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Wylfa Newydd

Horizon Nuclear Power (Wylfa) Ltd

Otter and Water Vole Technical Summary Report

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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[1]. 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[2] 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 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 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).

[1] 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.

[2] 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 3 – 2013

Watercourse 4 – 2014

Watercourse 10 – 2014

Watercourse 12 – 2014

Watercourse 13 – 2013

Watercourse 16 – 2014

Watercourse 28 – 2014

Cemlyn Lagoon – 2014

Coastal Stretch 1 – 2013

Coastal Stretch 2 – 2014

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 3 – 2010

Watercourse 8 – 2011

Watercourse 10 – 2014

Watercourse 13 – 2013

Watercourse 15 – 2013

Watercourse 19 – 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 *Anguila anguila*, 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^2 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 re-colonisation 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^2 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.

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Appendix A. Incidental Records

Table 6.1 Incidental records from Jacobs ecologists

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

Appendix B. Figures

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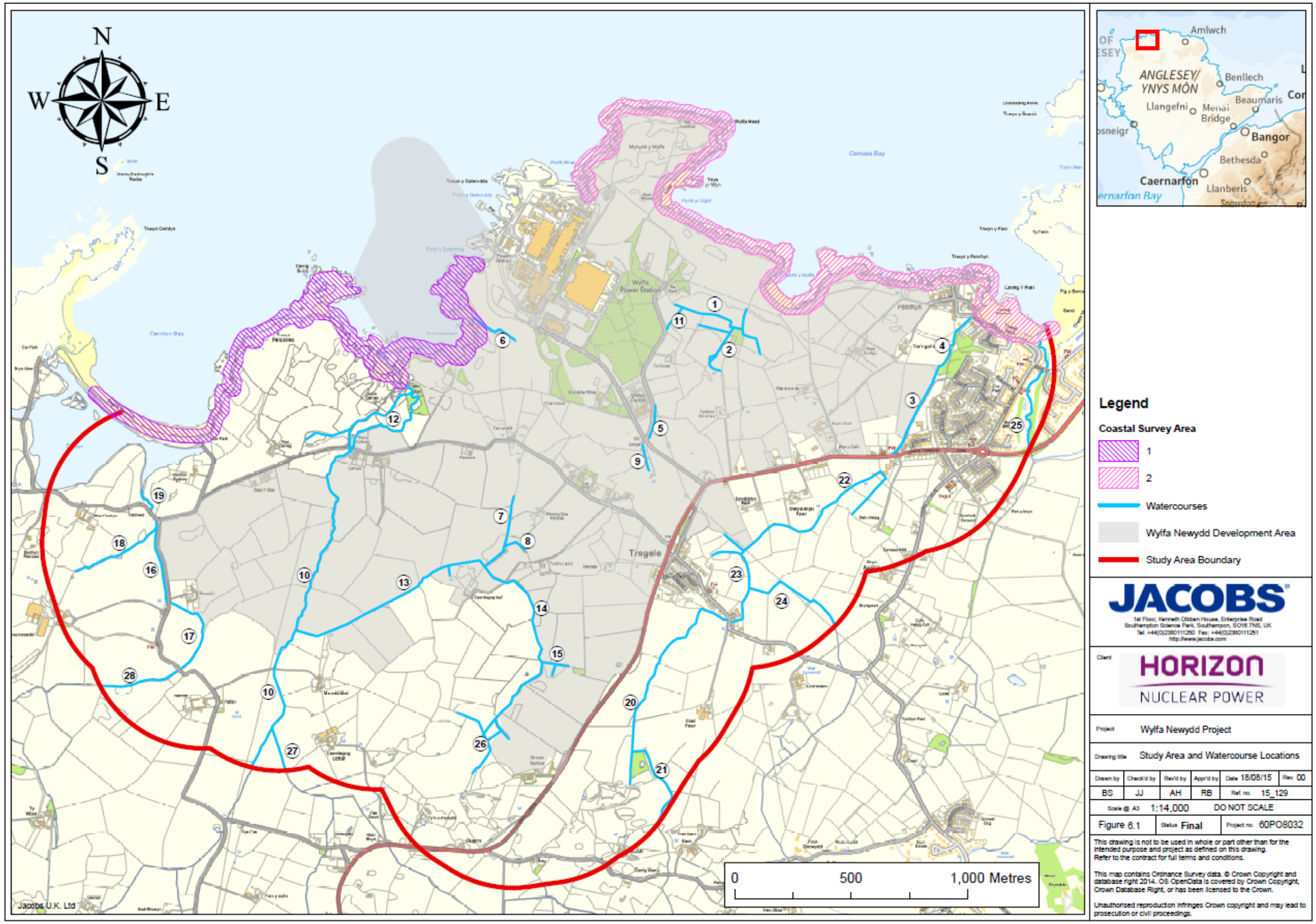

Figure 6.1 Study area and watercourse locations

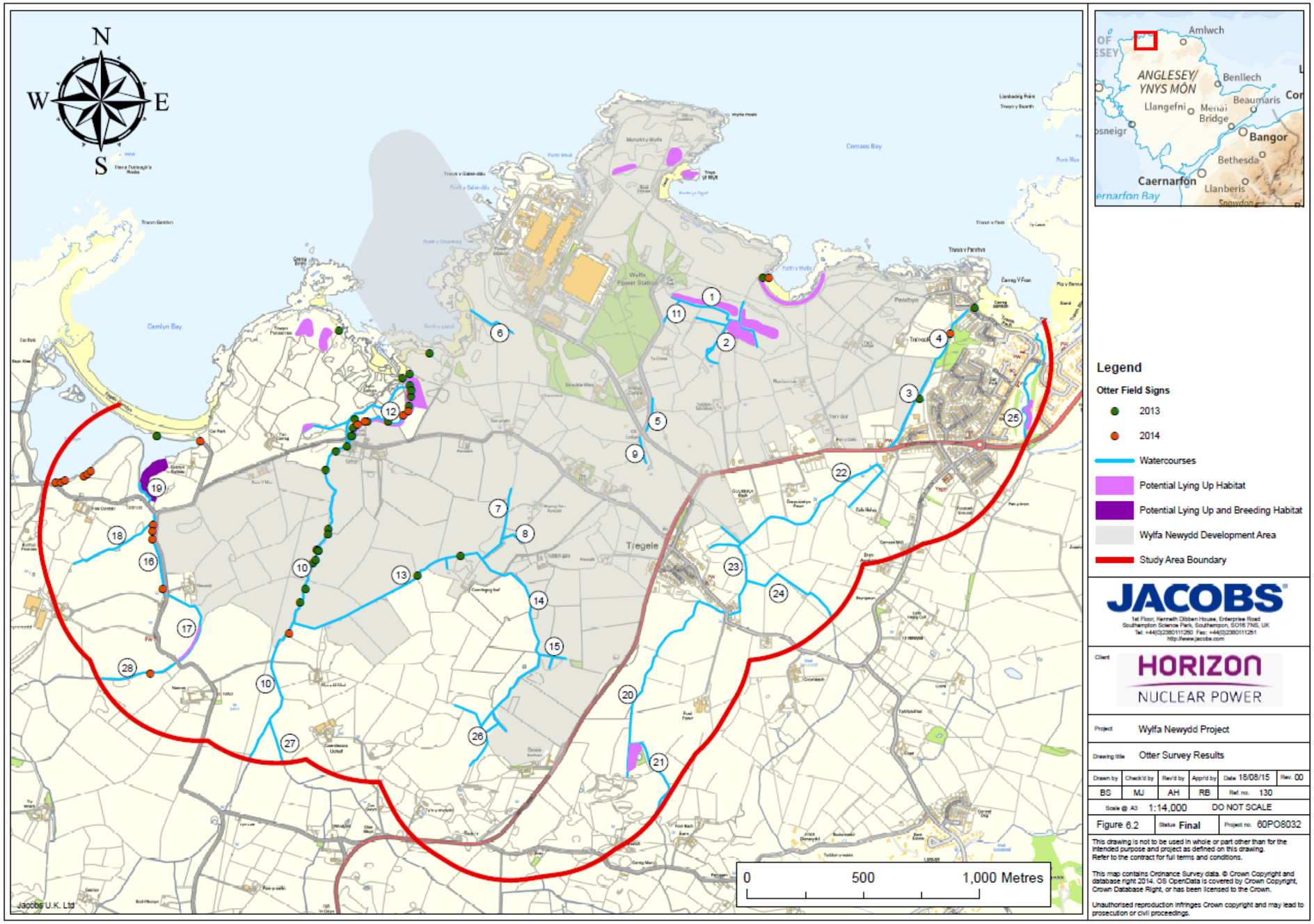

Figure 6.2 Otter survey results 2013 and 2014

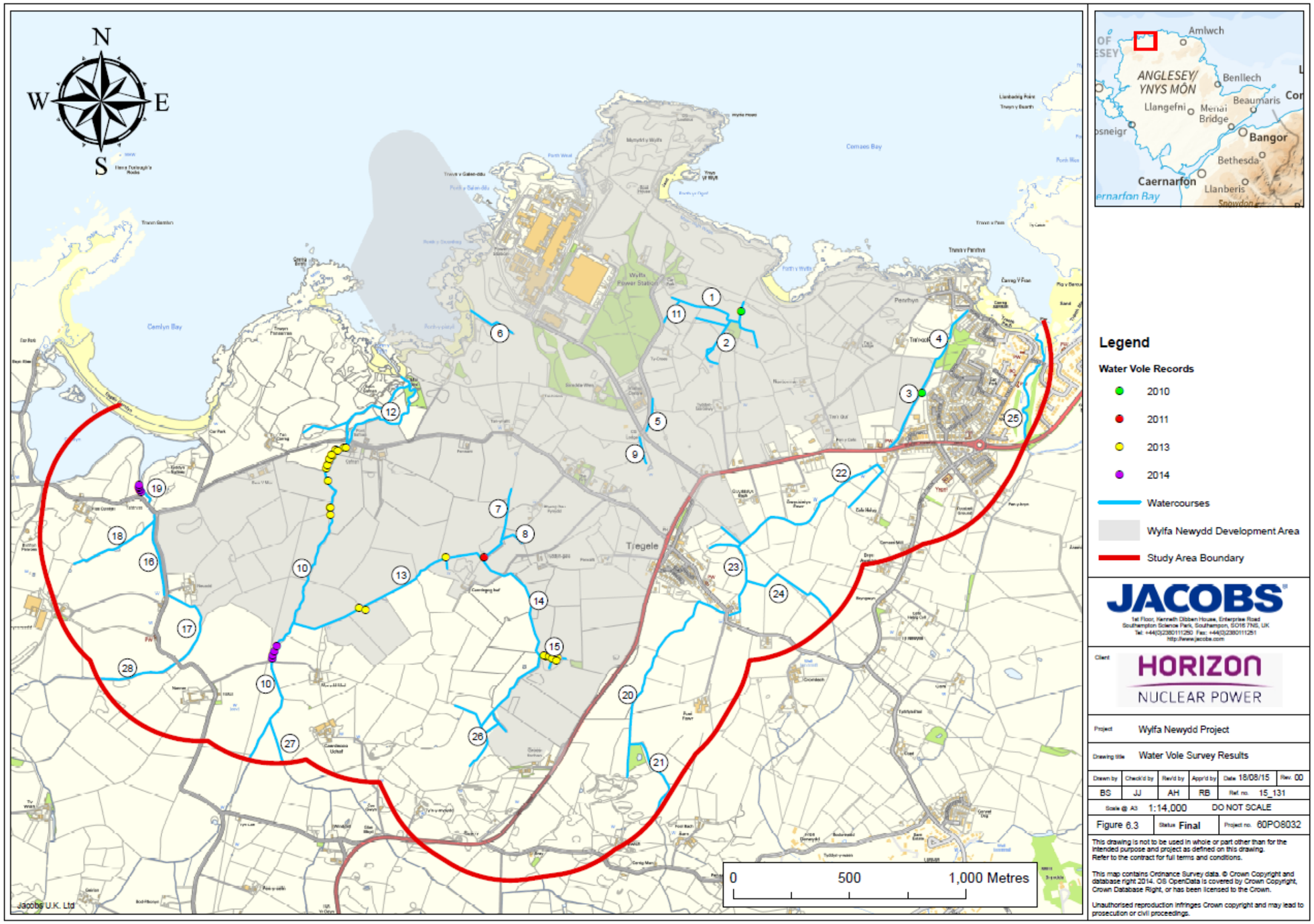

Figure 6.3 Water vole survey results

Appendix C. Cofnod Background Data Search Records

Table 6.2 Cofnod background data search records

Scientific Name	English Name	Location	Record Date	Abundance
Lutra lutra	Otter	Cemlyn (Compartment 13)	Before September 1990	Not given
Lutra lutra	Otter	In the sea	01/09/2001	1
Lutra lutra	Otter	SSSI: Cemlyn Bay	Before 12/08/1981	Spraint only
Lutra lutra	Otter	Cemlyn; The Trwyn	12/06/2011	1
Arvicola amphibius	Water vole	Cemlyn – Compartment 541; Eastern Car Park	09/06/1986	1
Arvicola amphibius	Water vole	Cemlyn – Compartment 541; Eastern Car Park	03/07/1986	2
Arvicola amphibius	Water vole	Cemlyn	17/05/2008	Prints only
Arvicola amphibius	Water vole	Cemlyn	23/05/2001 – 26/07/2001	Heard only
Arvicola amphibius	Water vole	Cemlyn	28/06/1999	1 (seen in mouth of weasel)
Arvicola amphibius	Water vole	Cemlyn	Spring 1998 – Summer 1998	Burrows
Arvicola amphibius	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.[3]
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.

[3] "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.	-[4]	-	-	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.

[4] "-" 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.[5]
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.

[5] "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	-[6]	-	-	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.

[6] "-" 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.