as the Application Site, is illustrated in figure 1.2 which also shows the location of the site compound and security track. This section provides an account of the environmental context of the proposed development before describing the SPC Proposals and the associated programme of works.

### 2.2 Environmental context

2.2.1 The local landscape is high quality and in particular, the whole Anglesey rural coastline, and inland to several kilometres, is designated as an Area of Outstanding Natural Beauty (AONB) (refer to figure 9.1).

2.2.2 Settlement patterns around the Wylfa Newydd Development Area are characterised by small clusters of residential dwellings and more isolated farmsteads. Larger settlements include the villages of Cemaes to the immediate east and Tregel to the south-east. Other urban areas include the towns of Amlwch (9km east), Holyhead (24km south-west) and Llangefni (37km south-east).

2.2.3 In places, the AONB boundary is formed by the existing A5025 which is the main vehicular route to the site. Land extending to the north-east of Cemaes and to the west of Cestyll Garden is designated as an AONB and both areas abut coastline that is also designated as part of the North Anglesey Heritage Coast. A small section of the Wylfa Newydd Development Area to the south-west of the Existing Power Station is within the AONB. The Wylfa Newydd Development Area also lies within the locally designated Anglesey Special Landscape Area (SLA).

2.2.4 The road to the Existing Power Station also provides access to the Magnox visitor centre, car park, café and picnic/play area. There is a grass playing field to the south of the Existing Power Station, adjacent to the Wylfa Sports and Social Club premises.

2.2.5 Land within and surrounding the Wylfa Newydd Development Area is predominantly in agricultural use for grazing by sheep or cattle. It is contained by hedgerows and crossed by a network of roads, rural lanes, a network of footpaths, watercourses and overhead electricity infrastructure. Soils within the SPC Application Site are generally of low fertility although the area contains small pockets of higher quality agricultural land.

#### Topography

2.2.6 The main landform features comprising the landscape setting are:

- the rocky coastal shoreline to the north;
- the artificial wooded drumlins associated with the Existing Power Station; and
- the natural drumlin landscape, giving rise to the undulating agricultural fields covering much of the Wylfa Newydd Development Area beyond the immediate vicinity of the Existing Power Station.

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2.2.7 To the south-west of the Existing Power Station, land within the Wylfa Newydd Development Area is at an elevation of about 2m above ordnance datum (AOD), with a gentle slope towards a rocky coastline. The area largely comprises coastal grassland and agricultural land, characterised by rocky headlands with small bays.

2.2.8 Away from the coast, land within the Wylfa Newydd Development Area generally comprises rough grazing with exposed rock and gorse thickets. The landscape is characterised by several small rounded hills (known as drumlins), which rise up to approximately 40m AOD in the southern parts of the Wylfa Newydd Development Area.

## **2.3 Environmental constraints associated with the SPC Application Site**

2.3.1 Within and around the area of the Application Site there are a number of physical features and habitats, some of which are formally designated, which need to be taken account of in the development of the design.

2.3.2 Several watercourses and other water features cross the Wylfa Newydd Development Area (see figure 11.2). The nearest major watercourse is the Afon Wygyr, which drains land to the east of the Existing Power Station and flows into the Irish Sea at Cemaes Bay. There is a small stream that occasionally discharges into Porth-y-pistyll and there are also a number of small springs and drainage ditches crossing the Wylfa Newydd Development Area that feed/rise from the Tre'r Gof Site of Special Scientific Interest (SSSI) or Cae Gwyn SSSI. To the west the Afon Cafnan discharges into Porth-y-pistyll.

2.3.3 The Existing Power Station is drained by three surface water drainage systems. Two discharge onto the foreshore, and one into the Existing Power Station's main cooling water outfall. In addition to watercourse catchments, there are several small ponds which appear isolated from watercourses. According to the Natural Resources Wales (NRW) Flood Maps, the Wylfa Newydd Development Area is predominantly of low flood risk, but small parcels of land on low lying areas are within a higher risk classification.

2.3.4 Sites subject to ecological conservation designations (both statutory and non-statutory) of international, national and local importance are shown on figure 10.1. The most notable of these include the Tre'r Gof and Cae Gwyn SSSIs within and adjacent to the Wylfa Newydd Development Area, respectively; and Cemlyn Bay to the west, which forms part of the Ynys Feurig, Cemlyn Bay and The Skerries Special Protection Area (SPA) and the Cemlyn Bay Special Area of Conservation (SAC) and SSSI. In addition consultation is currently ongoing regarding the proposed Northwest Anglesey SAC and Marine SPA.

2.3.5 The two non-statutory Wildlife Sites; Wylfa Head and Trwyn Pencarreg, are also included within the ecological study area.

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- 2.3.6 There are a number of cultural heritage assets throughout the area which, although not within the SPC Application Site, require to be considered as part of the assessment process. These include archaeological remains, Scheduled Ancient Monuments, Historic Buildings, Conservation Areas and Historic Landscapes.
- 2.3.7 NRW is currently consulting on candidate SACs and possible new marine SPAs. The areas identified for these designations include marine areas extending north from the coast of Anglesey. The proposed boundaries include waters within and adjacent to the Wylfa Newydd Development Area and partially within the Power Station Site.
- 2.3.8 The areas being considered do not have policy protection until ministerial approval is given to formally consult on them; a three month consultation period commenced on 19th January 2016.
- 2.3.9 Finally there are a number of buildings and other structures throughout the Application Site which require to be demolished to facilitate the SPC development.

## **2.4 Description of the site preparation and clearance proposals**

2.4.1 The scope of works to be undertaken as part of the SPC Proposals includes a number of diverse activities for which a formal Scoping Opinion is being sought from the IACC. A planning application will be submitted by Horizon for this work, which will prepare the Wylfa Newydd Development Area for the main construction as approved under the DCO process. The SPC Proposals include the following activities:

- formation of workers and plant compounds, temporary portacabin housing offices and welfare facilities, car parks, and associated materials laydown areas and provision of temporary lighting;
- erection of perimeter fencing;
- erection of construction and ecology fencing within perimeter fence;
- translocation of protected species;
- use of outcrops to win rock (with associated blasting, crushing and screening);
- formation of haul, access & security roads with associated drainage;
- traffic management including formation of traffic signal control for vehicular crossing point on existing access to Magnox site;
- demolitions of structures;
- removal of internal field boundaries including stone walls within perimeter;
- formation of stone storage area(s);
- temporary closures of Cemlyn Bay Road;
- temporary closures and diversions of Public Rights of Ways (PRoW) as required;
- provision of other surface/groundwater drainage and sediment treatment ponds, location of headwalls that feed into existing outfalls;
- vegetation clearance and removal;
- management of vegetation on cessation of grazing;
- contaminated land remediation as necessary;

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- watercourse diversion; and
- topsoil clearance and storage (including phasing).

## Proposed Works

- 2.4.2 The activities associated with SPC Proposals will take place over approximately a two year period during late 2016 / early 2017 and 2018 onwards, the programme of which is explained further in section 2.4 and table 2.1. Initial activities will include the erection of fencing, provision of car parks and offices (expected to be in the location of the existing ground investigation works compound, adjacent to the existing Wylfa Sports and Social Club premises), the translocation of protected species (such as water vole), the demolition of properties and the removal of field boundaries. Thereafter it is proposed to use suitable rock material from outcrops on site to provide source material (between 60,000 and 70,000 tonnes) to enable the formation of laydown areas, haul roads and security tracks throughout the Application Site. The use of on-site inert material, (including from demolitions and rendered stone walls) will minimise the need for additional deliveries by road. The location of the rock outcrops to be used is shown on figure 1.3.
- 2.4.3 A site for the storage of stone and other material won from property demolition and removal of walls around fields has been identified and is also shown on figure 1.3.
- 2.4.4 Where necessary, subject to health and safety requirements, PRow will be subject to temporary closure and diversion. It is intended to ensure any associated disruption is kept to a minimum.

### Vegetation

- 2.4.5 Vegetation will be cleared from the main areas of the Application Site. This includes trees and shrubs which will be treated appropriately. Details of this and related activities will be contained within a Materials Management Plan and Site Waste Management Plan, prepared by the contractor, as part of a wider Environmental Management Plan.

### Topsoil

- 2.4.6 Topsoil will be removed from various targeted areas and stored in mounds in a phased manner at locations around the Application Site. The initial phase of top soil stripping is planned to commence during the spring/summer of 2018. Subsequent phases will be undertaken around the same time as the DCO is anticipated to be granted. This is to ensure that the period when underlying materials are exposed is kept to a minimum, and the SPC Proposals can transition easily into the bulk earthworks phase associated with the main construction activities.
- 2.4.7 The extent and phasing of these areas is identified within figure 2.1. The initial topsoil strip (phase 1 and 2) will take place in the general area identified for the construction of the proposed Generating Unit 1. Soils to be stored longer than 6 months will be stored in mounds (up to 2m in height with one in two side slopes) formed to the west of the A5025 opposite Tregele and to the north of the dwellings situated between the Existing Power Station site access and Cemaes.

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2.4.8 Subsequent topsoil stripping will take place on land to the west of Cemaes (phase 3) and in the vicinity of the proposed generating unit 2 (phase 4). Soils will be stored (in a similar manner to the previous phases) at locations to the west of Cemaes and to the south of the proposed location for Generating Unit 1.

#### ***Drainage***

2.4.9 Where necessary, a drainage system will be provided within the Application Site to deal with runoff from topsoil strip and mounds, rock outcrop areas, security and access tracks and haul roads. The drainage will include a number of ponds or lagoons designed to allow suspended solids in run-off to settle, rather than being discharged directly to the water-bodies in the vicinity of the Application Site.

#### ***Plant, machinery and workforce***

2.4.10 A range of plant and machinery will be used to undertake the works, including excavators to remove stone from the rock outcrops, and demolition plant. Rock crushers will also be used. Soil stripping will involve the use of bulldozers to enable stockpiling before placement in mounds by excavators and dump-trucks. Drum rollers, mid-range excavators and bulldozers will be used to form haul roads and security tracks. At its peak the workforce associated with the SPC Proposals will number approximately 80.

#### ***General***

2.4.11 The majority of activities associated with SPC will take place during daylight hours and, where appropriate, take account of seasonal considerations such as the breeding bird season. With the exception of the site compound and car park, it is not anticipated that work areas around the Application Site will require illumination.

2.4.12 Other works to be undertaken on the Application Site during 2016/2017, that are not part of the SPC proposals, will include the removal and re-routing of underground electricity cables, which will be carried out by others, such as Scottish Power, under their own permitted development rights.

## ***2.5 Programme of the site preparation and clearance proposals***

2.5.1 An outline of the proposed indicative programme for the implementation of the SPC Proposals is provided in table 2.1. It is anticipated that SPC Proposals will commence when the application is approved and last for approximately 24 months.

2.5.2 A range of environmental assessments, modelling, ground investigation and other surveys will continue throughout 2016. The finalised proposals will be subject to detailed impact assessment, the conclusions of which will be recorded in a single Environmental Statement for the whole of the SPC development which will accompany the planning application. Submission of the planning application is planned for August / September 2016.

2.5.3 Subject to consenting and authorisation through the relevant statutory procedures, Horizon anticipates certain activities commencing as soon as possible upon the grant of consent.

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**Table 2.1: Indicative programme of works**

Activity	2016/2017	2018 onwards
Establishment of offices and car park on existing site compound and provision of temporary lighting	x	
Erection of perimeter security fence	x	x
Erection of construction and ecology fencing within perimeter security fence	x	x
Translocation of protected species	x	x
Utilisation of outcrop/borrow pit to win rock (with associated crushing and screening)	x	
Formation of haul, access & security roads	x	x
Demolition of structures	x	x
Removal of internal field boundaries including stone walls within perimeter	x	x
Formation of stone storage area	x	
Temporary closure of Cemlyn Bay Road	x	x
Temporary closures and diversions of PRoW as required	x	x
Provision of other surface/groundwater drainage and sediment treatment ponds, location of headwalls that feed into existing outfalls	x	x
Vegetation clearance and removal	x	x
Contaminated land remediation	x	x
Diversion of watercourse	x	x
Topsoil strip, storage and seeding		x

## 2.6 Restoration

2.6.1 As the SPC Activities precede the Wylfa Newydd DCO, should DCO not be granted then any works undertaken as part of the planning approval shall require to be reinstated to an agreed scheme of works. The Environmental Statement will include details of the proposed site restoration scheme to be implemented, should the Wylfa Newydd Project not proceed for whatever reason. It will also record the predicted environmental effects associated with the implementation of the site restoration scheme, including details of any mitigation considered appropriate for restoration activities.

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### 3 Consultation

#### 3.1 Consultation with the community

- 3.1.1 In accordance with the requirements of the Planning Act 2008, the Wylfa Newydd Project was subjected to a process of wide-ranging pre-application consultation (PAC1<sup>1</sup>) in late 2014. The purpose of the exercise was to engage statutory and non-statutory consultees, and the local community, on the preliminary details of the Generating Station and its Associated Development to ensure the Wylfa Newydd Project is developed in a way that seeks to meet the aspirations and objectives of consultees.
- 3.1.2 The Stage One pre-application consultation materials were prepared in accordance with statutory requirements and DCLG<sup>2</sup> Guidance on pre-application consultation, and built on Horizon's engagement activities up to that point. The aim was to provide information available at that time, to allow the development of an open and ongoing dialogue with Horizon's key stakeholders and the community.
- 3.1.3 In respect of the SPC Proposals, information was included within the Stage One pre-application consultation documentation. The outcomes of the Stage One pre-application consultation process have been reviewed by Horizon, and used to inform the design of the proposed works.
- 3.1.4 A number of public information events were held over a period of two weeks in July 2015, in order to inform their understanding of the Wylfa Newydd Project.
- 3.1.5 Horizon plans to undertake further pre-application consultation for the Wylfa Newydd Project in 2016.

#### 3.2 Other consultation

- 3.2.1 Consultation with stakeholders has informed the development of the SPC Proposals and the identification of environmental constraints, sensitivities and potential environmental effects.
- 3.2.2 Stakeholder engagement has been undertaken with various organisations in order to procure background data, information and records relevant to the Application Site and beyond. Key organisations engaged to date have included the IACC, NRW and various statutory undertakers.
- 3.2.3 Where necessary and appropriate, consultation with relevant organisations has taken place to ensure agreement has been reached on the approach and methodologies to be used in the various technical assessments.

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<sup>1</sup> PAC1 consultation information is available electronically at <http://consultation.horizonnuclearpower.com/>

<sup>2</sup> The Government Department of Communities and Local Government, with responsibility for (among other things) developing planning policy and planning legislation.

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- 3.2.4 Consultation will continue with key organisations throughout the EIA process to obtain and verify baseline environmental information, further refine and scope and methodologies where necessary, and to obtain views and opinions on appropriate mitigation measures for incorporation into the final design.
- 3.2.5 As part of its statutory obligations, the IACC will consult on the EIA scope with statutory and non-statutory agencies and provide Horizon with a summary of key issues and/or recommendations arising from the process within a formal Scoping Opinion. Horizon will also issue a copy of this Scoping Report to a number of non-statutory consultees for wider review and comment. Horizon will then consider all information returned from the scoping consultation, together with any other relevant responses, and will modify the scope of the EIA accordingly to take account of any new material issues.

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## 4 Approach to assessment

### 4.1 Legislative context

- 4.1.1 Council Directive of 13 December 2011 ‘...on the assessment of the effects of certain public and private projects on the environment’ (the ‘EIA Directive’; 2011/92/EU) forms the basis for the legal requirement for EIA and of EIA practice in the UK, (note that this has been subsequently amended by Directive 2014/52/EU).
- 4.1.2 The EIA Directive is implemented in the UK through separate statutory instruments specific to different consenting regimes and jurisdictions.
- 4.1.3 In the case of the SPC Proposals, this is the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, as amended (hereafter ‘the EIA Regulations’).

### 4.2 Screening

- 4.2.1 Screening procedures exist within the EIA Regulations to determine whether development proposals qualify for EIA. A review of the SPC Proposals against the thresholds and criteria contained in the EIA Regulations was undertaken by Horizon to determine EIA requirements, as per section 1.4 of this report.

### 4.3 Scoping

#### Observations

- 4.3.1 An underlying principle of the EIA process is that it should concentrate on environmental issues where effects associated with a development proposal have the potential to be significant. For the purposes of scoping, it was necessary to consider the maximum likely effects of the SPC Proposals i.e. the worst-case development scenario.
- 4.3.2 The scoping process has involved:
- a review of available documentation related to the form and status of the existing environment;
  - consultation with statutory and non-statutory agencies and other environmental bodies with knowledge of the proposed Wylfa Newydd Project and surrounding area;
  - preliminary desk-based and site-based appraisals and surveys; and
  - knowledge of the potential environmental implications of comparable development proposals.

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4.3.3 The following broad observations regarding the SPC Proposals were noted during the Horizon scoping process:

- the nature of the receiving environment and the type of works associated with the proposals are such that environmental effects could arise during the implementation phase of SPC Proposals. Unusually the SPC Proposals will not have a distinct 'operational' phase as it is a precursor to activities associated with the main construction project;
- a need to undertake certain types of environmental survey within appropriate time periods to capture representative data or reflect seasonal changes;
- a requirement for continued liaison with stakeholder and regulatory authorities to input into the EIA and design process;
- potential for cumulative effects exists through the interaction of the SPC Proposals with other committed development projects in the locality, other Associated Development and/or the combined effects of two or more environmental aspects associated with the SPC Proposals (e.g. combined visual, noise and air quality effects on residents) (discussed further in chapter 19); and
- no requirement to consider "decommissioning" as a future assessment scenario, but the need to consider the restoration of the Application Site should the DCO application be refused or the Wylfa Newydd Project not proceed for whatever reason. The Environmental Statement will provide details (and an assessment) of a scheme of restoration which will be put in place should this situation arise.

## Guidance

4.3.4 Guidance contained in a number of documents was used to inform the process of scoping:

- Environmental Impact Assessment: A Handbook for Scoping Projects<sup>3</sup> - This comprises a suite of project and process specific guidance notes to inform the accurate scoping of development related effects;
- Welsh Office Circular 11/99: Environmental Impact Assessment - Provides guidance on the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999;
- Guidelines for Environmental Impact Assessment (2004), published by the Institute for Environmental Management and Assessment (IEMA); and
- IACC: Draft Approach and Methodology for Environmental and Cumulative Impact Assessment<sup>4</sup> - This provides draft guidance and standardised methodologies for EIA and Cumulative Impact Assessment for developers, planning officers and consultants for development projects on Anglesey.

<sup>3</sup> Environment Agency, May 2002.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/296952/geho0411btrf-e-e.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296952/geho0411btrf-e-e.pdf)

<sup>4</sup> Isle of Anglesey County Council, July 2014. Draft Approach and Methodology for Environmental and Cumulative Impact Assessment Guidance for Developers, Planning Officers and Consultants.

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## Considerations

4.3.5 Horizon previously issued a request for a formal Scoping Opinion for the entire Wylfa Newydd Project in 2009 to the Planning Inspectorate. This was based on the previous design of the Generating Station. The document proposed a structure for undertaking and reporting the EIA associated with the Wylfa Newydd Project. The process of scoping noted that consistency across all Wylfa Newydd Project EIAs will be necessary in order to have a robust approach to the identification and assessment of potential cumulative effects. Environmental matters and topic titles requiring consideration in the Generating Station EIA and Environmental Statement have accordingly been reviewed as part of the scoping of the SPC Proposals against the above guidelines with the following being noted:

- certain environmental assessment topics that are applicable to the Generating Station will not be applicable to the SPC Proposals; therefore some environmental aspects can be scoped out of the EIA from the outset;
- several related assessments are likely to form standalone documents (e.g. Health Impact Assessment) and will be submitted alongside the Environmental Statement and other documentation as part of the EIA and planning application for the SPC Proposals; and
- compliance with planning policy objectives would need to be considered as part of individual environmental topics, where appropriate as part of the EIA and planning application for the SPC Proposals.

## Scoping matrix

4.3.6 Following a review of environmental topic areas, a tabular matrix has been developed (in table 4.1) to assist identification of potential environmental issues to be scoped into the EIA.

4.3.7 The scoping matrix takes the form of an initial evaluation of potential interactions between the key development stages of the SPC Proposals and receptors and resources associated with the receiving human, natural and built environment. The findings are summarised in rating form, whereby a one-star rating is indicative of potential interactions of low significance and a three-star rating is indicative of potential interactions of high significance.

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**Table 4.1: Scoping matrix**

	EIA Topics								
	Air Quality	Noise and Vibration	Cultural Heritage	Landscape and Visual Effects	Terrestrial and Freshwater Ecology	The Water Environment	Geology and Soils	Public Access and Recreation	Socio Economics
<b>SPC Activities</b>									
Establishment of offices and car park on existing site compound and provision of temporary lighting	*	*		*		**			
Erection of perimeter security fence		*	**	*	*	*		**	
Erection of construction and ecology fencing within perimeter security fence		*	**	*	**	*		*	
Translocation of protected species					***			*	
Utilisation of outcrop/borrow pit to win rock (with associated crushing and screening)	**	**	*	*	*	**	**	**	
Formation of haul, access and security tracks	***	***	*	**		**	**	**	
Demolition of structures	**	**	*	*				*	
Removal of internal field boundaries including stone walls within perimeter	*	*	**	**	*	*		*	
Provision of stone storage area	*	*	*	**	*	*	*	*	

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	EIA Topics								
	Air Quality	Noise and Vibration	Cultural Heritage	Landscape and Visual Effects	Terrestrial and Freshwater Ecology	The Water Environment	Geology and Soils	Public Access and Recreation	Socio Economics
Temporary closure of Cemlyn Bay Road								***	*
Temporary closures and diversions of PRow as required								***	*
Provision of other surface/groundwater drainage and sediment treatment ponds, location of headwalls that feed into existing outfalls			**	*	**	***	**	*	
Vegetation clearance and removal	**	**	*	***	***	**	**	*	
Contaminated land remediation	**	**	*	*	**	**	***	**	
Diversion of watercourse	*	*	**	***	***	***	**	*	
Topsoil strip, storage and seeding (by phase)	***	***	**	***	**	***	***	*	

4.3.8 Environmental subject areas to be considered in the EIA for the SPC Proposals are discussed later in this report. The scope of the environmental subject areas are identified in accordance with the requirements of the EIA Regulations and will outline:

- the extent and availability of existing environmental information;
- key sensitivities and interests within the receiving environment;
- data collection and survey requirements including study areas;
- the scope and level of assessment detail to be progressed; and
- methodologies, guidance and criteria to be followed where they differ to that described elsewhere in this report.

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## 4.4 *Delivery of the Environmental Impact Assessment*

### EIA guidance

- 4.4.1 In addition to the guidance documents presented in paragraph 4.3.4 and those cited elsewhere in this report, the EIA will also give due regard to relevant and applicable topic-based guidance where appropriate.
- 4.4.2 Cognisance will also be given to environmental assessment guidance contained within NPS EN-6, other guidance prepared by the Department for Communities and Local Government<sup>5</sup>, and Advice Notes prepared by the Planning Inspectorate<sup>6</sup>, where considered appropriate.

### Establishment of the baseline environment

- 4.4.3 The EIA for the SPC Proposals will commence with the identification and review of information relating to known, or the likely presence of, environmental receptors and resources within a defined study area in order to determine their relative value, importance or sensitivity towards change.
- 4.4.4 Environmental resources will include those environmental aspects which support and are essential to natural or human systems. These include areas or elements of population, ecosystems, watercourses, air and climatic factors, landscape, and material assets.
- 4.4.5 Environmental receptors will comprise, but not be limited to, people (i.e. occupiers of dwellings and users of recreational areas, places of employment and community facilities) and elements within the environment (e.g. flora and fauna) that rely on environmental resources.
- 4.4.6 Desk-based data sources will comprise: consultation responses; published literature; databases, records and schedules relating to environmental designations; national, regional and local policy documentation; historic and current mapping; recent aerial photography; consultation responses; and data gathered from previous environmental studies.
- 4.4.7 Surveys will be undertaken to fill data gaps, verify and consolidate information gathered during the desk-based reviews, to evaluate those reviews and confirm the relationships between specific environmental interests and their wider environmental value.

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<sup>5</sup> Planning Act 2008: Guidance on the pre-application process, published by DCLG (March 2015).

<sup>6</sup> A series of published advice notes intended to inform developers, consultees, the public and others about a range of process matters in relation to the Planning Act 2008 process.

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4.4.8 Study area extents will vary in accordance with the environmental topic area being considered. For some topics, a study area may be defined as relatively localised to the SPC activities, whilst for others it may extend outward to capture distant communities and environmentally sensitive areas. The definition of each study area will be achieved through a review of the relationship between the SPC Proposals and the receiving environment, and also by reference to established thresholds stipulated in topic-specific EIA guidance.

### Impact identification and assessment

4.4.9 Effects comprise identifiable changes to the baseline environment as a result of the SPC Proposals. Effects can be:

- **Direct** e.g. loss of habitat;
- **Indirect** e.g. pollution downstream arising from silt deposition during earthworks;
- **Short-term** i.e. those which are confined to the implementation phase, such as temporary dust emissions from working areas;
- **Medium-term** i.e. those which may persist after the end of implementation until mitigation measures become effective.
- **Long-term** i.e. those which are permanent (irreversible) or which may decline over longer timescales.

4.4.10 Effects can be either beneficial (e.g. provision or safeguarding of local employment) or adverse (e.g. loss of an attractive environmental component).

4.4.11 Impact assessments will be both quantitative and qualitative in nature, and will be based on comparisons between the environmental conditions immediately prior to the implementation of the SPC Proposals and the predicted environmental conditions post implementation. Effects will be defined in accordance with current guidance, accepted terminology and standardised methodologies defined in paragraph 4.4 6, to predict the magnitude of effect (change) resulting from the SPC Proposals.

### Identification of environmental effects

4.4.12 Professional judgement (of experienced subject specialists), defined thresholds, established criteria and standards will be used to report the environmental effects.

4.4.13 Environmental effects are formulated as a function of the receptor/resource value and sensitivity, and the predicted magnitude of effect (or change). Effects can be referred to as either prior to, or following the establishment of, environmental mitigation.

### Environmental mitigation

4.4.14 Environmental mitigation measures will be developed to address potentially significant adverse environmental effects. The principles to be adopted in the identification and development of mitigation will be: avoidance (where possible); reduction (where avoidance cannot be achieved); or compensation (where reduction is unachievable or would not achieve the required level of mitigation).

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4.4.15 It is possible for mitigation to be implemented in a variety of ways. It can take the form of: agreed measures incorporated into the evolving design of the SPC Proposals; standard industry best practices which can be enforced through planning obligations and conditions; or measures proposed in outline which require further development and formal agreement to ensure their implementation.

### **Significance of environmental effects**

4.4.16 The EIA Regulations require that an EIA describes the likely significant effects of a project on the environment, but they do not provide a specific definition of 'significance'.

4.4.17 Horizon's process of identifying the significance of predicted environmental effects has been developed to standardise the approach across the various aspects of the Wylfa Newydd Project subject to EIA.

4.4.18 Although professional judgement is the principal factor in determining which effects would be significant, the EIA topic specialists are guided by the methodology outlined here and others where applicable, in order to ensure consistency between topics.

4.4.19 The Institute of Environmental Management and Assessment<sup>7</sup> suggests that the assessment of significance should be based on the characteristics of the effect and the sensitivity of the receptor, and notes that the evaluation of significance may be based upon one or more of the following:

- comparison with Regulations or standards;
- reference to criteria such as protected species, protected sites, landscapes, etc.;
- consultation with stakeholders and decision-makers;
- compliance with policy (or plan) objectives;
- comparison with experience on similar projects elsewhere; and
- experience and professional judgement of the specialist assessor.

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<sup>7</sup> IEMA, 2004. The Institute of Environmental Management and Assessment's Guidelines for Environmental Impact Assessment. IEMA.

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4.4.20 IEMA's 2011 Special Report on the State of EIA Practice in the UK (IEMA, 2011)<sup>8</sup> notes that EIA does not tend to discuss significance in absolute terms; instead, the assessment's findings are regularly set out as different levels of significance. IEMA states that this approach is considered to be good practice as it attempts to aid communication of the scale of the effect by introducing a classification. It is also important to provide clarity in the assessment of where an effect is not considered to be significant. Taking an overview of the Wylfa Newydd Project, an environmental effect is considered significant if, in the professional judgement of the expert undertaking the assessment, it would meet at least one of the following criteria:

- It leads to an exceedance of defined guidelines or widely recognised levels of acceptable change (which will be different for different topics within the EIA).
- It is likely that the consenting authority will reasonably consider applying a planning condition, requirement or legal agreement to the consent to require specific mitigation to reduce or overcome the effect.
- It threatens or enhances the viability or integrity of a receptor or receptor group of concern.
- It is likely to be material to the ultimate decision about whether or not the consent application should be approved.

4.4.21 Each specialist topic chapter has described how the importance, sensitivity or value of receptors and magnitude of change has been determined so that they correspond with the terms in table 4.2 and table 4.3.

#### ***Value of receptors***

4.4.22 The baseline studies for each topic have enabled the identification of a number of 'receptors' (i.e. features of environmental interest that might be potentially affected by an environmental effect). The information gathered during the baseline studies has enabled each receptor to be assigned a 'value' and a degree of 'sensitivity' to each determined effect. Table 4.2 below sets out generic criteria for determining the value/sensitivity of receptors. These have been used as guidance for determining topic-specific criteria. For some receptors, the criteria in table 4.2 may suggest that more than one 'value' may apply. However, this table is used as a guide, and a precautionary approach is taken, guided by professional judgement.

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<sup>8</sup> IEMA, 2011. Special Report – The State of Environmental Impact Assessment Practice in the UK. IEMA.

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**Table 4.2: General criteria for determining the value of receptors**

Value/Sensitivity	General criteria
High	Of value, importance or rarity on a national scale, and with very limited potential for substitution; and/or Very sensitive to change, or has little capacity to accommodate a change.
Medium	Of value, importance or rarity on a regional scale, and with limited potential for substitution; and/or Moderate sensitivity to change, or moderate capacity to accommodate a change.
Low	Of value, importance or rarity on a local scale; and/or Not particularly sensitive to change, or has considerable capacity to accommodate a change.
Negligible	Of value, importance or rarity on a very local scale; and/or Not sensitive to change, or has very considerable capacity to accommodate a change.

**Magnitude of change**

4.4.23 The magnitude of change measures the scale or extent of the change from the baseline condition, irrespective of the value of the receptor(s) affected. In determining magnitude, the extent of the physical change is considered in the context of other factors such as existing long-term trends. The magnitude of some changes will alter over time, and in such cases, the assessment will take account of this temporal variation.

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**Table 4.3: General criteria for magnitude of change**

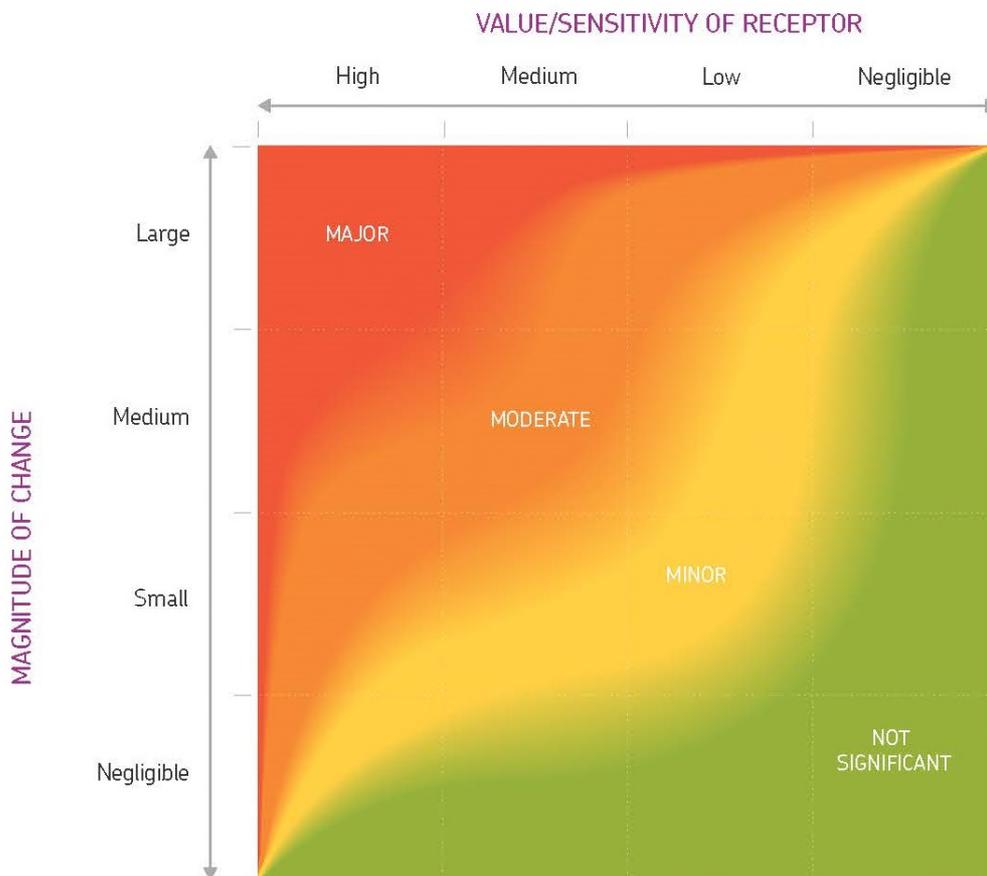
Magnitude of change	General criteria
Large	Loss of resource and quality and integrity of resource; severe damage to key characteristics, features or elements; or  Large scale or major improvement of resources quality; extensive restoration or enhancement; major improvement of attribute quality.
Medium	Loss of resource, but not adversely affecting its integrity; partial loss of/damage to key characteristics, features or elements; or  Benefit to, or addition of, key characteristics, features or elements; improvements of attribute quality.
Small	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (or maybe more) key characteristic, feature or element; or  Minor benefit to, or addition of, one (or maybe more) key characteristic, feature or element; some beneficial effect on attribute or a reduced risk of negative effect occurring.
Negligible	Very minor loss or detrimental alteration to one (or maybe more) characteristic, feature or element; or  Very minor benefit to, or positive addition of, one (or maybe more) characteristic, feature or element.

**Determination of significance**

4.4.24 The assessment of the degree of significance of an effect is determined through professional judgement, where necessary guided by the matrix shown in figure 4.1. The degree of significance is influenced by the value of a receptor and the magnitude of the predicted change. Degrees of significance are described on a scale from ‘not significant’ to ‘major’, with intermediate terms of ‘minor’ and ‘moderate’. To be considered significant at all, the specialist must judge that one of the criteria outlined in wording above has been satisfied.

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**Figure 4.1: Guide to significance ratings**



4.4.25 As described, figure 4.1 is used as a guide only, with the principal basis for the assessment being the professional judgement of the assessor. Therefore, it is possible to moderate the significance rating up or down the scale where the assessor believes it to be appropriate, in accordance with their expert judgement. This will include and taking into consideration mitigation proposed and the eventual residual effects. Any such modification is explained, with reasons, in this scoping report.

## 4.5 **Format of the Environmental Statement**

4.5.1 The baseline information and conclusions of the impact assessment process will be reported in an Environmental Statement which will accompany the planning application for the SPC Proposals.

4.5.2 The Environmental Statement will comprise three volumes, the content of which will be summarised in a Non-technical Summary. It will include:

- Volume 1 - Main text;
- Volume 2 - Figures and other illustrative material; and
- Volume 3 - Appendices.

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4.5.3 A common format will be adopted for the content and structure of Volume 1 of the Environmental Statement.

- **Introduction** - This will introduce the Environmental Statement and the background to the SPC Proposals (and the Wylfa Newydd Project), and those components that have been subject to EIA. The statutory context concerning the need for EIA will also be summarised;
- **The SPC Proposals** - This will establish the need for the works in the context of the Wylfa Newydd Project and prevailing national and local policy. It will also provide a detailed description of the proposals, including a summary of the construction process and implementation timescales;
- **Consideration of alternatives** - This section will examine the alternatives that have been considered in the development of a preferred design solution; and
- **Approach to the assessment** - This will summarise the scoping process undertaken to establish the potential environmental effects of the SPC Proposals, and include any modifications to the scope arising from receipt and examination of the formal Scoping Opinion. The section will summarise the legal basis for EIA, the assessment process undertaken, and the format of the environmental assessments reported in the Environmental Statement.

4.5.4 The proposed structure for each environmental assessment topic will need to retain a certain degree of flexibility, depending on the matters being covered. The following outline reporting format will be adopted.

- Introduction.
- Legislation, Policy and Guidance.
- Methodology.
- Consultation.
- Baseline Environment.
- Assessment of Effects<sup>9</sup>.
- Mitigation.
- Residual Effects.
- Conclusions.
- Glossary of Technical Terms and Abbreviations.
- References.

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<sup>9</sup> In relation to Welsh Language and Culture, where technical assessments have a direct relationship to this subject - for example Socio-Economics - any predicted effects will be reported as a sub-section within the 'Assessment of Effects' section.

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4.5.5 Cumulative effects will be reported in two ways:

- Intra-development cumulative effects i.e. interactions between subjects assessed as part of the SPC Proposals, will be reported across the relevant technical assessments.
- Intra-project and Inter-project cumulative effects i.e. those associated with the SPC Proposals and other components of the Wylfa Newydd Project, and between the Wylfa Newydd Project and unrelated developments, will be reported within a separate chapter of the Environmental Statement.

4.5.6 A summary of any identified intra-development effects will also be presented in the separate cumulative effects chapter for completeness. The cumulative assessment will focus on identifying potentially significant effects rather than every conceivable interaction.

## **4.6 *Other studies and assessments***

4.6.1 Consultation has identified a requirement for wider studies to be undertaken and reported outside the framework of the EIA that will have a bearing on, or relationship to, the SPC Proposals. These comprise the following.

- Habitats Regulations Assessment;
- Flood Consequences Assessment; and
- Health Impact Assessment Report.

4.6.2 Based on current available information, it is possible that European protected species (EPS) derogation licences will be required in accordance with Regulation 53 of the Conservation of Habitats and Species Regulations 2010 (as amended). Should significant effects on European protected species be recorded during the EIA process, “ghost” derogation licences will be prepared for submission alongside the planning applications.

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## 5 Topics scoped out

### 5.1 EIA topics

5.1.1 The process of scoping identified that physical changes associated with implementation of the SPC Proposals will be restricted to the identified site and adjacent land. Following a review of the SPC Proposals, it was concluded that the following environmental topics can be effectively scoped out of the SPC EIA and will not, therefore, be discussed in the SPC Environmental Statement on the basis of there being no activities or changes that would lead to significant environmental effects in the areas of:

- Marine water and sediment quality;
- Coastal processes and geomorphology;
- Marine ecology (including phyto and zooplankton, subtidal and intertidal habitats and communities marine fish, marine mammals and seabirds);
- Traffic and Transport and
- Radiological effects.

5.1.2 The following sections outline the evidence which Horizon have based the assessment to scope out the issue from further consideration under the EIA.

#### **Marine water, sediment quality, coastal processes and geomorphology**

5.1.3 There are no marine activities associated with the SPC Proposals, (activities below Mean High Water Springs (MHWS)). One potential issue leading to changes in marine water quality, coastal processes and effects on coastal geomorphology receptors relates to fine sediment release from the land-based activities via fluvial water bodies or from runoff directly into coastal water bodies. The potential effects of fine silt on the fluvial water bodies will form part of the Water Environment chapter of the Environmental Statement, and are discussed herein. All sediment releases including runoff would be adequately mitigated through an appropriate drainage strategy and construction environment management plan, incorporating a drainage system with settlement lagoons and possible flocculent / coagulant treatment. An Environmental Permit would be required for discharges from settlement ponds to controlled waters including surface and marine waters which would set limits for suspended sediment concentration and quality of the discharge. This would ensure that the quantity and quality of sediment releases are carefully controlled. In addition, the coastal waters adjacent to the location of SPC Proposals are characterised by strong tidal flows which means there is high mixing and high capacity for dilution and dispersal. As the amount of sediment reaching water bodies would not significantly increase there would not be any change to sediment transport processes and therefore no significant effect on coastal processes or coastal geomorphology. An exception is Cemlyn Lagoon as there are no works in proximity to the Lagoon or within the Cemlyn Stream catchment which flows into the lagoon, and there would be no increase in sediment or change in runoff into Cemlyn Lagoon.

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## Marine ecology

- 5.1.4 As there would not be any significant effects on marine water quality, neither would there be any indirect effects from changes to water quality on other marine ecology receptors including: phyto and zooplankton, subtidal and intertidal habitats and communities, fish, marine mammals and seabirds.
- 5.1.5 Although there would be an increase in noise levels and dust within the area of works, given the distance to sensitive marine receptors (seabirds and hauled out seals) and the mobile nature of these fauna, no likely significant effects are predicted. No works are planned in the marine environment and therefore the use of artificial lighting and visual disturbance is not relevant to marine environment receptors.

## Traffic and transport

- 5.1.6 Traffic associated with SPC Proposals has been established in discussions with the design team and from information obtained from a process of early contractor involvement. All vehicles would access the SPC Application Site via the A5025 to Valley, and the A55 thereafter. Traffic flows for the A5025 have been derived using data gathered during an extensive programme of surveys undertaken during August and November 2014. Growth factors have been applied to the surveyed flows to account for background increases in traffic, such as changes in car ownership and demographics (employment, population and housing). Additionally, traffic associated with relevant committed developments that could have a potential effect on the road network within the study area have also been included as part of the Baseline traffic flow.
- 5.1.7 The resultant additional traffic associated with SPC workers and materials based upon the programme of works equates to a maximum of 110 vehicles per day, comprising the following:
- 45 cars into the SPC Application Site and 45 cars out of the SPC Application Site in the AM and PM hours respectively (Monday to Saturday); and
  - 10 HGVs into the SPC Application Site and 10 HGVs out of the SPC Application Site in the AM and PM hours respectively (Monday to Friday).
- 5.1.8 Without the additional SPC traffic, the A5025 has a predicted Annual Average Daily Traffic (AADT) of 3,100 at Tregale and 5,700 at Valley. The maximum of 110 additional vehicles per day represents an increase in traffic of less than 10%. As the A55 has significantly higher flows than the A5025, the percentage increases for the A55 would be even lower than those for the A5025.
- 5.1.9 The additional traffic on the A5025 and A55 represents an increase in traffic of less than 10% and therefore does not require assessment in line with the IEA guidelines<sup>10</sup>.

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<sup>10</sup> Guidelines for the Environmental Assessment of Road Traffic produced by the Institute of Environmental Assessment (IEA) state that projected changes in traffic of less than 10% create no discernible environmental impact.

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## **Radiological issues**

5.1.10 The scope and extent of the SPC Proposals contain no works which would have a bearing on radiological issues. Accordingly there are no significant effects associated with radiological issues.

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## 6 Air quality

### 6.1 Existing environment

- 6.1.1 The term air quality refers to air pollution which can potentially affect health, such as emissions from car exhausts, and dust which can also give rise to annoyance due to the soiling of surfaces through deposition. Air pollution and dust can also affect plants and ecosystems. The term “dust” refers to all particulate matter which is all solid particles suspended in air or settled and deposited onto a surface after having been suspended in air due to construction related activities. This includes the smaller sized particles associated with potential health effects (i.e. PM<sub>10</sub> and PM<sub>2.5</sub>) and also larger particles associated with causing annoyance or affecting sensitive vegetation through deposition onto a surface.
- 6.1.2 The air quality assessment considers the following sensitive receptors in the vicinity of the Application Site:
- human receptors, such as, residential properties, schools, hospitals, care homes, recreational areas and footpaths in local communities (Tregele, Cemaes and other individual properties in close proximity to the Wylfa Newydd Development Area); and
  - ecological receptors comprising habitats and ecosystems which are sensitive to air pollution or dust deposition. These include Special Areas of Conservation (SAC) and Special Protection Areas (SPA) which are protected at a European level, Sites of Special Scientific Interest (SSSI) which are generally protected by national legislation, and non-statutory sites of ecological interest known as candidate local wildlife sites.
- 6.1.3 The IACC’s Local Air Quality Management (LAQM) process and supporting reports, as produced by the IACC, were reviewed in order to determine the existing air quality situation with regard to the air quality pollutants relevant to the SPC Proposals. The review of the LAQM reports and other relevant data sources such as the Defra/Welsh Government background maps indicated that the existing background air quality in the vicinity of the Wylfa Newydd Development Area appears to be good and concentrations of air pollutants are generally well within the relevant air quality objectives (AQOs). This also applies to all other locations on Anglesey except for sites in the immediate vicinity of the A55(T) where measurements have shown elevated concentrations of nitrogen dioxide (NO<sub>2</sub>).
- 6.1.4 The IACC has undertaken measurements of NO<sub>2</sub> at two locations in the vicinity of the Wylfa Newydd Development Area which are adjacent to the A5025. The results for 2011/2012 showed that the measured concentrations were very low, and well within the AQO. Other measurements further south adjacent to the A5025 were comparable. The IACC has also undertaken measurements of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) at the Wylfa Newydd Development Area. The results show that the measured concentrations are relatively low, and well within the relevant AQOs.

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- 6.1.5 Dust deposition monitoring has also been carried out by the IACC in the vicinity of the Wylfa Newydd Development Area. These were reported to be indicative of dust deposition levels for 'open country' and are well below the levels of dust deposition which could possibly affect amenity and give rise to complaints, generally around 200 mg/m<sup>2</sup>/day. The dust deposition data will be used to inform any future monitoring and dust mitigation associated with the SPC Proposals.
- 6.1.6 Ecological receptors within 2km of the Wylfa Newydd Development Area include the Tre'r Gof SSSI, Cae Gwyn SSSI and Wylfa Head LNR. Each of these receptors is located within or adjacent to the Wylfa Newydd Development Area boundary. The concentrations of NO<sub>x</sub> (oxides of nitrogen) and SO<sub>2</sub> (sulphur dioxide) are currently well below the relevant AQOs specified for the protection of vegetation and ecosystems (known as the "critical levels"). With regard to nitrogen and acid deposition, the existing deposition rates can be obtained from the Air Pollution Information System (APIS) website ([www.apis.ac.uk](http://www.apis.ac.uk)). In common with much of the UK, these show that nitrogen deposition levels are generally above the most stringent critical load values for each site and acid deposition levels are generally within the critical load values for each site.

### Potential effects

- 6.1.7 Sensitive ecological receptor sites may be vulnerable to effects as a result of concentrations of NO<sub>x</sub> and SO<sub>2</sub> or deposition of nitrogen or acid from the air if there are significant changes in the emissions of NO<sub>x</sub> and SO<sub>2</sub> as a result of the scheme. Some vegetation within these ecological sites may also be vulnerable to deposition of dust. The existing dust deposition in the vicinity of the Wylfa Newydd Development Area as measured by the IACC is below the levels of dust deposition which could possibly affect sensitive vegetation.
- 6.1.8 The potential effects associated with the SPC Proposals comprise the following:
- fugitive emissions of dust generated by activities such as vehicle movements on dusty surfaces leading to increased concentrations of PM<sub>10</sub>/PM<sub>2.5</sub> in the vicinity (within approximately 350m) of the Application Site. There is also the potential for increased dust deposition on buildings, gardens, associated roads and on vegetation;
  - emissions of air pollutants from plant or machinery leading to increased concentrations of NO<sub>x</sub>, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in air at locations close to the Application Site. This could also lead to increases in nitrogen and acid deposition at ecological receptors up to 2km from the Application Site boundary; and
  - emissions of air pollutants from road vehicles such as cars, vans or lorries travelling to and from the Application Site on the road network which are associated with the SPC Proposals. This could lead to increased concentrations of NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in air and increases in nitrogen and acid deposition at ecological receptors at locations close (within approximately 200m) to the affected road network.
- 6.1.9 The potential increase in air pollution concentrations and airborne dust in the form of PM<sub>10</sub> or PM<sub>2.5</sub> both have the potential to effect human health. Increases in dust deposition also have the potential to affect amenity which could lead to complaints.

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## **6.2 Proposed scope, methodology and criteria**

### **Study area**

- 6.2.1 For potential dust emissions during the SPC Proposals, the assessment will focus on areas extending up to 350m from the Application Site. This study area has been based on guidance produced by the Institute of Air Quality Management (IAQM)<sup>11</sup> for identifying when an assessment of dust effects is required. The potential for effects at distances beyond 350m will be markedly reduced, and any mitigation measures applied to protect sensitive receptors within 350m will also assist in the reduction of effects beyond this distance.
- 6.2.2 Air quality assessment of the potential effects due to emissions from on-site combustion sources such as construction plant and machinery will focus on human and ecological receptors up to 2km from the Application Site boundary. This encompasses an area where the highest potential effects may occur due to emissions to air from the relevant sources within the Application Site. This study area has been identified using professional judgement, as there is no current authoritative guidance on how far an air quality study area should extend from the activities associated with the SPC Proposals.

### **Assessment of dust emissions**

- 6.2.3 The assessment of fugitive dust emissions will be carried out using a risk-based appraisal with reference to the location of the Application Site in relation to nearby sensitive locations, the planned type and scale of the SPC related activities and Application Site characteristics. This assessment follows the process set out in guidance produced by the Institute of Air Quality Management (IAQM). The methodology is a widely used and accepted approach to determine the risk associated with construction activities and sets out clear requirements for mitigation based on the determined risk level. The higher the risk associated with the construction, the higher the level of mitigation, controls, management and monitoring is required. The assessment will include consideration of potential dust sources on the Application Site and also the potential for mud to be tracked out onto access roads which could generate dust emissions.

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<sup>11</sup> Institute of Air Quality Management, Guidance on the assessment of dust from demolition and construction, February 2014.

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## Assessment of emissions from plant and machinery

- 6.2.4 Combustion emissions from on-site construction plant and vehicles during SPC Proposals shall be assessed using the ADMS 5.1 dispersion modelling software. This is a detailed modelling approach which is used to calculate concentrations of pollutants at specific receptor locations or across a modelled grid. The modelled concentrations will be combined with the existing concentrations and compared to the relevant AQOs or critical levels used to calculate the nitrogen or acid deposition for comparison to the critical loads. The assessment will be undertaken using a worst-case approach, with the modelled scenario comprising the phase of the SPC Proposals that would give rise to the highest potential air quality effects at sensitive receptors.
- 6.2.5 The potential effects on human health would be described and the judgement of overall significance of the air quality effects will be undertaken in line with the approach set out in the Environmental Protection UK (EPUK)/IAQM guidance<sup>12</sup>. The potential effects on habitat sites will be assessed in line with the NRW H1 Annex F guidance based on whether the process contribution is above 1% of the relevant critical level or critical load and whether the total concentration or deposition exceeds 70% of the critical level or critical load. Input from the ecologists will be required to determine significance where the process contribution is above 1% and the total concentration or deposition exceeds 70%.
- 6.2.6 The above approach will be used to give clear definition of what effects need to be considered in more detail in relation to the predicted annual mean concentrations or deposition. For short-term mean concentrations (i.e. the 24-hour mean critical level for NO<sub>x</sub>), it is considered that a potentially significant effect would be identified where the predicted contribution from the Proposed Activities would lead to an exceedence of the critical level.
- 6.2.7 For other sites such as locally designated sites, the NRW H1 guidance document states that:
- “Where the appropriate environmental standard (typically a critical load or critical level) is exceeded over the site and the facility makes a significant contribution to that exceedence, further controls should be considered taking account of their costs and benefits.”*
- 6.2.8 For the intensive farming sector, other NRW guidance (H1 Annex A) states that a proposal may not be acceptable where the process contribution exceeds 100% of the relevant critical level or critical load at locally designated sites. This guidance is proposed to be adopted for use in this assessment for the identification of potentially significant effects.

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<sup>12</sup> Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning & Development Control: Planning for Air Quality, May 2005 (v1.1)

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## Assessment of road traffic emissions

6.2.9 The additional peak traffic flows generated by the SPC activities are currently estimated in the region of 90 car movements and 20 Heavy Goods Vehicles (HGVs) movements each weekday and Saturday. This equates to a very low percentage increase in annual average daily traffic flows (AADT) on the A5025 of around 2 – 3% and a much lower percentage of the AADT on the A55(T). The changes are considerably lower than the thresholds for identifying an affected road set out in the DMRB guidance<sup>9</sup> which are total daily movements of 1000 AADT or movements of 200 AADT for HGVs. Similarly the movements are lower than the thresholds for identifying the need for an air quality assessment set out in the EPUK/IAQM guidance of 500 AADT for cars and light goods vehicles or 200 AADT for HGVs. On this basis, specific modelling of road traffic emissions during the SPC Proposals will not be undertaken given that the effects on air quality are considered to represent an insignificant effect on both human and ecological receptors. This issue is therefore scoped out of further consideration and will not be covered within the SPC Environmental Statement.

## Assessment criteria

- 6.2.10 The level of value of a receptor is already incorporated within the specific methods prescribed in the best practice guidance documents for defining the significance of air quality effects. Where possible, a magnitude of change has been specified for the air quality effect to help determine the significance but this is not possible for all effects considered, particularly for effects at ecological receptors where the prescribed guidance does not include the classification of magnitude of change.
- 6.2.11 The overall assessment approach is broadly consistent with the evaluation of the significance of environmental effects as described in section 4.4. This includes, for example, the comparison of predicted effects with standards, reference to criteria for protected sites and the experience and professional judgement of the specialist assessor.

## Potential mitigation

6.2.12 The assessment of dust emissions will output the risk of effects associated with each of the SPC activities and determine specific mitigation measures required to minimise potential effects to a low or negligible risk, as set out in the IAQM guidance. Where appropriate, recommendations for monitoring will be included based on the IAQM guidance on monitoring in the vicinity of demolition and construction sites<sup>13</sup>. Appropriate controls on, or mitigation of, emissions to air from the construction plant and vehicles, will also be specified where appropriate.

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<sup>13</sup> Institute of Air Quality Management, Guidance on Air Quality monitoring in the Vicinity of Demolition and Construction Sites

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6.2.13 The following types of mitigation will be considered:

- the implementation of appropriate dust management and controls;
- implementation of appropriate controls on emissions from construction plant;
- the development of appropriate management and/or monitoring plans for nearby sensitive ecological sites; and
- site inspections and monitoring during construction.

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## 7 Noise and vibration

### 7.1 Existing environment

7.1.1 The SPC noise and vibration assessments will include consideration of the following sensitive receptors in the vicinity of the Application Site and associated transportation routes such as the A5025:

- Human receptors – when present at dwellings, schools, hospitals, places of worship, recreational areas (land and sea based), or other noise sensitive locations;
- Ecological receptors – within land-based areas designated for protected species (fauna only) and in the marine environment; and
- Infrastructure receptors – historic such as Listed Buildings and Registered Parks and Gardens, and contemporary such as the Existing Power Station and statutory or other underground services.

#### Environmental baseline

7.1.2 Noise and vibration can have an effect on the environment and on the quality of life enjoyed by individuals and communities, and may in certain circumstances lead to effects on human, ecological and infrastructure receptors. Potential noise and vibration effects should, therefore, be taken into account when assessing development proposals. It is important to understand the baseline noise and vibration environment of the Application Site and surrounding locality. This is used, along with relevant noise and vibration guidelines, as the basis for assessing the potential noise and vibration effects associated with the Application Site.

7.1.3 Environmental noise levels at a receptor can be influenced by a complex mix of man-made and natural noise sources, as well as the interaction of various physical factors which can affect how noise travels from the source to the receptor. Three baseline surveys have been undertaken:

- 2010 preliminary survey by Horizon;
- 2012 by the IACC; and
- 2014 detailed survey by Horizon.

7.1.4 Taking into account the extended survey duration, removal of data affected by adverse weather, and exclusion of 'atypical' data implemented for the 2014 survey, it is proposed to use the 2014 baseline data to characterise the existing noise environment. The 2014 data are either lower than, or within the lower part of the range of, comparable values previously measured. Use of the 2014 data therefore represents a conservative basis for assessment.

7.1.5 The baseline data has been reviewed with reference to relevant guidance documents, good industry practice, and by specific request by the IACC. Using professional judgement, suitable 'typical' baseline noise level values have been selected and presented in table 7.1.

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**Table 7.1: Summary of results from 2014 survey**

Time Period	Typical noise level (dB)	Monitoring location					
		Tre'r-gof-isaf	Maes Capel	Bron Wylfa	Maen-y-Bugail	Hafan	Ysgubor Ddegwm
Day (0700-1900 hours)	LA90 T	35	40	38	35	34	39
	LAeq 1hr	42	46	46	40	43	48
	LAeq 12hr	43	46	48	45	46	49
Evening (1900-2300 hours)	LA90 T	34	39	36	35	31	32
	LAeq T	38	41	43	39	37	45
	LAeq 4 hr	41	43	45	43	40	46
Night (2300-0700 hours)	LA90 T	33	38	32	34	28	27
	LAeqT	34	40	37	38	33	36
	LAeq 8 hr	38	42	40	41	39	41

7.1.6 The  $L_{Aeq T}$  results in table 7.1 have been compared with the World Health Organisation's Guideline for Community Noise (1999) which presents guideline noise levels for community noise in specific environments. The daytime and evening baseline noise levels are all well below the guideline value of 55dB  $L_{Aeq T}$  associated with protecting the majority of people from 'serious annoyance' in outdoor living areas. Furthermore, with the exception of Ysgubor Ddegwm, these baseline noise levels are also well below the guideline value of 50dB  $L_{Aeq T}$  associated with protecting the majority of people from 'moderate annoyance' in outdoor living areas. At Ysgubor Ddegwm, the weekday daytime noise levels are close to this guideline value at 49dB(A) during the daytime period.

## 7.2 Potential effects

7.2.1 Possible sources of noise and vibration during SPC activities include:

- the operation of machinery and mobile plant e.g. excavators, dozers, rollers, dumptrucks, crushing equipment, rock blasting etc; and
- the transportation of personnel, materials and equipment to and from the Application Site on the public highways.

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7.2.2 There is a greater likelihood of significant effects to occur at noise sensitive receptors close to the site boundaries and/or transportation routes. With respect to the sensitivity of receptors, Technical Advice Note (Wales) 11 - Noise (TAN 11)<sup>14</sup> focuses on residential properties as being noise sensitive, although it does cite developments such as offices, hospitals and schools as containing buildings and activities that are potentially noise-sensitive. The Institute of Environmental Management and Assessment's Guidelines for Environmental Noise Impact Assessment published in October 2014<sup>15</sup> detail additional noise sensitive receptor types, including:

- places of worship;
- open air amenities;
- cemeteries;
- farms and kennels;
- retail premises; and
- some commercial and industrial installations.

7.2.3 Receptors within the study area have been identified and grouped for ease of reference. For residential receptors in proximity to the Application Site, the following receptor groupings have been defined:

- Cemaes village;
- receptors on A5025 between Cemaes and Tregelge;
- Tregelge village;
- receptors west of the Wylfa Newydd Development Area;
- receptors south of the Wylfa Newydd Development Area; and
- receptors east of the Wylfa Newydd Development Area.

7.2.4 An analysis of the Ordnance Survey (OS) Address Point 2 data set has identified the following additional receptors:

- Cemaes Primary School;
- St David's Roman Catholic Church;
- offices;
- retail;
- recreational receptors comprising playing fields and football venue; and
- Llanbadrig church.

<sup>14</sup> Welsh Government, 2015. *Technical Advice Note (TAN) 11: Noise (1997)*. Available from: <http://gov.wales/topics/planning/policy/tans/tan11/?lang=en>

<sup>15</sup> Institute of Environmental Management and Assessment, 2014. *Guidelines for Environmental Noise Impact Assessment*.

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- 7.2.5 The key ecological receptor identified is the Cemlyn Bay area of the Ynys Feurig, Cemlyn Bay and The Skerries SPA, which has been designated due to its importance to four species of breeding terns. There may be an increase in noise levels within part of the SPA and potential noise effects will be considered by the terrestrial and freshwater ecology chapter. It is acknowledged that there are other designated sites within the noise and vibration study area, however, these have been designated on botanical grounds and are not considered to be noise-sensitive (even to changes in grazing wildlife potentially disturbed by noise from the SPC Proposals). There are a number of bat roosts within the noise study area, and species records including water vole and otter. Further details can be found in section 10 in this scoping report.
- 7.2.6 Infrastructure receptors occurring within the study area include the buildings comprising the residential dwellings and other properties identified as noise-sensitive. In addition, the Existing Power Station, National Grid Transformers, underground statutory services, the Registered Park and Garden at Cestyll, and a number of listed buildings have also been identified as infrastructure receptors.

### **7.3 Proposed scope, methodology and criteria**

#### **Study area**

- 7.3.1 The noise and vibration study area is based on a zone approximately 600m from the Application Site boundary. This has been identified using professional judgement and guidance presented in the Design Manual for Roads and Bridges (DMRB) volume 11, section 3, part 7 noise and vibration (HD213/11)<sup>16</sup>, in the absence of current authoritative guidance on how far a noise study area should extend from the SPC activities.
- 7.3.2 Whilst noise and vibration generated by SPC Proposals may be a consideration at distances in excess of 600m, the study area is large enough to encompass the nearest noise and vibration-sensitive receptors, which will be used to classify the maximum magnitude of any effects. Based on the noise impact assessment of receptors within 600m, consideration will be given to the likelihood of significant noise effects outside the topic study area.

#### **Construction noise**

- 7.3.3 Noise from the use of machinery and mobile plant within the Application Site will be modelled using the methodology set out in BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites, Part 1 Noise*<sup>17</sup>.

<sup>16</sup> Highways Agency Design Manual for Roads and Bridges (DMRB) volume 11, section 3, part 7 noise and vibration (HD213/11).

<sup>17</sup> British Standard, 2009. Code of practice for noise and vibration control on construction and open sites, Part 1 Noise. (BS5228-1:2009+A1:2014).

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7.3.4 CadnaA noise modelling software will be used to apply the BS5228-1 methodology. The CadnaA software allows a 3-dimensional environmental model to be constructed using digital mapping and topographic data (ground height contours). The noise modelling process is complex, but in simple terms it takes into account the following data:

- noise source location and height;
- noise emission data;
- noise source on-time;
- distance between noise source and receptor;
- receptor locations and heights;
- ground contours;
- building heights;
- locations and dimensions of barriers between noise source and receptor; and
- ground attenuation.

7.3.5 The assessment of the construction noise will be based primarily upon guidance contained within BS5228-1, and may be supplemented by Minerals Planning Policy (Wales) Minerals Technical Advice Note (Wales) 1: Aggregates (MTAN 1). BS5228-1:2009+A1:2014 provides two methodologies (Method 1 and Method 2) for the prediction of significance during typical construction works, based upon existing measured ambient noise levels. It should be noted that the thresholds in BS 5228-1:2009+A1:2014 are examples and therefore, if deemed necessary there is scope for them to be adapted to local circumstances. In addition to the existing and future baseline noise levels, (comparison of future baseline and development scenarios at selected phases of each development), specific numerical assessment criteria derived for the SPC Proposals will take into account the duration of the construction period.

### **Construction vibration**

7.3.6 The prediction of vibration propagation through the ground is complex, and for a detailed analysis a large number of physical factors characterising the ground conditions and the different types of vibrational waves have to be taken into account. As a result of these factors, the accurate prediction of vibration propagation requires complex computational models populated with detailed input data. This process is beyond the scope of a vibration assessment for SPC since plant lists will not have been finalised and this level of assessment effort considered disproportional to the potential for and scale of significant effects arising from the SPC works.

7.3.7 Simple empirical prediction methods will be used in conjunction with basic data currently available on equipment and ground composition. These empirical prediction methods have a tendency to overestimate vibration levels, and hence provide a conservative method of establishing potential vibration magnitude.

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- 7.3.8 Vibration from the use of machinery and mobile plant within the Wylfa Newydd Development Area will be predicted using the methodology set out in BS5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites, Part 2 Vibration*<sup>18</sup>. Spreadsheet techniques will be used to implement the BS5228-2 standard. The principal source of vibration during the SPC Proposals is likely to be vibratory compaction, typically used in the construction of haul roads.
- 7.3.9 The assessment of vibration effects will be based primarily on guidance in BS5228-2. In addition, reference will be made to any additional vibration criteria identified during consultations with the operators of the Existing Power Station, National Grid transformers and other infrastructure maintained by service providers that would be required to ensure adequate protection for these infrastructure receptors.

### Road traffic noise and vibration

- 7.3.10 The additional traffic flows generated by SPC activities are currently estimated to be in the region of 90 car movements and 20 HGV movements each weekday and Saturday. Using traffic survey data for the A5025 in close proximity to the Application Site (which also has the lowest measured flows of the Valley to the Power Station Site section) and the Calculation of Road Traffic Noise (CRTN) methodology<sup>19</sup>, it is estimated that the additional road traffic during SPC activities would result in a maximum change in noise level in the region of 0.2dB(A)  $L_{A10\ 18hr}$ , which would be considered imperceptible. No further assessment of road traffic noise or vibration is therefore proposed.

### Assessment criteria

- 7.3.11 The key receptors considered by the noise and vibration assessment are people, and hence it is not considered appropriate to differentiate these receptors by assigning a 'value'. However, it is recognised that people may have different sensitivities to noise and vibration effects, depending on where they are and what they are doing. The noise and vibration assessment therefore uses the term 'sensitivity' and does not refer to the term 'value'.
- 7.3.12 The value/sensitivity scale set out in section 4.4. has been adapted using professional judgement to enable the categorisation of noise-sensitive receptors, as presented in table 7.2.

<sup>18</sup> British Standard, 2009. Code of practice for noise and vibration control on construction and open sites, Part 2 Vibration (BS5228-2:2009+A1:2014)

<sup>19</sup> Department of Transport and Welsh Office, 1988. Calculation of Road Traffic Noise.

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**Table 7.2: Human receptor sensitivities to noise effects**

Sensitivity	Noise specific criteria
High	Dwellings, residential healthcare facilities and schools
Medium	Places of worship, cemeteries, open-air amenities used for recreation and offices
Low	Farms, retail and commercial premises
Negligible	Industrial installations (including nuclear power stations)

7.3.13 The assignment of a magnitude of change will be principally based on professional judgement. The general magnitude scale in table 7.3 has been presented to illustrate that when forming this professional judgement, source specific and benchmark guidelines are taken into account along with the predicted changes in baseline noise levels. It is acknowledged that situations may arise that result in a noise or vibration change appearing to meet more than one of the magnitude criteria. For example a source-specific guideline may be met, whilst a benchmark criterion may be exceeded, and the change in noise levels is likely to be perceived. In each assessment of magnitude, professional judgement will be used to attach the relevant weight to each component criterion, and if guidelines are exceeded professional judgement will be used to define small, moderate and large margins.

**Table 7.3: Magnitude scale for noise and vibration effects**

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Magnitude of change	Topic specific criteria
Large	<ul style="list-style-type: none"> <li>Exceedance of relevant source-specific and/or benchmark guideline noise or vibration levels by a large margin; and/or</li> <li>change in noise or vibration levels highly likely to be perceived.</li> </ul>
Medium	<ul style="list-style-type: none"> <li>Exceedance of relevant source-specific and/or benchmark guideline noise or vibration levels by a moderate margin; and/or</li> <li>change in noise or vibration levels likely to be perceived.</li> </ul>
Small	<ul style="list-style-type: none"> <li>Exceedance of relevant source-specific and/or benchmark guideline noise or vibration levels by a small margin; and/or</li> <li>change in noise or vibration levels may be perceived.</li> </ul>
Negligible	<ul style="list-style-type: none"> <li>Compliance with relevant source-specific and/or benchmark guideline noise or vibration levels; and/or</li> <li>change in noise or vibration levels unlikely to be perceived.</li> </ul>

7.3.14 An effect is considered significant if relevant guideline levels are exceeded; a planning condition is required to control it; or it is otherwise a material consideration in determining the consent application. Where an effect is considered to meet one or more of these criteria, then the sensitivity and magnitude scales, defined in table 7.2 and 7.3 respectively, will be used to aid the determination of the level of significance in accordance with figure 4.1. Classifying each significant effect as major, moderate or minor is intended to inform the decision-making process by providing an indication of the weight to be given to each significant effect.

### Potential mitigation

7.3.15 A number of good practice measures will be assumed to be implemented, as part of the SPC design. These include:

- the plant complement would mainly consist of modern machinery designed to minimise noise levels that are generated during operations;
- plant and machinery would not be operated with covers open or removed, to ensure effective acoustic insulation is provided;
- the plant would also be properly maintained in accordance with the manufacturers' instructions to ensure that the occurrence of malfunctions that can give rise to elevated noise levels is reduced, and any malfunctions that do occur are swiftly repaired;
- the effectiveness of acoustic insulation and silencers fitted to plant would be qualitatively assessed and recorded on a weekly basis. Any items of plant with defective insulation or silencers would be identified for immediate investigation and remediation;
- the use of 'Smart', warbling or broadband reversing alarms would also be encouraged for all mobile plant, to reduce the intrusive nature of such sources;

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- pumps used nearest receptors would be powered by electricity wherever practicable, and all pumps and generators would be placed at locations to minimise noise emissions to sensitive receptors; and
- noisy activities will be restricted to daytime hours only – it is anticipated that all activities will be undertaken during daylight hours.

7.3.16 The results of the noise and vibration assessments will be used to determine the need for additional mitigation measures.

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## 8 Cultural heritage

### 8.1 *Existing environment*

- 8.1.1 The archaeological and cultural heritage baseline will be established as a result of desk-based surveys, walkover surveys and site inspections, archaeological geophysical surveys, interpretation and targeted archaeological trial trenching. The results of archaeological monitoring of ground investigation will be used and information from this incorporated into the baseline.
- 8.1.2 The archaeology and cultural heritage baseline will be considered under three sub-topics: archaeological remains, historic buildings and historic landscape. From work undertaken to date it is known that there are a number of heritage assets within the study area for terrestrial archaeology, historic buildings and the historic landscape. While it is located outside the study area, due to the potential for effects on its setting, the Amlwch and Parys Mountain Registered Landscape of Outstanding Historic Interest in Wales (HLW (Gw) 1) (HLT16) will be included in the terrestrial archaeology and cultural heritage baseline.
- 8.1.3 The following sources of information will be consulted to establish the existing conditions:
- Cadw for information on designated heritage assets (Scheduled Monuments, Listed Buildings, Registered Historic Parks and Gardens and Registered Historic Landscapes) (downloaded GIS data, last updated June 2014);
  - Gwynedd Archaeological Trust (GAT) Historic Environment Record (HER) for information on archaeological remains and historic buildings and historic landscape characterisation data; and
  - Welsh Assembly Government (WAG) Geography and Technology Services for Conservation Area boundaries accessed at: <http://lle.wales.gov.uk/>.
- 8.1.4 A review will also be undertaken of relevant planning policy and policy guidance at the national and local level to inform the scoping process. A full list of bibliographic and cartographic sources consulted during the exercise will be provided.
- 8.1.5 It has been established that a total of 527 heritage assets have been identified within the study area (as described in section 8.3) and they are listed by category below. An assessment of value of these heritage assets will be provided:
- 314 Archaeological Remains:
  - 197 Historic Buildings; and
  - 16 Historic Landscape Types.

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## **8.2 Potential effects**

8.2.1 A review of the SPC Proposals against the identified interests within the study area will establish the potential for the following range of potential effects on cultural heritage assets:

- removal of historic landscape elements, (e.g. field boundaries);
- removal of non-designated historic buildings;
- essential setting of the non-statutorily designated Cestyll Garden Grade II Register Historic Park and Garden;
- removal of parts of Dame Sylvia Crowe's landscaping scheme;
- removal of known and unknown archaeological remains; and
- changes in the setting of designated heritage assets.

## **8.3 Proposed scope, methodology and criteria**

- 8.3.1 The study area is defined as a circular area with a 6km radius extending from the centre point of the Existing Power Station. A 6km study area was used as beyond this area views of the proposed activities are likely to be limited and therefore significant effects on the setting of heritage assets are considered unlikely.
- 8.3.2 In accordance with the requirements of the Overarching NPS for Energy NPS EN-1, further work is required to inform the archaeology and cultural heritage baseline and assessment to include:
- additional data gathering from existing baseline sources informed by a detailed walkover survey;
  - implementation of a programme of trial trenching to help assess the value of any identified archaeological remains and the effect of the scheme on them. The scope of this has been agreed with Cadw/GAPS and commenced late 2015; and
  - the value of each heritage asset identified will be assessed. The magnitude and significance of the effect will be identified as well as appropriate mitigation and the significance of residual effects.
- 8.3.3 The outputs from this work will be used to inform the assessments of value and significance of effects on archaeological remains, and the need for and design of further evaluation or mitigation measures.
- 8.3.4 The archaeology and cultural heritage assessment will be iterative, whereby mitigation measures identified as required in early assessments will be incorporated into the design of the Proposed Activities and will inform the appropriate Environmental Management Plan for construction, reducing the potential for significant effects.
- 8.3.5 Where appropriate, consultation will continue to be undertaken with relevant stakeholders including Cadw, GAPS, the Welsh Historic Gardens Trust and the IACC.

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### Assessment criteria

- 8.3.6 The method for the assessment of value, magnitude and significance of effect is informed by the assessment process set out in the Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (ICOMOS, 2011)<sup>20</sup> and The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning: 3<sup>21</sup>.
- 8.3.7 The value of known heritage assets are to be assessed on a five point scale of high, medium, low, negligible and unknown. The assessment of value is based on professional judgement informed by the criteria provided in table 8.1 below.
- 8.3.8 The magnitude of effect is the degree of change that would be experienced by an asset and its setting if the proposed scheme were completed, as compared with a 'do nothing' situation. Magnitude of effect is assessed without reference to the value of the receptor and may include physical effects on the asset or effects on its setting or amenity value. The assessment of magnitude of effect was determined using professional judgement informed by the criteria provided below in table 8.2.

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<sup>20</sup> ICOMOS, 2011. Guidance on Heritage Impact Assessments for Cultural World Heritage Properties

<sup>21</sup> Historic England, 2015, The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning: 3.

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**Table 8.1: Criteria to assess the value of heritage assets**

Value	Archaeological remains (terrestrial and marine)	Historic buildings	Historic landscape types
High	<p>Archaeological remains of national importance e.g.</p> <p>Scheduled Monuments (including proposed sites) or undesignated assets of schedulable quality and importance or Protected Wrecks.</p> <p>Archaeological remains that are very sensitive to change, or have little capacity to accommodate a change.</p>	<p>Historic buildings of national importance e.g. Scheduled Monuments with standing remains, Grade I and Grade II* Listed Buildings, other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade, Conservation Areas containing very important buildings, undesignated structures of clear national importance.</p> <p>Historic buildings that are very sensitive to change, or have little capacity to accommodate a change.</p>	<p>Designated historic landscapes of outstanding interest e.g. Registered Landscapes of Outstanding Historic Interest in Wales, Grade I and II* park and gardens, undesignated landscapes of high quality and importance, and of demonstrable national value, well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).</p> <p>Historic landscapes that are very sensitive to change, or have little capacity to accommodate a change.</p>
Medium	<p>Archaeological remains of regional importance.</p> <p>Archaeological remains that are moderately sensitive to change, or have a moderate capacity to accommodate a change.</p>	<p>Historic buildings of regional importance e.g. Grade II Listed Buildings, historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations, Conservation Areas containing buildings that contribute significantly to its historic character, Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).</p> <p>Historic buildings that are moderately sensitive to change, or have a moderate capacity to accommodate a change.</p>	<p>Designated special historic landscapes e.g. Registered Landscapes of Special Historic Interest in Wales, Grade II parks and gardens, undesignated historic landscapes that justify special historic landscape designation, landscapes of regional value.</p> <p>Historic landscapes that are moderately sensitive to change, or have a moderate capacity to accommodate a change.</p>

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Value	Archaeological remains (terrestrial and marine)	Historic buildings	Historic landscape types
Low	<p>Archaeological remains of local importance or archaeological remains compromised by poor preservation and/or poor survival of contextual associations.</p> <p>Archaeological remains that are not particularly sensitive to change, or have considerable capacity to accommodate a change.</p>	<p>Historic buildings of local importance e.g. 'Locally Listed' buildings, historic (unlisted) buildings of modest quality in their fabric or historical association, Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).</p> <p>Historic buildings that are not particularly sensitive to change, or have considerable capacity to accommodate a change.</p>	<p>Historic landscapes of local importance e.g. robust undesignated historic landscapes, those historic landscape with importance to local interest groups, historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.</p> <p>Historic landscapes that are not particularly sensitive to change, or have considerable capacity to accommodate a change.</p>
Negligible	<p>Assets with very little or no surviving archaeological interest.</p> <p>Archaeological remains that are not sensitive to change, or have very considerable capacity to accommodate a change.</p>	<p>Buildings of no architectural or historical note; buildings of an intrusive character.</p> <p>Historic buildings that are not sensitive to change, or have very considerable capacity to accommodate a change.</p>	<p>Landscapes with little or no significant historical interest.</p> <p>Historic landscapes that are not sensitive to change, or have very considerable capacity to accommodate a change.</p>
Unknown	<p>The value of the archaeological remains cannot be ascertained based on existing information and professional judgement.</p>	<p>Buildings with some hidden (i.e. inaccessible) potential for historic significance.</p>	<p>The value of the historic landscape cannot be ascertained based on existing information and professional judgement.</p>

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**Table 8.2: Magnitude of effect on heritage assets**

Magnitude of effect	Archaeological remains	Historic buildings	Historic landscape types
Large	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to the ability to understand the setting of archaeological remains.	Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the ability to understand setting.	Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character.
Medium	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to the ability to understand the setting of archaeological remains.	Change to many key historic building elements, such that the resource is significantly modified. Considerable changes to the ability to understand the setting of an historic building.	Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.
Small	Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting or the ability to understand the setting of archaeological remains.	Change to key historic building elements, such that the asset is slightly different. Slight changes to setting or the ability to understand the setting of a historic building.	Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality, slight changes to use or access; resulting in limited changes to historic landscape character.
Negligible	Very minor changes to archaeological remains, or to the ability to understand their setting.	Very minor changes to historic buildings, or to the ability to understand their setting.	Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality, very slight changes to use or access; resulting in a very small change to historic landscape character.

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- 8.3.9 The significance of the effect, which can be adverse or beneficial, is to be determined based on the value of the heritage assets and the magnitude of effect. It will be derived using professional judgement informed by the significance matrix set out in section 4.6.6. All effects are adverse unless stated otherwise.
- 8.3.10 An effect is to be considered significant if it meets any one of the following criteria:
- after mitigation, it could result in substantial harm (EN-1, 5.8.14; Department of Energy and Climate Change, 2011<sup>22</sup>) to or loss of designated assets;
  - it is likely that the consenting authority will reasonably consider applying a planning condition, requirement or legal agreement to the consent to require specific mitigation to reduce or overcome the effect;
  - it threatens or enhances the viability or integrity of a heritage asset or group of heritage assets; and
  - it is likely to be material to the ultimate decision about whether or not the consent application should be approved.
- 8.3.11 To aid the determination of significance, the assessment of effects for cultural heritage will follow a stepped approach:
- determine the relevant heritage asset;
  - derive its value (importance) based on the criteria set out in table 8.1;
  - identify and consider all effects from each activity;
  - determine the magnitude of change that is likely as a result of the effects (table 8.2); and
  - present the significant effects and consider how mitigation may reduce or minimise the effect.
- 8.3.12 Throughout the assessment, professional judgement will be used to ensure that all effects which are considered to be significant are a material consideration in determining consent.

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<sup>22</sup> Department of Energy and Climate Change, 2011, Overarching National Policy Statement for Energy (EN-1)

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## **8.4** *Potential mitigation*

8.4.1 As part of the EIA process the following types of mitigation to address identified effects will be considered:

- discuss the programming of SPC activities in order to preserve heritage assets or minimise Project effects;
- design of haul routes to reduce effects on heritage assets;
- informed by non-invasive and invasive evaluation where required, undertake archaeological recording in advance of or during construction, followed by a programme of assessment, reporting, analysis and publication proportionate to the effect, submission of reports to the Historic Environment Record and National Monument Record of Wales and the preparation and submission to an appropriate repository of an ordered archive; and
- preservation of historic buildings and landscapes and/or their settings by record in advance of development through a programme of recording and reporting, submission of reports to the Historic Environment Record and National Monument Record of Wales and the preparation and submission of an ordered archive to an appropriate repository.

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## 9 Landscape and visual effects

### 9.1 *Existing environment*

- 9.1.1 The assessment considers the potential for visual effects (the effects on people's views) as well as landscape effects (effects on the landscape resource, such as changes in vegetation cover, landform and watercourses and on landscape and seascape character) from the SPC Proposals.
- 9.1.2 A small portion of the Application Site Area to the south-west of the Existing Power Station lies within the Anglesey Area of Outstanding Natural Beauty (AONB), which encompasses the south and west shoreline of the small bay at Porth-y-pistyll. The remaining part of the Application Site lies within the current Isle of Anglesey Special Landscape Area (SLA). To the north it, adjoins the Existing Power Station, a prominent feature in the landscape. East of the Existing Power Station, the northern boundary of the Application Site is defined by the coastline and adjoins the small bay at Porth Wylfa, but excludes Wylfa Head. The A5025 broadly defines the southern boundary north-east of Treglele, but excludes some small parcels of land generally associated with residential properties on the north side of the A5025 lies adjacent to the Application Site to the east..
- 9.1.3 The Application Site can be seen intermittently from the A5025, local roads, and from parts of the surrounding network of PRoWs, including the Wales Coast Path to the north. There are also views from Treglele and Cemaes. Much of the Application Site and surrounding area comprises an agricultural landscape, with pasture typically covering the distinctive, rounded drumlin landforms which characterise the undulating lowland landscape. There are few trees with the exception of the largely coniferous plantations, planted as part of the Existing Power Station landscape mitigation measures designed by Dame Sylvia Crowe.
- 9.1.4 West of the Existing Power Station, the Application Site adjoins Cestyll Garden, a historic garden listed as Grade II on the Cadw Register of Historic Parks and Gardens of Special Historic Interest in Wales. The associated kitchen garden situated to the south of Porth-y-pistyll, lies within the Application Site.
- 9.1.5 Relevant landscape designations within the study area are shown in figure 9.1.
- 9.1.6 Published sources of landscape character identify the following landscape character areas with potential intervisibility with the SPC Proposals and:
- 9.1.7 National Landscape Character Areas (NLCAs):
- Anglesey Coast, which largely overlaps with the AONB, but with no gap between the Existing Power Station and Cemaes; and
  - Central Anglesey, an expansive area covering the remaining overarching study area inland from the Anglesey Coast.

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- 9.1.8 IACC, Landscape Character Areas (LCAs most relevant to this Landscape and Visual Impact Assessment (LVIA):
- North West Coast, a relatively narrow coastal strip largely within the AONB, but with no gap at the Wylfa NPS Site;
  - North West Anglesey, to the south and east of the coastal margin, partially within the AONB, in particular to the west;
  - Amlwch and Environs, approximately 4km to the east of the Wylfa NPS Site; and
  - Parys Mountain, a small and distinctive character area approximately 7km to the east of the Wylfa NPS Site.
- 9.1.9 Within the study area, LANDMAP Level 3 Visual and Sensory Aspect Areas (VSAAs) comprise:
- North Coast, comprising the coastal intertidal zone and cliffs, within the North West Coast, IACC, LCA;
  - North West Coast, including Carmel Head, approximately 4.5km to the west of the Wylfa NPS Site;
  - North West Drumlins, (approximately coinciding with the Anglesey Coast NLCA, but excluding the Mynydd Mechell SLA);
  - Wylfa Power Station, encompassing part of the Wylfa NPS Site to the north, as well as the Existing Power Station;
  - North Coast Hinterland, to the north-east of Cemaes; and
  - Drumlins with Windfarms, to the east of Cemaes and Llanfechell.
- 9.1.10 Seascape character receptors are typically encompassed by the AONB and associated Heritage Coast. However, there is a break in the AONB between the Existing Power Station and Cemaes, which is included in the current Isle of Anglesey SLA. Published sources of seascape character comprise the following landscape character areas whose character may be influenced by the Proposed Activities:
- 9.1.11 Regional Seascape Character Areas (RSCAs);
- Point Lynas to Carmel Head, comprising the north coastal margin and approximately coinciding with the LANDMAP, North Coast VSAA;
- 9.1.12 Anglesey (and Snowdonia) SCAs:
- Cemlyn Bay, encompassing just over half of the WNDA to the south-west and extending up to approximately 3km inland in places and 3km offshore;
  - Amlwch and Cemaes, encompassing just under half of the Wylfa NPS Site to the north-east and extending up to approximately 1.5km inland and 1km offshore;
  - Carmel Head to Penrhyn to the west; and
  - North of Anglesey, offshore to the north of the Amlwch and Cemaes SCA.
- 9.1.13 Landscape receptors comprise landscape and seascape character areas and associated features, that is, the landscape resource that has the potential to be affected by the SPC Proposals. Visual receptors comprise individuals and defined groups of people whose views have the potential to be affected by the proposals.

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9.1.14 Table 9.1 sets out the main landscape and visual receptors potentially affected by the SPC Proposals, together with a preliminary assessment of their value in relation to existing landscape designations at national, county or local level.

**Table 9.1: Landscape and visual receptors**

<b>Landscape character receptors</b>	<b>Value</b>
Anglesey AONB	National
North Anglesey Heritage Coast	National
Proposed Mynydd Mechell SLA	County
Local landscape character outside Anglesey AONB and proposed SLA (Wylfa Power Station, North-west drumlins and North Coast)	Local, but within current Isle of Anglesey SLA - County
Local seascape character outside Anglesey AONB and Anglesey Heritage Coast (Cemlyn Bay and Amlwch and Cemaes)	No designation - Local, but within current Isle of Anglesey SLA - County
<b>Other landscape receptors</b>	<b>Value</b>
Dame Sylvia Crowe landscape design for Existing Power Station	No landscape designation, although recognised for its renowned landscape architect
<b>Landscape resource receptors</b>	<b>Value</b>
Topography	Local
Trees and woodland	Local
Field boundaries	Local
Watercourses	Local
Rock outcrops	Local
<i>Cestyll Garden and Parys Mountain</i>	<i>Considered within Cultural Heritage chapter</i>

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Visual receptors	Value
Views from Wales Coast Path	National
Views from the Copper Trail, (National Cycle Network Route 566)	National
Views from public footpaths (PRoW)	Local
Vehicle travellers' views from the surrounding road network	Local
Views from residential properties	Local
Offshore views from boats	Partly within Heritage Coast -National
Visual receptors	Value
Visitor views from Cestyll Garden historic garden have been scoped out, since no views of SPC Proposals are anticipated from Cestyll Garden	National
Views from other features of cultural heritage importance, including Llanfechell Standing Stones, Llanbadrig Point (historic churchyard)	National

## 9.2 *Potential effects*

9.2.1 Potential landscape and visual effects associated with the SPC Proposals comprise:

- loss of landscape features and consequent changes to local landscape and seascape character;
- loss of visual screening to Existing Power Station from vegetation removal;
- changes to landform and land use arising from topsoil stripping, temporary topsoil stockpiles and consequent changes to local landscape and seascape character;
- changes to publicly accessible views arising from SPC activities, and the presence of perimeter fencing, construction plant and compound; and
- changes to local community views.

9.2.2 No significant effects on night-time views are expected to arise from the SPC Proposals. Night-time views have therefore been scoped out of the LVIA.

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### 9.3 ***Proposed scope, methodology and criteria***

#### **Study area**

- 9.3.1 The study area will be confirmed by the production of a Zone of Theoretical Visibility (ZTV) plan covering the extents of the SPC Proposals. Preliminary ZTV mapping undertaken, with the aid of computer modelling, has identified that an appropriate study area for the assessment should extend up to a distance of 6km from the Application Site boundary. Site appraisals have indicated that beyond this distance, any views of the proposed activities would be barely perceptible and therefore not significant.
- 9.3.2 The extent of baseline study undertaken to date is shown in figure 9.1.

#### ***Landscape planning context.***

- 9.3.3 A summary of the assessment methodology is outlined below.
- 9.3.4 A detailed level of assessment will be undertaken to identify effects on landscape and visual receptors. The overarching assessment guidance to be followed will be the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3)<sup>23</sup>.

#### **Key activities to establish baseline**

- 9.3.5 Desk study work will be undertaken to gather more detailed baseline information on landscape designations, planning policy, landscape/seascape elements, landscape character, and views. Existing LANDMAP Level 3 landscape character information will be supplemented by a project level landscape and seascape character assessment.
- 9.3.6 Site appraisals have been undertaken to confirm the extents of actual visibility, including the location of significant vegetation and built form not modelled as part of the ZTV computer generation process. Site work has also been undertaken for the landscape and seascape character assessment to and gather further information on the characteristics of the landscape. Viewpoint photography has been carried out from locations agreed with statutory consultees, with viewpoints chosen to demonstrate representative and illustrative views from a range of receptors typifying the nature of views experienced by people living in, working in, or visiting the area. Photographs have been taken in accordance with the Landscape Institute Advice Note '*Photography and Photomontage in Landscape and Visual Impact Assessment*', dated January 2011<sup>24</sup>.

#### **Assessment criteria**

- 9.3.7 The assessment will adopt the criteria presented below and will include a period of maximum perceived change during implementation of the SPC Proposals. Given that the SPC Proposals are designed to prepare the Wylfa Newydd Development Area for further, more extensive activities, this is considered appropriate in this instance.

<sup>23</sup> Landscape Institute and Institute of Environmental Management and Assessment, 2013. Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3).

<sup>24</sup> Landscape Institute, 2011. Advice Note 01/11. Photography and Photomontage in Landscape and Visual Impact Assessment

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9.3.8 Landscape and visual sensitivity is established by assessing the value attached to a receptor and its susceptibility to the particular form of change likely to result from the SPC Proposals.

9.3.9 The criteria used to assess the sensitivity of landscape receptors is set out in table 9.2.

**Table 9.2: Sensitivity of landscape receptors**

Landscape sensitivity	Criteria
High	<p>Value: areas of landscape identified as being of national importance, for example, AONBs. Gardens and landscapes included on the Register of Historic Parks and Gardens of Special Historic Interest in Wales or the Register of Landscapes of Historic Interest in Wales.</p> <p>Susceptibility: the landscape is highly susceptible to the nature of the proposed development because the relevant characteristics or elements of the landscape have no or very limited ability to accommodate the development without undue effects.</p>
Medium	<p>Value: areas of landscape identified as having importance at the local authority level.</p> <p>Susceptibility: the landscape is moderately susceptible to the nature of the proposed development because the relevant characteristics or elements of the landscape have some ability to accommodate the development without undue effects.</p>
Low	<p>Value: undesignated landscapes, considered to have value to communities, for either their scenic quality, rarity, representativeness, conservation interest, recreational value, tranquillity or cultural associations.</p> <p>Susceptibility: the landscape has low susceptibility to the nature of the proposed development because the relevant characteristics or elements of the landscape are generally able to accommodate the development without undue effects.</p>
Negligible	<p>Value: undesignated landscapes, considered to have minimal value to communities.</p> <p>Susceptibility: the landscape is generally tolerant to the nature of the proposed development because the relevant characteristics or elements of the landscape are generally able to accommodate the development without undue effects.</p>

9.3.10 Table 9.3 sets out the criteria that will be used as a basis to assess the sensitivity of visual receptors.

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**Table 9.3: Sensitivity of visual receptors**

Visual sensitivity	Criteria
High	<p>Value: views that are associated with nationally designated landscapes or important heritage assets, promoted in sources such as maps and tourist literature, linked with important and popular visitor attractions where the view forms a recognised part of the visitor experience, or which have important cultural associations.</p> <p>Susceptibility: receptors for whom the nature of views form an important part of their experience or visual amenity, and which may therefore include; people engaged in types of outdoor recreation where their attention is likely to be focussed on particular views; visitors to heritage assets or other attractions where views of the surroundings are an important part of the experience; communities where views contribute to the landscape setting enjoyed by residents; and travellers on scenic routes.</p>
Medium	<p>Value: views that are associated with locally designated landscapes or areas of equivalent landscape quality, promoted in local sources, linked with locally important and popular visitor attractions where the view forms a recognised part of the visitor experience, or which have important local cultural associations.</p> <p>Susceptibility: receptors for whom the nature of views contributes to their experience, including some travellers on roads where attention is generally less likely to be focused on views and visual amenity, although such views can be appreciated.</p>
Low	<p>Value: views that, although they may have value to local people, have no formal planning status, are not associated with designated or otherwise high quality landscapes or with popular visitor attractions and have no more widely recognised cultural associations.</p> <p>Susceptibility: receptors for whom the nature of their view is secondary to their activity or occupation, including people engaged in outdoor sport or recreation which does not involve appreciation of views; people at their place of work, where the setting is not important to the quality of working life; and travellers where the view is incidental to the journey.</p>
Negligible	<p>Value: views with very little value to local people and with no formal planning status, that are not associated with visitor attractions and do not have any known cultural associations.</p> <p>Susceptibility: receptors for whom the nature of their view is of little importance.</p>

9.3.11 The size and scale of change in the landscape is mainly a reflection of the extent or proportion of landscape elements lost or added and/or the degree to which aesthetic or perceptual aspects are altered, both of which may result in erosion or enhancement of landscape character. The receptors identified may be individual elements or overall landscape character.

9.3.12 The criteria used to assess the magnitude of landscape change are set out in table 9.4.

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**Table 9.4: Magnitude of landscape change**

Magnitude of landscape change	Description
Large	<p>Size and scale: large level of change in landscape character and key characteristics. Major loss of or change to existing elements of the landscape and/or the introduction of major new and uncharacteristic elements.</p> <p>Geographical extent: the change would affect a large part of a landscape or character area and/or a large proportion of a characteristic landscape element.</p>
Medium	<p>Size and scale: moderate level of change in landscape character and key characteristics. Moderate loss of or change to existing elements of the landscape and/or the introduction of moderate new and uncharacteristic elements.</p> <p>Geographical extent: the change would affect a moderate part of a designated landscape or character area, including the immediate setting of the Wylfa Newydd Development Area and/or a notable proportion of a characteristic landscape element.</p>
Small	<p>Size and scale: minor level of change in landscape character and key characteristics. Minor loss of (or change to) existing elements of the landscape and/or the introduction of minor new and uncharacteristic elements or minor change to aesthetic attributes.</p> <p>Geographical extent: the change would affect a small part of a designated landscape or character area, including the immediate vicinity of the Wylfa Newydd Development Area and/or a small proportion of a characteristic landscape element.</p>
Negligible	<p>Size and scale: barely discernible level of change in landscape character with minimal loss of or change to existing elements of the landscape and/or barely discernible effects from the introduction of any new and uncharacteristic elements.</p> <p>Geographical extent: the change would affect a negligible part of a designated landscape or character area, including the immediate vicinity of the Wylfa Newydd Development Area and/or a small proportion of a characteristic landscape element.</p>

9.3.13 The criteria used to assess the size and scale of visual change will be based upon the amount of change likely to occur as a result of the proposals. The size and/or scale of change in views and visual amenity at representative (or other selected) viewpoints take into consideration the:

- degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of factors such as form, scale and mass, line, height, colour and texture; and
- angle of view in relation to the main activity of the viewer, for example, whether direct or oblique.

9.3.14 The criteria to be used to assess the magnitude of visual effects are summarised in table 9.5.

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**Table 9.5: Magnitude of visual change**

Magnitude of visual change	Criteria
Large	<p>Size and scale: complete or very substantial change in the view, resulting from the loss of important features or the addition of major new ones, to the extent that this would substantially alter the composition of the view and visual amenity.</p> <p>Geographical extent: the proposal is seen by a group of viewers in many locations across the study area, or from the majority of a linear route and/or by large numbers of viewers, or the view is available from all or most parts of a specific viewpoint or location.</p>
Medium	<p>Size and scale: clearly noticeable change in the view, resulting from the loss of features or the addition of new ones, to the extent that this would alter to a moderate degree the composition of the view and visual amenity.</p> <p>Geographical extent: the proposal is seen by a group of viewers from a moderate number of locations across the study area or from a moderate part of a linear route and/or by a moderate number of viewers; or the view is available from a moderate proportion of a specific viewpoint.</p>
Low	<p>Size and scale: perceptible change in the view, resulting from the loss of features or the addition of new ones, to the extent that this would, to a limited extent, alter the composition of the view and visual amenity.</p> <p>Geographical extent: the proposal is seen by a group of viewers at a small number of locations across the study area, or from only limited sections of a linear route, and/or by a small number of viewers; or the view is available from only a small proportion of a specific viewpoint.</p>
Negligible	<p>Size and scale: barely perceptible change in the view, resulting from the loss of features or the addition of new ones, to the extent that this would not discernibly alter the composition of the view and the visual amenity.</p> <p>Geographical extent: the proposal is either barely discernible in the study area or is seen by a viewer group at a very limited number of locations or from a very limited section of a linear route, and/or by only a very small number of viewers; or the view is hardly available from a specific viewpoint or location.</p>

9.3.15 The duration of change is categorised in table 9.6, based on guidance in GLVIA3, in terms of which changes are likely either to be permanent and/or irreversible, or temporary and/or reversible. The timescales are not finite and are provided as a guide only, for example, an effect likely to last for 11 years could be deemed medium-term, rather than long-term.

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**Table 9.6: Duration of change**

Duration of change	Description
Permanent/irreversible	Change that would last for approximately 25 years or more is deemed permanent or irreversible.
Long-term reversible	Change that is theoretically reversible, but would last for between approximately 10 and 25 years.
Medium-term	Change that is theoretically reversible, but would last from approximately 5 to 10 years.
Short-term reversible	Change that is reversible and would last up to approximately 5 years is deemed temporary, including some construction effects.

9.3.16 The level of significance of landscape and visual effects has been defined in terms of the relationship between the sensitivity of receptors and the magnitude of landscape and visual change, guided by the matrix used to guide significance ratings set out in section 4.6.6 of this Report. Following review of the table, professional judgements have been made about the significance level of each of the main landscape and visual effects identified in this assessment, and the result may therefore differ to that suggested by the matrix.

## **9.4 Potential mitigation**

9.4.1 As part of the EIA process the following types of mitigation will be explored, in order to address adverse landscape and visual effects:

- implementation of an Environmental Management Plan (EMP);
- protection of key landscape features within the LCA;
- enhancement of existing/retained hedgerows, stone walls and cloddiau where appropriate;
- temporary seeding of topsoil stockpiles as part of measures to control surface water runoff and minimise adverse visual effects; and
- 'just in time' topsoil strip to minimise the duration and extent of landscape disturbance.

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## 10 Terrestrial and freshwater ecology

### 10.1 Existing environment

#### Study area

- 10.1.1 For the purposes of scoping and the subsequent environmental impact assessment, the study area for terrestrial and freshwater ecology focuses on a 500m zone around the Wylfa Newydd Development Area. The study area was determined by professional judgement on a likely zone of potential effect considering internationally and nationally designated sites, individual species and species groups around the Wylfa Newydd Development Area. At present there is no relevant guidance on terrestrial and freshwater survey boundaries around a development of this type. Figure 10.1 shows the extent of the terrestrial and freshwater ecology study area.
- 10.1.2 The following sections provide an outline of the issues to be examined within the Environmental Statement, however, the study area for which will be the subject of further consideration on receipt of the Scoping Opinion.

#### Designated sites of nature conservation importance

- 10.1.3 A total of six statutory designated and non-statutory designated sites for nature conservation have been identified due to their location either within the topic study area or outside this boundary in areas with terrestrial and/or freshwater receptors that could be affected by the SPC Proposals.
- 10.1.4 Table 10.1 lists these sites along with the primary reasons for their designation and the value rating assigned to each site. The location of these sites is shown in figure 10.1.

**Table 10.1: Statutory and non-statutory designated sites for nature conservation within the study area**

Site	Designation	Approximate distance from Wylfa Newydd Development Area	Primary reasons for designation relevant to terrestrial and freshwater ecology
Tre'r Gof	SSSI	In the Wylfa Newydd Development Area	A hydrologically dependant alkaline basin mire/fen habitat with a wide range of wetland plant species, including blunt-flowered rush ( <i>Juncus subnodulosus</i> ) and the scarce marsh fern ( <i>Thelypteris palustris</i> ).
Wylfa Head	Wildlife Site (non-statutory)	In the Wylfa Newydd Development Area	A mixture of coastal grassland with some areas of heather ( <i>Calluna vulgaris</i> ). The site is notable for choughs ( <i>Pyrrhocorax pyrrhocorax</i> ) which breed on the cliffs, a colony of gulls which nest near Porth Wnal, and harbour porpoise ( <i>Phocoena phocoena</i> ) that frequent the waters around the headland.

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Site	Designation	Approximate distance from Wylfa Newydd Development Area	Primary reasons for designation relevant to terrestrial and freshwater ecology
Cae Gwyn	SSSI	Within 100m	Two wetland areas separated by an area of heathland. Wetland areas contain bogmosses ( <i>Sphagnum</i> spp.), common wetland herbs and royal fern ( <i>Osmunda regalis</i> ). Other notable species are cranberry ( <i>Vaccinium oxycoccos</i> ) and mud sedge ( <i>Carex limosa</i> ).
Trwyn Pencarreg	Wildlife Site (non-statutory)	200m north-west of the Wylfa Newydd Development Area	Coastal and semi-improved grassland adjacent to Porth-y-pistyll and Cemlyn Bay.
Cemlyn Bay	SAC	400m	Coastal lagoon habitat, and perennial vegetation of stony banks. Notable species include a bryozoan ( <i>Conopeum seurati</i> ), the lagoon cockle ( <i>Cerastoderma glaucum</i> ) and the lagoonal mud snail ( <i>Ventrosia ventrosa</i> ).  Perennial vegetation of stony banks is present as a qualifying feature but not the primary reason for designation.
Cemlyn Bay	SSSI	400m	Breeding bird assemblage – Arctic tern ( <i>Sterna paradisaea</i> ), common tern ( <i>Sterna hirundo</i> ), roseate tern ( <i>Sterna dougallii</i> ), and Sandwich tern ( <i>Thalasseus sandvicensis</i> ). Coastal lagoon and vegetated shingle which is characterised by sea kale ( <i>Crambe maritima</i> ), sea radish ( <i>Raphanus raphanistrum</i> ssp. <i>Maritimus</i> ) and yellow horned poppy ( <i>Glaucium flavum</i> ).
Ynys Feurig, Cemlyn Bay and The Skerries	SPA	400m	The SPA supports four species of breeding tern: Arctic tern (five year mean of 1,290 pairs representing 2.9% of population in the UK, 1992-1996); common tern (five year mean of 189 pairs representing 1.5% of population in the UK, 1992-1996); roseate tern (five year mean of three pairs representing 5% of population in the UK, 1992-1996); Sandwich tern (five year mean of 460 pairs representing 3.3% of population in the UK, 1993-1997) (JNCC, 2015 <sup>25</sup> ).

<sup>25</sup> JNCC. 2015. SPA description (information as published 2001) – Ynys Feurig, Cemlyn Bay and The Skerries. <http://jncc.defra.gov.uk/default.aspx?page=2055>. [Accessed: 03.08.2015].

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## Terrestrial ecology species and habitats

- 10.1.5 A range of baseline surveys covering key terrestrial ecological species have been undertaken within the SPC study area between 2009 and present.
- 10.1.6 Terrestrial and Freshwater Ecology work undertaken to date will input into that required for the Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) Compliance Assessment.
- 10.1.7 These include the following:
- Phase 1 Habitat Survey;
  - National Vegetation Classification (NVC) surveys;
  - fungi surveys of key habitats (coastal scrub, heath, grassland, amenity areas and woodland) within the study area;
  - baseline lichen surveys focussed on those areas with the potential to support the highest number of species or most likely to result in notable species being found;
  - surveys for bryophytes within the study area in areas thought most likely to support more diverse communities or rare species;
  - surveys for terrestrial invertebrates completed at 17 sites within the study area;
  - surveys for great crested newt (*Triturus cristatus*) and other amphibians have been completed in all accessible waterbodies with the potential to support breeding amphibians in the study area;
  - reptile surveys carried out in targeted locations within the study area since 2010 over four survey seasons;
  - choughs have been recorded each year since monitoring started in 2009;
  - breeding bird surveys over five breeding seasons using transects, targeted vantage point surveys and data gathered from incidental observations;
  - over-wintering and passage bird surveys for over five separate survey periods;
  - bat surveys undertaken within the study area every year since 2009;
  - otter surveys completed in all watercourses within the study area including coastal habitats;
  - water vole surveys; and
  - surveys and assessment of potential for other notable and protected mammal species to be present e.g. – brown hare (*Lepus europaeus*), hedgehog (*Erinaceus europaeus*), and polecat (*Mustela putorius*).

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## Valuation criteria

10.1.8 The criteria used to assign a value for each ecological receptor is consistent with that developed for the Wylfa Newydd Project; whereby published guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) is followed<sup>26</sup>. Table 10.2 defines the values used and how these relate to topic specific criteria published by CIEEM.

10.1.9 The assignment of receptor value has enabled the refinement of the assessment scope, resulting in the scoping out of receptors ascribed negligible values.

**Table 10.2: Criteria for determining value of terrestrial and freshwater ecology receptors**

Value	Topic specific criteria
High	Receptor is rare or uncommon on an international or national scale.  Receptor is of international/national importance, e.g. it is a statutory designated site (Special Area of Conservation (SAC), Special Protection Area (SPA) or SSSI), it is a species which has European protection through the provision of the Conservation of Habitats and Species Regulations (2010) (as amended), or is a cited feature of an internationally/nationally designated site.
Medium	Receptor is rare or uncommon on a regional/county scale.  Receptor is of regional/county importance, e.g. it is a non-statutory designated site for nature conservation such as a Wildlife Site, or is a cited feature of a non-statutory designated site for nature conservation.
Low	Receptor is relatively common and widespread but has elevated conservation status e.g. is listed in accordance with the requirements of the Section 42 list of the Natural Environment and Rural Communities Act (NERC) 2006 <sup>27</sup> , Local Biodiversity Action Plan, Birds of Conservation Concern Red or Amber listed or Red Data Book listed and/or is legally protected.
Negligible	Receptor is abundant and widespread.  Receptor is not or does not comprise a designating feature of any designated or non-designated site for nature conservation.  Receptor receives no legal protection and is not of elevated conservation concern status.

10.1.10 Phase 1 Habitat Surveys and NVC surveys have identified a range of terrestrial habitats present within the study area.

<sup>26</sup> IEEM. 2016. *Guidelines for Ecological Impact Assessment in the United Kingdom*. IEEM: UK

<sup>27</sup> *A list of species of principle importance to Wales under Section 42 of the Natural Environment and Rural Communities (NERC) Act*. Hereafter all habitats and species listed in accordance with the requirements of Section 42 of the NERC Act 2006 will be referred to as Section 42 habitats / species.

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- 10.1.11 There are a number of Section 42 habitats present in the study area. These are: dwarf shrub heath/upland heathland (coastal grassland heath-grassland mosaic); upland fen; linear areas of reedbed and scattered ponds; marsh and swamp; and wet woodland/willow scrub. These are also listed within the Anglesey Local Biodiversity Action Plan<sup>28</sup>.
- 10.1.12 The value of the vast majority of habitats in the study area is considered to be low. However, Section 42 habitats with heath/coastal grassland mosaic habitats (as key features of the Wylfa Head Wildlife Site) have medium value.
- 10.1.13 Surveys identified evidence of protected species, the key results of which are presented in table 10.3.

**Table 10.3: Summary of results of the terrestrial ecological surveys completed**

Ecological receptor	Results summary and value
Fungi	The survey recorded 85 species that are not protected or notable. Overall the lack of protected, rare or notable species suggests that the communities of fungi within the study area are of negligible value.
Lichen	In total the surveys recorded 262 taxa of lichen of which one species is listed on the NERC Act ( <i>Schismatomma graphidioides</i> ), 26 are Nationally Scarce, two are Nationally Rare, three are RDB Vulnerable listed, four are International Responsibility, and 21 were new Vice County records for Anglesey. The value of the lichen in the topic study area is considered to be medium, based on the quality of habitats at Trwyn Pencarreg, and the number of notable species recorded. However, it should be recognised that the total area of habitat where the lichen rich substrates are found is small when compared to the total area of the Wylfa Newydd Development Area.
Bryophytes	The survey recorded 126 species of bryophytes of which none are notable species. However, the survey did record eight species that are rare on Anglesey. The value of the majority of the bryophyte communities in the topic study area is considered to be negligible, as 94% of species found were common and widespread. The remaining 6% were only notable due to their distribution on Anglesey and are not of national concern.

<sup>28</sup> Anglesey's LBAP. 2015. [https://ukbars.defra.gov.uk/archive/plans/lbap\\_plans.asp?LBAP=%7b42A89BF7-2E26-4C14-8253-40937ACA129D%7d](https://ukbars.defra.gov.uk/archive/plans/lbap_plans.asp?LBAP=%7b42A89BF7-2E26-4C14-8253-40937ACA129D%7d). [Accessed: 03.08.2015].

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Ecological receptor	Results summary and value
Protected vascular plant species	<p>The Phase 1 Habitat Surveys and NVC did not find any plant species that receive legal protection.</p> <p>Cornflower (<i>Centaurea cyanus</i>) is a Section 42 species, but was recorded within a recently planted wildflower area and so was assumed to be introduced.</p> <p>Other notable species have been recorded but only within Cae Gwyn SSSI, Cemlyn Bay SSSI and SAC, and Tre'r Gof SSSI. These species are therefore considered as part of the assessment of those sites as a whole and are not treated individually (e.g. royal fern and cranberry). The value of vascular plant species outside of the statutory designated sites for nature conservation is therefore considered to be negligible.</p>
Terrestrial invertebrates	<p>The terrestrial invertebrate surveys have produced a species list for the topic study area which totals 717, of which 88 are of increased conservation status. None found had legal protection, but four priority species were found: the grayling (<i>Hipparchia semele</i>), small heath (<i>Coenonympha pamphilus</i>), and wall (<i>Lasiommata megera</i>) butterflies, and the cinnabar moth (<i>Tyria jacobaeae</i>).</p> <p>The value of the terrestrial invertebrate communities in the study area is considered to be low. The assessment is based on the presence of four species being listed in Section 42 of the NERC Act, and that only 12% of the species found have any elevated conservation status.</p>
Great crested newt	<p>Surveys of all waterbodies within the Wylfa Newydd Development Area, and within a buffer zone extending 500m beyond this, have not found great crested newt breeding in any ponds.</p> <p>A single great crested newt was incidentally recorded in terrestrial habitat near Cae Gwyn SSSI in 2013 within 500m of ponds on land that is not currently accessible for survey. There is therefore the potential for a great crested newt breeding pond to be present within 500m of the Wylfa Newydd Development Area.</p> <p>Given this level of uncertainty and the level of protection afforded to this species it is necessary to adopt a precautionary approach to valuing this receptor and it is therefore assigned a medium value, based primarily on its level of protection and the assumption that a population, if present, would be small.</p>
Other Amphibians	<p>Surveys recorded common toads (<i>Bufo bufo</i>) breeding in numerous ponds throughout the study area. Surveys also recorded common frog (<i>Rana temporaria</i>) and palmate newts (<i>Lissotriton helveticus</i>) in many ponds.</p> <p>The value of the study area for amphibians (excluding great crested newts) is considered to be low. This is primarily due to the abundance and widespread distribution (regionally and nationally) of the species recorded on site, but taking account of the declining national status of common toad and it being a Section 42 species.</p>

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Ecological receptor	Results summary and value
Reptiles	<p>The results found several scattered populations of adder (<i>Vipera berus</i>) and common lizard (<i>Zootoca vivipara</i>).</p> <p>The value of the reptile populations in the study area is considered to be low due to the small populations present and the widespread distribution of the species found.</p>
Chough	<p>The species is known to be present year-round and is breeding within the study area.</p> <p>The species is a key feature of Wylfa Head Wildlife Site and therefore has a separate value to other bird species.</p> <p>The value of the chough population in the study area is considered to be medium.</p>
Breeding birds	<p>Surveys have recorded 102 species of breeding bird over five breeding seasons. Eighty-nine of these species were considered to have bred within the study area of which 46 are notable species i.e. those species that are afforded special protection or are of conservation concern.</p> <p>Surveys also recorded three Schedule 1 species that are breeding or likely to be breeding in the study area (excluding chough): barn owl (<i>Tyto alba</i>), merlin (<i>Falco columbarius</i>) and peregrine falcon (<i>F. peregrinus</i>).</p> <p>The compiled species list of breeding birds from a site as large as the study area and from all five years of survey data is not considered to be exceptional.</p> <p>The value of the breeding birds assemblage is therefore considered to be low.</p>

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Ecological receptor	Results summary and value
Over-wintering and passage bird species	<p>Surveys have recorded a total of 95 over-wintering and passage bird species, of which 56 species are notable.</p> <p>Many of the notable records are of individual birds, low numbers of birds, or species recorded in one year only.</p> <p>Large flocks (greater than five birds) of 21 notable species were recorded during surveys comprising: black-headed gull (<i>Chroicocephalus ridibundus</i>); chough; curlew (<i>Numenius arquata</i>); fieldfare (<i>Turdus pilaris</i>); great black-backed gull (<i>Larus marinus</i>); greylag goose (<i>Anser anser</i>); herring gull (<i>Larus argentatus</i>); house sparrow (<i>Passer domesticus</i>); lapwing (<i>Vanellus vanellus</i>); linnet (<i>Carduelis cannabina</i>); mallard (<i>Anas platyrhynchos</i>); meadow pipit (<i>Anthus pratensis</i>); oystercatcher (<i>Haematopus ostralegus</i>); redwing (<i>Turdus iliacus</i>); skylark (<i>Alauda arvensis</i>); snipe (<i>Gallinago gallinago</i>); song thrush (<i>Turdus philomelos</i>); starling (<i>Sturnus vulgaris</i>); teal (<i>Anas crecca</i>); widgeon (<i>Anas penelope</i>); and woodcock (<i>Scolopax rusticola</i>).</p> <p>The baseline information shows that the numbers of species recorded in more than one year, i.e. the numbers of the species recorded above single birds or low numbers of birds, is within the range of a site of local conservation importance (25 – 54)<sup>29</sup>.</p> <p>The value and sensitivity of the assemblage of over-wintering and passage bird species is therefore considered to be low.</p>
Bats	<p>Bat species recorded during surveys comprised:</p> <ul style="list-style-type: none"> <li>• brown long-eared (<i>Plecotus auritus</i>);</li> <li>• common pipistrelle (<i>Pipistrellus pipistrellus</i>);</li> <li>• Nathusius' pipistrelle (<i>Pipistrellus nathusii</i>);</li> <li>• Natterer's (<i>Myotis nattereri</i>);</li> <li>• soprano pipistrelle (<i>Pipistrellus pygmaeus</i>); and</li> <li>• whiskered/Brandt's bat (<i>Myotis mystacinus/brandtii</i>).</li> </ul> <p>The most recent survey data from 2015 shows that there are over 20 bat roosts in buildings within the study area, and that the most significant roost comprises a maternity colony of around 40 Natterer's bats.</p> <p>The activity surveys consistently show that there are hot-spots of activity around the following locations: Cafnan Farm; Cemlyn Road; Cestyll Gardens; Cemaes community woodland; Dame Sylvia Crows Mound; Foel Fawr; The Firs Depot; Tyddyn Gele and the Magnox Visitor Centre.</p> <p>Given the results of the baseline survey and the historic records of bats within the wider area, the value of the assemblage of bats in the study area is considered to be medium.</p>

<sup>29</sup> Fuller, R.J. 1980. A method for assessing the ornithological interest of sites for conservation. *Biological Conservation*. 17: 229-239.

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Ecological receptor	Results summary and value
Otter	<p>Evidence of otter has been recorded in nine locations in the form of foraging remains or spraint. These locations include the coastal habitats, freshwater habitats at Cemlyn lagoon, the Afon Cafnan and its tributary, and the Afon Wygyr. The evidence recorded demonstrates otters are active within the catchment but suggests that the use of the study area is regular but very low, probably only by one or two individuals.</p> <p>The value of otter populations in the study area is considered to be medium.</p>
Water voles	<p>Surveys recorded evidence of the species in the form of burrows, latrines and feeding remains in five separate locations within the study area.</p> <p>Most recent surveys in 2014 found that the species was present in three areas: the stream feeding Cemlyn Lagoon; the Cafnan Stream and the tributary feeding Cafnan Stream near Caerdegeg Isaf.</p> <p>Survey data show that the population of water vole within the study area is dynamic, but probably in decline.</p> <p>The value of the remaining water vole populations in the study area is considered to be medium.</p>

10.1.14 There are habitats within the study area that have the potential to support several other protected or notable mammal species. A number of species are considered to be absent from the study area due to a lack of or limited evidence, comprising:

- badger (*Meles meles*);
- harvest mouse (*Micromys minutus*);
- pine marten (*Martes martes*); and
- red squirrel (*Sciurus vulgaris*).

10.1.15 Brown hare, hedgehog and polecat are all confirmed as being present within the study area. These species are deemed to have low value ratings given their level of legal protection and likely presence and distribution within the wider landscape and that despite being Section 42 they do not receive any additional legal protection.

10.1.16 Recent discussions with the IACC and the Red Squirrel Survival Trust indicate the species' range is expanding across Anglesey. Targeted surveys have therefore been proposed for 2016 to determine red squirrel presence / likely absence within the study area. Given the current uncertainty over their presence, and the level of protection afforded to this species, it is necessary to adopt a precautionary approach to valuing this receptor and it is therefore assigned a medium value, based primarily on its level of protection and the assumption that a population, if present, would be small.

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## Freshwater ecology species and habitats

10.1.17 Baseline surveys, covering key ecological receptors, were completed within the study area. Surveys undertaken comprise:

- annual macrophyte surveys undertaken between 2012 and 2014;
- diatom surveys undertaken quarterly between 2011 and 2014<sup>32</sup>;
- macroinvertebrate surveys undertaken seasonally between 2011 and 2014<sup>32</sup>; and
- fish surveys undertaken between 2011 and 2014<sup>32</sup>. and
- Water quality monitoring undertaken across all watercourses within the study area between 2011 and 2014<sup>32</sup>.

10.1.18 The study area contains a diverse range of aquatic habitats including ponds, streams, ditches, wetland, coastal headland pools and seepages, many of which are ephemeral waterbodies.

10.1.19 There are four main waterbodies located within the study area, two of which, at the time of writing are WFD classified waterbodies:

- the Cemlyn catchment which outflows to Cemlyn lagoon at the west of the study area (WFD un-named – Wygyr catchment (5) ID: GB110102059150);
- the Afon Cafnan catchment (WFD un-named - Wygyr catchment (6) ID: GB110102059160);
- the Tre'r Gof sub-catchment; and
- the Cemaes catchment in the east, flowing north to Cemaes Bay.

10.1.20 Additional to these main sub-catchment are a number of minor watercourses such as Porth-y-pistyll, along with some isolated ponds that are not hydrologically connected to the main watercourses.

10.1.21 The aquatic habitats across the study area have been characterised with habitat descriptions. The physical habitat of the watercourses varies between that of natural streams to drainage ditches or streams which have been historically deepened and have lost much of their natural character.

10.1.22 The value of the majority of the freshwater habitats in the topic study area is considered to be low. Table 10.4 summarises the survey results to date.

**Table 10.4: Summary of results of the freshwater ecological surveys completed**

Ecological receptor	Results summary and value
Macrophytes	<p>Macrophyte species recorded across the study area were common and typical of lowland streams. A total of 107 species have been recorded across the study area and included species adapted to riverine and pond habitats.</p> <p>The value of macrophyte receptors within the study area is considered to be negligible due chiefly to the absence of species of conservation interest and the site scale importance of the communities present.</p>

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Ecological receptor	Results summary and value
Phytobenthos (Diatoms)	<p>Diatom sampling to date shows that there is a large variability in populations, which would be expected given the diverse range of habitat types assessed.</p> <p>The value of the diatom receptor across all watercourses is considered to be negligible due to the site scale importance, widespread distribution and common nature of the receptor. The species present are typical of a lowland coastal stream.</p>
Macroinvertebrates	<p>A total of 236 macroinvertebrate species have been recorded across the Application Site, 39 of which are species of local conservation importance.</p> <p>Two near-threatened species were identified within the study area:</p> <ul style="list-style-type: none"> <li>Hydraena palustris (minute moss beetle) has been recorded in Power Station pond; and</li> <li>Omphiscola glabra (mud snail, (IUCN, 2015) has been recorded in Tregel pond.</li> </ul> <p>The value of the macroinvertebrate receptor within the study area is considered to be low across the site due to the presence of species of local or higher conservation value. The macroinvertebrate communities within the study area have a widespread distribution and are considered common. The identification of species of higher conservation value at Power Station pond and Tregel pond has resulted in the macroinvertebrate receptor in these ponds being considered to be of medium value and of regional importance.</p>
Fish	<p>Four fish species have been identified within the study area:</p> <ul style="list-style-type: none"> <li>brown trout<sup>30</sup> (<i>Salmo trutta</i>) – found in low numbers in the Afon Cafnan only;</li> <li>European eel (<i>Anguilla anguilla</i>) – found across the topic study area in low numbers;</li> <li>nine-spined stickleback (<i>Pungitius pungitius</i>) – found in low numbers in the Afon Cafnan only; and</li> <li>three-spined stickleback (<i>Gasterosteus aculeatus</i>) – found to be abundant in majority of the main watercourses across the study area.</li> </ul> <p>The European eel receives protection under the Eel Regulations 2009, is listed as Critically Endangered on the RDB list and is a Section 42 species. The brown trout is also a Section 42 species. Neither species of the stickleback have any conservation designations.</p> <p>The value of fish receptor within the study area is considered to be high due to the presence of European eel across the study area and brown trout in the Afon Cafnan. There is, however, limited habitat for these species within the upper reaches of the catchments, typically due to channel modification and low flows. European eel are considered of international importance while the remainder fish species are of local importance.</p>

<sup>30</sup> Note brown trout and sea trout are the same species (*Salmo Trutta*) but display different lifestyle characteristics in terms of habitat use (brown trout are only found in freshwater whilst sea trout migrate between freshwater and marine habitats).

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## **Invasive non-native plant species**

10.1.23 Invasive non-native (INN) plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 have been recorded at several locations within the study area and are listed below:

10.1.24 Aquatic species:

- curly waterweed (*Lagarosiphon major*);
- waterweed (*Elodea spp.*);
- New Zealand pigmyweed (*Crassula helmsii*);
- parrot's-feather (*Myriophyllum aquaticum*); and
- water fern (*Azolla filiculoides*).

10.1.25 Terrestrial species:

- cotoneaster (*Cotoneaster spp.*);
- giant rhubarb (*Gunnera manicata* and *G. tinctoria*);
- Japanese knotweed (*Fallopia japonica*);
- Japanese rose (*Rosa rugosa*);
- montbretia (*Crocasmia x crocosmiflora*);
- rhododendron (*Rhododendron ponticum*); and
- variegated yellow archangel (*Lamium galeobdolon* subsp. *argentatum*).

## **10.2 Potential Effects**

10.2.1 Potential terrestrial and freshwater ecology effects associated with the SPC Proposals comprise:

- mortality/injury of species;
- habitat loss, fragmentation or modification;
- habitat/species disturbance (including noise, visual and light disturbance);
- introduction or spread of INN plant species;
- air quality changes; and
- hydrological changes (including water quality and quantity).

## **10.3 Proposed scope, methodology and criteria**

10.3.1 The baseline environmental information for terrestrial and freshwater ecology is considered to be sufficiently robust to inform the ecological assessment of the SPC Proposals although it is recognised that some uncertainty remains as to the status of a potential great crested newt population around the Cae Gwyn SSSI and that of a red squirrel population within the study area. Further survey work is required to confirm this status of these species within the study area and it is hoped that they will be completed prior to submission of an ES, should land access issues be resolved.

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- 10.3.2 Some uncertainty remains as to the status of a potential great crested newt population around the Cae Gwyn SSSI and that of a red squirrel population within the study area. Further survey work is required to confirm this status of these species within the study area.
- 10.3.3 However, the only great crested newt record is from Cae Gwyn SSSI, with all other water bodies within the Wylfa Newydd Development Area having been surveyed and returning negative results. Potential source populations for this single record have been considered as being un-surveyed ponds to the north and west of the record. These ponds and the single record itself lie over 500m from the nearest boundary of the SPC Proposals.
- 10.3.4 Additional freshwater ecology monitoring has been carried out during 2015 to add to the data already collected, including additional diatom, macroinvertebrate, macrophyte and fish monitoring. The 2015 sampling round focused on the pond sites added during 2014 to provide a two year data set. The 2015 data will form part of the baseline for the ecological assessment. The freshwater baseline dataset is appropriate to detect effects from the SPC Proposals and determine suitable mitigation.
- 10.3.5 It is proposed that the scope of the ecological assessment will focus on those designated sites, habitat and species which have been valued as low, medium or high. Those ecological receptor groups given a negligible value (fungi, bryophytes, protected plant species and diatoms) and those species where baseline surveys have concluded a likely absence from the site (badger, harvest mouse, great crested newt and pine martin) will not be included within the assessment and will not be considered within the Environmental Statement.
- 10.3.6 The SPC Proposals will also be subject to a HRA screening in accordance with the Conservation of Habitats and Species Regulations 2010 (as amended).

### **Assessment methodology**

- 10.3.7 The assessment methodology for the SPC Proposals will follow generic assessment criteria, as outlined in chapter 4, which has been developed for the EIA to provide a consistent approach across all environmental disciplines.
- 10.3.8 The final stage in the assessment is to determine the potential significance of the effects. This process combines the information from table 10.2 and table 10.5 for each receptor and is derived according to the significance matrix as set out in section 4.4. However, this process is primarily informed by the use of professional judgement as the matrix is flexible and allows independent professional interpretation of results.

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**Table 10.5: Criteria for magnitude of change on terrestrial and freshwater ecology receptors**

Magnitude of change	Topic specific criteria
Large	<p>The activity is likely to result in permanent or long-term effects (a change that is likely to occur over a period greater than 10 years or is permanent) to the integrity of the receptor in terms of the coherence of its ecological structure and function and may affect the conservation status of the receptor.</p> <p>The receptor is degraded to the extent that populations and habitats are destroyed or significantly affected.</p>
Medium	<p>The activity is likely to affect the integrity of the receptor in the medium-term (for the duration of phases (i.e. construction, operation, decommissioning)) with effects ceasing or becoming reversible after this period.</p>
Small	<p>The activity is likely to affect the integrity of the receptor in the short-term (the duration of the activity only) with effects ceasing or becoming reversible after this period.</p>
Negligible	<p>Little or no effect to the integrity of the receptor with reversible effects experienced only in the short-term.</p>

## 10.4 Potential mitigation

10.4.1 An ecological mitigation strategy will be developed that sets out key mitigation principles. The following additional tasks will be undertaken:

- a mitigation approach will be developed through discussion with NRW, the Isle of Anglesey County Council's County Ecologist and North Wales Wildlife Trust, and will take into account the work of the Wales Biodiversity Partnership with regards to Biodiversity Action Plan Action Area Mapping and NRW's Terrestrial Science Group's work on ecological connectivity;
- obtaining European Project Species mitigation licenses or conservation licenses where such species will be impacted by the developments. Each licence will have its own associated specific mitigation requirements which will be integrated with the wider strategy; and
- mitigation measures will be identified as required in early assessments and incorporated into activities to reduce the potential for significant effects.

10.4.2 Details of all ecological mitigation measures will be considered in the assessment and presented in the Environmental Statement for the SPC Proposals.

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# 11 The Water environment

## 11.1 Existing environment

11.1.1 This chapter describes the baseline conditions for flood risk, surface water and groundwater, and the potential effects associated with the SPC Proposals.

11.1.2 The baseline for surface water and groundwater includes the following sub-topics in addition to consideration of the assessment appropriate to WFD legislation:

- water quality (freshwater);
- hydrology;
- hydrogeology; and
- fluvial geomorphology (including hydromorphology).

11.1.3 There are potential linkages between fluvial and coastal geomorphology, in the sense that potential changes in volumes of sediment carried by watercourses can directly affect the coastal water body. Therefore, potential mitigation measures given herein are considered adequate to remove the risk of potential effects to fluvial and coastal geomorphology. As such this will not be considered further within the Environmental Statement for the SPC Proposals.

11.1.4 The following information and data will be reviewed as part of this scoping exercise to establish the existing hydrological conditions associated with the SPC Proposals:

- Ordnance Survey mapping;
- NRW website (<http://naturalresourceswales.gov.uk/>);
- Consultations with NRW;
- Environment Agency “What’s in your backyard” website (hosting information on Wales, <http://apps.environment-agency.gov.uk/wiyby/>);
- Western Wales River Basin Management Plan (2009)<sup>31</sup>;
- Government’s Multi-Agency Geographic Information for the Countryside (MAGIC – <http://magic.defra.gov.uk/>) website;
- British Geological Survey website ([www.bgs.ac.uk](http://www.bgs.ac.uk/));
- Cranfield Land Information System website ([www.landis.org.uk](http://www.landis.org.uk/));
- Flood Estimation Handbook CD ROM 3 (Wallingford HydroSolutions Ltd);
- information request to IACC (September 2014);
- information request to NRW (October 2014);
- Managing the risk of flooding in the Western Wales River Basin District (2013)<sup>32</sup>; and
- environmental constraints.

<sup>31</sup> Environment Agency. 2009. Western Wales River Basin Management Plan. Available from: <https://naturalresources.wales/media/674895/ww-rbmp.pdf>.

<sup>32</sup> Natural Resource Wales. 2013. Managing the risk of flooding in the Western Wales River Basin District. Available from: <https://naturalresources.wales/media/1076/managing-the-risk-of-flooding-in-the-western-wales-river-basin-district.pdf>

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11.1.5 A review will also be undertaken of relevant planning policy guidance at the national and local level to inform the scoping process.

11.1.6 The data review undertaken to date noted that both surface water and groundwater within the study area could provide a source for local water supply, support and/or be linked to water-dependent ecological features that are classified as designated sites. Surface water bodies could also be important landscape, hydromorphological and ecological features in their own right. Further assessment will be undertaken to establish potential effects.

### Study area

11.1.7 The groundwater study area is a nominal 3km radius (land only – figure 11.1) around the centre of Power Station Site – this area has been set as it exceeds the maximum likely radius of influence of any potential effects from the Wylfa Newydd Development Area and it will capture all off-site groundwater features of relevance to the impact assessment.

11.1.8 The surface water study area is based on stream catchments at and around the Wylfa Newydd Development Area, see figure 11.2. This area has been defined as it captures all surface water features of relevance to the assessment. In addition, the surface water study area is linked to the flood risk study area as surface water flows within these catchments will all contribute to the flood risk.

### Flood Risk

11.1.9 According to the NRW Flood Maps, the Wylfa Newydd Development Area is predominantly of low flood risk, but small parcels of land on low lying areas near Porth-y-pistyll are within a higher risk classification.

11.1.10 The flood risk study area shares the same area as the surface water study area, figure 11.2. The northern boundary of the study area is defined by the Irish Sea coastline. The Eastern and Western boundaries are defined by watercourses or by their surface water catchment boundaries, beyond which effects of the Proposed Activities are unlikely to occur. The full southerly extent of the study area is defined by the catchments of the various watercourses that flow through and past the Wylfa Newydd Development Area.

11.1.11 In total there are five small surface water catchment areas within and around the SPC Site which include the following (shown in figure 11.2):

- **Tre'r Gof Catchment**, which is approximately 1km<sup>2</sup>, drains northwards to the Tre'r Gof SSSI, which forms an inland 'drainage basin' fed by a number of small ephemeral watercourses<sup>33</sup> and where there is a high groundwater level. This SSSI is also believed to receive additional flow from shallow groundwater around the basin periphery. The Tre'r Gof basin drains to the coast via a culvert and outfall at Porth Wylfa;

<sup>33</sup> An ephemeral water body is a wetland, spring, stream, river, pond or lake that only exists for a short period following precipitation or snowmelt.

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- **Afon Cafnan Catchment**, which is some 10km<sup>2</sup> and located to the south and west of the Wylfa Newydd Development Area, discharges to the sea south of Porth-y-pistyll. This catchment includes Cae Gwyn SSSI, which drains via a tributary, referred to here as Caedegog Isaf, into Afon Cafnan;
- **Cemaes Catchment**, which is 2.7km<sup>2</sup> and is located immediately to the east of the topic study area, drains north from Llanfechell discharging into Cemaes Bay;
- **Power Station Catchment** is a very small catchment immediately to the south of the Existing Power Station and drains westward discharging to the coast at Porth-y-pistyll. The stream that drains the catchment is part culverted and was possibly re-aligned during the construction of the Existing Power Station; and
- **Cemlyn Catchment**, which drains an area of approximately 3km<sup>2</sup> that includes a small area of the south-western end of the topic study area. The catchment drains via an unnamed watercourse into the lagoon at Cemlyn Bay which is an ecologically designated area.

### **Geomorphology**

11.1.12 The study area, which is shown on figure 11.3, is based on stream catchments extending out to 1km from the Wylfa Newydd Development Area. Consideration was given to adjoining upstream and downstream waterbodies outwith this immediate buffer zone, to ensure all surface water features of relevance are captured in subsequent assessments.

### **NRW and TAN 15 Fluvial Flood Zones**

11.1.13 TAN 15 supplements the content of Planning Policy Wales with specific reference to development and flooding. It provides a framework. *'... within which risks arising from both river and coastal flooding and from additional run-off from development in any location, can be assessed.'*

11.1.14 The majority of the Wylfa Newydd Development Area is located within just three of the five catchments, shown on figure 11.2. These are the Afon Cafnan catchment, the Power Station catchment, and the Tre'r Gof catchment. There are no formal fluvial flood defences protecting the Wylfa Newydd Development Area.

11.1.15 Both the Power Station catchment and Tre'r Gof catchments are smaller than other local catchments. Flow out of Tre'r Gof catchment is through a culvert to Porth Wylfa beach. The Power Station catchment drains to Porth-y-pistyll beach. They are considered to be relevant in relation to potential surface water flooding (i.e. a response to short duration rainfall) rather than fluvial flooding (i.e. response to prolonged river level increases where catchments respond more slowly to rainfall and groundwater base-flow).

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11.1.16 Figure 11.4 shows the fluvial and coastal flood zone as shown on the TAN 15 Development Advice Map<sup>34</sup> issued by the Welsh Government. The zones on this relate to TAN15 which defines three development advice zones, A, B, and C:

- Zone A – Considered to be little or no risk of fluvial or tidal/coastal flooding;
- Zone B - Areas known to have been flooded in the past evidenced by sedimentary deposits; and
- Zone C<sup>35</sup> - A flood with 0.1% chance of happening in any year (Based on NRW extreme flood outline, equal to or greater than 0.1% annual probability of river or sea flooding).

11.1.17 The TAN 15 Development Advice Map indicates that the Wylfa Newydd Development Area and surrounding area is predominantly outside of Zones C and B (i.e. in Zone A) except for:

- low-lying areas inland of Porth-y-pistyll in Zones C where extreme sea levels result in inland flooding;
- near the south-western tip of the Power Station Site within the Afon Cafnan catchment where areas are shown as being within fluvial Flood Zone C; and
- low-lying areas inland of Porth Wylfa associated with Tre'r Gof SSSI that are shown to be within Zone B.

11.1.18 The TAN 15 Development Advice map (figure 11.4) only shows modelled flood extents for tidal flooding and fluvial flooding associated with the Afon Cafnan. However, fluvial flooding along the Afon Cemaes and surface water flooding across the Wylfa Newydd Development Area has now been modelled using a combined pluvial/fluvial 2D model. This modelling uses more detailed topography/modelling methods and provides a more accurate representation of flood risk than the Development Advice Map (figure 11.4). The modelling shows a small area in the south-east of the Wylfa Newydd Development Area at flood risk and, therefore, within Zone C. This will be the subject of further detailed assessment.

## Hydrogeology

11.1.19 The soils in the topic study area are low permeability shallow loam with peat at Tre'r Gof SSSI. Over most of the Wylfa Newydd Development Area, groundwater appears to form a continuous body with water in the bedrock interacting with water in the superficial deposits. However, this is not universally the case. In some parts of the Wylfa Newydd Development Area the groundwater in the two deposits is separate, whilst in other areas the superficial deposits have no groundwater and can 'confine' groundwater in the underlying bedrock.

<sup>34</sup> TAN 15 Development and Flood Risk Map Flood Zone <http://data.wales.gov.uk/apps/floodmapping/> [Accessed: 08.09.2014]

<sup>35</sup> Flood Zone C (actually C2 refers to applicable boundary within proximity to the Power Station Site as illustrated figure 11.4).

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- 11.1.20 There is continued and ongoing monitoring of groundwater level data collected from a large number of monitoring boreholes, which has demonstrated that groundwater is generally shallow at a depth of between 0.1m and 3.2m below ground level across the Wylfa Newydd Development Area. The water level data appears to show two groundwater bodies, one with groundwater flow towards Tre'r Gof and the second towards Porth-y-pistyll.
- 11.1.21 Flow beneath the Wylfa Newydd Development Area is dominantly through fractures. Borehole hydraulic conductivity<sup>36</sup> tests, which demonstrate the ease with which water can pass through the rock, show a wide range of values (<10<sup>-5</sup>m/d to over 1 m/d), with no discernible spatial pattern, but a general decrease in bedrock hydraulic conductivity with depth.
- 11.1.22 Within the topic study area, the superficial strata<sup>37</sup> beneath the Wylfa Newydd Development Area are predominately designated as 'unproductive strata' by NRW, although the superficial materials that infill Tre'r Gof SSSI are designated as 'Secondary A' aquifers. The underlying solid strata are designated as 'Secondary B' aquifers. These designations indicate strata that are important for providing baseflow to rivers and can support small water abstractions.
- 11.1.23 The topic study area lies within the 'Ynys Môn Minor' groundwater drinking water protected area.<sup>38</sup> This part of North Wales is 'de-regulated' with respect to groundwater, so there is currently no requirement for any groundwater abstractions to be licensed, although this is subject to change and will be confirmed in the Environmental Statement. However, the Isle of Anglesey County Council (IACC) holds details of most private water supply abstractions and details of these have been obtained.
- 11.1.24 The Ynys Môn Minor WFD groundwater body (GB41002G204400), which includes much of Anglesey, was assessed by the Environment Agency in 2009 to be of 'Good Quality' (Quantitative). However, the groundwater body was assessed to have 'Poor Chemical Quality' due to hazardous substances which were classified by the Environment Agency as being associated with mines and the potential for nutrients and hazardous substances to affect groundwater-dependent terrestrial ecosystems. As the groundwater body is extensive, the chemical water quality will vary locally and is likely to be much better in some areas than the overall classification.

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<sup>36</sup> A measure of the ability of a material (usually a geological stratum) to transmit water.

<sup>37</sup> Plural of stratum; a layer of material, naturally or artificially formed, often one of a number of parallel layers one upon another.

<sup>38</sup> Groundwater drinking water protected areas contain water bodies (e.g. rivers, reservoirs, canals or groundwater) where 'raw' water is abstracted for human consumption at a rate of at least 10m<sup>3</sup>/day or over 50 people are served.

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## Hydrology

- 11.1.25 The UK Meteorological Office average annual rainfall data available online<sup>39</sup> for the period 1981 to 2010, shows an average annual rainfall at Cemaes of 841mm/yr - which is below the UK average of 1154mm/yr. A rain gauge was installed on the Wylfa Newydd Development Area in 2011 and this data will supplement data from the Meteorological Office.
- 11.1.26 In addition to the five surface water catchments there are a number of small ponds within the topic study area, apparently isolated from the small watercourses, whilst the Existing Power Station is drained by three surface water drainage systems. Two discharge onto the foreshore and one discharges into the main outfall.
- 11.1.27 The small nature of the catchments in the topic study area means that the streams are ungauged. However, five flow gauges have been added to the four inlets to the Tre'r Gof SSSI and one on the outlet in order to provide a better understanding of the water balance within the SSSI.
- 11.1.28 The topic study area is located within the Ynys Môn Catchment Abstraction Management Strategy<sup>40</sup> area but does not lie within either of the two Water Resource Management Units identified within the Catchment Abstraction Management Strategy area, which are located to the south. Surface water is not however abstracted locally to any significant degree.

## Fluvial geomorphology

- 11.1.29 Limited information on the baseline geomorphological conditions of the surface water in the topic study area from desk study information required fluvial geomorphology reconnaissance surveys on sections of watercourses within the study area. This included the WFD water bodies, associated tributaries and drains to gain an understanding of the catchment networks. Surveys were undertaken in both the summer and winter seasons. The assessments collected data on sediment processes, channel characteristics and longitudinal and lateral processes within the catchment, informing channel processes and other key geomorphological issues.
- 11.1.30 There are three WFD watercourses within the topic study area as shown in figure 11.5. These watercourses are designated under European water legislation as WFD water bodies (table 11.1). In addition, there are several small watercourses within or bordering the Wylfa Newydd Development Area which form vital components of the catchments.

<sup>39</sup> Met Office <http://www.metoffice.gov.uk/public/weather/climate/valley-isle-of-anglesey#?tab=climateComparisons> [Accessed: 08.09.2014].

<sup>40</sup> A Catchment Abstraction Management Strategy assesses how much water is reliably available on a catchment by catchment basis, in order to help manage water resources and the water environment.

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**Table 11.1: WFD Water Bodies and current statuses**

WFD water body name (River)	Water body name used in surface water assessment	Water body ID	Current status	Hydromorphologic al designation	Morphology
Unnamed – Wygyr catchment	Cemlyn Stream	GB110102059150	Moderate ecological status	Not designated as artificial/heavily modified	Supports good ecological status
Unnamed – Wygyr catchment	Afon Cafnan	GB110102059160	Moderate ecological status	Not designated as artificial/heavily modified	Supports good ecological status
Unnamed – Wygyr catchment	Not included in surface water assessment	GB110102059170	Good ecological status	Not designated as artificial/heavily modified	Supports good ecological status

11.1.31 Geomorphology and hydromorphology underpin the WFD, being key factors contributing to whether a water body can achieve or maintain Good Ecological Status. An assessment of the baseline conditions allows the status to be determined and provides an understanding of the potential effects to the fluvial environment and associated ecological habitats and water quality.

### Water quality

11.1.32 Surface water quality data have been collected since 2011; however, there is limited groundwater quality data for some areas in the vicinity of the Wylfa Newydd Development Area.

11.1.33 Recent ground investigations have included the collection of groundwater quality data and a preliminary assessment indicates the following:

- most samples in the topic study area demonstrate a high level of mineralisation with manganese, sulphate, calcium and chloride higher than is typical elsewhere on Anglesey;
- apart from manganese and ammoniacal nitrogen, the quality of most water samples is better than the drinking water quality standards<sup>41</sup> for the tested parameters; and
- pH is neutral or slightly alkaline.

<sup>41</sup> Quality parameters set for drinking water at the consumer's tap; mainly derived from The Water Supply (Water Quality) Regulations 2000.

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- 11.1.34 Very localised groundwater contamination associated with construction of the Existing Power Station is believed to be present, principally by chlorinated solvents and oils. These will be assessed in more detail as part of the assessment, and the need for mitigation will be evaluated.
- 11.1.35 The topic study area is covered by the River Basin Management Plan for the Western Wales River Basin District, prepared under the WFD. The only watercourses identified in the River Basin Management Plan are the Afon Cafnan and Cemlyn Stream, which are referred to as unnamed Wygyr catchments and for which the chemical quality is stated as 'not requiring assessment'.
- 11.1.36 Additional water quality and surface water flow data has recently been collected as part of the ecological assessments and will be used in the EIA.

## **11.2 Potential effects**

- 11.2.1 Potential surface and groundwater effects associated with the SPC Proposals, including waste / materials management and use of water resources, comprise:
- effects on surface water flow where fencing and access routes are installed across watercourses and ditches;
  - habitat loss/degradation, in particular at Tre'r Gof SSSI, due to changes in runoff regime associated with topsoil stripping and storage;
  - changes to watercourse geomorphology/hydromorphology;
  - erosion of exposed ground in areas stripped of topsoil, acting as an additional source of fine sediment;
  - changes in water quality in watercourses around the Wylfa Newydd Development Area associated with topsoil stripping, temporary topsoil storage mounds and the construction and use of haul roads;
  - changes to surface water flow patterns and other dynamics associated with drainage from haul roads and the site compound and car parking area;
  - pollution of Controlled Waters from any leaks or spills of fuel and other chemicals stored on site;
  - changes in groundwater levels due to vegetation and topsoil removal;
  - localised effects on groundwater at/around rock outcrops; and
  - mobilisation of existing groundwater contamination adjacent to the Existing Power Station.

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11.2.2 Potential flood risk effects associated with the SPC Proposals comprise:

- changes in surface contours altering flood flow conveyance capacity;
- changes in surface contours and surfacing altering catchment areas and runoff rates;
- loss of functioning of channel controls including culverts and road crossings;
- construction of new channel controls associated with access routes or security fencing;
- loss of fluvial floodplain, or fluvial flood flow obstruction, associated with soil storage/mounding;
- high sediment loading/deposition changing conveyance of channels/structures;
- alteration of existing surface water overland flow routes;
- change in groundwater flow rate and direction; and
- interception of groundwater flow by altered ground profile.

### 11.3 Proposed scope, methodology and criteria

#### Assessment criteria

11.3.1 Table 11.2 sets out the criteria for determining the value (i.e. level of importance) of water related features. The values have been derived to reflect the importance of features outlined in key policy documents such as the Water Framework Directive (2000).

**Table 11.2: Criteria for determining value of water related features**

Value	Generic criteria	Surface water and groundwater specific criteria
High	High importance and rarity, national scale, and limited potential for substitution	<ul style="list-style-type: none"> <li>• water feeding sites with a high environmental importance with an international or national value including Ramsar sites; SACs; SPAs; SSSIs;</li> <li>• internationally and nationally important Groundwater Dependent Terrestrial Ecosystems (GWDTE);</li> <li>• nationally and regionally important watercourses;</li> <li>• a watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence;</li> <li>• public water supplies;</li> <li>• nationally important fisheries; or</li> <li>• principle aquifers or highly productive aquifers with high aquifer vulnerability.</li> </ul>

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Value	Generic criteria	Surface water and groundwater specific criteria
Medium	High or medium importance and rarity, regional scale, limited potential for substitution	<ul style="list-style-type: none"> <li>important in the context of the region including watercourses or water bodies;</li> <li>main rivers within a catchment, locally important watercourses;</li> <li>a watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences;</li> <li>Private Water Supplies (PWS) serving 3 or more properties;</li> <li>regionally important fisheries;</li> <li>groundwater that supports highly dependent GWDTEs which are not designated; or</li> <li>principle aquifers or Secondary A aquifers (see glossary for aquifer definitions).</li> </ul>
Low	Low or medium importance and rarity, local scale	<ul style="list-style-type: none"> <li>low or local environmental importance;</li> <li>minor watercourses or water bodies;</li> <li>degraded fisheries or receptor not important for fisheries;</li> <li>a watercourse showing signs of modification and recovering to a natural equilibrium and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences;</li> <li>low productivity aquifer, which will often correspond to a Secondary B aquifer (see glossary for aquifer definitions);</li> <li>PWSs located within the vicinity of a mains water supply or PWSs used for agricultural purposes and not for drinking water purposes; or</li> <li>groundwater that supports undesignated moderately dependent GWDTE.</li> </ul>
Negligible	Very low importance and rarity, local scale	<ul style="list-style-type: none"> <li>a highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification;</li> <li>not classified as an aquifer under WFD. i.e. water bearing stratum identified through ground investigation that is not classified; or</li> <li>groundwater that supports a wetland not classified as a GWDTE although may receive some minor contribution from groundwater.</li> </ul>

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**Magnitude of change**

11.3.2 The magnitude of change (table 11.3) is a measure of the scale or extent of the change in the baseline condition, irrespective of the value of the receptor(s) affected. In determining magnitude, the extent of the physical change would be considered in the context of other factors such as the likelihood of effect, existing long-term trends, the timescale over which the effect occurs, and whether the effect is temporary or permanent. In assessing impacts the following time scales have been used:

- Short-term: Effects which are confined to either the construction phase or the decommissioning phase, such as temporary water emissions from working areas.
- Medium-term: Effects which may persist after the end of construction until mitigation measures become effective, up to a specified ‘design year, or up to a specified ‘future year’.
- Long-term: Effects which are permanent (irreversible) or which may decline over longer timescales, but would still persist after a specified ‘design year’ when mitigation measures are considered to have established and reached their full effectiveness.

**Table 11.3: Criteria for magnitude of change for surface water and groundwater**

Receptor	Magnitude of change and criteria			
	Large	Medium	Small	Negligible
Fluvial geomorphology	Loss or extensive damage to geomorphological habitat and processes due to extensive modification. Replacement of a large extent of the natural bed and/or banks with artificial material. Extensive change to channel planform.	Partial loss or damage to geomorphological habitat and processes due to modifications. Replacement of the natural bed and/or banks with artificial material (total length is more than 3% of water body length).	Slight change or deviation from baseline conditions, or partial loss or damage or improvement/gain to in-channel habitat and geomorphological processes due to modifications.	Very slight change from surface water baseline conditions, approximating to a ‘no change’ situation.

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Receptor	Magnitude of change and criteria			
	Large	Medium	Small	Negligible
Runoff regime	Long-term irreversible change in overall volume of runoff from the surface water study area and changes to flow paths and rates resulting in change to flood risk and erosion potential.	Temporary change, over a medium time period, in overall volume of runoff from the surface water study area and changes to flow paths and rates resulting in change to flood risk and erosion potential.	Short-term change in volume of runoff and changes to flow paths and rates in localised areas of the surface water study area resulting in change to flood risk and erosion potential to localised areas only.	No measurable change in runoff regime across the surface water study area.
Water availability/supply	Long-term measurable reduction in the volume or flow of water within a water body with the potential to effect water quality and aquatic ecosystems.	Temporary measurable change, over a medium time period, in the volume or flow of water within a water body, leading to a temporary change in water quality, but no effect upon ecosystems.	Short-term or minor change in volume or flow of water within a water body with no effects upon water quality or ecosystems.	No measurable change in water volume or flow within a water body.
Surface water quality	Measureable change in water quality status with respect to Environmental Quality Standards (EQS) for more than one month with long-term irreversible effects on aquatic ecosystems.	Measureable change in water quality status with respect to EQS for less than one month with a temporary effect on aquatic ecosystems in the medium-term.	Measureable change in water quality but no change with respect to EQS. No significant effect on aquatic ecosystems.	No measureable change in surface water quality.

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Receptor	Magnitude of change and criteria			
	Large	Medium	Small	Negligible
Aquifer: groundwater recharge and flow	<p>Irreversible or permanent change to the recharge, flow or discharge of groundwater.</p> <p>May have a large effect upon PWSs or licensed groundwater abstraction, supply to ecosystem or groundwater base flow to a watercourse such that it affects WFD criteria or standards.</p> <p>Affects large or multiple area(s).</p>	<p>Measurable change to the recharge, flow or discharge of groundwater.</p> <p>Limited effect upon PWSs or licensed groundwater abstraction, supply to ecosystem or groundwater base flow to a watercourse but with no effect on WFD standards.</p> <p>Effects affect moderate size area.</p>	<p>Short-term reversible changes to the recharge, flow or discharge of groundwater.</p> <p>Effects are limited to small discrete areas.</p>	<p>No measurable change in the recharge, flow or discharge of groundwater.</p>
Aquifer: groundwater levels	<p>Irreversible or permanent change to groundwater levels of over 1m.</p> <p>May effect PWSs or licensed groundwater abstraction, supply to ecosystem or groundwater base flow to a watercourse such that it affects WFD criteria or standards.</p> <p>Affects affect large or multiple area(s).</p>	<p>Measurable change to groundwater levels.</p> <p>May affect PWSs or licensed groundwater abstraction, supply to ecosystem or groundwater base flow to a watercourse but with no effect on WFD standards.</p> <p>Affects moderate size area.</p>	<p>Short-term, reversible or minor changes to groundwater levels.</p> <p>Effects are limited to small discrete areas.</p>	<p>No measurable change in groundwater levels.</p>

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Receptor	Magnitude of change and criteria			
	Large	Medium	Small	Negligible
Aquifer: groundwater quality	<p>Permanent or long-term change in groundwater quality with respect to water quality standards.</p> <p>Change in groundwater quality within the whole Wylfa Newydd Development Area and beyond.</p>	<p>Temporary change in groundwater quality, changing site quality with respect to water quality standards for several months.</p> <p>Change in groundwater quality over the majority of the Wylfa Newydd Development Area.</p>	<p>Measurable but temporary change in groundwater quality, but not changing status with respect to water quality standards.</p> <p>Local in extent and confined to within the Wylfa Newydd Development Area.</p>	No measurable change in groundwater quality.
Groundwater movement to GWDTE	<p>Measurable change in quality or volume of groundwater flow to GWDTE resulting in permanent or long-term damage to dependent flora/fauna and a change in status.</p>	<p>Measurable change in quality or volume of groundwater flow to GWDTE resulting in temporary damage to many dependent flora/fauna.</p>	<p>Measurable short-term change in quality or volume of groundwater flow to GWDTE resulting in temporary damage to a small number of dependent flora/fauna.</p>	No measurable effects to groundwater.
Private Water Supplies	<p>Measurable change in quality or volume of water available for supply with respect to The Water Supply Regulations (2010); leading to change in water pressure and/or in supply volumes.</p>	<p>Measurable change in quality or volume of water available for supply for more than 1% of samples with respect to The Water Supply Regulations; temporary visual coloration change and alteration to sediment content.</p>	<p>Measurable change in quality or volume of water available for supply abstraction for less than 1% of samples, but no change with respect to The Water Supply Regulations. No change in pressure or flow.</p>	No measurable change in water supply.

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### **Determination of significance**

11.3.3 In the professional opinion of the assessor, an effect is considered to be significant if it meets any one of the following criteria:

- it could lead to an exceedance of defined guidelines or widely recognised levels of acceptable change (e.g. exceedance of an EQS of a water quality parameter);
- it is likely that the consenting authority will reasonably consider applying a planning condition, requirement or legal agreement to the consent to require specific mitigation to reduce or overcome the effect;
- it threatens or enhances the viability or integrity of a receptor or receptor group of concern; and
- it is likely to be material to the ultimate decision about whether or not the consent application should be approved.

11.3.4 To aid the determination of significance, the assessment of effects has taken the following stepped approach in this chapter:

- determine the relevant receptors;
- derive their value (importance) based on the criteria set out in table 11.2;
- identify and consider all effects from each Project activity;
- determine the magnitude of change likely as a result of the effects (table 11.3); and
- present the environmentally and ecologically significant effects and consider how mitigation may reduce or minimise the effect.

11.3.5 The potential effect significance will be presented as either Major, Moderate, Minor or Not Significant as detailed in section 4.4. Professional judgement will be used to ensure that effects which are considered to be a material consideration in determining consent are identified as significant.

### **Flood risk**

11.3.6 Flood consequence assessment (FCA) comprises completion of an assessment in accordance with TAN15 that investigates the flood risk posed to the SPC Proposals and the flood effects arising from those proposals. This will include more detailed flood modelling work and further details of the SPC drainage proposals.

11.3.7 Horizon will ensure that FCA work meets regulator expectations and is consistent with current policy and guidance.

## **11.4 Potential mitigation**

### **Potential mitigation against flooding**

11.4.1 As part of the assessment, consideration will be given to the following types of mitigation to address the identified effects of flooding:

- appropriate design modifications to the surface water systems;
- appropriate design of watercourse diversions;
- where possible schedule dry weather channel construction;

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- temporary stabilisation of new channel banks;
- flood risk and drainage modelling to identify mitigation;
- new/temporary surface water drainage channels;
- no channel or overland flow obstructions;
- groundwater drainage systems;
- development of Application Site drainage features at initial stages of development; and
- use of retention ponds to restrict discharge and remove sediments.

### Hydrogeology, hydrology and geomorphology

11.4.2 The next steps in the assessment for hydrogeology, hydrology and geomorphology (including hydromorphology) relate to the collection of additional, more detailed data to improve understanding of the baseline conditions. Potentially this could involve a number of studies including but not limited to:

- further interpretation of hydrogeological features from past and ongoing ground investigations;
- continued monitoring of groundwater levels at and around the Wylfa Newydd Development Area;
- monitoring of surface watercourses discharging to Tre'r Gof SSSI and Cemlyn Bay SSSI/SAC and from Cae Gwyn SSSI;
- continued collection of groundwater and surface water quality data from both existing locations and new sites; and
- evaluation of the water balance of Tre'r Gof SSSI.

### Tre'r Gof SSSI

11.4.3 Further work related to the assessment of the hydrogeology and hydrology at Tre'r Gof SSSI includes the collection of additional, more detailed data to improve understanding of the baseline conditions. Potentially this could involve a number of studies including but not limited to:

- monthly visits over a period of up to 12 months (not all of which would be completed prior to production of the SP&C ES) in order to identify the location of springs and flushes and to assess variations in flow from these features and to collect water samples to establish water quality variations over time;
- probing to assess peat thickness followed by installation of shallow piezometers to allow monitoring of water levels in the peat. If appropriate a dual piezometer would be installed to allow monitoring of "floating" peat raft;
- identification of any additional hydrogeological features from ongoing site visits;
- assessment of the sensitivity of flora to variations in water quality and flow rates into the SSSI;
- continued monitoring of groundwater levels at and around the Wylfa Newydd Development Area;

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- monitoring of flumes established on surface watercourses discharging into Tre'r Gof SSSI to establish stream flow and response to rainfall;
- monitoring of the flume discharging from Tre'r Gof to allow comparison of inflows to, and outflows from, the SSSI;
- review and revision of the conceptual hydrogeological model for the site; and
- evaluation of the water balance of Tre'r Gof SSSI.

11.4.4 The design of the drainage system for the areas to be stripped of soil, used for soil storage and for the formation of new access tracks shall be reviewed to assess the potential effects on the streams flowing into the SSSI and the ecological status of the feature. Where appropriate, measures would be proposed to mitigate any adverse effects identified from the drainage system. It is understood at this stage that the drainage system is likely to incorporate flow attenuation and settlement ponds and it is also likely that dosing with flocculants would be used to reduce sediment loading to the streams flowing into the SSSI. These actions will be the primary method of minimising the potential impact on the SSSI.

#### **Potential mitigation for groundwater**

11.4.5 As part of the assessment, consideration will be given to the following types of mitigation to address identified effects on the surface and groundwater environments:

- appropriate design of diverted watercourse, see figure 11.6;
- timing of construction to drier periods to minimise potential for sediment mobilisation;
- sediment management and implementation of EMPs;
- provision of sediment and pollution control;
- removal of contaminated soils;
- appropriate reuse of soils;
- monitor flows into and out of sensitive receptors;
- follow good practices and Pollution Prevention Guidelines;
- appropriate drainage design;
- compliance with construction Environmental Permit conditions for groundwater activities and surface water discharges;
- minimise water use; and
- monitor groundwater and surface water flows at sensitive receptors.

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## 12 Geology and soils

### 12.1 Existing environment

#### Study area

- 12.1.1 The majority of potential effects on soils and geological receptors are considered likely to be associated with direct disturbance of ground conditions as part of the SPC Proposals. For the assessment of the likely effects on contamination of soils, a 250m zone around the SPC Application Site (shown as a green dashed line on figure 12.1) has been used.
- 12.1.2 Information and records relating to the existing geological and soils environment were obtained from the following sources and current project documentation.
- BGS mapping for Anglesey: 1:50,000 scale 'Solid and Drift Geology' geological map of Anglesey (BGS, 1974)<sup>42</sup>.
  - Ordnance Survey historical mapping provided by Groundsure, (Groundsure, 2015)<sup>43</sup>.
  - National Soil Resources Institute Soils Site Report: Full Soils Site Report (NSRI, 2015)<sup>44</sup>.
  - North West Wales Aggregate Safeguarding Map (BGS and Welsh Assembly, 2012)<sup>45</sup>.
  - BGS GeoSure V7 and Mineral Resources Wales data (BGS, 2015)<sup>46</sup>.
  - Wood, M. 2007. Developing a Methodology for Selecting Regionally Important Geodiversity Sites (RIGS) in Wales and A RIGS Survey of Anglesey and Gwynedd. Vol.2.

#### Soil type.

- 12.1.3 One soil type has been identified as being present within the study area: East Keswick soils<sup>47</sup>. These are deep, well-drained fine loamy soils with slowly permeable subsoils, a low storage capacity, slight seasonal waterlogging (although low risk of flooding) potential and low natural soil fertility.

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<sup>42</sup> British Geological Survey. 1974 BGS mapping for Anglesey: 1:50,000 scale 'Solid and Drift Geology' geological map of Anglesey.

<sup>43</sup> Groundsure, 2015. Ordnance Survey historical mapping

<sup>44</sup> NSRI, 2015. National Soil Resources Institute Soils Site Report: Full Soils Site Report.

<sup>45</sup> British Geological Survey. BGS and Welsh Assembly, 2012. North West Wales Aggregate Safeguarding Map

<sup>46</sup> British Geological Survey, 2015. BGS GeoSure V7 and Mineral Resources Wales data.

<sup>47</sup> National Soil Resources Institute Soils Site Report: Full Soils Site Report, 2015

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## Agricultural Land Classification

12.1.4 An Agricultural Land Classification (ALC) survey undertaken in 2015<sup>48</sup> identified that most of the soils within the Wylfa Newydd Development Area are Subgrade 3b (moderate quality), with a large area of Grade 5 (very poor quality) and small areas of Subgrade 3a (good quality) and 2 (very good quality). Subgrade 3a and Grade 2 soils are classified as 'Best and Most Versatile' (BMV) agricultural soils. The location and extent of the different agricultural land classification grades is shown in figure 12.2.

## Sites of Geological Importance

12.1.5 The Isle of Anglesey was included in the European Geopark Network (EGN) in 2009 as a result of its outstanding geodiversity and geological heritage. In November 2015, Anglesey was identified as one of the first UNESCO Global GeoParks. The Anglesey Geopark (called the GeoMôn Geopark) covers the 720km<sup>2</sup> of the Isle of Anglesey and has approximately 200km of coastline. Regionally Important Geodiversity Sites (RIGS) are locally designated sites of local, regional, and national importance for their geodiversity. RIGS are conserved and protected from development by local authorities.

12.1.6 There are four RIGS located within the study area as shown in table 12.1. A further eleven RIGS and two geological SSSIs (sites designated for their national or international geological importance) are present within the wider area. The RIGS and geological SSSIs are shown on figure 12.3.

**Table 12.1: Regionally Important Geodiversity Sites within the study area**

Site Name	Reasons for Designation
Porth Wnal Dolerite	Tertiary mafic dyke important for enhancing knowledge of plate tectonics and modern day earthquakes.
Porth Wnal Granite	Important for demonstrating relationships and relevant timing of igneous, tectonic and sedimentary events in Anglesey.
Cemaes Bay	International significance as the type section (best example) for the Gwna mélange.
Trwyn y Penrhyn (Cemaes Bay)	Important for the understanding of igneous dykes injected into the Gwna mélange and Precambrian stromatolitic <sup>49</sup> limestones.

<sup>48</sup> Reading Agricultural Consultants Limited, Wylfa Nuclear Power Station Anglesey, Agricultural Land Classification and Soil Resources, 2015

<sup>49</sup> Stromatolites are the oldest fossils found on Earth, which were formed by trapping and binding together sedimentary grains and microorganisms in shallow water.

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## Bedrock geology

### *Published bedrock geology*

12.1.7 The bedrock geology underlying the majority of the study area comprises metamorphic<sup>50</sup> rocks of the New Harbour Group which date from the Cambrian<sup>51</sup> geological period. The bedrock geology underlying the areas north and north-east of the Existing Power Station comprise the Gwna Group which dates from the late Precambrian<sup>52</sup> to early Cambrian<sup>53</sup> geological period. The south-western and southern 250m boundary surrounding the Wylfa Newydd Development Area is underlain by the Skerries Group, the age of which is still under debate but which has recently been classified as part of the New Harbour Group. Figure 12.4 presents the bedrock geology of the study area provided by the BGS.

### *Encountered bedrock geology*

- 12.1.8 During the Detailed Onshore Ground Investigation (DOnGI), the Gwna Group was encountered towards the north-east of the Wylfa Newydd Development Area. The Gwna Group was found to comprise chaotic, randomly-orientated clasts<sup>54</sup> of breccias<sup>55</sup>, quartzite, phyllite, psammite, granites, basalt, limestone and schist in a fine-grained schistose matrix. Clast size was found to vary from millimetre scale to large rafts more than 100m across.
- 12.1.9 The majority of the Wylfa Newydd Development Area has been confirmed to be underlain by the New Harbour Group by the ground investigations undertaken to date. The New Harbour Group is characterised by fissile green mica schist, gritty green mica schist with bedded jasper, jaspery phyllite<sup>56</sup>, psammite and alternating with pelites<sup>57</sup>.
- 12.1.10 Rockhead elevation (the depth at which solid bedrock geology is situated at beneath ground level) across the Wylfa Newydd Development Area varies from 0m AOD to 20m AOD, with the majority of rockhead elevation between 5m AOD and 15m AOD. Rockhead is typically deeper towards the coast and increases in elevation inland, with localised depressions associated with glacial erosion.

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<sup>50</sup> Rock that has been subjected to very high heat and pressure which has led to physical and chemical changes.

<sup>51</sup> The Cambrian period extends from c. 541 to 485 Mya.

<sup>52</sup> The Precambrian period extends from 46 000 million years ago (formation of the Earth) to 541 million years ago.

<sup>53</sup> The Cambrian period extends from 541 to 485 million years ago.

<sup>54</sup> Fragments of rock broken off by weathering.

<sup>55</sup> Rocks composed of fragments of other rocks or minerals held together by fine grained sediment.

<sup>56</sup> Metamorphosed slate.

<sup>57</sup> Metamorphic rock derived from fine grained sediment which typically consist of green silty or muddy layers.

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## Superficial geology

### *Published superficial geology*

12.1.11 The superficial geology (the material overlying the bedrock) underlying the Wylfa Newydd Development Area comprises glacial till<sup>58</sup> deposited during the last major glaciation phase 14,000 to 24,000 years ago (the Late Devensian).

12.1.12 After the ice sheet retreated at the end of the glaciation period, wind-blown sediments were deposited and subsequently re-worked by weathering and erosion during periods of periglacial (freeze/thaw) conditions. Valleys and topographical depressions were infilled by glacio-lacustrine<sup>59</sup> sediments (mainly laminated silts and clays). Figure 12.5 presents the superficial geology of the study area provided by the BGS.

### *Encountered superficial geology*

12.1.13 Ground investigations have confirmed that superficial deposits mainly comprise glacial till, which typically comprises clay with sand and gravel bands. A number of different types of till have been identified on site which are related to the different glacial processes that took place across the area, these include:

- melt-out till: material that has melted out of a glacier and been deposited directly in place;
- lodgement till: material that has been deposited at the base of the glacier as it moves (two types noted within the Application Site; till with locally-derived materials (locally-derived lodgement till) and till with materials from the Irish Sea (Irish Sea lodgement till); and
- basal till: material deposited at the base of the glacier.

12.1.14 Other types of superficial deposits are also present including wind-blown silts and sands (loess), sands and gravels associated with alluvium and lacustrine or glacio-lacustrine deposits.

12.1.15 The Preliminary Site Investigation (PSI) and DOnGI identified alluvium and peat deposits within the Tre'r Gof SSSI which are underlain by a deep sequence of such glacio-lacustrine and lacustrine<sup>60</sup> sediments. Due to its sensitive nature, the Tre'r Gof SSSI was not investigated during the DOnGI. However, information was obtained during the IOnGI which enabled some understanding of geological conditions within the SSSI to be recorded. The Tre'r Gof SSSI is located within a buried valley that is believed to be orientated east to west running from Porth y Wylfa towards the Existing Power Station. Over time the valley has been infilled with material, believed to be lacustrine or glacio-lacustrine in origin. These deposits are overlain by typically between 4m to 8m of peat and alluvium, although some much deeper areas of superficial material (up to 30m) have been identified where bedrock is deeper.

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<sup>58</sup> Unsorted glacial material, formerly referred to in the UK as 'boulder clay' and typically comprising clay with bands of sand and gravel.

<sup>59</sup> Glacier sediments deposited into lakes.

<sup>60</sup> Sediments deposited in lakes

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12.1.16 The two drumlins within the Application Site have been found to mainly comprise Irish Sea lodgement till, which is approximately 35m thick within the drumlin features.

12.1.17 Where the drumlins are absent, the thickness of the superficial deposits has generally been found to be less than 5m, but in some areas where bedrock is deeper or there are localised depressions within the rock, deposits have been recorded up to 15m thick.

### **Artificial geology (made ground)**

#### ***Published artificial geology***

12.1.18 The geological mapping information, referred to in paragraph 12.1.1 above, does not show artificial geology (made ground or in-filled ground) across the Wylfa Newydd Development Area.

#### ***Encountered artificial geology***

12.1.19 The majority of the Wylfa Newydd Development Area is undeveloped and therefore artificial geology is largely absent. Made ground has been encountered within the Application Site during the various phases of ground investigation completed to date. It has predominantly been recorded in the area surrounding the Existing Power Station, associated with the construction laydown area used during the development of that site. In addition, large 'spoil' mounds are present to the east of the Existing Power Station including 'Dame Sylvia Crowe's Mound' which is a significant landscape feature within the Wylfa Newydd Development Area. Other areas of made ground are to be associated with road construction, associated development and isolated residential properties, particularly around Cemlyn Road and the Magnox Sports and Social Club fields.

12.1.20 Made ground has typically been found to comprise re-worked natural material, in some areas also containing anthropogenic (man-made) materials such as brick and concrete. In some parts of the Application Site, made ground has been found to comprise 'waste' or 'fill' materials that contained plastic, pipe, wire and glass. Asbestos and asbestos-containing materials have also been identified within made ground in a number of locations throughout the Application Site.

12.1.21 As part of the interpretation undertaken by Atkins of the DOnGI, made ground encountered within trial pits dug specifically for geo-environmental (contamination) purposes and to define the extent of the Areas of Potential Concern (APC's), was separated into four distinct categories, type 1 to type 4. Table 12.2 presents the classification of these made ground types.

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**Table 12.2: Made ground types encountered during DOnGI**

Type	Unit	Description
1.	Waste material	Dark brown, mottled, dark grey sandy gravel with cobbles, containing a mixture of metal, wire, plastic sheeting, fibreglass, whole bricks, asphalt, slag, an old oil filter, ash, plastic pipe, plastic tape, glass, wood, masonry, corrugated board/metal and possible asbestos board/cement
2	Re-worked natural ground intermixed with made ground/waste	Brown clayey sandy gravel with medium cobble and boulder content, containing inclusions of anthropogenic waste material
3	Re-worked natural/possible made ground	Brown to dark brown or grey slightly clayey sandy gravel with rare quantities of brick or ceramics
4	Topsoil	Firm, friable, brown, gravelly, sandy clay with abundant rootlets and occasional anthropogenic material

12.1.22 Following a review of strata descriptions from made ground encountered during all phases of investigation (up to and including the 2015 ground investigation) a made ground type has been assigned to all locations investigated. Figure 12.6 presents a plan showing the 'worst case' i.e. highest made ground type found in each exploratory hole, with exaggeration placed on the scale to provide an indication of the potential made ground type coverage across the site.

### Land contamination

12.1.23 A number of previous land contamination investigations have been completed on the Wylfa Newydd Development Area. These assessments have included the desk-based review of available information (e.g. historical maps, aerial photographs and environmental searches from the IACC and NRW) and the interpretation of ground conditions encountered during several phases of intrusive investigation.

12.1.24 During the desk study reporting undertaken between 2005 and 2012, a number of APCs were identified that primarily related to the former construction areas around the Existing Power Station Site. Of the previously identified APCs, APC7, 9, 10, 11, 12, 15 and 16 are considered to be of relevance given they are inside the Wylfa Newydd Development Area. In addition based on a review of all ground conditions, including data from the 2015 ground investigation, two further APCs have been identified; APC18 has been identified based on made ground associated with properties (former and existing) along the Cemlyn Road and APC19 has been identified based on made ground associated with the Magnox Sports and Social Club area. Details of the APCs are presented in table 12.3 and the locations and extent are presented on figure 12.7.

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**Table 12.3: Areas of Potential Concern from contamination**

APC	Description
APC7	Located to the south of the Existing Power Station Site - includes contractor's laydown area, car park and workshop during site construction with some evidence of cars being abandoned in the area following the SPC Proposals. Chlorinated solvents observed within water samples obtained from a sump and surface watercourse during historical investigations.
APC9	Located to the north of the 400kV switch house at the Existing Power Station Site - includes a general area for administration, staff parking, site plant, stores, workshops and a cement mixing plant from the construction of the station. Also includes part of contractor's site disposal area.
APC10	Former topsoil storage area.
APC11	Construction works spoil heap (later removed to the area north of 400kV switch house, APC9). Contractor's site disposal area.
APC12	Spoil heap area (Dame Sylvia Crowe's Mound). Anecdotal evidence that the heap contains buried heavy machinery and site vehicles. The mound covers the areas of two old quarries identified during the review of historical mapping.
APC15	Area identified from historical map review (Halcrow, 2012) as potentially including made ground.
APC16	Tregele petrol station located adjacent to the Wylfa Newydd Development Area.
APC17	A localised area of made ground containing buried general waste (plastic/rubber etc) visually identified to the east of the Tai Hirion farmstead.
APC18	Made ground associated with former properties along Cemlyn Road (identified following DOnGI)
APC19	Made ground associated with Magnox Sports and Social Club area

12.1.25 Figure 12.7 shows the location and extent of the APCs listed above.

#### **Chemical testing data from APCs**

12.1.26 Chemical testing data obtained during the PSI, IOnGI and DOnGI was compared to publically available assessment criteria used to assess potential risks to human health or controlled waters (groundwater or surface water). A summary of the results of testing will inform the assessment process.

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### **Other areas**

12.1.27 Due to the rural nature of the site, geo-environmental investigation and chemical testing of soils has been primarily targeted at APCs, with only limited investigation targeted at other parts of the site. However, although they did not typically include chemical testing, the significant number of geotechnical holes excavated during the DOnGI provided information on ground conditions across a large part of the proposed Power Station Site.

12.1.28 The available information indicates that a significant proportion of the made ground encountered outside of the APCs comprises reworked natural material with no anthropogenically derived materials. Figure 12.6, which presents a combined plan of made ground by type across the site highlights the relatively limited extent and low type of made ground across the majority of the site outside of the identified APCs.

### **Ground gas**

12.1.29 A ground gas assessment was undertaken by Atkins (2015) based on one round of gas monitoring results at boreholes across the Application Site. An assessment of the results using guidance provided by the Construction Industry Research and Information Association (CIRIA) (CIRIA, 2007) indicated that only negligible amounts of methane or carbon dioxide were present at the Application Site and that these concentrations of ground gas pose a 'very low risk' to potential receptors i.e. buildings and their occupants.

### **Mineral reserves**

12.1.30 There are a number of Aggregate Safeguarding Areas which have been identified on the BGS North West Wales Aggregate Safeguarding Map within the Wylfa Newydd Development Area, and are shown in table 12.4 and figure 12.8.

12.1.31 A Category 1 Aggregate Safeguarding Area contains resources considered to be of national importance. A Category 2 Aggregate Safeguarding Area contains resources considered to be of local or regional importance. There are no Category 1 Aggregate Safeguarding Areas within the Wylfa Newydd Development Area.

**Table 12.4: Aggregate Safeguarding Areas within study area**

Resource	Category	Location	Details
Igneous	2	Porth-y-pistyll and Wylfa Head	
Quartzitic sandstone	2	Wylfa Head	Potential for silica sand and silica rock
Sand and gravel	2	Tre'r Gof SSSI	

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## **12.2 Potential effects**

12.2.1 The process of scoping identified the following potential effects to arise as a result of the SPC Proposals:

### **Soil quality**

- degradation, destruction or loss of soils (including areas of Best and Most Versatile (BMV) soils) as a result of not undertaking topsoil strip in areas prior to construction of haul roads, security track or soil storage areas;
- degradation, destruction or loss of soils as a result of undertaking topsoil strip and temporary storage;
- depletion (adverse effect) of geological mineral resources (Category 2 Aggregate Safeguarding Areas) as a result of excavation followed by reuse (beneficial effect); and
- exposure of soils during construction leading to increased erosion.

### **Geological Features and Resources**

- disturbance (temporary) and potential damage of Cemaes Bay RIGS as a result of undertaking topsoil strip and storage in vicinity – note, other RIGS in area are not considered likely to be affected by SPC Proposals;
- damage to/loss of unprotected rock exposures within the UNESCO designated GeoMôn GeoPark; and
- restricted public access to geologically important sites.

### **Contaminated Land**

- acute and chronic harm to construction workers as a result of any encountered contaminated materials;
- mobilisation and spread of pre-existing contamination including:
  - leaching of contaminants within soil into surface waters and groundwater.
  - generation of fugitive dust and sediment (including potential for asbestos, especially within APC7).
  - human (construction workers, site users and nearby residents) contact with contamination as a result of ingestion, inhalation and dermal contact.
  - mixing of suitable reusable material with unsuitable material.
- pollution of controlled waters via leaching and vertical and/or lateral migration of contaminants;
- the creation of new contaminant pathways or mobilisation of existing contaminants that may pose a risk to human health or the environment;
- damage to property and utilities via attack from sulphate, pH, chlorides, acids/alkalis, permeation of contaminants in made ground materials;
- disturbance or spreading of existing contaminated soils through ground preparation, soil handling, windblown dust and vehicle movements;

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- excavation of soil requiring either treatment prior to re-use or off-site disposal due to its chemical quality;
- pollution arising from the temporary storage on-site of contaminated soils, chemicals, fuels and other polluting substances; and
- beneficial effects from the remediation of any areas of contaminated land encountered.

### Designated Sites

- temporary direct/indirect effects on proximal SSSIs that are directly dependent on geology and hydrogeological conditions (potentially relating to construction-related pollution/mobilisation of existing contaminants or changes in groundwater flow due to alterations to underlying geology).

### 12.3 Proposed scope, methodology and criteria

- 12.3.1 In undertaking the assessment of the SPC Proposals, further work is required. This is detailed below.
- 12.3.2 It is anticipated that a Materials Management Plan (MMP) prepared in accordance with the *Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011)*<sup>61</sup> will be prepared to inform the re-use of excavated material. This will be complemented by a Project Waste Management Plan (PWMP) that will inform the Wylfa Newydd Masterplan Materials Management Plan (MMMP), site-wide Site Waste Management Plan (SWMP) and Integrated Waste Strategy (IWS).
- 12.3.3 Soil management operations will generally be in accordance with Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites<sup>62</sup>.
- 12.3.4 The desk-based geological baseline assessment will be supplemented by a survey of key geological outcrops during a site walkover, in order to assess their value and sensitivity. Where appropriate, consultation with GeoMôn will be undertaken to understand the potential sensitivities of affected outcrops.

### Assessment criteria

- 12.3.5 The methodology adopted for assessing potential environmental effects is set out in section 4.4. In the absence of specific guidance, the assessment of potential effects on soils and geology receptors is led by professional judgement and experience and is informed by the baseline information. The criteria used to determine the value and sensitivity of receptors specific to soils and geology are set out in table 12.5 and 12.6.

<sup>61</sup> CL:AIRE, 2011. Definition of Waste: Development Industry Code of Practice. [http://www.claire.co.uk/index.php?option=com\\_content&view=category&id=977&Itemid=330](http://www.claire.co.uk/index.php?option=com_content&view=category&id=977&Itemid=330).

<sup>62</sup> Defra, 2009. Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

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**Table 12.5: Criteria for determining value of soils and geology receptors**

Value of receptor	Generic criteria	Topic specific criteria
High	<p>Of value, importance or rarity on a national scale, and with very limited potential for substitution; and/or</p> <p>Very sensitive to change, or has little capacity to accommodate a change.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>• ALC:</li> <li>• Grade 1 – excellent quality soil (Best and Most Versatile (BMV));</li> <li>• Grade 2 – very good quality (BMV) soil; and</li> <li>• Subgrade 3a – good quality (BMV) soil.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>• Human Receptors i.e. construction workers, future site users, maintenance workers, adjacent land users and future construction workers.</li> <li>• Controlled Waters, which for this sensitivity includes:</li> <li>• Nationally or internationally important sites e.g. Ramsar sites; Special Areas of Conservation (SACs); Special Protection Areas (SPAs); and Sites of Special Scientific Interest (SSSIs); <ul style="list-style-type: none"> <li>• Nationally and regionally important watercourses;</li> <li>• Public water supplies; and</li> <li>• Principal or highly productive aquifers with high aquifer vulnerability.</li> </ul> </li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>• Geology has a national designation (e.g. SSSI) and/or has a very low capacity to accommodate change.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>• Category 1 Aggregates Safeguarding Area (National Importance).</li> </ul>

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Value of receptor	Generic criteria	Topic specific criteria
Medium	<p>Of value, importance or rarity on a regional scale, and with limited potential for substitution; and/or</p> <p>Moderate sensitivity to change, or moderate capacity to accommodate a change.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>• ALC;</li> <li>• Subgrade 3b – moderate quality soil.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>• Controlled Waters, which for this sensitivity includes: <ul style="list-style-type: none"> <li>• Main rivers within a catchment, locally important watercourses;</li> <li>• Private Water Supplies serving three or more properties; and</li> <li>• Principal aquifers or Secondary A aquifers.</li> </ul> </li> <li>• Property, which for this sensitivity includes: <ul style="list-style-type: none"> <li>• Crops and domesticated animals (grazing livestock);</li> <li>• buildings.</li> </ul> </li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>• Geology has a local or regional designation (e.g. RIGS) and/or has a low capacity to accommodate any change.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>• Category 2 Aggregates Safeguarding Area (local and regional importance).</li> </ul>

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Value of receptor	Generic criteria	Topic specific criteria
Low	<p>Of value, importance or rarity on a local scale; and/or</p> <p>Not particularly sensitive to change, or has considerable capacity to accommodate a change.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>• ALC:</li> <li>• Grade 4 – poor quality soil; and</li> <li>• Grade 5 – very poor quality soil.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>• Controlled Waters, which for this sensitivity includes: <ul style="list-style-type: none"> <li>• Minor watercourses or waterbodies;</li> <li>• Low productivity aquifer (frequently designated as a Secondary B aquifer); and</li> <li>• Private Water Supplies located within the vicinity of a mains water supply or used for agricultural purposes and not for drinking water purposes.</li> </ul> </li> </ul> <p><b>Sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>• Geology not listed but possesses key characteristics which may be locally important and/or has a high capacity to accommodate change.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>• No mineral resources identified.</li> </ul>
Negligible	<p>Of value, importance or rarity on a very local scale; and/or</p> <p>Not sensitive to change, or has very considerable capacity to accommodate a change.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>• ALC:</li> <li>• No soil present.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>• Controlled Waters, which for this sensitivity includes:</li> <li>• Strata not classified as an aquifer under the Water Framework Directive</li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>• Geology is non-distinctive and/or is likely to tolerate the proposed change or there are no listed sites.</li> </ul> <p><b>Geological resources</b></p> <ul style="list-style-type: none"> <li>• No mineral resources identified.</li> </ul>

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**Table 12.6: Criteria for magnitude of change for soils and geology**

Magnitude of change	Generic criteria	Topic specific criteria
Large	<p>Loss of resource or quality and integrity of resource; severe damage to key characteristics, features or elements; or</p> <p>Large scale or major improvement of resources quality; extensive restoration or enhancement; major improvement of attribute quality.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>• Permanent loss or sterilisation of identified BMV soil resources.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>• Soil contamination is considered to pose a high risk to potential receptors with one or more pollutant linkages certain to be present.</li> <li>• Soils certain to be deemed as Part 2A (Category 1 in Part 2A Guidance (DEFRA, 2012))<sup>63</sup> and/or considered unsuitable for use.</li> <li>• Removal of all identified pollutant linkages that pose a risk to identified receptors.</li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>• Severe damage to the site so that it is unrecognisable compared to baseline conditions.</li> <li>• Improvement of the site so that key characteristics/features are significantly enhanced or new features of interest are exposed.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>• Total loss/sterilisation of the identified reserve/resource.</li> </ul>

<sup>63</sup> Defra, 2012. Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance. Available from: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/223705/pb13735cont-land-guidance.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf)

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Magnitude of change	Generic criteria	Topic specific criteria
Medium	<p>Loss of resource, but not adversely affecting its integrity; partial loss of/damage to key characteristics, features or elements; or</p> <p>Benefit to, or addition of, key characteristics, features or elements; improvements of attribute quality.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>Reduction in quality of the BMV soil resources.</li> <li>Loss or sterilisation of other soil resources.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>Soil contamination is considered to pose a moderate risk to potential receptors with one or more pollutant linkages present.</li> <li>Soils likely to be deemed as Part 2A (Category 2 in Part 2A Guidance (DEFRA, 2012)) and/or considered unsuitable for use.</li> <li>Removal of the majority of identified pollutant linkages so that risks to receptors are reduced.</li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>Partial loss of the key characteristics of the site.</li> <li>Improvements to the key characteristics of the site.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>Permanent sterilisation of a significant part (&gt;50%) of the identified reserve/resource.</li> <li>Loss of access to the whole of the identified resource (although the reserve/resource remains intact).</li> </ul>
Small	<p>Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (or maybe more) key characteristic, feature or element; or</p> <p>Minor benefit to, or addition of, one (or maybe more) key characteristic, feature or element; some beneficial effect on attribute or a reduced risk of negative effect occurring.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>Measureable reduction in quality of other soil resources.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>Soil contamination is considered to pose a low risk to potential receptors with one or more pollutant linkages possibly present.</li> <li>Soils possibly deemed as Part 2A (Category 3 in Statutory Guidance (DEFRA, 2012)) and/or considered unsuitable for use.</li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>Noticeable but insignificant changes to sites of importance.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>Permanent loss/sterilisation of a part (&lt;50%) of the identified reserve/resource.</li> </ul>

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Magnitude of change	Generic criteria	Topic specific criteria
Negligible	<p>Very minor loss or detrimental alteration to one (or maybe more) characteristic, feature or element; or</p> <p>Very minor benefit to, or positive addition of, one (or maybe more) characteristic, feature or element.</p>	<p><b>Soil quality:</b></p> <ul style="list-style-type: none"> <li>No measurable change to quality of soil resources.</li> </ul> <p><b>Contamination:</b></p> <ul style="list-style-type: none"> <li>Soil contamination is considered to pose a very low risk to potential receptors with one or more pollutant linkages unlikely to be present.</li> <li>Soils unlikely to be deemed as Part 2A (Category 4 in Statutory Guidance (DEFRA, 2012) and/or considered unsuitable for use.</li> </ul> <p><b>Listed sites of geological importance:</b></p> <ul style="list-style-type: none"> <li>No noticeable change to site of importance.</li> </ul> <p><b>Geological resources:</b></p> <ul style="list-style-type: none"> <li>Loss of access to a minor part (&lt;50%) of the identified resource (although the reserve/resource remains intact).</li> </ul>

### **Determination of significance**

12.3.6 The assessment of significance is determined through professional judgement, and where necessary, guided by the significance matrix shown in section 4.4. Significance is influenced by the value of a receptor (using the criteria in table 12.5) and the magnitude of change (using the criteria in table 12.6). An effect is considered to be significant if it meets any one of the following criteria:

- it leads to an exceedance of defined guidelines or widely recognised levels of acceptable change;
- it threatens or enhances the viability or integrity of a receptor or receptor group of concern; and
- it is likely to be material to the ultimate decision about whether or not the consent application should be approved.

### **Potential mitigation**

12.3.7 The soils and geology assessment will be iterative, whereby mitigation measures identified as required in early assessments will be incorporated into the designs. The findings of the contamination risk assessment and remediation strategy report will be used to inform appropriate mitigation actions for addressing any contamination effects identified during the assessment. The assessment results will also inform the appropriate Environmental Management Plan (EMP) during construction, reducing the potential for significant effects.

12.3.8 Technical consultations on the assessment outcomes and proposed mitigation measures will be undertaken (including NRW, the IACC and GeoMôn).

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12.3.9 Where relevant, consultation will be carried out with ecological teams to understand the potential effects upon the ecological SSSI in the vicinity of the SPC Proposals insofar as they could potentially be affected by changes to soils and geology within the study area.

12.3.10 As part of the assessment, Horizon will also examine and consider the following types of mitigation to address identified effects:

- undertake works in proximity to RIGS with due consideration of the importance of the areas;
- implementation of demolition and site clearance inspection to inform development of appropriate management procedures and method statements;
- materials handling and storage compounds will not be placed in close proximity to surface waters without additional practicable mitigation measures in place to manage sediment runoff; and
- follow Pollution Prevention Guidelines and best construction practice.

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## 13 Public access and recreation

### 13.1 Introduction

13.1.1 Recreation relates to both terrestrial (onshore) and marine (offshore) recreational activities and public access. The SPC Proposals are restricted to onshore land within the Wylfa Newydd Development Area; therefore effects on offshore recreational activities are considered negligible and consideration is not included in this Scoping Report and will not be considered further within the Environmental Statement for the SPC Proposals. Initial conclusions are based on desk research, survey work undertaken to date and findings from stakeholder engagement.

13.1.2 This topic addresses the following distinct elements, namely:

- Public access – the effects of the Proposed Activities on PRoW (footpaths, bridleways, cycle routes and byways) and informal facilities such as access to the coastline, beaches and areas of open access land; and
- Onshore recreation – the effects of the Proposed Activities on formal facilities (for example sports playing fields) as well as on more informal recreational activities such as horse-riding, angling, birdwatching and dog walking.

### 13.2 Existing environment

#### Study area

13.2.1 The topic study area is shown in figure 13.1 and illustrates the different geographical areas within which effects will be considered for the various elements of the topics listed above. Effectively the topic study area is divided into two, defined here as local and regional.

13.2.2 The local study area reflects a radius of approximately 2km from the boundary of the Wylfa Newydd Development Area. Onshore this incorporates Wylfa Head to the north, Cemaes and Llanbadrig Point to the east, Cemlyn Bay to the west and extends south to include the village of Tregele and Llanfechell.

13.2.3 This local study area is considered to adequately capture usage of the PRoW network in the vicinity of the Wylfa Newydd Development Area and access to the local foreshore, taking into account features such as key access points to the network, car parks and logical start/finish points for recreation journeys. For example, the car park at the western side of the causeway at Cemlyn Bay is included within the study area to the west of the local area. The car park adjacent to St Patrick's Church is included within the study area to the east. Cemaes itself forms another logical start and finish point for journeys.

13.2.4 Visual effects will be assessed under the landscape and visual topic area, and reported within the public access and recreation topic where effects upon recreational users have been identified.

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13.2.5 The effects on businesses and more formal recreational facilities will be considered within the socio-economic assessment. Where there are effects on recreation they will be discussed further under the recreation topic.

### Environmental baseline

- 13.2.6 The environmental baseline information collected to date has largely focused on public access. The local study area is served by a network of public footpaths, including a section of the Wales Coast Path. The footpath network provides access to a range of coastal and inland environments, with long-distance views to the west towards Cemlyn Bay and east towards Llanbadrig Point. Wylfa Head provides a good vantage point with views over the landscape and seascape and is widely used by the public. The PRow network within and near the Wylfa Newydd Development Area is illustrated in figure 13.1.
- 13.2.7 Footpath counts have highlighted the popularity of the Wales Coast Path at Wylfa Head in particular and also around Cemaes Bay. The counts revealed that the section of the Wales Coast Path around Cestyll Garden and the PRow to the south of the Existing Power Station are comparatively less well-used. While the majority show evidence of use, some of the public footpaths were not usable at the time of the 2011, 2013, and 2014 surveys.
- 13.2.8 National Cycle Route 566 (the Copper Trail) currently routes along the minor road running through a section of the Wylfa Newydd Development Area.
- 13.2.9 The part of Cestyll Garden (Grade II listed in the Register of Parks and Gardens of Special Historic Interest in Wales) which is currently open to the public three days a year, lies just to the west of the Wylfa Newydd Development Area.
- 13.2.10 There is access to the foreshore from the public footpaths, for example at Porth-y-pistyll and Porth yr Ogof. Members of the public have been observed swimming at Porth yr Ogof and Porth Wylfa. Dog walking is the main reason why many people visit Wylfa headland, parking at the Fisherman's car park.
- 13.2.11 Whilst not encouraged, angling takes place within the vicinity of the Existing Power Station site and walkers carrying angling equipment were noted during the surveys.
- 13.2.12 Engagement with stakeholders during 2011 and 2014 suggested a shortage of indoor recreation opportunities. The cafe at the Existing Power Station Visitor Centre is used by locals and visitors (including Wales Coast Path users as it is on the existing alignment of this footpath and road cyclists travelling on the Copper Trail or the A5025) and as a wider education resource.

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13.2.13 The Wylfa Sports and Social Club is a private members club situated on the Existing Power Station approach road, opposite the existing Visitor Centre. This club is owned by the Nuclear Decommissioning Authority<sup>64</sup> and incorporates an event hall and lounge bar, pool and snooker room, shooting facility (used by a clay pigeon shooting club), multi-function outdoor games court and football pitch. The membership of the club includes the general public from the surrounding local community. Anglesey is served by five horse-riding centres, with a further two situated near to Caernarfon on the mainland. In centres close to beaches such as at Rhosneigr and Trearddur Bay, horse-riding lessons along local beaches can be provided; however, there are no bridleways within the local study area.

### **13.3 Potential effects**

13.3.1 Potential effects associated with the SPC Proposals, including the operation of construction machinery and equipment and the traffic associated with the work force comprise:

- changes to journey times and inconvenience to users from temporary closure of existing PRoWs;
- reduction in amenity of surrounding PRoW network owing to visual effects, dust and noise;
- disturbance to recreational assets such as Wylfa headland;
- temporary closure of Cemlyn Road and access road to Fisherman's car park; and
- closure of the Wylfa Sports and Social Club.

### **13.4 Proposed scope, methodology and criteria**

13.4.1 The next phase of the assessment will involve the following studies:

- further consultation with statutory bodies including the IACC and NRW regarding the phasing of PRoW closures and diversions; and
- completion of an assessment of the potential effects of the SPC Proposals on the established public access and recreation baseline.

#### **Assessment criteria**

13.4.2 The value of the receptors has been based on a range of factors which include usage, designations and attractiveness. These factors have been informed by the baseline studies.

13.4.3 The value criteria have been adapted from the general criteria set out in section 4.4, using professional judgement. The higher values have been attributed to those recreational receptors which offer opportunities that are matched by few alternatives (i.e. have limited potential for substitution) and/or for which any effect on the receptor would affect a higher number of recreational users.

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<sup>64</sup> The non-departmental public body created through the Energy Act 2004 responsible for decommissioning and cleaning up civil nuclear facilities on 17 sites and providing for the disposal of all the resulting wastes.

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13.4.4 Tables 13.1 to 13.3 set out the value criteria applied to each public access and recreation sub-topic, together with the rationale behind the professional judgement applied in applying those criteria to each value.

**Table 13.1: Value of receptor – public access**

Value of receptor	Criteria
High	<p>National or regional trail.</p> <p>These routes would be very sensitive to change on the basis of the effect on a highly promoted recreational resource.</p>
Medium	<p>PRoW which is clear of significant obstruction and shows evidence of regular use.</p> <p>Permissive path that is clear of significant obstruction and shows evidence of recent use where the landowner has not regularly demonstrated the right to close the footpath without the need for consent.</p> <p>These routes would be sensitive to change on the basis that it would affect established patterns of recreational use.</p>
Low	<p>PRoW which, when surveyed, included significant obstruction and there was no evidence of recent use.</p> <p>Permissive path where use by the public is restricted on a regular basis and the landowner has taken significant efforts to demonstrate the right to close the footpath without the need for consent.</p> <p>These routes would be unlikely to be sensitive to change as there is no evidence of established patterns of use.</p>
Negligible	<p>Undesignated routes that are informally taken by low numbers of people (as evidenced on the ground) as links between PRoW and permissive paths.</p> <p>These routes would not be sensitive to change as only low numbers of informal users would be affected and alternative formal recreational routes could be taken.</p>

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**Table 13.2: Value of receptor – onshore recreation**

Value of receptor	Criteria
High	<p>A site designated as an area for public access such as national parks, open access land, common land, village green.</p> <p>National Trust land where no access fee is payable, such as areas of coast or countryside.</p> <p>Areas that are widely known for formal wildlife watching tours.</p> <p>A large beach with access to facilities such as car parks, jetties and harbours.</p> <p>A wide expanse of sandy beach that is widely used for recreational activities.</p> <p>Tourist attraction that is widely marketed and attracts more than 100 visitors per day and is open six or more days per week throughout the year.</p> <p>A leisure centre or other sports facility that attracts more than 100 members of the general public per day.</p> <p>A highly attractive area which is tranquil in nature within no influence from industry and is popular on the basis of these characteristics. Used by local residents and tourists.</p> <p>Facilities/locations in this category are considered to be very sensitive to change on the basis that they are well promoted and recognised in the tourism sector. Effects on these facilities/locations would affect a high number of residents/tourists and/or they offer opportunities for which there are no alternatives in the area.</p>
Medium	<p>A site that is widely used by the public for the purposes of recreational activities in an informal manner such as coastline where access is not restricted and the clifftops provide access to the sea.</p> <p>Areas where wildlife watching is known to occur which is based on designated bird colonies.</p> <p>A tourist attraction that is widely marketed and is open for less than five days per week throughout the year.</p> <p>A leisure centre or other sports facility that attracts between 20 and 100 members of the general public per day.</p> <p>A highly attractive area which is tranquil in nature despite influences from industry and is popular on the basis of these characteristics. Used by both local residents and tourists.</p> <p>Facilities/locations in this category are considered to be sensitive to change on the basis that they are used regularly by residents and tourists and/or they offer opportunities for which there are limited alternatives in the area.</p>

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Value of receptor	Criteria
Low	<p>A tourist attraction that attracts fewer than 1000 visitors annually and which has restricted opening hours (less than one day per week).</p> <p>Areas where wildlife watching takes place in an informal manner and in a more general sense, such as areas of headland.</p> <p>A sports facility that attracts low numbers (fewer than 20 per day) or a private members club where there is limited access to the wider public.</p> <p>An attractive area that while having elements of tranquillity is influenced by industrial activities that detract from the enjoyment of the area but is still popular with recreational users from the local community.</p> <p>Facilities/locations in this category are considered to have low sensitivity to change since relatively few people would be affected and/or there are alternative facilities/locations offering similar opportunities for recreation.</p>
Negligible	<p>A tourist attraction that attracts fewer than 1000 visitors annually and which has restricted opening hours (less than one day per month). Areas of coastline where public access is currently restricted to less than one day per week.</p> <p>An unattractive industrial area that is highly influenced by those industrial uses but is used by recreational users from the local community.</p> <p>Facilities/locations in this category are considered to have very low sensitivity to change since very few people would be affected and/or there are preferable alternative facilities/locations for recreation available in the area.</p>

13.4.5 Tables 13.1, 13.3 and 13.4 set out the magnitude criteria that have been applied in this preliminary assessment of public access and recreation. The magnitude criteria relate to the scale of change predicted to occur as a result of the SPC Proposals.

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**Table 13.3: Definition of magnitude – public access**

Magnitude	Criteria
Large	<p>Closure of PRow</p> <p>Long-term or permanent diversion to a PRow which results in an increase or decrease in the length of the route by more than 1km.</p> <p>Long-term disturbance to the tranquil nature or attractiveness of a PRow that would affect people's enjoyment to the extent that it discourages use.</p>
Medium	<p>Long-term or permanent diversion of a PRow which results in an increase or decrease in the length of the route by between 0.5 and 1km.</p> <p>Disturbance to the tranquil nature or attractiveness of a PRow that would affect people's enjoyment of the PRow.</p> <p>Temporary closure (less than six months) of a national trail or long distance path</p>
Small	<p>Diversion of a PRow which results in an increase or decrease in the length of the route of less than 0.5km</p> <p>Temporary closure (less than six months) of PRow.</p> <p>Temporary or intermittent disturbance to the tranquil nature of a PRow that would affect people's enjoyment of the PRow.</p>
Negligible	<p>Minor diversion of a PRow where there is no overall reduction in the enjoyment of the route.</p> <p>Additional disturbance by way of increased industrial activities on an existing industrial site.</p>

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**Table 13.4: Definition of magnitude – onshore recreation**

Magnitude	Criteria
Large	Permanent or long-term (one summer season or more) loss of access to an onshore recreational receptor.
Medium	Temporary or short-term (less than one season) loss of access to an onshore recreational receptor.  Disturbance to the tranquillity and attractiveness of recreational resources that would result in the area being used less frequently by members of the public.
Small	Disturbance to the tranquillity and attractiveness of the recreational resources but not to the extent that it affects use by members of the public.
Negligible	Occasional or slight disturbance to the tranquillity and attractiveness of the recreational resource but not really noticeable to members of the public for the principal purpose of their visit.

13.4.6 The assessment of significance has been made through professional judgement based on the matrix set out in section 4.4.

### Potential mitigation

13.4.7 As part of the assessment, the following types of mitigation to address identified effects will be considered:

- footpath closure and diversion schedules that enable construction work to continue while minimising the effect on recreational users;
- diversion route for the Wales Coast Path during SPC to be identified and suitably signed to inform users; and
- ensure where possible that public access to Wylfa Head is maintained throughout SPC.

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## 14 Socio-economic effects

### 14.1 Introduction

- 14.1.1 Social effects refer to the consequences to human populations of any public or private actions that relate to the ways in which people live, work, play, relate to one another, organise to meet their needs and generally cope as members of society. Economic effects cover issues such as employment, direct and indirect spending associated with the activities on site for this project phase.
- 14.1.2 In the socio-economic context receptors are individuals, organisations or groups who are users or beneficiaries of socio-economic resources (such as community facilities, businesses, local roads, and accommodation providers).
- 14.1.3 It is anticipated that the majority of staff associated with the SPC Proposals will be resident within a daily construction commuting zone (90 minute study zone). As a result there are not expected to be any individuals moving into the area during this project phase as the workforce will already be residents of the study zone area.
- 14.1.4 Migration effects are therefore not expected but other socio-economic effects may still occur and will be assessed as part of SPC Proposals.

### 14.2 Existing environment

#### Study area

- 14.2.1 Defining the spatial scope can be complex because of the need to consider individuals and structures at a variety of distances. These individuals and structures may be affected because of a number of potential effects such as economic effect (which is difficult to define spatially) and visual effect (which is also difficult due to differences in people's perceptions). Each of the impact topics will experience effects at different geographic scales, some at multiple scales. Therefore a number of topic study areas are proposed. Effects will then be assessed as appropriate within the areas defined:
- near neighbours – approximately 5km from the Application Site. The 5km zone has been selected to ensure that significant effects on the physical environment (in terms of air, noise and visual assessment) are incorporated in the socio-economic assessment study zone. The study includes the communities such as Tregle and Cemaes;
  - Key Socio-Economic Study Area (KSA) - This area is considered to represent the area most likely to be affected (both positively and negatively). It is defined by the Travel to Work Areas (TTWAs) for Bangor, Caernarfon and Llangefni TTWA and the Holyhead TTWA. The definition is based on a best fit selection of 2011 Census of Population administrative wards;
  - daily construction commuting zone (DCCZ) – this area is based upon a 90 minute drive time distance from the Application Site defined using Ordnance Survey Open data Strategic shape data. This area represents the one way travel limit assumed for workers to commute on a daily basis from their permanent residence. It is understood that during SPC most workers will be existing residents of this zone

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and so this is identified as 'local' employment. Figure 14.1 shows the local study area for the socio-economic assessment;

- North Wales – this area consists of a grouping of local authority districts consisting of the Isle of Anglesey; Gwynedd; Conwy; Denbighshire; Flintshire and Wrexham; and
- National – Standard geographies such as Wales, Great Britain and the UK are also used where appropriate either for comparison purposes to the consideration of effects that flow outside the previous geographies.

## Environmental baseline

14.2.2 This baseline will be further developed as more information becomes available. It will include the identification of information relating to the wider study area and clarification of existing data availability with the relevant Local Authority officers.

## Population

14.2.3 In 2011, Anglesey had a population of 69,751, an increase of around 3% on the 2001 Census. In 2011, Anglesey accounted for 18.5% of the DCCZ population.

Approximately 61% of Anglesey's residents are of working age (16-64), broadly in line with the DCCZ and Wales as a whole. Anglesey has generally seen net inward migration since 2001, although there has been a steady out-migration of younger people, aged between 15 and 29. This is a similar trend to both North Wales and Wales as a whole. Whilst Wales and North Wales are expected to see population growth over the 2015 to 2036 period, Anglesey's population is forecast to decline by 3%. Almost 46% of Anglesey's population can speak, read and write in Welsh, substantially higher than the Welsh average of 14.6% and the second highest rate in Wales.

14.2.4 Migration in and out of Anglesey for the year ending June 2012 showed no net migration with 2,300 coming in and the same number leaving.<sup>65</sup> Gwynedd showed a slight outmigration, with 5,800 leaving and only 5,700 coming in.<sup>66</sup>

14.2.5 The age structure of a population indicates both the current and strategic (future) requirements of an area. A younger population, for example, may require additional access to schools, safe recreation play facilities and the development of future employment opportunities, whilst aging populations are likely to require a greater focus on healthcare, living support, accessibility and social networks. Anglesey has an aging population, with reducing levels of young people and a shrinking working age population. This will generate a range of social challenges in the coming years for the area.

<sup>65</sup> Office of National Statistics. Internal Migration, mid-year 2012. Moves within the United Kingdom; Local Authorities, Regions and Unitary Authorities.

<sup>66</sup> Office of National Statistics. Internal Migration by Local Authorities in England and Wales, Year Ending June 2012. Available from: <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcn%3A77-314026> [Accessed: 08.09.2014].

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14.2.6 The working age population is indicative of the capacity to undertake and participate in economic activity. Table 14.1 shows that in 2011, 61% of the usually resident population in the DCCZ were of working age (16-64). The Isle of Anglesey alone accounted for around 18% of the working age population.

**Table 14.1: Population distribution by age cohort<sup>67</sup>**

Age	Isle of Anglesey		DCCZ		Wales	
	number	%	number	%	number	%
Age 0 to 15	11,861	17	65,114	17	556,296	18
Age 16 to 64	42,244	61	228,719	61	1,944,616	63
Age 65 to 74	8,574	12	43,133	12	300,550	10
Age 75 plus	7,072	10	39,034	10	261,994	9
Total (all usual residents)	69,751	100	376,000	100	3,063,456	100

## Economy

14.2.7 An overview of the general economy for an area is useful to help explain the background to current employment levels and availability of resources within an area. Anglesey's economy is characterised by a few large employers (e.g. Anglesey Airport (RAF Valley), the Existing Power Station, the IACC and health care services) and a significant number of small businesses (mostly agricultural, retail and construction-based), which only tend to employ a few people.

14.2.8 The Isle of Anglesey accounted for 1.5% of Welsh Gross Value Added (GVA) in 2013, the smallest of all the Nomenclature of Territorial Units for Statistics areas in Wales. Anglesey's share of Welsh GVA has remained broadly unchanged in recent years. Over the 2008 to 2013 period, Anglesey's GVA rose by 2.4%, in contrast to growth of 11.9% for Wales as a whole, partly due to the closure of Anglesey Aluminium in 2010. In 2013, GVA per head in Anglesey was £11,368, well below the £16,893 for Wales and the £23,755 for the UK as a whole. This is partly explained by the relatively high level of out-commuting for Anglesey. In terms of industry, Anglesey has above Welsh average shares in agriculture, forestry and fishing, wholesale, retail, transport, hotels and food suggesting a strong dependence on agricultural and tourism-related businesses within Anglesey.

<sup>67</sup> Nomis: Age structure (KS102EW)

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14.2.9 In contrast, production and real estate activities are relatively less important for Anglesey's economy than elsewhere in Wales. Within Anglesey and Gwynedd there are a higher proportion of sole proprietors and partnerships, and a lower proportion of companies, likely to reflect the high proportion of agricultural units. In 2013, there were 481 active businesses per 10,000 population in Anglesey, above the Welsh average of 466, but lower than the 523 for North Wales as a whole. The classification of Anglesey as an enterprise zone for energy is expected to assist with the growth of certain sectors, including production and energy.

## Employment

- 14.2.10 Employment influences a range of factors including income, access to housing, education, services and social networks. At around 75%, the economic activity rates for the Isle of Anglesey and the DCCZ are broadly in line with national Welsh rate. In 2014, the unemployment rate for Anglesey was 7%, slightly lower than the 7.4% for Wales, but the rate for Gwynedd, at 6.1%, was significantly lower. The proportion of the working population claiming out of work benefits on Anglesey fell from 13.7% in May 2011 to 11.8% in May 2014, substantially below the 13.0% for Wales as a whole.
- 14.2.11 The job density rate – the number of filled jobs divided by the working age population – for Anglesey has improved in recent years, but at 0.62 in 2012 it was still much lower than in Wales (0.71) and North Wales (0.75). There has been no significant growth in earnings on Anglesey since 2008, in contrast to other parts of North Wales. In 2014, median weekly earnings on Anglesey were £445 compared to £516 in Gwynedd and a Welsh average of £480. In 2012, Gross Disposable Household Income (GDHI) on Anglesey was £15,022, above the Welsh average (£14,623) and the sixth highest across Welsh local authorities. In 2013 GDHI fell across the board, although the figure for Anglesey remained above the Welsh average.
- 14.2.12 Just over 10% of the working age population on Anglesey work in agriculture and fishing, double the proportion for Wales and higher than the 7% across the DCCZ as a whole. The proportion employed in the construction industry (7%) is also higher than in the DCCZ (6%) and Wales (5%). Utilities employment on Anglesey is 3.7%, above the Welsh average of 1.7%, reflecting the presence of the existing Magnox reactors. In 2011, across North Wales 10% of establishments reported that they had a vacancy, and 3% reported a "hard-to-fill" vacancy, compared to 12% and 4%, respectively, for Wales. In 2011, nearly 8,900 Anglesey residents were travelling to workplaces off the island, whilst slightly over 3,100 people were travelling on to the island for work. The average distance travelled to work for residents within the DCCZ is around 12 miles, higher than the Welsh average (10.4 miles) but lower than for Anglesey (14 miles).

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## Tourism

14.2.13 It is important to take into account any potential effect on the tourism sector as it provides a major source of income to the area. In 2013, the total economic effect of tourism on Anglesey was estimated to be around £256m, a 4.4% increase on 2012, with the total number of visitor days increasing to 5.32m. Around 4,000 jobs on Anglesey are related to tourism, largely in accommodation and retail, with a further 16,000 in Gwynedd. The tourism bed stock on Anglesey decreased by almost 9% between 2008 and 2011, with falls in self-catering accommodation and camping accommodation.

14.2.14 The North Wales Visitor Survey 2003 (published 2004)<sup>68</sup> identifies the visitor profile for the region in which the Wylfa Newydd Development Area is located. It highlights that there is a very high rate of repeat business (82%) and that the average spend per trip is £161 per group (with 50% of all holidays lasting 1-3 nights). Focused surveys will be undertaken as part of tourism investigations associated with the main DCO applications and relevant outcomes for the SPC phase will be incorporated as appropriate.

## Land use

14.2.15 Agricultural land is classified using the Agricultural Land Classification system. The majority of the land in the KSA is coastal lowland, with a substantial presence of agricultural land, including small areas of arable farming and pastureland. There are a number of designated areas within the KSA, including 206 sites of special scientific interest and 29 national nature reserves. There are also 52 historical conservation areas and one world heritage site. A number of strategic development sites have been identified in the Anglesey and Gwynedd Joint Local Development Plan linked to the Energy Island Programme for Anglesey. Around 300 hectares of land have been identified as either primary or secondary development sites within the KSA.

## 14.3 Potential effects

14.3.1 The potential socio-economic effects of the SPC Proposals include the following:

- creation of Project-related job opportunities;
- creation of indirect job opportunities e.g. manufacture of materials used within SPC;
- change in demand for tourist accommodation (potential for reduction due to decrease in visitor numbers);
- change in visitor numbers for key attraction sites potentially affected;
- difficulty in access associated with increased demand on road transport network affecting visitor accessibility;
- effect on agricultural land (severance, loss of areas), potential effect on agricultural employment sector;

<sup>68</sup> Tourism Partnership North Wales (2004) North Wales Visitor Survey 2003. Available from: <http://www.tpnw.org/docs/strategies/North%20Wales%20Visitor%20Survey%202003.pdf> [Accessed: 08.09.2014].

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- effect from loss of land in terms of economy (e.g. land zoned for commercial or residential development); and
- potential effect to improve low grade agricultural land through design of soil management strategy.

14.3.2 The study will also consider the effect on the near neighbour communities by considering “in-combination” effects; these are where there may be an effect on a community from more than one technical area. This might include for example, increased noise, plus worsening air quality and then also increased traffic (say for a new road development). It is proposed to identify the communities where these in-combination effects may occur from SPC Proposals (sometimes referred to as intra-development effects – effects from within the project itself).

## **14.4 Potential mitigation**

14.4.1 The following types of mitigation to address identified effects will be considered:

- investment in relevant training and apprenticeships;
- work with existing training providers;
- work with recruitment providers e.g. job centres;
- maximise purchasing opportunities for local companies;
- signage to promote certain facilities during the preparation SPC Proposals period;
- staging of SPC periods requiring significant interruption in access in periods that avoid holiday peak seasons; and
- maintaining business/farm access.

14.4.2 Qualitative description will occur where there is the possibility for near neighbour communities to experience significant effects from a range of technical areas (likely to include noise, air, transport and landscape effects as a minimum). In-combination issues will then be considered to assess whether any additional mitigation measures or enhancements are required to ensure communities receive minimum possible disruption.

## **14.5 Proposed scope, methodology and criteria**

### **Assessment criteria**

14.5.1 The significance of an effect is determined by assessing the magnitude of the change and the sensitivity of the receptor (the beneficiary, user, occupier or owner). For socio economic purposes these are slightly different to the ‘normal’ assessment criteria. A sensitivity rating has been given to each topic area/receptor based on professional judgement and whether the topic/receptor is stated as a policy priority (particularly related to the SPG on new nuclear build). The broad criteria for determining the sensitivity of receptors is outlined in table 14.2.

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**Table 14.2: Sensitivity criteria**

Sensitivity	Definition
High	The receptor or effect type is identified as a priority in local and relevant policies.  Alternatively, there is evidence that this receptor or type of effect faces major socio-economic challenges or underperforms, or there is vulnerability in the study area.
Medium	The receptor or effect type is not identified as a priority in local and relevant policies.  Alternatively, there is evidence of considerable socio-economic challenge or underperformance and vulnerability for this receptor or type of effect.
Low	The receptor or effect type is not identified as a priority in local and relevant policies.  Alternatively, there is evidence that this receptor or type of effect is resilient, and there are no identified weaknesses or challenges in the study area.
Negligible	The receptor or effect type is not identified as a priority in local and relevant policies.  Alternatively, there is evidence that this receptor or type of effect currently performs well, with no weaknesses or challenges in the study area.

14.5.2 The sensitivity of the receptors is considered within the identification of significance criteria for the assessments presented within this chapter. Also implicitly included in the significance criteria is the consideration of the magnitude of the potential change.

14.5.3 There are a number of assessment terms which are common across all socio-economic topics, unless otherwise noted. These are defined in table 14.3 along with their specific application to the socio-economic assessment.

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**Table 14.3: Definition of common socio economic terms**

Nature of effect	Explanation
<b>Type of effect</b>	
<b>Geographic scale</b>	
Local	The effect would occur within the Local Area of Influence, Anglesey or within the KSA, as appropriate.
Regional	The effect would occur on a spatial scale covering the DCCZ, north-west Wales or North Wales.
National	The effect would occur on a spatial scale covering Wales, England and Wales or the UK.
<b>Duration of effect</b>	
Temporary	The effect would be reversed in the future.
Permanent	The change is expected to be permanent and there is no intention for it to be reversed.
Short-term	Effects would be experienced for a period of up to two years.
Medium-term	Effects would be experienced for a period of two to eight years.
Long-term	Effects would be experienced for a period of eight years or more.
<b>Certainty</b>	
High	The assessment uses assumptions that have been confirmed or agreed with stakeholders.
Medium	The assessment is based on standard assumptions/best practice or professional judgement of quantitative evidence.
Low	The assessment is based on unconfirmed assumptions and there is a risk that the effect may be substantially different from that which is presented.

14.5.4 Significance is determined by assessing magnitude and sensitivity for each effect, see table 14.4. Taken together these determine whether the effect is considered to be 'significant' or 'not significant'. Effects can be beneficial or adverse.

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**Table 14.4: Significance of effects**

Significance		Sensitivity of receptor		
		High	Medium	Low
Effect magnitude	High	Major adverse/beneficial - significant	Major adverse/beneficial - significant	Moderate adverse/beneficial - significant
	Medium	Major adverse/beneficial - significant	Moderate adverse/beneficial - significant	Minor adverse/beneficial – not significant
	Low	Moderate adverse/beneficial - significant	Minor adverse/beneficial – not significant	Negligible effect – not significant
	Negligible	Minor adverse/beneficial – not significant	Negligible effect – not significant	Negligible effect – not significant

14.5.5 Studies will be undertaken into the following aspects.

### Workforce requirements

14.5.6 An evaluation of local labour availability and workforce requirements will be undertaken. This study will involve an evaluation of the skill set and total contribution (numbers) of local labour which creates both direct and indirect effects within the local labour market.

### Businesses and supply chains

14.5.7 An evaluation will be undertaken of businesses and supply chains within the local and wider area that will potentially be able to provide materials and services to the SPC Proposals. This study will lead to an understanding of local company capacities and procurement policies that may serve to enhance local access to employment opportunities.

### Tourism

14.5.8 An assessment will be undertaken of potential effects on the tourism sector, including consideration of the ways in which current (and future) visitors to the area may change their behaviour with the onset of the SPC Proposals.

### Land use assessment

14.5.9 A desk-based assessment will be undertaken which will investigate the potential loss of land (and relative percentages of parcels of land) associated with the SPC Proposals. Consideration will be given to current land use and potential future land use where it is included in local development plans.

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## 15 Cumulative effects

15.1.1 The process of scoping identified potential for cumulative effects to occur on identified environmental resources and receptors at different levels (activity, development and project), as a result of the proposed SPC Proposals.

- **Project** i.e. the Wylfa Newydd Project (comprising construction and operation of the Power Station and all Associated Development) or other projects such as an offshore wind energy development;
- **Development** i.e. the individual elements of a project (e.g. the A5025 proposals, which form part of the Wylfa Newydd Project); and
- **Activity** i.e. individual tasks and activities associated with the development (e.g. vegetation clearance and earthworks undertaken as part of the SPC Proposals).

15.1.2 Cumulative effects can potentially occur at each level (activity, development or project), for example, cumulative effects can arise from different activities, from different developments, or across different projects. The following terminology has been adopted to describe cumulative effects associated with the Wylfa Newydd Project.

- **Intra-development:** cumulative effects can arise when a single resource or receptor is affected by more than one impact from the same development, usually at the same time. For example, nesting birds close to the site may be affected by both noise and dust arising from SPC works; the combined effect may be more significant than the individual noise and dust effects assessed separately. These cumulative effects will be assessed within and between the individual topic chapters of the relevant environmental statement.
- **Intra-project:** in a complex project involving multiple developments, such as the Wylfa Newydd Project, cumulative effects can arise when a single resource or receptor is affected by impacts from different developments (in the same project) at the same time. For example, noise from site preparation and clearance and light from A5025 highway construction could combine to have an effect on a single population of bats feeding in the area. This group of cumulative effects could also be termed 'inter-development'.
- **Inter-project:** cumulative effects can arise when a single resource or receptor is affected by more than one project at the same time. For example, noise from construction of the Wylfa Newydd Generating Station and noise from the construction of a new National Grid overhead power line could combine to have a cumulative effect on local residents.

15.1.3 Scoping recorded potential for both additive and combined effects to occur on environmental resources and receptors.

- **Additive** i.e. when different activities, developments and/or projects have a comparable effect on a single resource or receptor at the same time. An example would be increased noise nuisance resulting from noise generated during the SPC activities and noise from another project in proximity to the receptor; and
- **Combined** i.e. when different types of impact have an effect on a specific resource or receptor. An example would be reduced bat foraging resulting from construction noise associated with the SPC Proposals and light pollution arising from the operation of another project in proximity to the foraging area.

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- 15.1.4 With both types of effect, individual effects may not be significant when considered in isolation, but when considered together with others the cumulative effect could prove significant. The SPC cumulative effects assessment will consider additive and combined effects from both intra-project and inter-project interactions.
- 15.1.5 The process identified a number of uncertainties which may limit the scope and timing of the assessment. For example, it is very difficult to predict the effects from another project which is in its formative stages. In order to minimise the uncertainties, the consideration of other development projects will be limited to those that are in the public domain e.g. approved and capable of being constructed, at screening or scoping stage or are reasonably foreseeable<sup>69</sup>. Liaison will be undertaken by Horizon to work collaboratively with other developers to accurately assess significant cumulative effects.
- 15.1.6 Consultation undertaken with the IACC as part of the Wylfa Newydd Stage 1 Pre-application Consultation exercise identified a number of reasonably foreseeable development projects which will be considered in the cumulative assessment. As these projects are currently at different stages of development, liaison will continue with the IACC as part of the EIA process to acquire further information on their progression, and to identify any new development projects that may emerge and require consideration in the cumulative assessment. Consultation with the IACC (and others) will also be undertaken to inform the shaping and framing of the scope and coverage of cumulative assessments for each environmental topic area.
- 15.1.7 For some environmental topics, the consideration of cumulative effects can be undertaken quantitatively (e.g. incorporation of future development scenarios into traffic modelling); however for other topics (e.g. landscape and visual assessment) the nature of cumulative effects assessment is more speculative. In those cases, professional judgement using qualitative methods will be adopted to determine potential cumulative effects, using available information and published data.
- 15.1.8 The cumulative effects assessment will utilise available guidance and criteria and will also reference other published guidance set out in paragraph 4.3.4 of this report.
- 15.1.9 Factors to be considered in assessing the significance of cumulative effects will include: determination of the type and sensitivity of receptors or resources potentially affected; development-related activities which could potentially affect their condition; their ability to absorb change; and the probability of cumulative effects occurring.
- 15.1.10 Focus will be directed towards the identification of potentially significant cumulative effects, rather than every potential interaction or permutation. Emphasis will be placed on the contribution that the SPC Proposals have in the overall cumulative effect. Where assumptions need to be made to reduce the level of uncertainty within the assessment, these will be reported and explained in the Environmental Statement.

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<sup>69</sup> Existing projects, consented projects, projects reasonably likely to be granted consent, and other projects planned in the area (such as those for which development briefs have been adopted in order to encourage a specific type of development, at a particular site and sites allocated in local plans).

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15.1.11 It is intended that the cumulative effects assessment undertaken as part of the EIA for the SPC Proposals will support the development of EIAs to be progressed for the Wylfa Newydd Project.

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## 16 Health Impact Assessment

### 16.1 Background

16.1.1 A Health Impact Assessment (HIA) seeks to identify issues that may harm or improve general levels of health and wellbeing. In all geographical areas there are inequalities in health between population groups. HIA also seeks to identify how health inequalities may be affected by the proposal. At all times HIA seeks to recommend mitigation that may improve health and reduce inequalities in health.

### 16.2 HIA Screening

- 16.2.1 This chapter provides information on the HIA screening undertaken to develop conclusions about the potential health effects of the SPC Proposals. This screening exercise uses the World Health Organization definition of health<sup>70</sup>, *'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'*.
- 16.2.2 The HIA process follows the Wales Health Impact Assessment Support Unit (WHIASU) guidance.<sup>71</sup> It is also informed by the Isle of Anglesey Health Impact Assessment Tool<sup>72</sup> and the toolkit for Mental Well-Being Impact Assessment.<sup>73</sup> This is in line with the approach for the HIA of the Wylfa Newydd Project.
- 16.2.3 This screening exercise has concluded that the potential effects arising from SPC warrant further assessment due to the potential for effects on health to occur. As such a 'rapid' HIA will form part of the assessment process and will accompany the planning application for the SPC Proposals.
- 16.2.4 The screening exercise has identified that significant negative health effects are most likely to be associated with air quality and noise effects due to heavy onsite vehicles/plant (e.g. rock crushers, bulldozers and excavators). Air quality effects are likely to focus on fine particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) that is produced either by the mechanical action of onsite vehicles/plant or by wind erosion of exposed soil.
- 16.2.5 The HIA screening exercise has also considered effects on mental wellbeing and finds that moderate negative effects may occur for residents of Tregele and Cemaes due to changes in social and community influences on health e.g. social isolation, concerns about community identity and decreased local pride. This could arise from temporary public right of way closures/diversion and from changes to the landscape.

<sup>70</sup> World Health Organization. Preamble to the Constitution of the World Health Organization; signed on 22 July 1946 by the representatives of 61 States and entered into force on 7 April 1948. Official Records of the World Health Organization, no. 2, p.100. 1948 New York. Available at <http://bit.ly/1cgnJ3S>

<sup>71</sup> WHIASU. Health Impact Assessment: a practical guide. 2012 Ed. Chadderton, C., Elliott, E., Green, L., Lester, J., and Williams, G. Wales Health Impact Assessment Support Unit. Cardiff, Wales. Available at <http://bit.ly/WH8g9F>

<sup>72</sup> Isle of Anglesey. Isle of Anglesey Health Impact Assessment Tool. 2010. Available at <http://bit.ly/LSB0kb>

<sup>73</sup> Mental well-being impact assessment: a toolkit for well-being. 2011 Members of the National MWIA Collaborative (England). Available at <http://bit.ly/1k7DLTR>

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16.2.6 These potential negative effects will be considered in a separate stand-alone report which is being prepared to accompany the planning application. The HIA will undertake further work to support the report by providing a consideration of relevant health thresholds that could form part of monitoring and mitigation plans.

16.2.7 The workforce for SPC is small and will be drawn largely from existing personnel within North Wales. Thus, there are expected to be limited social effects associated with the workforce either adversely e.g. on health services or positively e.g. on employment or the economy.

16.2.8 Table 16.1 summarises HIA screening of SPC activities.

**Table 16.1: HIA screening of site preparation and clearance activities**

HIA screening conclusion	
Demolition of existing buildings	Scoped out of the HIA as the works will be conducted by a small workforce undertaking temporary, small scale disturbance and emissions.  Changes in social and community influences on health are possible.
Installation of construction site boundary fences and diversion of PRow	
Vegetation clearance and dry stone wall dismantling and storage	
Topsoil clearance (not option land) and storage	Changes to local air quality (including dust emissions). Changes in noise exposure. Changes in social and community influences on health.
Installation of drainage	Scoped out of the HIA as the works will be conducted by a small workforce undertaking temporary, small scale disturbance and emissions.  Changes in social and community influences on health are possible.
Removal of rock outcrop (borrow pit)	Changes to local air quality (including dust emissions). Changes in noise exposure. Changes in social and community influences on health.
Watercourse diversion	
Construction of haul roads, plant compounds, car parks and offices	

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- 16.2.9 The HIA notes that some activities of SPC (e.g. soil clearance and storage) are similar to, but of a smaller scale than activities to be carried out in the main construction phases (addressed through the DCO application). Despite being comparable these smaller SPC activities may cause significant changes to the environment in their own right. This is particularly the case in terms of community perceptions of effects as the SPC activities will constitute the initial major tranche of works, and as such are likely to be particularly noticeable.
- 16.2.10 Further consultation, design, environmental assessments and detailed modelling will continue to be undertaken as necessary. The HIA will provide input to these processes to ensure that potential health effects are taken into account during the consideration of the SPC Proposals.
- 16.2.11 As mentioned previously, further HIA work will be documented in the form of a Rapid HIA report, which will accompany the SPC planning application. The outcome of the Rapid HIA will be reported in a separate document to the Environmental Statement.
- 16.2.12 HIA work in relation to SPC will also be presented as part of the DCO application HIA, which will consider health effects from all Wylfa Newydd Project activities.

Site Preparation and Clearance Scoping Report	DCRM Reference No	Revision:	1.0
	WN034-S5-PAC-REP-00009	Issue date:	08/02/2016

## 17 Welsh Language Impact Assessment

- 17.1.1 IACC Supplementary Planning Guidance<sup>74</sup> (SPG) provides advice on how the Local Authority will take into account the well-being of the Welsh language in the development process, and the supporting information that may be required to allow an adequate assessment of planning applications.
- 17.1.2 The Ynys Môn Unitary Development Plan considered the relationship of planning policies and proposals to social needs and problems including their likely effect on different groups in the population. All community and town council areas on Anglesey can be defined as Language Sensitive Areas, as 25% or more of their Community Council areas speak Welsh (based on the 2001 Census).
- 17.1.3 Land use designations in the Ynys Môn Unitary Development Plan will have considered the linguistic effect of those developments; however, development proposals that were not formally allocated will have to be assessed in terms of their effect on the Welsh language and the local community.
- 17.1.4 Given that the whole of Anglesey is a language-sensitive area, the need for a Language Statement affects all development except householder and minor applications. The extent of SPC Proposals therefore requires a Language Statement to assess the effect of the development on the Welsh language within the community.
- 17.1.5 There are instances where the Local Authority will require a language impact assessment (LIA) depending on the extent of the proposed developments. LIA will be required on for all relevant development, which is defined in the SPG with reference to thresholds applied to housing, employment and tourism development. The SPG also refers to other developments/projects, noting that advice as to whether an LIA is required will be given by the local authority on a case by case basis. This is based on developments that:
- provide for significantly more than local needs, on their own or cumulatively;
  - are relatively large in comparison with local market demand;
  - will attract a relatively significant influx of non-Welsh speakers; or
  - provide for the continuation of past trends which are known to detrimentally affect the wellbeing of the language.
- 17.1.6 Whilst the site area is extensive, the extent of development within the SPC Proposals. It is considered that the SPC Proposals do not fall into the above categories, either in isolation or cumulatively. As such, it is considered that the proposals do not need to be the subject of a specific LIA.

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<sup>74</sup> Isle of Anglesey County Council, 2007. Supplementary Planning Guidance: Planning and the Welsh Language

## NOT PROTECTIVELY MARKED

Site Preparation and Clearance Scoping Report	DCRM Reference No	Revision:	1.0
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- 17.1.7 The Planning (Wales) Act 2015 (the Act), introduces for the first time, legislative provision for the Welsh language in the planning system. Section 31 of the Act clarifies that impacts on the Welsh language may be a consideration when determining planning application, so far as it is material to the application. The effect of the development should therefore be considered as part of the socio-economic chapter of the SPC Proposals EIA.
- 17.1.8 To conclude, the effect of the SPC Proposals on the Welsh language within the community should be considered within a stand-alone Language Statement and as an important and integral part of relevant topic chapters. However, the proposal does not need be subject of a specific LIA.

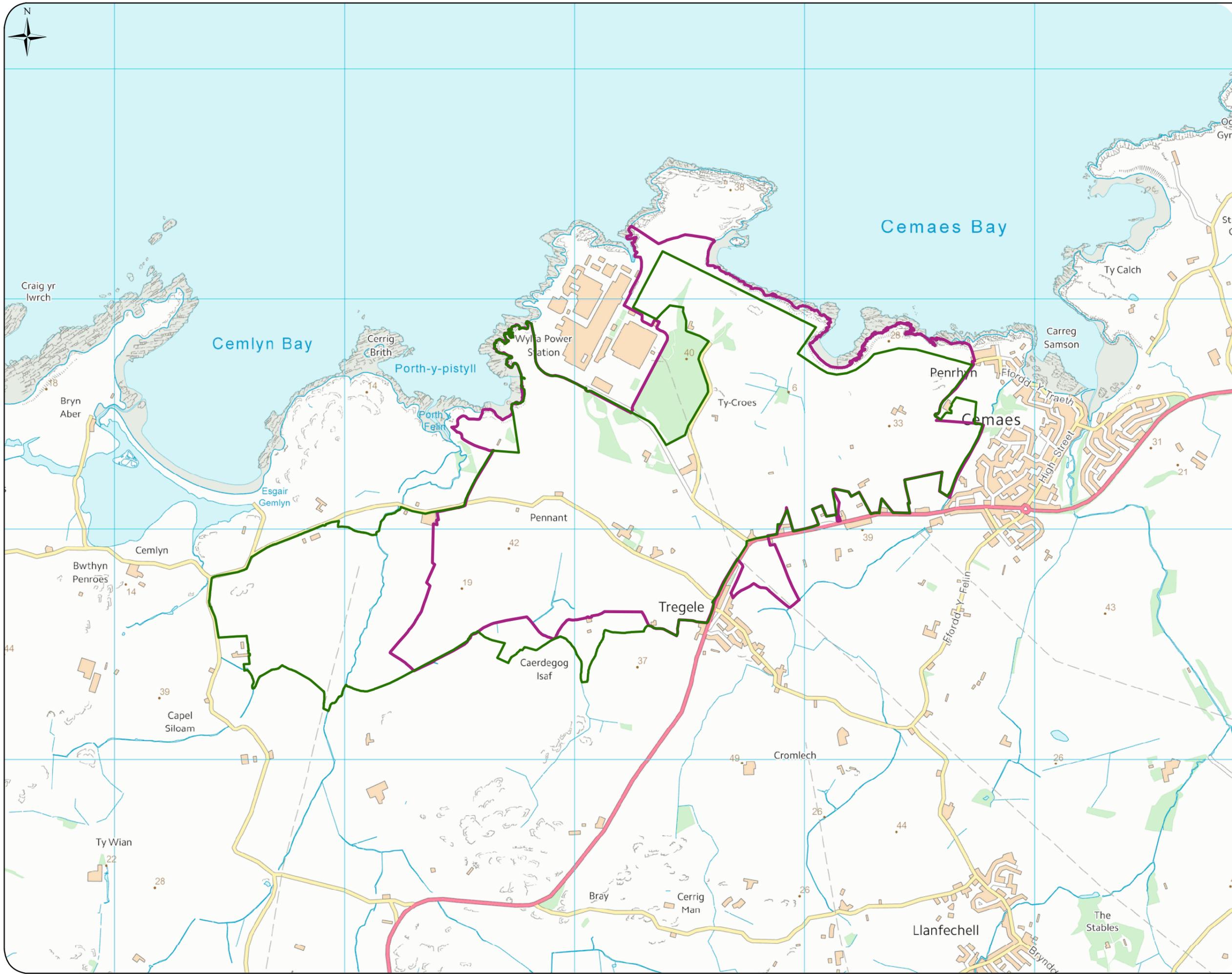
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Site Preparation and Clearance Scoping Report	DCRM Reference No	Revision:	1.0
	WN034-S5-PAC-REP-00009	Issue date:	08/02/2016

## 18 Site restoration

### 18.1 *Scheme details*

- 18.1.1 The Environmental Statement will include details of the proposed site restoration scheme to be implemented should the Wylfa Newydd Project not proceed. As the SPC Activities precede DCO, should DCO not be granted then any works undertaken as part of the planning approval, shall require to be reinstated to an agreed scheme of works. This scheme of works will be agreed with key stakeholders.
- 18.1.2 The scheme will include the replacement of topsoil, restoration of field boundaries, landscape planting and other works designed to return the site to a condition resembling its former state. It will also identify the anticipated environmental effects of implementing the scheme and include mitigation as considered appropriate.



**FIGURE 1.1**  
**WYLFA NEWYDD LOCATION PLAN**

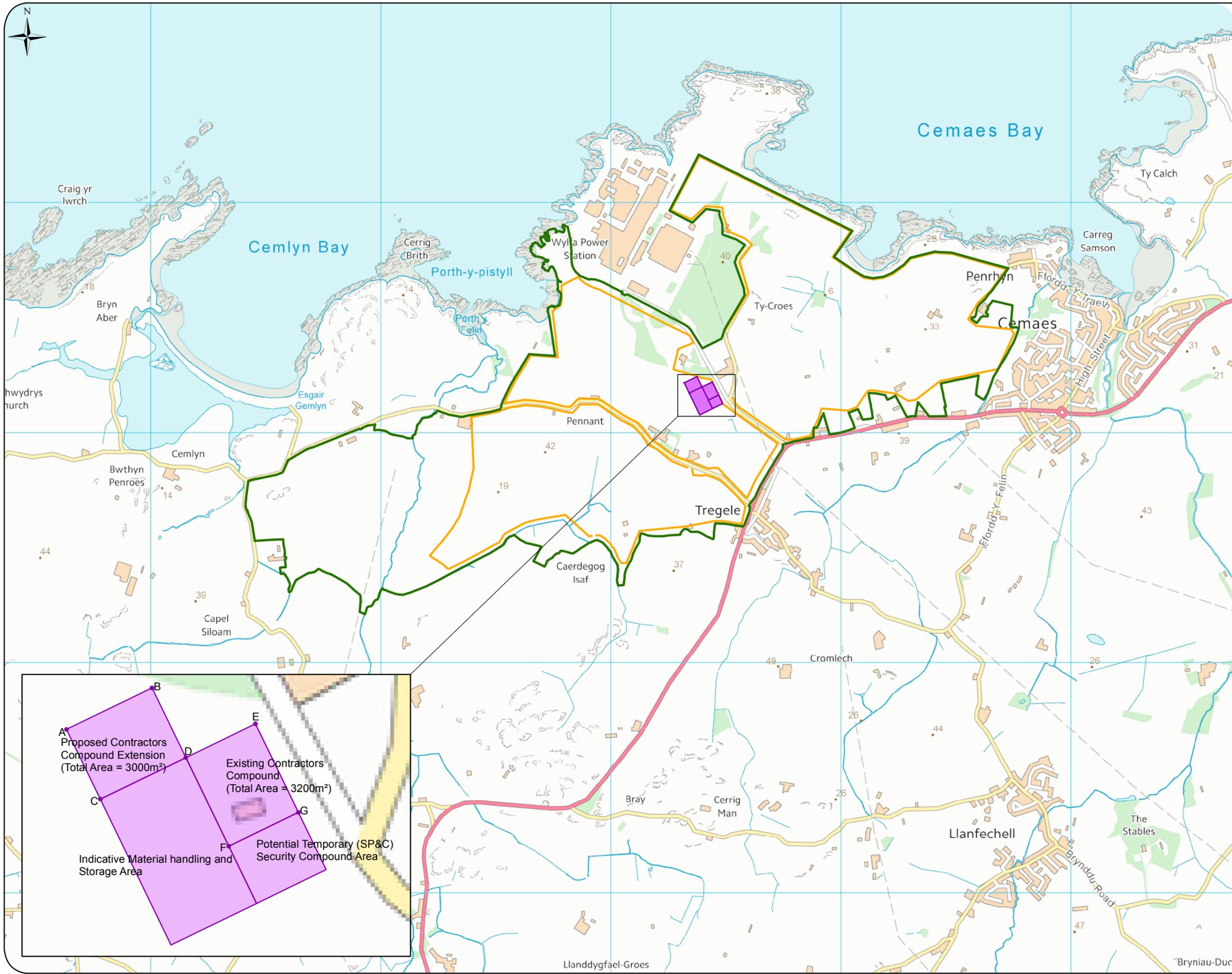
- LEGEND
- Boundary of Site Preparation and Clearance
  - Wylfa NPS Site



Scale: 1:15,000  
When printed at A3



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**FIGURE 1.2**  
**SITE COMPOUND, INTERNAL HAULAGE**  
**AND SECURITY TRACK**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Contractor Compound
  - Security Track



Scale: 1:15,000  
 When printed at A3  
 0 150 300 450  
 m

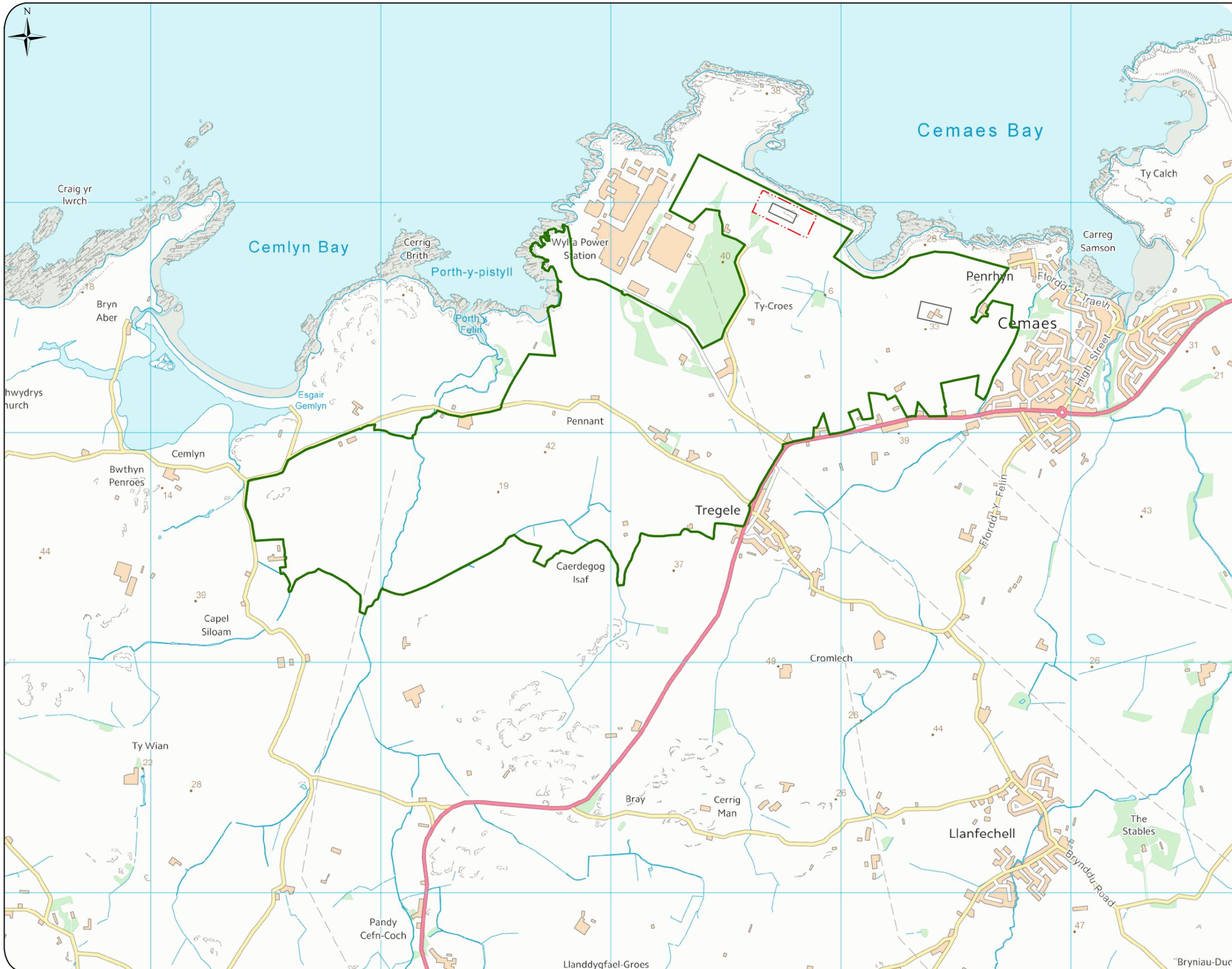
**HORIZON**  
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A Proposed Contractors Compound Extension (Total Area = 3000m<sup>2</sup>)

D Existing Contractors Compound (Total Area = 3200m<sup>2</sup>)

C Indicative Material handling and Storage Area

F Potential Temporary (SP&C) Security Compound Area

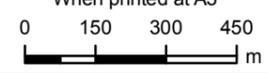


**FIGURE 1.3  
ROCK STORAGE AREAS**

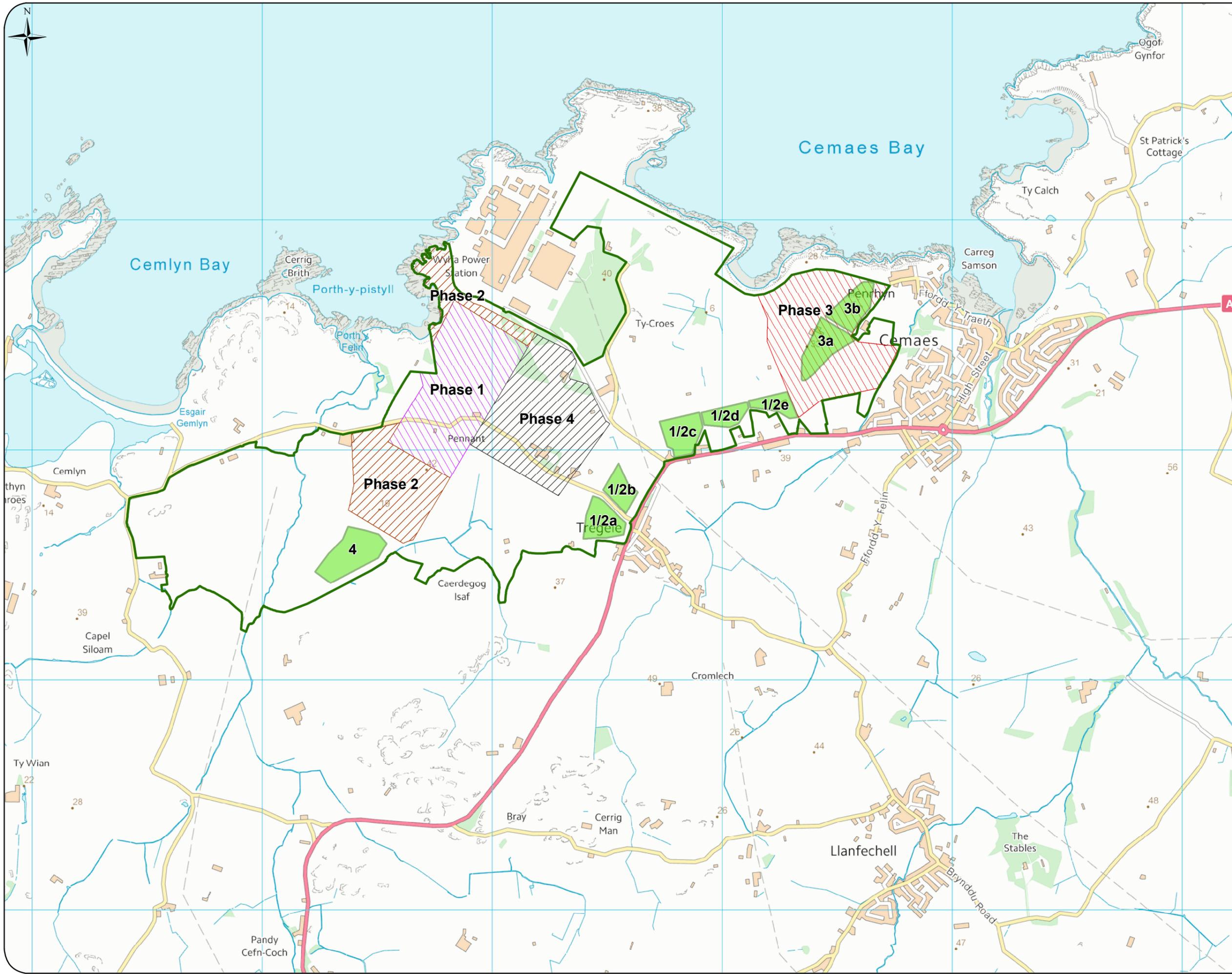
- LEGEND**
- Boundary of Site Preparation and Clearance
  - Rock Outcrop
  - Rock Storage Area



Scale: 1:15,000  
When printed at A3



**HORIZON**  
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**FIGURE 2.1**  
**SOIL STRIP AND STORAGE AREAS**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Topsoil Mounds
  - Topsoil Strip Areas**
  - Phase 1
  - Phase 2
  - Phase 3
  - Phase 4



Scale: 1:15,000  
When printed at A3



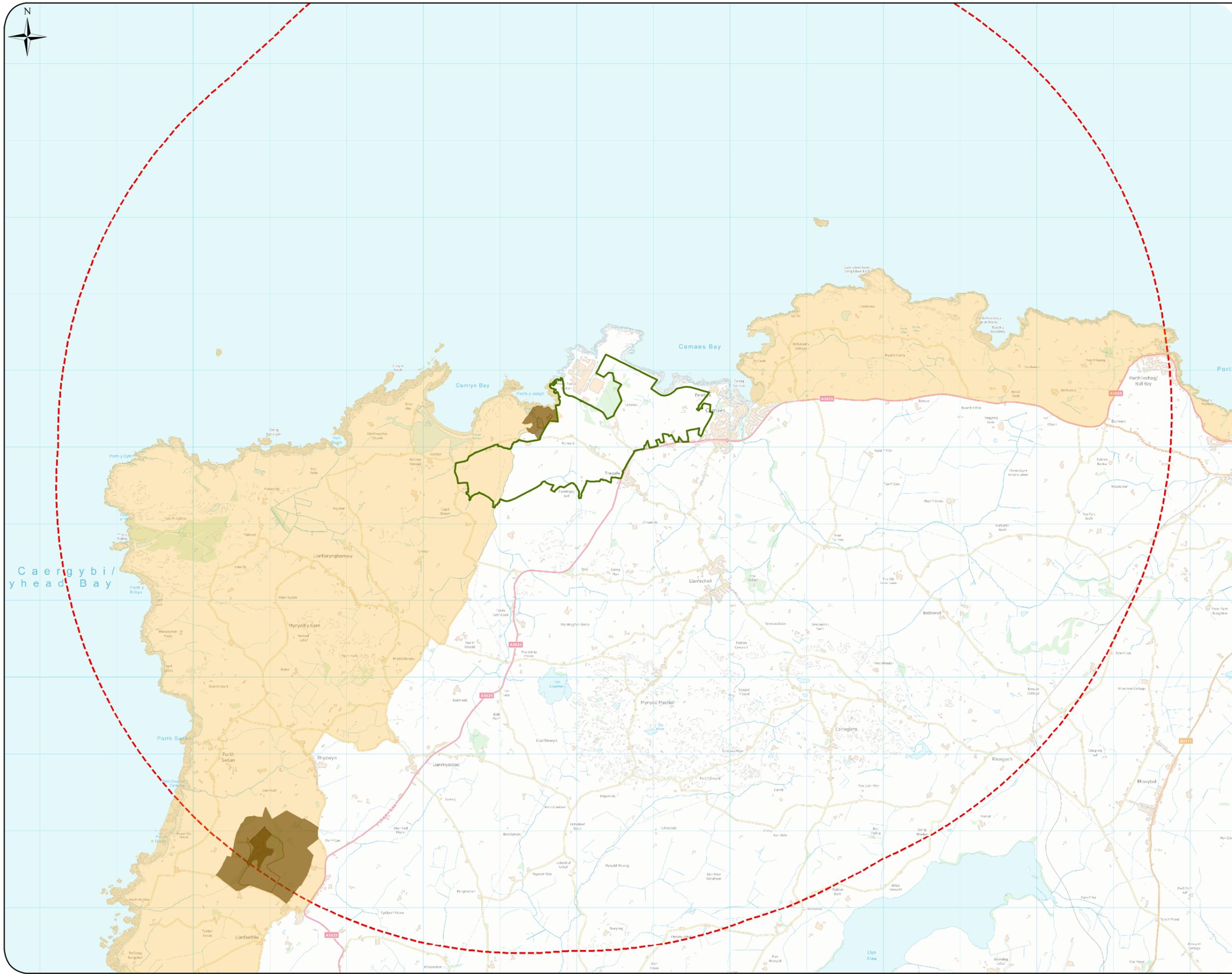
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**FIGURE 9.1**  
**LANDSCAPE STUDY AREA AND**  
**LANDSCAPE DESIGNATIONS**

**LEGEND**

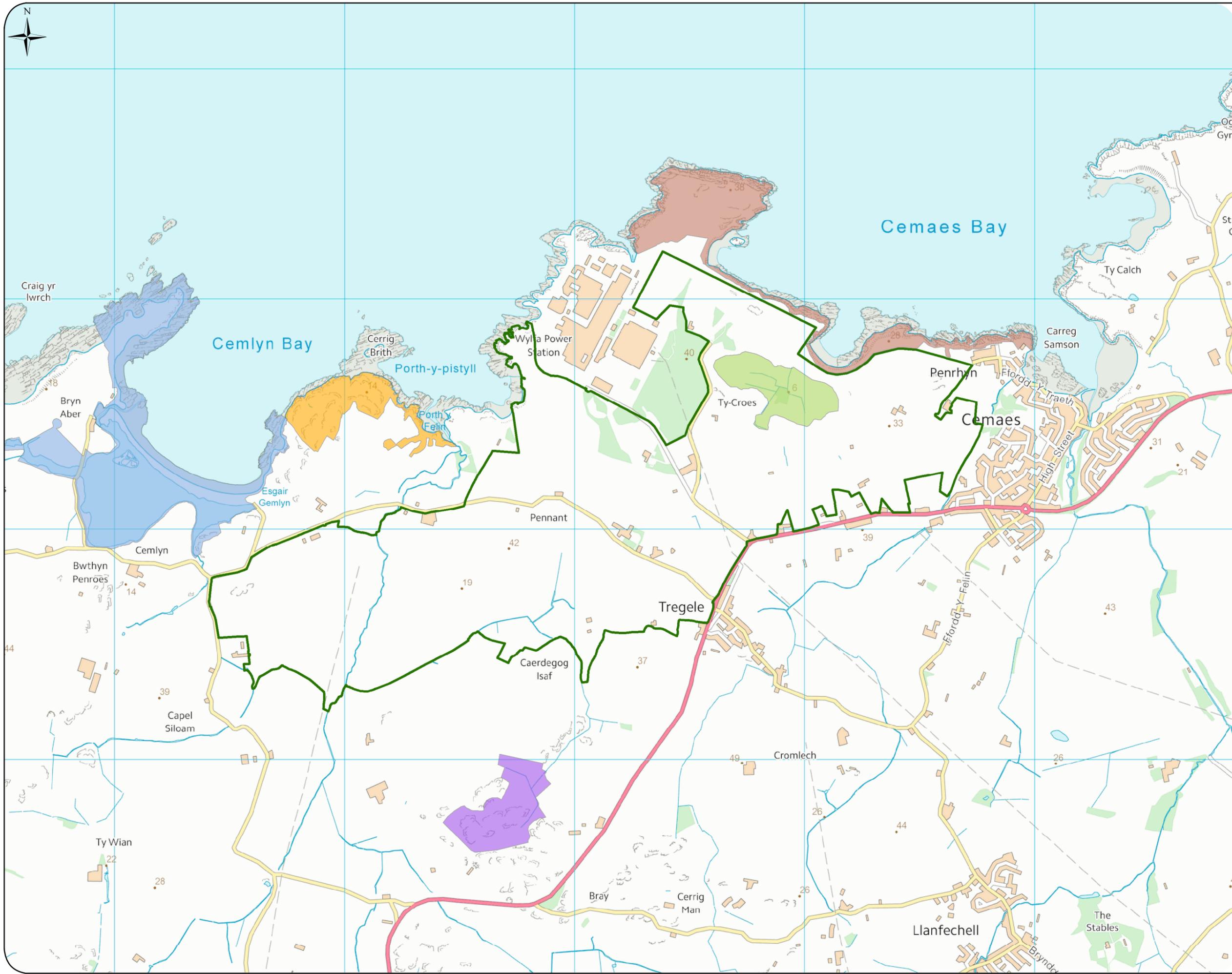
-  Boundary of Site Preparation and Clearance
-  Landscape Study Area
-  Registered Park & Garden
-  Anglesey Area of Outstanding Natural Beauty



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**HORIZON**  
NUCLEAR POWER



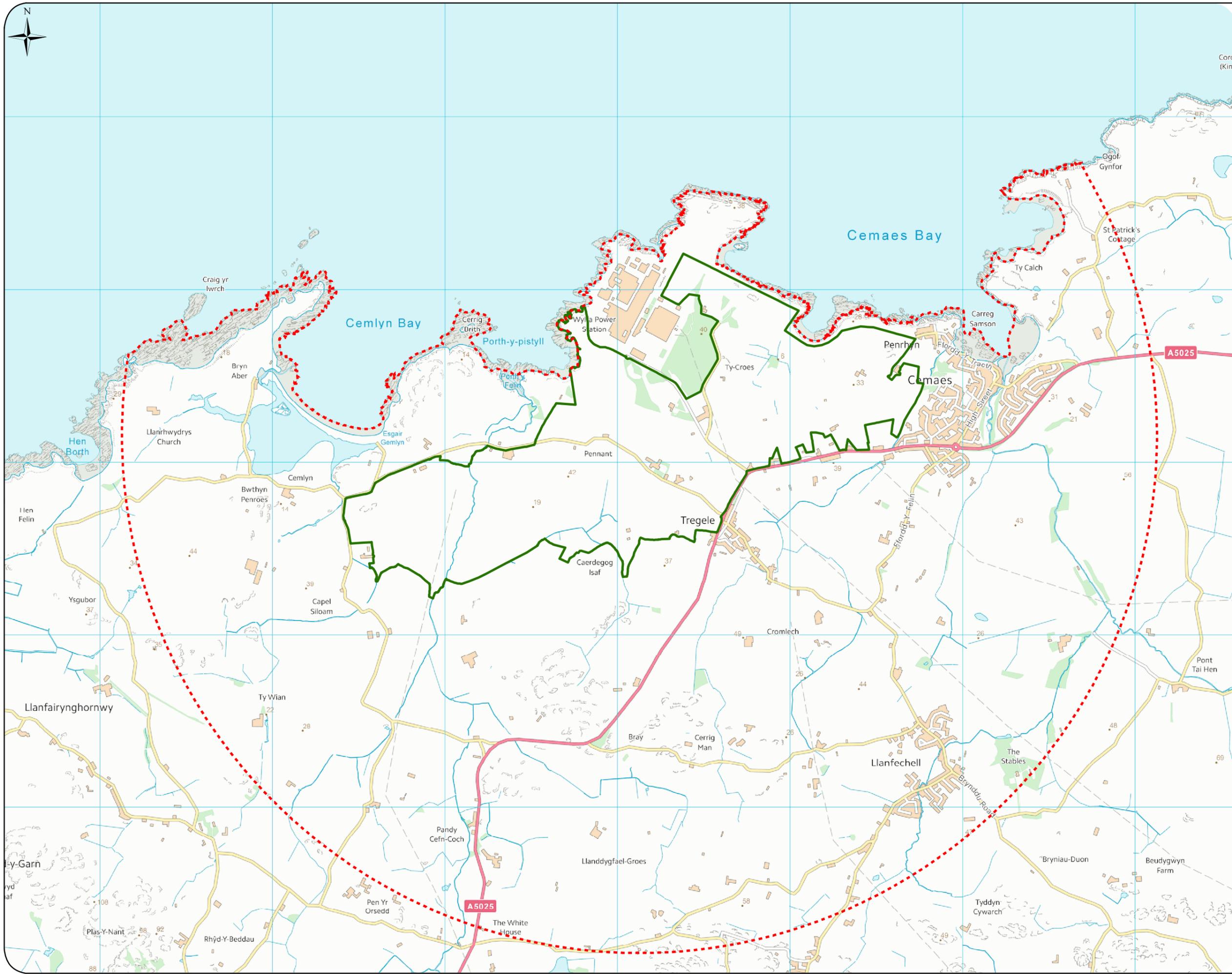
**FIGURE 10.1**  
**ECOLOGICAL DESIGNATIONS,**  
**TERRESTRIAL & FRESHWATER ECOLOGY**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Wyfa Head Wildlife Site
  - Trwyn Pencarreg Wildlife Site
  - Cae Gwyn SSSI
  - Cemlyn Bay SSSI/SAC  
Ynys Feurig, Cemlyn Bay and The Skerries SPA
  - Tre'r Gof SSSI



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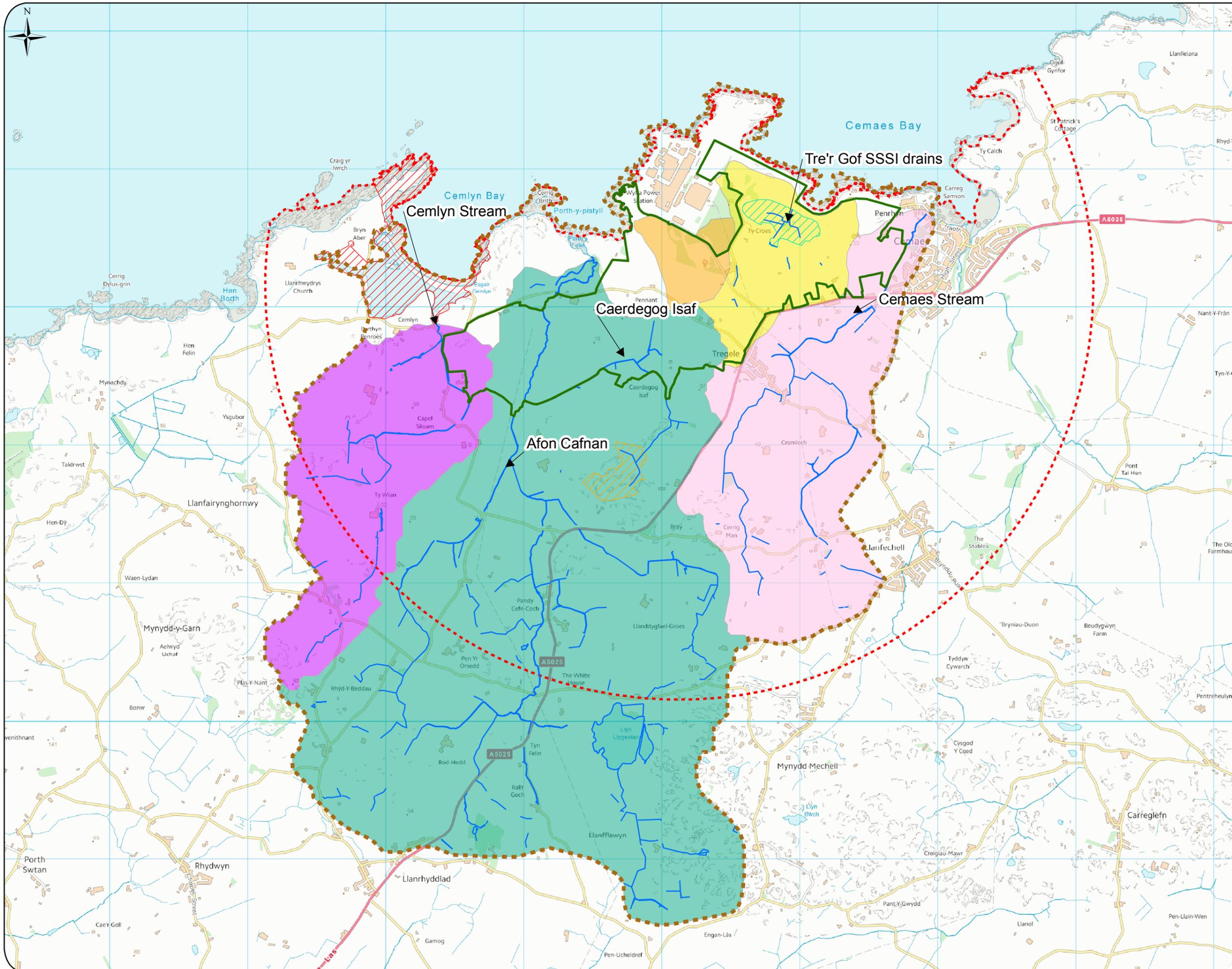
**FIGURE 11.1**  
**GROUNDWATER TOPIC STUDY AREA**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Groundwater Study Area



Scale: 1:20,000  
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m





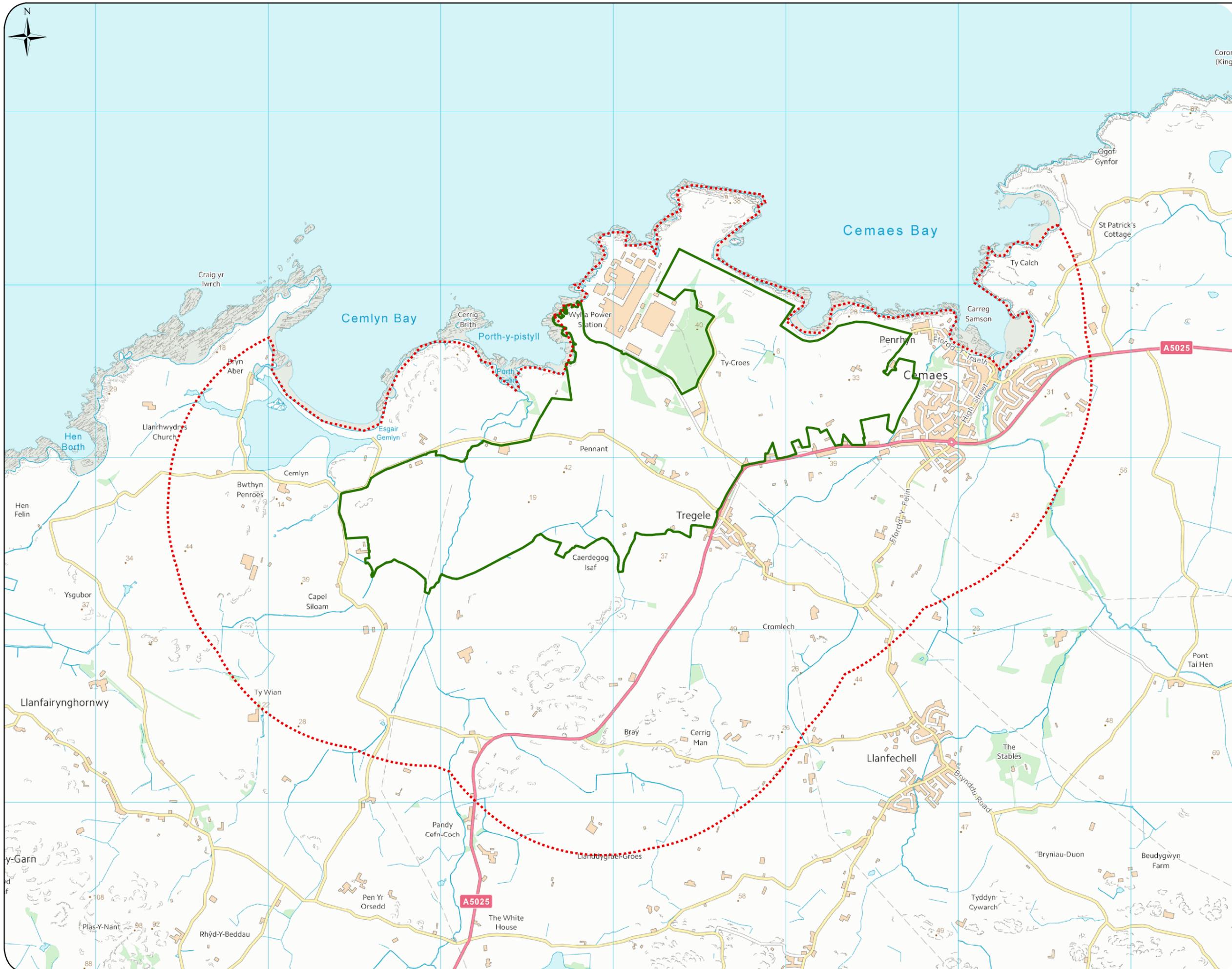
**FIGURE 11.2**  
**SURFACE WATER TOPIC STUDY AREA**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Groundwater Study Area
  - Surface Water Study Area
  - Surface Water Features
  - Cae Gwyn SSSI
  - Cemlyn Bay SSSI / SPA / SAC
  - Tre'r Gof SSSI
  - Afon Cafnan Catchment
  - Cemaes Catchment
  - Cemlyn Catchment
  - Power Station Catchment
  - Tre'r Gof Catchment



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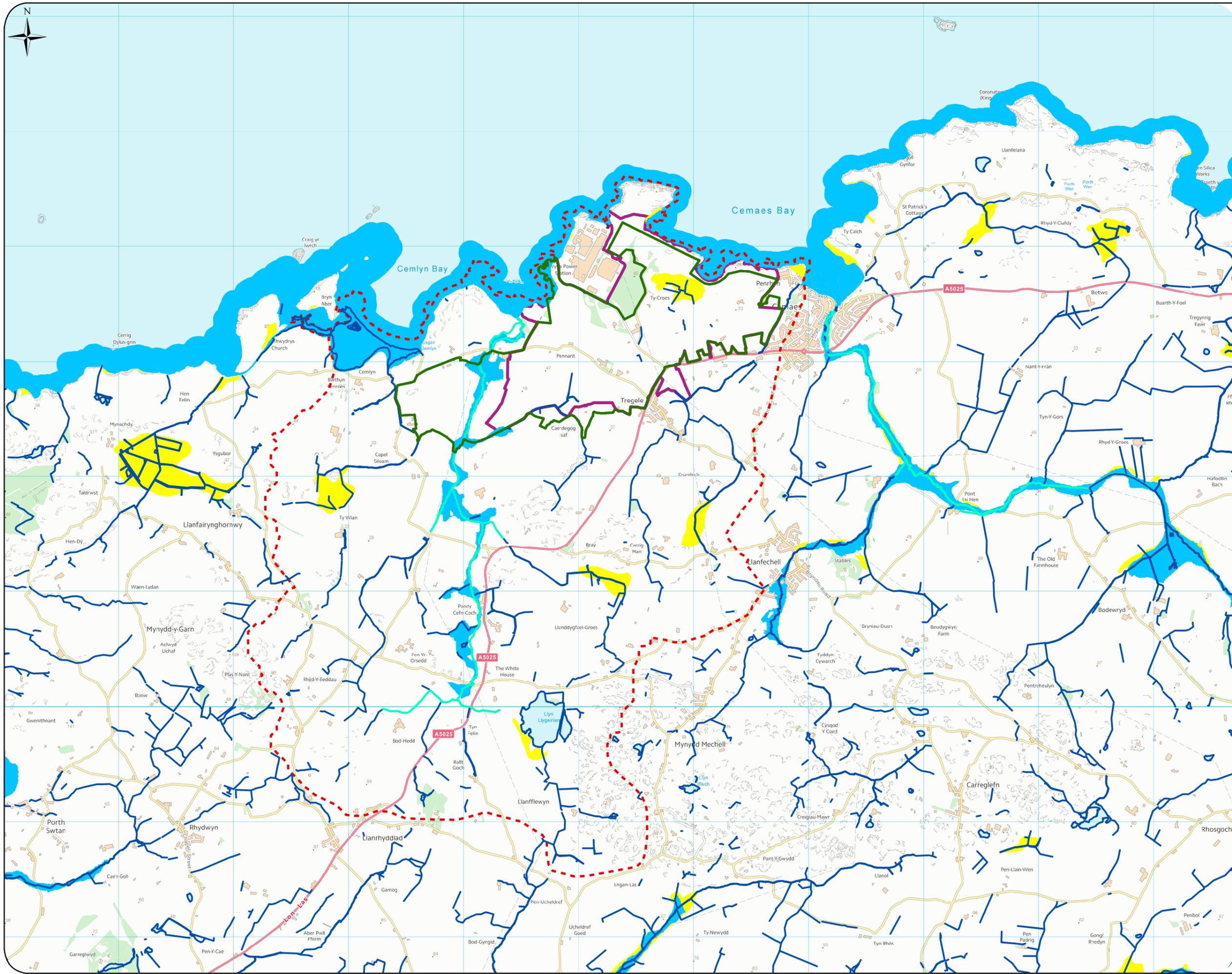
**FIGURE 11.3  
GEOMORPHOLOGY STUDY AREA**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Geomorphology Study Area



Scale: 1:20,000  
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m





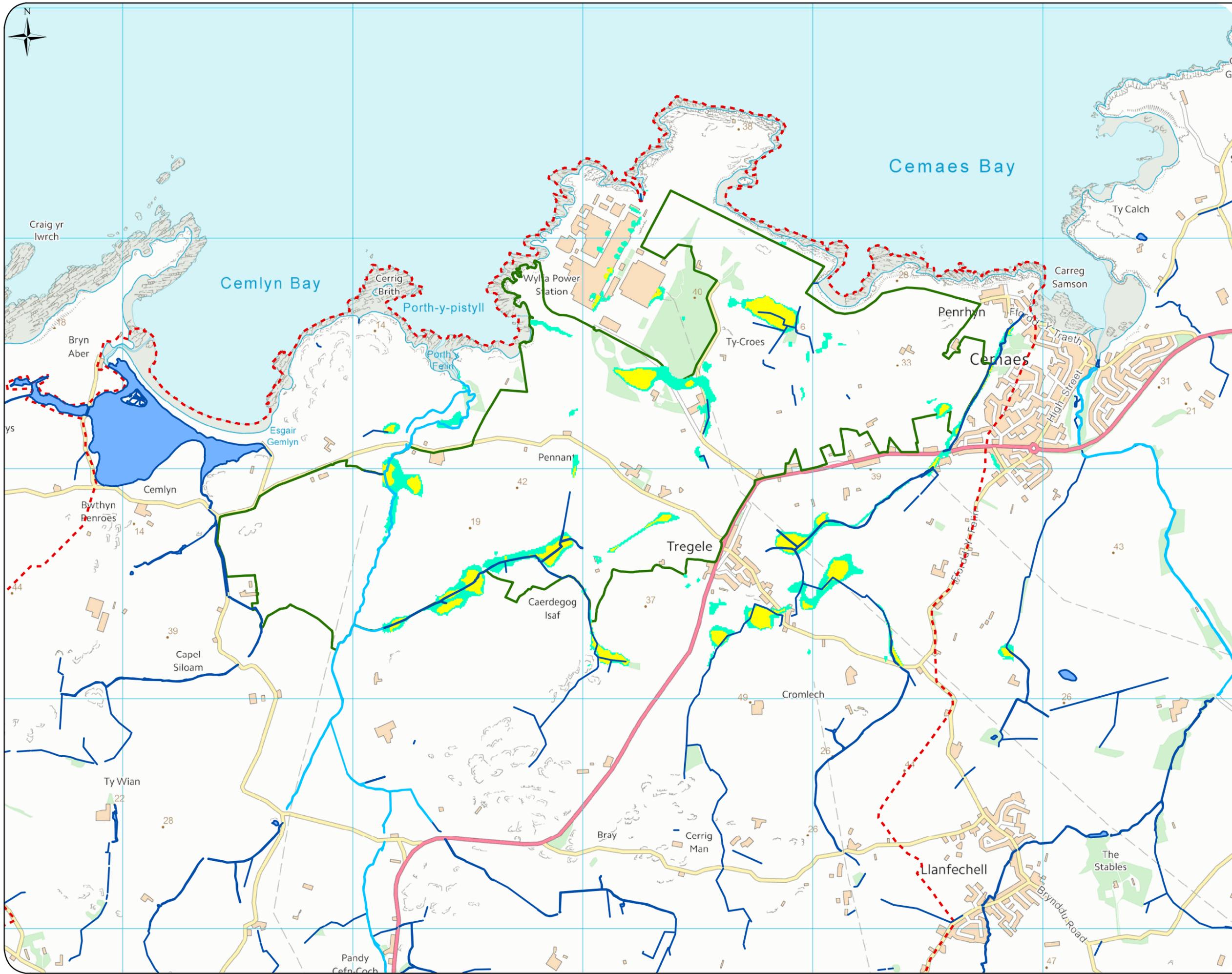
**FIGURE 11.4**  
**TAN15 DEVELOPMENT ADVICE MAP**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Flood Risk Study Area
  - Streams/rivers forming part of the Coastal WFD water body catchments
  - Fluvial WFD water bodies
  - Zone A: Considered to be at little or no risk of fluvial or coastal/tidal flooding
  - Zone B: Areas known to have been flooded in the past
  - Zone C2: Without significant flood defence infrastructure



Scale: 1:30,000  
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**FIGURE 11.5**  
**FLOOD EXTENTS DERIVED FROM**  
**FLUVIAL AND PLUVIAL**  
**FLOOD MODELLING**

- LEGEND
- Boundary of Site Preparation and Clearance
  - Flood Risk Study Area
  - Surface Water Features
  - Streams/rivers forming part of the Coastal WFD water body catchments
  - Fluvial WFD water bodies
  - Fluvial / Pluvial Flooding greater than 0.3m
  - Fluvial / Pluvial Flooding greater than 0.1m

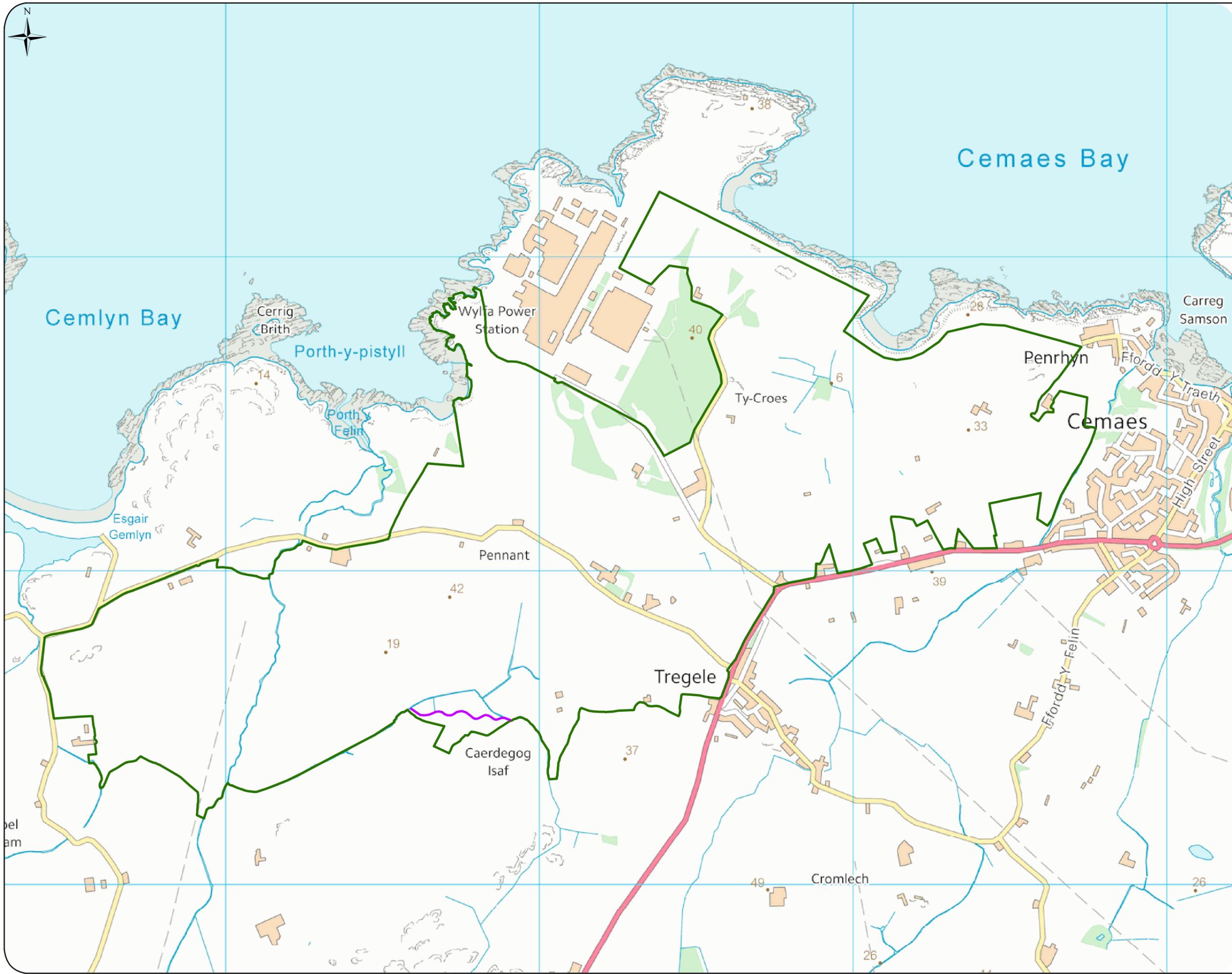


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**FIGURE 11.6**  
**DIVERSION OF**  
**CAERDEGOG ISAF WATERCOURSE**

- LEGEND
- Boundary of Site Preparation and Clearance
  - Proposed Watercourse Realignment



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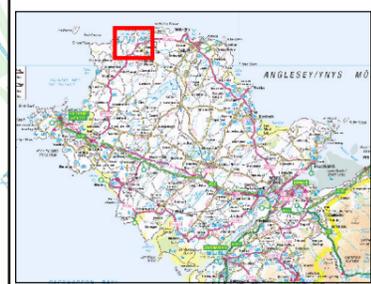
**HORIZON**  
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**FIGURE 12.1**  
**SOILS AND GEOLOGY**  
**STUDY AREA**

**LEGEND**

- Boundary of Site Preparation and Clearance
- Site Preparation and Clearance Study Area - Geology and Soils



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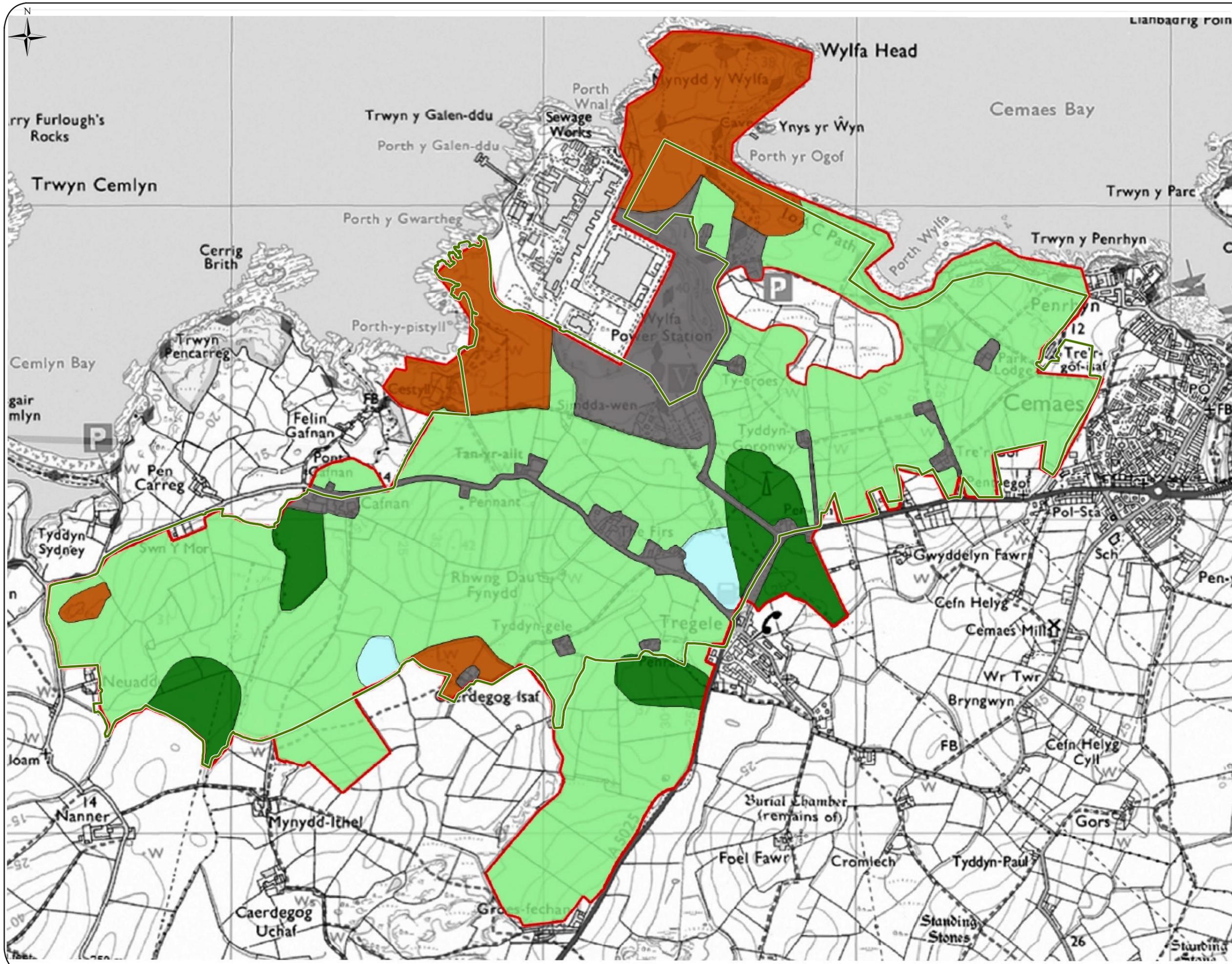


FIGURE 12.2  
AGRICULTURAL LAND CLASSIFICATION

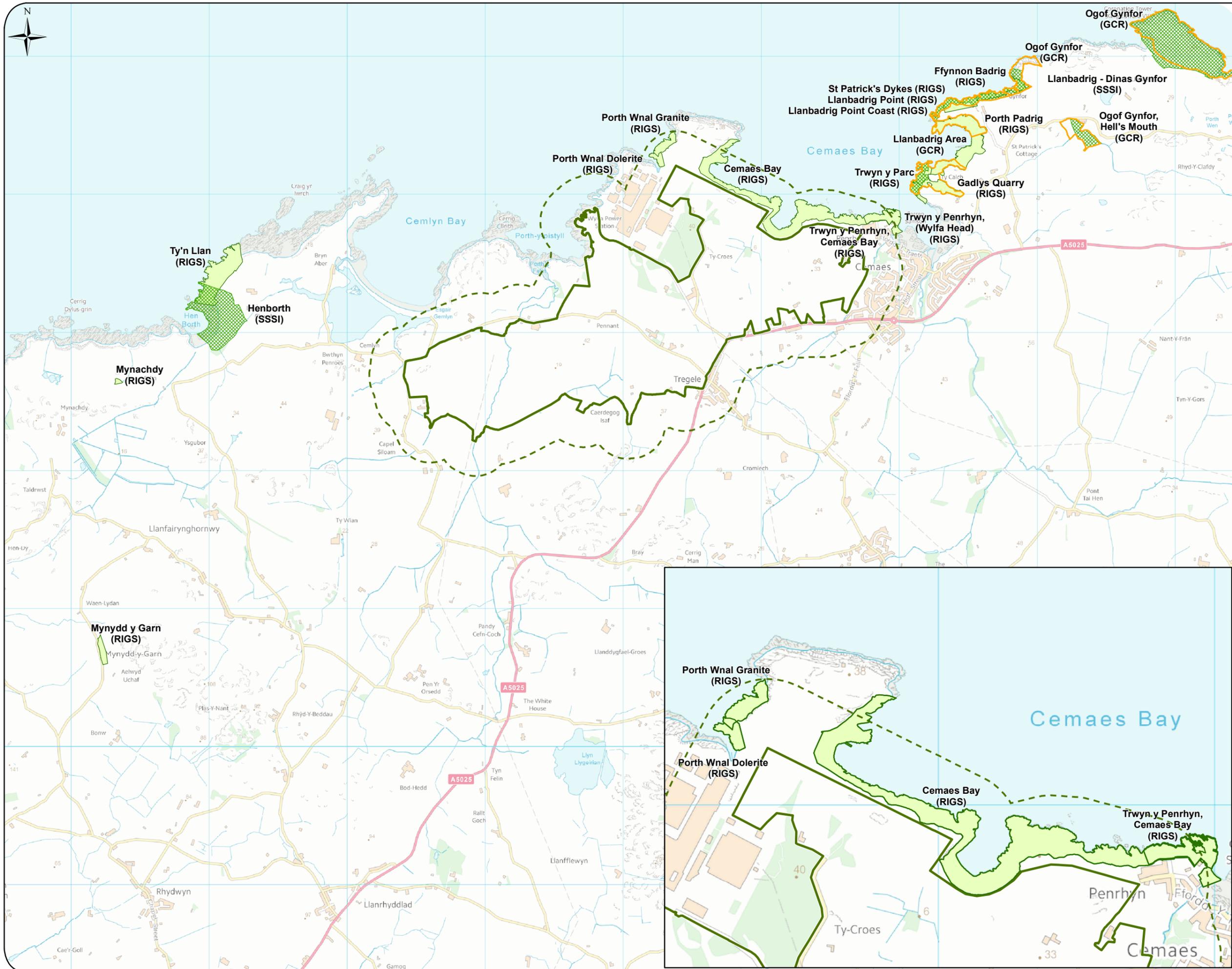
- LEGEND
- Boundary of Site Preparation and Clearance
  - Agricultural Land Classification - Study Area
  - \* Grade 1 - excellent quality
  - Grade 2 - very good quality
  - Subgrade 3a - good quality
  - Subgrade 3b - moderate quality
  - Grade 4 - poor quality
  - Grade 5 - very poor quality
  - \* Not Present

Source: Reading Agricultural Consultants Ltd (2015) Wylfa Nuclear Power Station Anglesey – Agricultural Land Classification and Soil Resources



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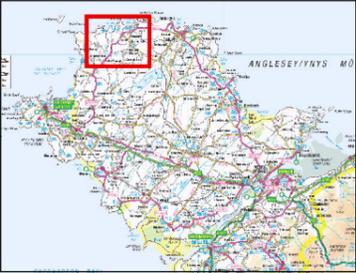
**HORIZON**  
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**FIGURE 12.3 DESIGNATED SITES OF GEOLOGICAL IMPORTANCE**

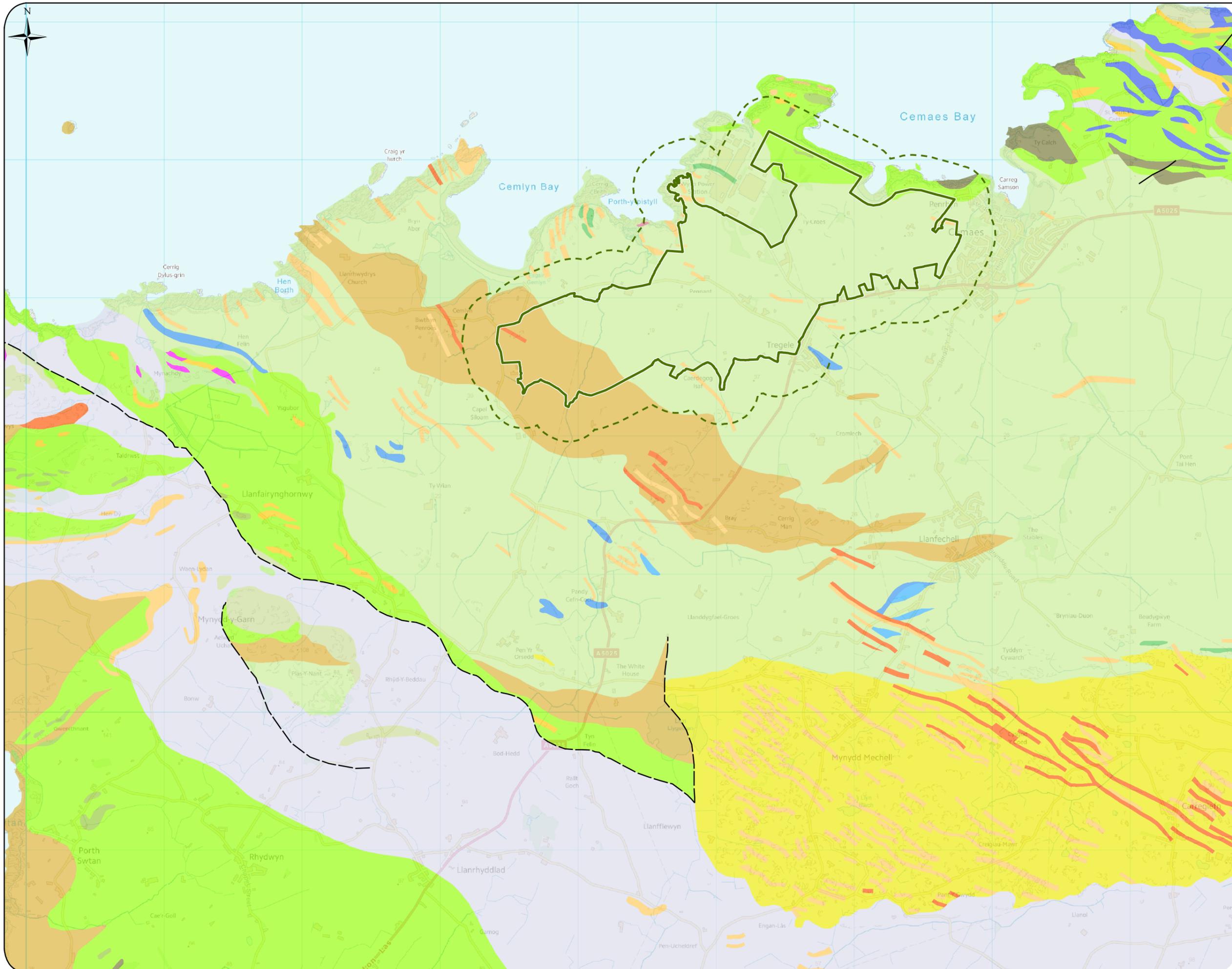
**LEGEND**

- Boundary of Site Preparation and Clearance
- Site Preparation and Clearance Study Area - Geology and Soils
- Geological Site of Special Scientific Interest (SSSI)
- Regionally Important Geological Site (RIGS)
- Geological Conservation Review (GCR)



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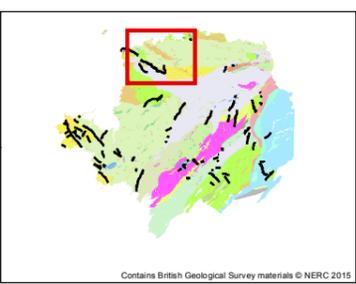




**FIGURE 12.4**  
**PUBLISHED BEDROCK GEOLOGY**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Site Preparation and Clearance Study Area - Geology and Soils
  - Fault, inferred, displacement unknown
  - Fault, observed, displacement unknown
  - OLD RED SANDSTONE SUPERGROUP - SANDSTONE
  - ORDOVICIAN ROCKS (UNDIFFERENTIATED) - MUDSTONE AND SANDSTONE, INTERBEDDED
  - ORDOVICIAN ROCKS (UNDIFFERENTIATED) - SANDSTONE AND CONGLOMERATE, INTERBEDDED
  - CENTRAL ANGLESEY SHEAR ZONE AND BERW SHEAR ZONE (UNDIFFERENTIATED) - SCHIST, GLAUCOPHANE
  - COEDANA COMPLEX - GRANITE, GNEISSOSE
  - COEDANA COMPLEX - GNEISS, MICACEOUS
  - CHURCH BAY TUFFS AND SKERRIES GRITS (UNDIFFERENTIATED) - TUFF AND SANDSTONE
  - GWNA GROUP - FELSITE
  - GWNA GROUP - METABASALTIC-ROCK
  - GWNA GROUP - PELITE
  - GWNA GROUP - QUARTZITE
  - GWNA GROUP - SCHIST
  - NEW HARBOUR GROUP - CALCILICATE-ROCK
  - NEW HARBOUR GROUP - JASPER
  - NEW HARBOUR GROUP - LAVA
  - NEW HARBOUR GROUP - MICA SCHIST AND PSAMMITE
  - SOUTH STACK FORMATION - PSAMMITE AND PELITE
  - UNNAMED IGNEOUS INTRUSION OF UNKNOWN AGE - FELSITE
  - UNNAMED IGNEOUS INTRUSION OF UNKNOWN AGE - GABBRO, MICROGABBRO AND DIORITE
  - UNNAMED IGNEOUS INTRUSION OF UNKNOWN AGE - SERPENTINITE

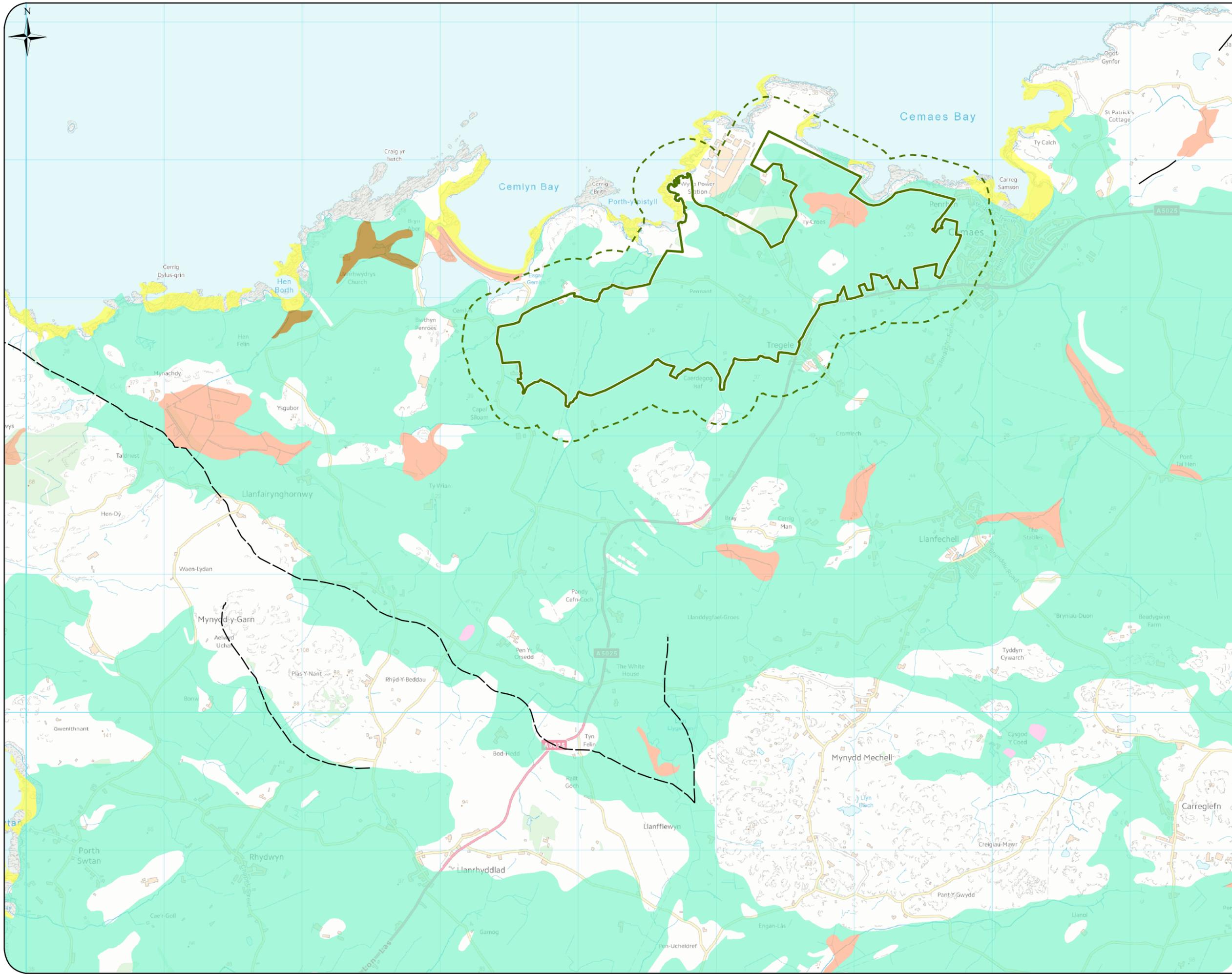
Source:  
Data obtained from the British Geological Survey (BGS).



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m

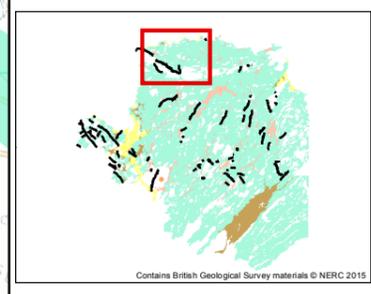


**FIGURE 12.5  
PUBLISHED SUPERFICIAL GEOLOGY**



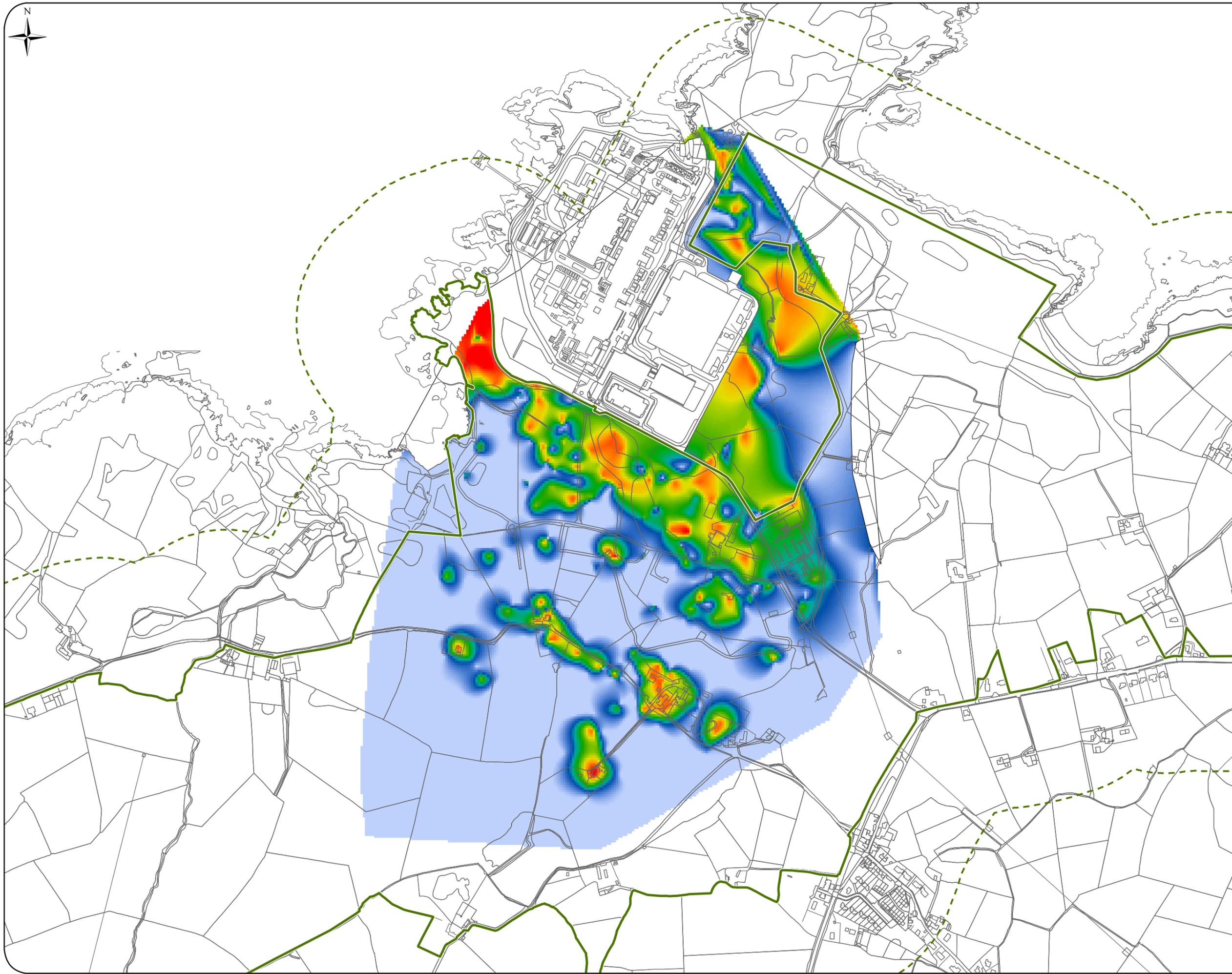
- LEGEND**
- Boundary of Site Preparation and Clearance
  - Site Preparation and Clearance Study Area
  - Fault, inferred, displacement unknown
  - Fault, observed, displacement unknown
  - ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
  - COASTAL ZONE DEPOSITS (UNDIFFERENTIATED) - SAND, SILT AND CLAY
  - TIDAL FLAT DEPOSITS - CLAY AND SILT
  - GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
  - GLACIAL TILL, DEVENSIAN - DIAMICTON

Source:  
Data obtained from the British Geological Survey (BGS).



Scale: 1:25,000  
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0 200 400 600  
m

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**FIGURE 12.6**  
**INDICATIVE LOCATION OF WORST-CASE**  
**MADE GROUND BY TYPE**

**LEGEND**

- Boundary of Site Preparation and Clearance
- Site Preparation and Clearance Study Area - Geology and Soils

Made Ground Interpolation

- Made Ground not found
- Type 4 Made Ground
- Type 3 Made Ground
- Type 2 Made Ground
- Type 1 Made Ground

Notes:  
 Made Ground Types identified as interpreted by DOnGI. Made Ground Type descriptions can be found in Table 3.1. Ground investigation data from Soil Mechanics Onshore and Offshore GI (1997-1998), PSI (2010), IOnGI and IOffGI (2011), DOnGI (2014) and SSL (2015). Display shows all Made Ground Types 1-4. Where multiple Types occur at the same location, the lowest Type has been displayed, to provide a worst case assumption of Made Ground present.



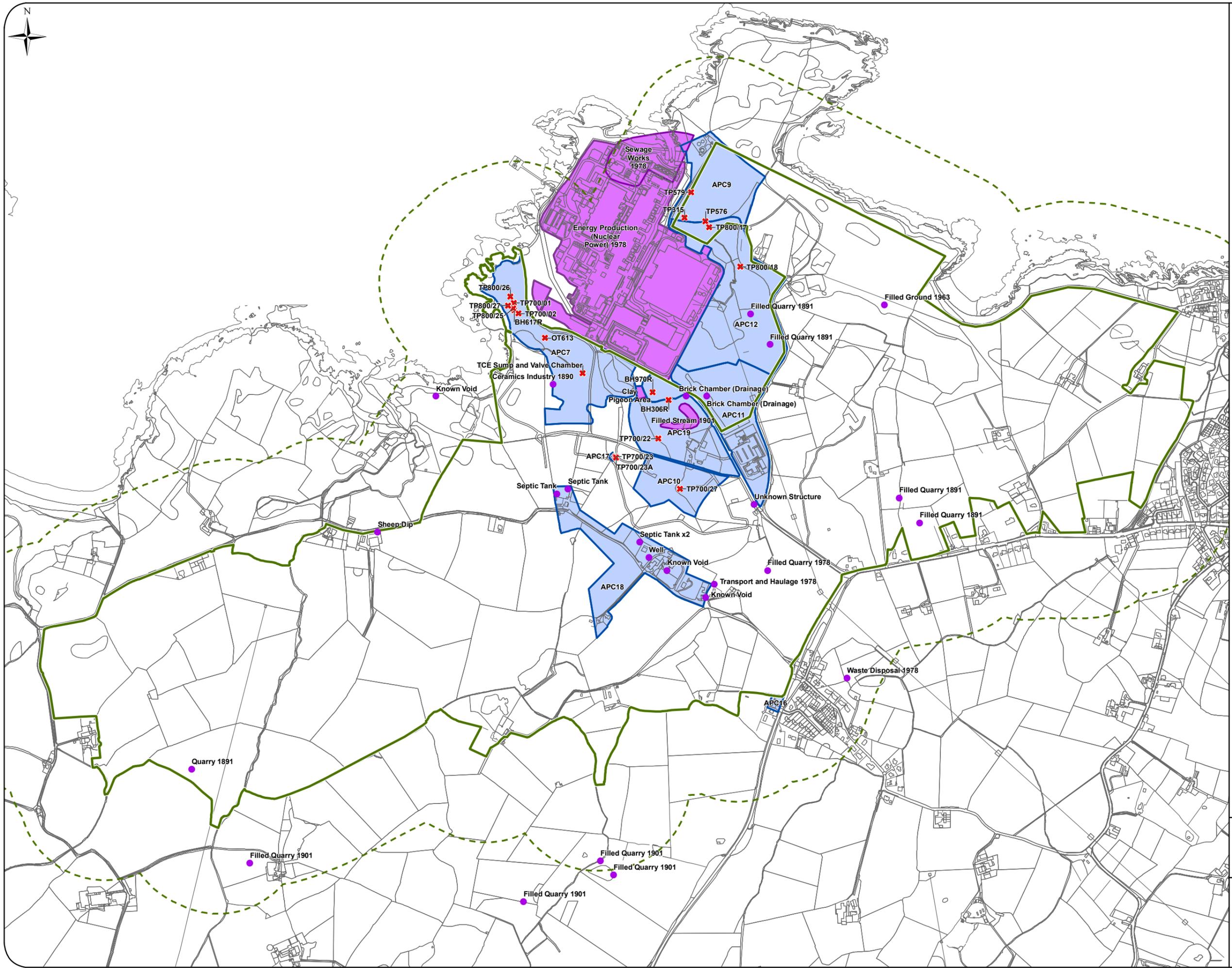
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FIGURE 12.7  
CONTAMINATION - AREAS  
OF POTENTIAL CONCERN

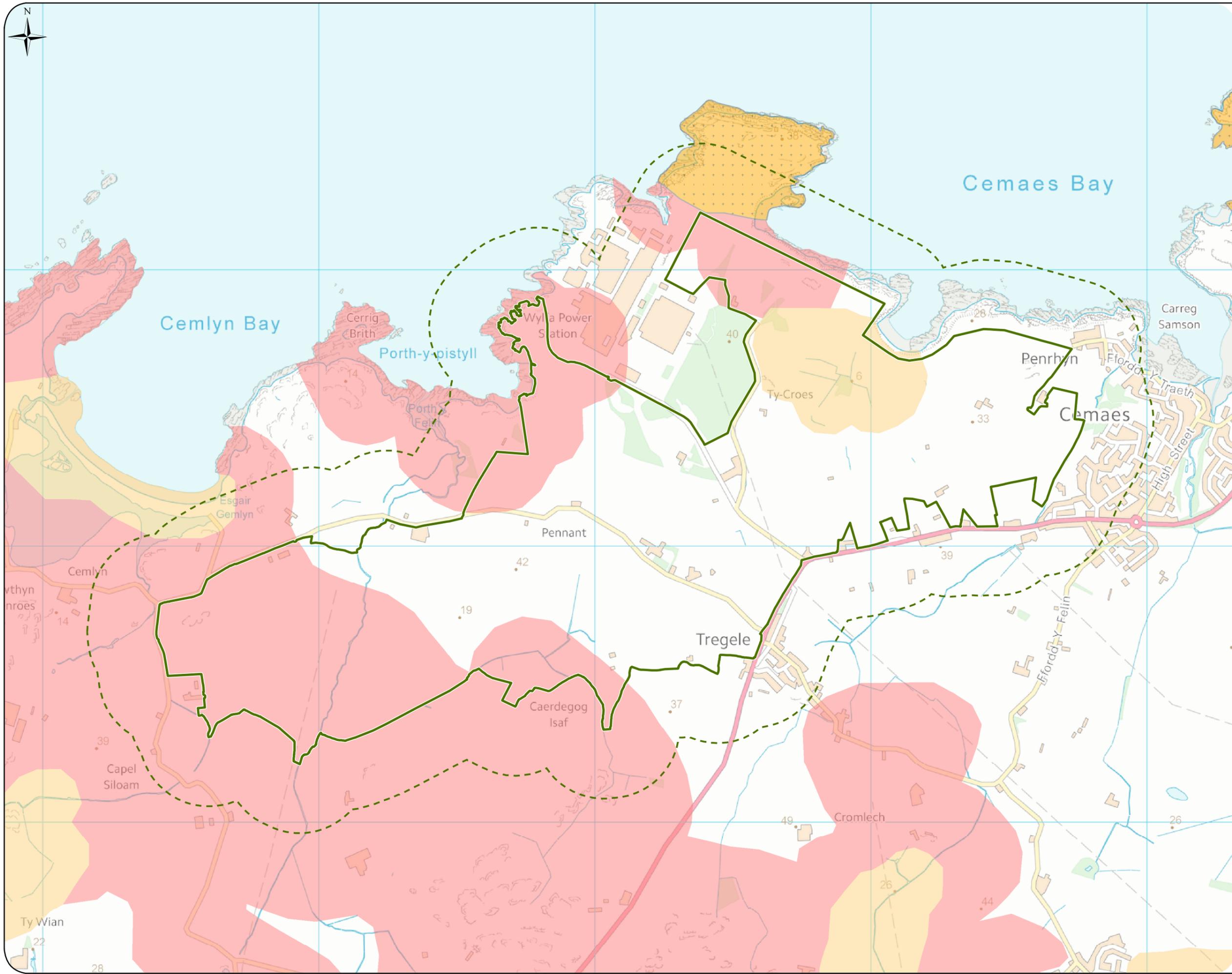
- LEGEND**
- Boundary of Site Preparation and Clearance
  - Site Preparation and Clearance Study Area - Geology and Soils
  - Exploratory Hole Showing Evidence of Contamination
  - Potential Sources of Contamination
  - Areas of Potential Concern



Scale: 1:10,000  
When printed at A3

0 100 200 300 m



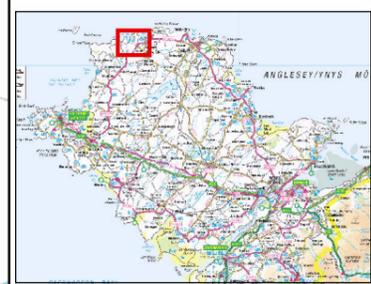


**FIGURE 12.8**  
**AGGREGATE SAFEGUARDING AREAS**

**LEGEND**

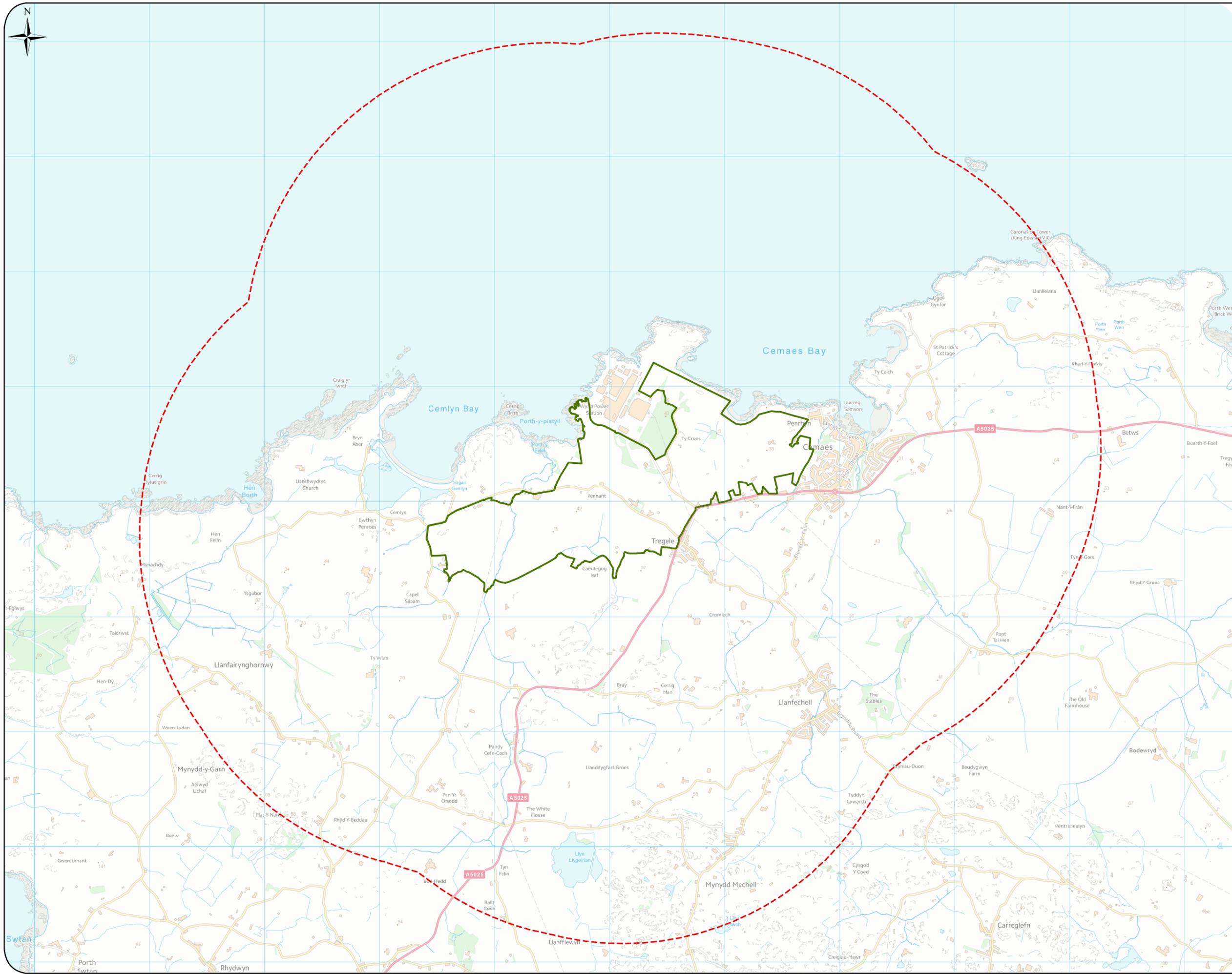
- Boundary of Site Preparation and Clearance
- Site Preparation and Clearance Study Area - Geology and Soils
- Category 2 Aggregates Safeguarding**
- Sand and gravel
- Sandstone (stipple denotes quartzitic sandstone with potential for silica sand and silica rock)
- Igneous rocks

Source:  
BGS and Welsh Assembly (2012) North West Wales Aggregate Safeguarding Map



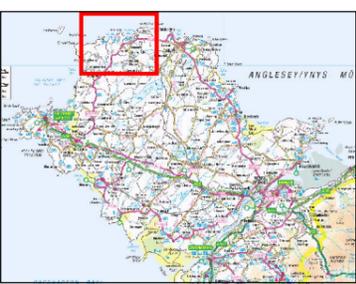
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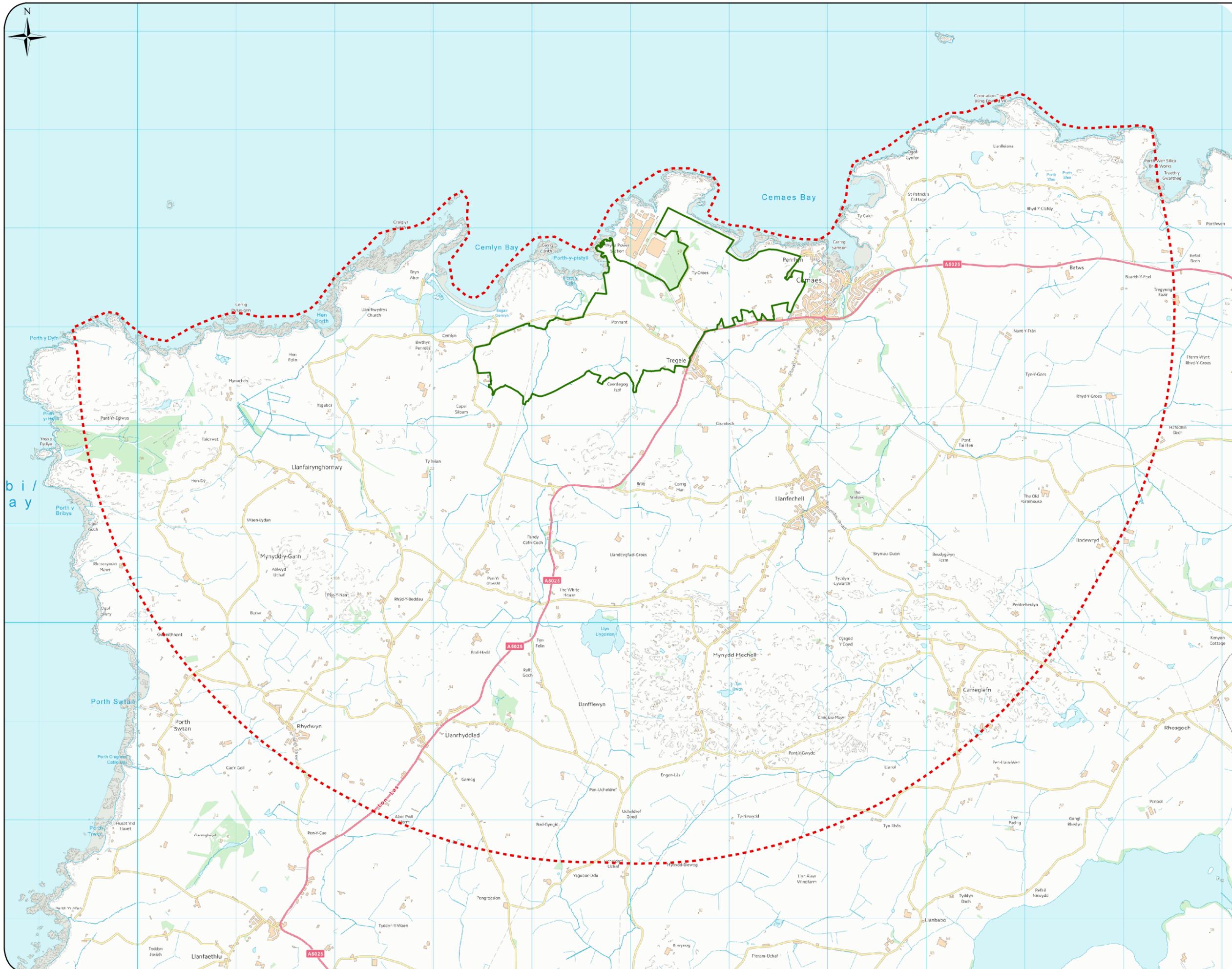
**FIGURE 13.1**  
**PUBLIC ACCESS AND RECREATION**  
**STUDY AREA**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Recreation Study Area



Scale: 1:30,000  
 When printed at A3  
 0 250 500 750  
 m





**FIGURE 14.1**  
**SOCIO ECONOMIC STUDY AREA**

- LEGEND**
- Boundary of Site Preparation and Clearance
  - Socio-economic Local Area of Influence



Scale: 1:35,000  
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m

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