The Abergelli Power Gas Fired Generating Station Order

6.2 Environmental Statement Appendices - Volume F Ecology Part II

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Appendix 8.7

Bat Activity Transect and Roost Survey Report

Abergelli Power Project
Bat Activity and Roost Survey

Abergelli Power Limited
April 2018

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Author	Clare Morgans
Approved by (1st checker)	Lisbeth Nash
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Prepared for:

Abergelli Power Limited

Prepared by:

AECOM Limited
3rd Floor
Portwall Place
Portwall Lane
Bristol
BS1 6NA
UK

T: +44 117 901 7000
aecom.com

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1. Bat Survey Report

1.1 Introduction

1.1.1 AECOM was commissioned to undertake a suite of ecological survey work to inform the Abergelli Power Project (the "Project").

1.1.2 The Project Site is located near to the village of Felindre, Swansea, as shown in Figure 1.1. The central grid reference for the Project Site is SN65280143.

1.1.3 The Preliminary Ecological Appraisal (PEA) Report (Appendix 8.1 of the ES) identified that surveys for bats were required at the Project Site. The Project Site was assessed as having 'High' commuting and foraging potential (Collins, 2016). Four buildings (outside of, but adjacent to the Project Site boundary) were assessed as having the potential to support roosting bats (Appendix 8.1 of the ES).

1.1.4 This baseline report outlines the presence of bat species within the Project Site boundary and makes initial indications of potential effects and outlines initial recommendations for further surveys, mitigation and enhancement.

1.1.5 The bat survey encompasses suitable habitat in close proximity to and within the Project Site boundary, as shown on Figure 1 and Figures 3.1-3.4.

1.1.6 Previous surveys have been undertaken by BSG Ecology in 2014 which are presented in Appendix 8.1 of the ES.

1.2 Site Description

1.2.1 The Project Site supports semi-natural broadleaved and plantation woodland, rows of broadleaved trees, standalone broadleaved trees, dense and scattered scrub, improved and semi-improved grassland and marshy grassland, tall ruderal, running water ditches, ponds, species-rich hedgerow with trees, species-poor hedgerow with trees, species-poor intact hedgerows, earth banks, fences and bare ground (hard standing). In order to cover the Project Site adequately two walked transects were undertaken and nine static detector monitoring locations were established across the Project Site.

1.2.2 The walked transect North (Figure 3.1) predominantly encompasses improved grassland fields with hedgerows and mature tree lines. It also includes a few areas of dense scrub, semi-improved neutral grassland, and a running water ditch (which is connected to the Afon Llan watercourse outside of the Project Site) and a tree lined minor road and track.

1.2.3 The walked transect South (Figiure 3.1) predominantly encompasses; marshy and improved grassland fields with hedgerows and treelines, with ancient and semi-natural woodland. It also includes semi-improved neutral grassland and areas of scattered scrub. There are three running water ditches and the walked transect runs adjacent to a an area of running water on the eastern Project Site boundary which connects to the Afon Llan watercourse, which is outside of the Project Site.

1.2.4 Plates 1.6 and 1.7 show exmaples of the transect habitats.

1.2.5 The nine static detector monitoring locations were placed on field boundaries across the Project Site, sampling improved grassland, semi-improved grassland, marshy grassland, field boundaries, woodland edges and trees lines. Table 1.25 describes the habitats around each static detector location and locations of the static detectors are shown in Figure 3.4.

1.3 The Project

1.3.1 Full details of the Project and Site Description are provided in Chapter 3: Project & Site Description.

1.4 Objectives of the Study

1.4.1 The objectives of this study were:

- To identify nature conservation sites within the Project Site or within 10km of the Project Site boundary designated for bats;
- To identify any known records and/or populations of bats within the Project Site or within 2km of the Project Site boundary;
- To establish the presence of any bat roosts within the Project Site;
- To establish bat species composition within the Project Site;
- To record and map spatial distribution and temporal bat activity within the Project Site;
- To highlight any potential ecological constraints in respect to bats;
- To outline further survey work that may be required; and,
- To make suggestions for mitigation, compensation and enhancement of the natural features identified within the Project Site in respect to bats.

1.5 Legislation

1.5.1 All bats and their roosts in Wales are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). They are also included in Schedule 2 of the Conservation of Habitats and Species Regulations 2010, known as The Habitats Regulations. The Wildlife and Countryside Act 1981 was amended by the Countryside and Rights of Way Act 2000 (CRoW) which adds an extra offence of recklessly disturbing roosting bats or obstructing access to their roosts; makes species offences arrestable, increases the time limits for some prosecutions and increases penalties.

1.5.2 The Wildlife and Countryside Act, the Habitats Regulations and the CRoW Act, together make it an offence, among other things, to recklessly, intentionally or deliberately:

- Deliberately capture, injure or kill any wild animal which is a European Protected Species (EPS),
- Deliberately disturb wild animals of any such species, and,
- Damage or destroy a breeding site or resting place of such an animal

1.5.3 Disturbance is defined as that which is likely:

- To impair their ability:
  - To survive, to breed or reproduce, or to rear or nurture their young, or
  - In the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- To affect significantly the local distribution or abundance of the species to which they belong.

1.5.4 A bat roost is defined as "*any structure or place (including trees) which any bat uses for shelter or protection".* Because bats tend to re-use the same roosts, legal opinion is that the roost is protected whether or not the bat(s) are present at the time.

1.5.5 If the Project is likely to destroy or disturb bats or their roosts, then a European Protected Species License (EPSL) will be required from Natural Resources Wales (NRW), which would be subject to appropriate mitigation and working methods to protect bats.

1.5.6 This is a brief summary of the legislation. When dealing with individual cases, the client is advised to consult the full texts of the relevant legislation and obtain further legal advice.

1.6 Quality Assurance

1.6.1 This survey and subsequent report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to establishing and maintaining our certification to the international standards BS EN ISO 9001:2008 and 14001:2004 and BS OHSAS 18001:2007. In addition, our IMS requires careful selection and monitoring of the performance of all sub-consultants and contractors.

1.6.2 All AECOM Ecologists who worked on this project are members of (at the appropriate level) the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2017) when undertaking ecological work.

1.7 Methodology

a) Desk study

1.7.1 The desk study was completed as part of the AECOM PEA (Appendix 8.1 of the ES). In relation to bats, the objectives of the desk study were to review the existing information available in the public domain to identify the following:

- Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs) designated for bats within a 10km radius of the Project Site boundary paying due regard to Bat Conservation Trust (BCT) guidelines (Collins, 2016) ,

using the Multi Agency Geographic Information for the Countryside (MAGIC) website (NE, 2017);

- Bat records up to 2km from the Project Site boundary, purchased from the South East Wales Biodiversity Records Centre (SEWBReC);
- Ancient Semi-Natural Woodland (ASNW), Plantation on Ancient Woodland Site (PAWS), Restored Ancient Woodland Site (RAWS) or Ancient Woodland Site of Unknown category (AWSU) within or adjacent to the Project Site using Ancient Woodland Inventory 2011 dataset downloaded from the Lle website (WG and NRW, 2017);
- The Section 7 list of species of Principal Importance for Conservation of Biological Diversity in Wales; and,
- Features of ecological interest surrounding the Project Site, and features connecting these habitats (e.g. hedgerows, watercourses, railway lines) using aerial photographs and Ordnance Survey (OS) maps.

1.7.2 The County Ecologist and Glamorgan Bat Group was consulted regarding locally designated site citations, local bat records not available from SEWBReC and any local knowledge about the area.

1.7.3 Appendix 8.8 of the ES which contains the previous bat surveys undertaken by BSG Ecology in 2014 was provided by the client and reviewed.

b) Bat Roosts in Buildings

i. Preliminary Ground Level Roost Assessments

1.7.4 There are no buildings within the Project Site. Buildings adjacent (adjacent is defined as up to 20m from the Site boundary) to the Project Site boundary were classified into categories dependent on the presence of features suitable as bat roost habitat.

1.7.5 The assessment was conducted via an external appraisal from the ground using binoculars where necessary. Table 1.1 provides descriptions of the roost potential categories for buildings.

ii. Emergence/Re-Entry Surveys

1.7.6 Surveys paid due regard to Bat Surveys: Good Practice Guidelines (Collins, 2016). Each survey consisted of two surveyors stood around the buildings so that bats could be observed leaving/re-entering Potential Roost Features (PRF). Bat activity was also recorded if observed by the surveyors.

1.7.7 Emergence surveys started at least 15 minutes before sunset and continued for 2 hours. The dawn re-entry survey started at least 2 hours before sunrise and continued until 15 minutes after sunrise.

1.7.8 Broadband frequency division detectors were used and digital recordings were made to assist with species identification if required.

Table 1.1 Building and Tree Bat Roost Potential Categories

Roost Suitability	Descriptions for Buildings	Descriptions for Trees
Known or Confirmed	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potential for longer periods of time due to their size, shelter, protection, conditions (e. g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat. Can include structures with points of access to the interior of the building and poorly maintained fabric providing ready access points for bats into structures, but at the same time not draughty. Structures of traditional stone, brick or timber construction. Structures with large (>20cm) roof timbers with mortice joints, cracks and holes. Structures of pre or early 20th century construction. Structures with large complicated and/or uncluttered roof spaces providing unobstructed flying spaces. Structures with weather boarding and/or hanging tiles with gaps. Structures with accessible south facing roofs. Structures with proximity to good foraging habitat such as woodland, wetland, water and /or good hedgerows.	A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potential for longer periods of time due to their size, shelter, protection, conditions (e. g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions (e. g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat but unlikely to support a roost of high conservation status. Can include structures with some potential to support roosting bats, but fewer features than a high risk building. Features may include areas suitable for crevice dwelling and/or access points into structures. Some proximity to foraging habitat.	A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.

Roost Suitability	Descriptions for Buildings	Descriptions for Trees
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter protection, appropriate conditions and/or suitable habitat to be used on a regular basis or by large numbers of bats (i. e. unlikely to be suitable for maternity or hibernation).	Tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen have only very limited roosting potential.
Negligible	No features suitable for roosting bats. Can include structures constructed from unsuitable materials e. g. prefabricated with steel and sheet material. Structure is draughty, light and cool buildings with no roosting opportunities. High levels of regular disturbance including external and/or internal lighting. Building is isolated from areas of foraging habitat.	Trees with no potential to support bats.

Source: Category descriptions drawn from Collins, 2016 and Mitchell-Jones, 2004 to be applied using professional judgement

c) Bat Roosts in Trees

i. Preliminary Ground Assessment

1.7.9 The bat study area comprised the land within the Project Site boundary and the area within the Zone of Influence (ZoI) (Figure 2). The Bat Survey Guidelines (Collins, 2016) state that bat roost assessments must be considered within the Project Site boundary and the areas under the ZoI of the project. For potential bat roosts the ZoI was assessed to be all land within the Project Site boundary; and using professional judgement, within a 50 m buffer surrounding area where the Generating Equipment Site will be situated due to noise, vibration and lighting during construction, operation and decommissioning.

1.7.10 Trees within or adjacent (adjacent is defined as up to 20m from the Site boundary) to the Project Site boundary were classified into categories dependent on the presence of features suitable as bat roost habitat.

1.7.11 Trees up to 50m from the Generating Equipment Site were classified into categories dependent on the presence of features suitable as bat roost habitat.

1.7.12 The assessment was conducted via an external appraisal from the ground using binoculars where necessary. Table 1.1 provides descriptions of the roost potential categories for trees.

1.7.13 Eleven trees with bat roost potential were identified during the PEA (Appendix 8.1 of the ES). Thirty four trees were identified during a ground level roost assessment of trees in July 2017.

ii. Potential Roost Feature Climbed Inspection Survey

1.7.14 Following the Ground Level Roost Assessment trees which were assessed as having ‘Low or Moderate’ bat roost potential were subject to a PRF climbed inspection. No trees with High bat roost potential were identified.

1.7.15 These PRF climbed inspections were undertaken in August 2017. The inspections were completed by certified and bat licenced tree climbers.

1.7.16 The inspections paid due regard to Bat Surveys: Good Practice Guidelines (Collins, 2016), Bat Workers Manual (Mitchell-Jones and McLeish, 2004) and Bats and Woodland Management (Forestry Commission, 2005).

1.7.17 Trees were climbed using ropes and/or ladders. Once accessed, features were examined in detail using a torch, endoscope or mirror to inspect (where possible) the full extent of the features and search for bats or evidence of bat activity (e. g. droppings, urine stains, odour, feeding remains, scratch marks, grease stains, wear marks). Where necessary, trees were re-categorised following the PRF climbed inspection.

1.7.18 Two trees identified as having bat roost potential during the preliminary ground level roost assessments were not climbed as they were approximately 20 and 55m outside of the Project Site boundary.

1.7.19 Sixteen trees could not be accessed and two could not be found during the PRF climbed inspections, as described in the Limitations (Section 1.8).

iii. Emergence/Re-Entry Surveys

1.7.20 Following the Ground Level Roost Assessment and PRF climbed inspections, emergence/re-entry surveys were undertaken on trees with a category of Moderate or above.

1.7.21 Surveys paid due regard to Bat Surveys: Good Practice Guidelines (Collins, 2016). Each survey consisted of one surveyor stood so that bats could be observed leaving/re-entering the PRF. Bat activity was also recorded if observed by the surveyors.

1.7.22 Emergence surveys started at least 15 minutes before sunset and continued for 2 hours (see Limitations). The dawn re-entry survey started at least 2 hours before sunrise and continued until 15 minutes after sunrise.

1.7.23 Broadband frequency division detectors were used and digital recordings were made to assist with species identification if required. The weather conditions during the surveys were recorded and were largely considered favourable for bats. Survey dates and weather conditions are given in Table 1.3.

d) Bat Activity Surveys

i. Preliminary Assessment of Potential Commuting and Foraging Habitat

1.7.24 The Project Site was assessed as having High commuting and foraging potential for bats (Collins, 2016) during the PEA (Appendix 8.1 of the ES). Habitats within the Project Site were classified into categories dependent on the presence of features suitable for bats to commute and forage. Table 1.2 provides category descriptions for commuting and foraging habitat.

Table 1.2 Commuting and Foraging Habitat Potential Categories

Roost Suitability	Descriptions
High	Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
Low	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or un-vegetated stream, but isolated, i. e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small number of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Negligible	Negligible habitat features on site likely to be used by commuting or foraging bats.

Source: Category descriptions drawn from Collins, 2016 to be applied using professional judgement

ii. Bat Activity – Walked Transects

1.7.25 Surveys paid due regard to Bat Surveys: Good Practice Guidelines (Collins, 2016). Two walked transect routes were developed to sample the Project Site, one in the north and one in the south. These are shown on Figures 3.1 to 3.3.

1.7.26 Each transect was walked twice per month. Dusk activity surveys were completed in June, July, August, September and October 2017. One dusk and dawn survey within one 24 hour period was completed in September 2017.

1.7.27 No surveys were completed in April and May 2017 due to the late commencement of the Project. Activity surveys following the methodology above are due to be undertaken in April and May 2018.

1.7.28 Each survey consisted of two surveyors walking a pre-determined transect route at a steady pace across the Project Site. The start point and direction of each transect was varied across the months to reduce bias.

1.7.29 The transect contained set Listening Points (LPs) which the surveyors stopped at for three minutes. Each transect contained 12 LPs, with the exception of the first set of surveys in June which had 11 LPs (see Section 1.8, Limitations). The locations of the LPs are shown on Figures 3.1 to 3.3.

1.7.30 Tables 1.23 and 1.24 describe the habitat at each of the LPs.

1.7.31 Dusk transect surveys began 15 minutes before sunset and continued for up to 3 hours after sunset, except for one occasion (see Section 1.8, Limitations). The dawn transect started at least 2 hours before sunrise and continued until sunrise, except on one occasion (see Limitations).

1.7.32 A broadband frequency division detector was used (Bat Box Duet with EM3) and digital recordings made to assist with species identification if required.

1.7.33 The weather conditions for all but one of the surveys (see Section 1.8, Limitations) completed to date was considered to be favourable for bats. The weather conditions and survey dates are given in Table 1.3.

iii. Bat Activity – Static Detector Surveys

1.7.34 Surveys paid due regard to Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016). Nine static detector locations were selected within the Project Site to incorporate a range of habitats and give spatial coverage of the Project Site. The locations of the static detectors are shown in Figure 3.4.

1.7.35 Static detector surveys were completed in June, July, August, September and October 2017.

1.7.36 The dates of the static detector surveys were:

- June 26 – 01 July 2017;

- 24 July – 29 July 2017;
- 23 August 2017 – 01 September 2017;
- 12 September 2017 – 18 September 2017; and,
- 17 October - 21 October 2017.

1.7.37 No surveys were completed in April and May 2017 due to the late commencement of the Project. Activity surveys following the methodology above are due to be undertaken in April and May 2018.

1.7.38 The static detectors were set to begin recording 30 minutes before sunset and continue until 30 minutes after sunrise for a period of five consecutive nights (Collins, 2016). Some equipment failures reduced the static detector recording time (see Limitations and Appendix 3A).

1.7.39 Full spectrum frequency detectors (Wildlife Acoustics Song Meter 2 (SM2/SM2+) with sample rate 384kHz) and ultrasonic SMX-U1 omnidirectional microphones were used to obtain digital recordings of bat echolocation calls in order to determine the species present at each Static Detector Location.

e) Data Analysis and Interpretation

1.7.40 Bat echolocation call analysis where required was undertaken by a suitably experienced ecologist, with support from reference material including the British Bat Calls Species Identification Guide (Russ, 2012).

1.7.41 The AnalookW software programme (version 4.2n) was used to analyse bat echolocation calls. A series of custom made filters in Analook were applied to the bat echolocation call data. All calls were manually checked once filters had been applied, and any additional or incorrect calls were relabelled.

1.7.42 Long-eared bats have very quiet echolocation calls and these are often not recorded on bat detectors but may be audible using bat detectors. Where long-eared bats are suspected but the echolocation call has not been recorded then the long-eared bat (possible) category has been used. This is shown in Tables 1.8 to 1.12.

1.7.43 There are six resident species of Myotid bat in Britain. Myotid bats are difficult to identify to species level as the echolocation calls can have overlapping frequencies and can be visually similar when viewed on bat echolocation call software, such as Analook. Therefore all Myotid bat echolocation calls were grouped together for the purposes of calculating Bat Activity Index (BAI).

1.7.44 Where possible, calls with characteristics of specific Myotid bats were noted to inform the species composition within the Project Site.

1.7.45 For the walked transect data, a BAI was calculated as the number of passes divided by the survey time in ‘hours’. Survey time was calculated to the nearest 15 minutes, expressed as 0.25 hours, to account for minor differences in survey duration (see Section 1.8, Limitations).

1.7.46 For the static detector survey data, a BAI was calculated as the number of passes divided by the survey time in 'nights'. Survey time was calculated to the nearest 0.5 nights, to account for differences in survey duration (see Section 1.8, Limitations and Appendix 3A). The half way point for each night was calculated using the start and finish time. If the static detector failed before the half way point then 0.5 of a night was used in the BAI calculations. If the static detector failed after the half way time point the whole night was used in the BAI calculations.

1.7.47 Bat activity is an indication of the amount of use bats make of an area (Collins, 2016). A bat pass is defined by BCT as a sequence of greater than two echolocation calls made as a single bat flies past the microphone (BCT, 2017). A bat pass is an index of bat activity rather than a measure of number of individuals in a population (Collins, 2016).

1.7.48 The statistics software programme 'R' (R Core Team, 2013) was used to assist data interpretation and to help look for statistically significant differences and/or relationships. This was completed by an ecologist with appropriate statistical knowledge and experience of the programme.

1.7.49 Due to the variation in successful recording nights, statistical tests could only be completed from the first night of data from each static detector, for each month.

1.7.50 The data was assessed for normal distribution and the most appropriate statistical tests applied. The data was not normally distributed and therefore non parametric tests, Kruskal-Wallis and Mann Whitney-Wilcoxon, were used.

1.7.51 Calculated values within this report have been given to one decimal place, except for survey times in Table 1.13, BAI totals in Table 1.18 and BAI values in Table 1.20.

Table 1.3 Survey Dates and Weather Conditions

Survey Date	Sunset/ Sunrise Time	Start Time	End Time	Survey Type	Surveyors	Temp (°C) Start/ End	Humidity (%) Start/ End	Wind Speed Avg. (mph) Start/ End	Cloud Cover (Octars) Start/ End	Rain
13 June 2017	21:34	21:19	00:27	South Transect	LN & CM	13.7 12.6	87.4 86. 5	0.0 0.0	1/8 0/8	None
14 June 2017	21:35	21:20	00:18	North Transect	LN & CM	19.5 14.0	66.6 80.3	0.0 0.0	7/8 8/8	None
26 June 2017	21:38	21:23 21:23	00:19 00:51	North Transect South Transect	LN & UJ CM & BW	15.9 Nr	74.4 Nr	0.0 Nr	8/8 Nr	Light rain at 23:16 for a few minutes
06 July 2017	21:34	21:20	00:35	South Transect	LN & UJ	16.9 17.1	85.4 86.3	0.0 0.0	1/8 7/8	None
10 July 2017	21:32	21:20	00:28	North Transect	UJ & SB	14.0 15.7	83.0 85.0	0.7 0.6	5/8 8/8	Very light drizzle at 00:20
24 July 2017	21:17	21:00 21:00	00:17 00:17	North Transect South Transect	LF & SB LN & NW	17.3 13.0	75.8 86.0	0.0 0.0	1/8 0/8	None
07 August 2017	20:55	20:39 20:40	23:44 00:00	North Transect South Transect	UJ & SB LN & LF	13.0 17.0	81.0 81 0	F1 - Light Wind (Beaufort Scale)	2/8 8/8	None
08 August 2017	20:53	20:30	22:53	Building 3 – Roost	LN & LF	14.9 12.9	82.0 85.2	0.0 0.7	6/8 5/8	None
09 August 2017	05:51	03:47 03:41	06:06 06:06	Tree 36 – Roost Tree 44 – Roost	LN LF	15.2 12.5	79.4 93.8	0.0 0.6	8/8 Nr	Light rain but sheltered in woodland
15 August 2017	20:39	20:24 20:24	22:39 22:39	Tree 3 – Roost Tree 19 – Roost	LF UJ	15.7 12.1	83.3 92.8	0.0 0.9	3/8 2/8	None

Survey Date	Sunset/ Sunrise Time	Start Time	End Time	Survey Type	Surveyors	Temp (°C) Start/ End	Humidity (%) Start/ End	Wind Speed Avg. (mph) Start/ End	Cloud Cover (Octars) Start/ End	Rain
		20:20	22:39	Tree 21 – Roost	LN					
21 August 2017	20:27	20:12	22:27	Building 4 – Roost	UJ & RS	20.1 18.4	81.4 86.1	0.0 0.0	8/8 6/8	None, light drizzle day before
23 August 2017	20:23	20:08 20:08	23:23 23:19	North Transect South Transect	LN & LF UJ & CM	15.7 15.0	83.7 91.5	0.8 1.2	4/8 7/8	Light rain at 21:20 for a few minutes
29 August	20:05	19:35 19:30	22:05 22:05	Tree 36 – Roost Tree 44 – Roost	LN CM	14.2 11.0	76.5 85.6	0.0 0.0	7/8 7/8	None
30 August 2017	06:23	04:23 04:21 04:23	06:38 06:38 06:38	Tree 3 – Roost Tree 19 – Roost Tree 21 – Roost	RS CM LN	11.3 12.7	100.0 89.7	0.9 0.0	8/8 8/8	Rain until 04:40, then dry
31 August 2017	06:26	04:26	06:41	Building 4 – Roost	LN & CM	11.7 8.9	91.4 90.7	0.0 0.7	5/8 1/8	None
06 September 2017	06:35	04:35 04:35	06:50 06:50	Building 3 – Roost Tree 19 - Roost	LN & SB UJ	14.8 11.4	85.1 89.3	0.0 0.6	8/8 3/8	None
07 September 2017	06:37	04:37 04:37	06:42 06:37	North Transect South Transect	LN & LF UJ & SB	14.1 13.0	80.1 82.3	0.0 0.0	8/8 6/8	None
11 September 2017	19:40	19:25	22:27	North Transect	UJ & BW	13.2 11.2	89.2 87.2	0.6 1. 2 (max)	3/8 0/8	Day before, dry during survey
12 September 2017	06:45	04:45	06:44	North Transect	LN & SB	10.1 10.3	86.6 89.9	0.8 0. 9	1/8 1/8	Showers day before, dry during survey
13 September 2017	06:47	04:17	06:42	South Transect	LN & SB	10.4 11.0	80.3 85.1	2.3 2. 3	1/8 3/8	Rain in night, dry

Survey Date	Sunset/ Sunrise Time	Start Time	End Time	Survey Type	Surveyors	Temp (°C) Start/ End	Humidity (%) Start/ End	Wind Speed Avg. (mph) Start/ End	Cloud Cover (Octars) Start/ End	Rain
										during survey
13 September 2017	19:36	19:21	22:27	South Transect	UJ & BW	15.0 9.0	72.0 88.6	0.0 2.4	7/8 8/8	Rain before survey. Dry at start of survey. Light rain at 21:33. Heavy rain at 21:50, lighter rain at 22:17.
03 October 2017	18:50	18:35 18:36	21:50 21:50	North Transect South Transect	BW & SB LN & RS	11.4 12.9	75.8 73.4	0.8 1.2	2/8 8/8	None
17 October 2017	18:19	18:04 18:04	21:18 21:18	North Transect South Transect	UJ & RS CM & SB	13.0 13.0	Nr Nr	0.0 0.0	7/8 7/8	None

Nr=not recorded

LN – NRW Bat Licenced Ecologist, UJ – Senior Ecologist, LF – Ecologist, CM – Ecologist, BW – NRW Bat Licenced Ecologist, SB – Assistant Ecologist, RS – Sustainability Consultant, NW – Environmental Consultant.

1.8 Limitations

1.8.1 Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with a survey, they can contribute to a robust ecological assessment of a site.

a) Suitable Roost Feature Climbed Inspection Survey

1.8.2 There are 16 trees which were not climbed due to access and/or health and safety restrictions and there are two trees which were not climbed as they could not be found due to dense woodland, however were the subject of emergence survey at a later date. These trees did not have their bat roost suitability category altered from the original assigned category and all trees with Moderate suitability subsequently had emergence/re-entry surveys. Therefore this is not deemed to be a significant limitation.

b) Roost Survey

1.8.3 Building 1 did not have a full Ground Level Preliminary Assessment due to time constraints (Appendix 8.1 of the ES). However this building is approximately 120m outside of the Project Site boundary and no further surveys were considered necessary on this building. Therefore this is not a significant limitation.

1.8.4 Access was not granted to Buildings 7 and 8 (collectively known as Abergelli Farm) to the west of, but outside of the Project Site boundary and these could not be assessed for their suitability to support roosting bats. However, these buildings (BSG Buildings 4 and 5) were previously assessed by BSG (PB, 2015) (see Table 1.4). The previous results will be used in the assessment. These buildings will be subject to emergence and re-entry surveys in 2018.

c) Bat Activity Walked Transect Survey

1.8.5 The first set of June walked transect surveys had 11 LPs per transect, this was increased to 12 LPs per transect for all subsequent surveys. This was done to increase the spread of sample points. This is not deemed to be a significant limitation to the surveys or this report.

1.8.6 On 10 July 2017 during the Northern Transect the SD recording card briefly came out of the EM3 bat detector and calls during that period were not recorded electronically. However, this was replaced and all bats heard during the period were recorded on the survey sheet and were of common species which the surveyor was able to determine species identification with confidence. This is not deemed to be a significant limitation to the survey or the results.

1.8.7 On 13 September 2017 the dawn South Transect survey finished at 06:42 which was 5 minutes before sunrise, however no bats had been heard since 06:16 and therefore this is not deemed to be a significant limitation.

1.8.8 On a small number of occasions surveyors walked past an LPs or LPs were not accessible meaning that bat data was not recorded for 3 minutes at that location. For calculations of Bat Activity Index, the survey time at each LP has been adjusted to reflect this variation and will mitigate the impact of this limitation of the comparisons of bat activity between LPs. The occasions are listed below:

- On 10 July 2017 North Transect LP 4 was missed;
- On 23 August and 7, 11 and 12 September 2017, North Transect LP1 was not accessible due to horses being present in the field. A replacement LP was completed as close as possible to the original location at LP1a, as shown on Figure 5.2;
- On 7 and 13 September 2017 LP7 on the South Transect not accessible due to the presence of rams in the field. On 7 September 2017, LP9 was missed, this was replaced with LP9a (see Table 1. 12, LP9a and Figure 5. 3). As LP9 was replaced with another LP close to the original location, this is not deemed to be a significant limitation;
- On 3 October 2017, LP9 was missed, this was replaced with LP9b (See Table 1.12, LP9b and Figure 5. 3). As LP9 was replaced with another LP close to the original location, this is not deemed to be a significant limitation.

1.8.9 No surveys were completed in April and May 2017 due to the late commencement of the Project. Best practice guidelines recommend transect surveys are undertaken between April and October (Collins, 2016). Activity walked transect surveys following the methodology described above are due to be undertaken in April and May 2018.

1.8.10 The weather conditions encountered on the dusk transect surveys on 13 September 2017 (see Table 1.3) were not considered wholly favourable for bats, but not so bad as to need to abandon the survey. There was light rain at 21:33 and a spell of heavy rain between 21:50 and 22:17. The North Transect was also sampled at dusk on 11 September 2017 in September in favourable weather conditions.

1.8.11 It was not possible to incorporate land within the National Grid land within a walked bat activity transect due to due to site access restrictions at night and during the early morning.

d) Bat Activity Static Detector Survey

1.8.12 Some of the static detectors did not record for the full five night period. Details of malfunctions and reduced survey nights are provided in Appendix 3A Static Detector Limitations.

1.8.13 No data was recorded at South 3 in June 2017 and South 1 in July 2017.

1.8.14 Data in these locations was successfully collected in the other 4 months.

1.8.15 No data was recorded at: Lane 2 in August and September 2017. Two other static detectors (Lane 1 and Lane 3) were positioned within the Lane and have captured bat activity which is representative of the Lane.

e) Data Analysis and Interpretation

1.8.16 Different bat species vary in their likelihood of detection using bat detectors and therefore it is not relevant to compare numbers of bat passes from different species (Collins, 2016).

1.8.17 Results of the statistical analysis could only utilise the first night of data for each location in each month, due to the variation in successful recording nights. Therefore, the results are less powerful than if the full five nights could have been compared. However, the statistical analysis provides an additional tool, alongside BAI and count data in the interpretation of bat activity.

1.9 Baseline Environment

a) Desk Study Results

1.9.1 The designated habitats, sites and features, in relation to bats, within proximity to the Project Site are listed in Table 1.4 below.

Table 1.4 Desk Study Results

Designation / Feature	Description
Nationally and Internationally Designated Sites for bats within 10km	There are no sites designated for bats within 10km of the Project Site boundary.
Locally Designated Sites within 2km	There are several locally designated sites within 2km of the Project Site boundary (Appendix 8.1 of the ES). However, none of these are designated for bats or specifically mention bat species on the citations
Bat records from the last 10 years within 2km	The following recent (last 10 years) bat species have been recorded within 2km of the Project Site: Daubenton's *Myotis daubentonii*, Natterer's *Myotis nattereri*, Noctule *Nyctalus noctule*, pipistrelle species *Pipistrellus sp*., common pipistrelle *Pipistrellus pipistrellus,* soprano pipistrelle *Pipistrellus pygmaeus,* long-eared species *Plecotus sp.,* brown long-eared *Plecotus auritus* and generic records of bat species *Chiroptera*. None of these records of bats were from within the Project Site There are records of known roost sites within 2km of the Project Site as follows: • A noctule tree roost approximately 1km north-west of the Project Site boundary; • Common pipistrelle roost approximately 1.3km east of the Project Site boundary; • A common pipistrelle roost approximately 1.8km south-east • A common pipistrelle roost approximately 1km southeast of the Project Site boundary; • A common pipistrelle roost approximately 1km north-west of the Project Site boundary; • A soprano pipistrelle roost approximately 2km south-west of the Project Site boundary; • A soprano pipistrelle roost approximately 2km north-west of the Project site boundary; • A long-eared bat and brown-long-eared bat roost approximately 1.6km east of the Project Site boundary; and • A long-eared bat and brown long-eared bat roost approximately 1.1km north-west of the Project Site boundary. The specific location of the bat roosts is confidential.

Designation / Feature	Description
Priority Species – Listed on The Environment Act (Wales) 2016 Section 7	Barbastelle *Barbestella barbastellus*, Bechstein's *Myotis bechsteinii*, noctule, common pipistrelle, soprano pipistrelle, brown long-eared, greater horseshoe *Rhinolophus ferrumequinum* and lesser horseshoe *Rhinolophus hipposideros* bats are listed on the Section 7 list.
Ancient Woodland	The following five areas have been identified: • An 8.1ha area of RAWS within and extending south-west outside the Project Site. Part of this RAWS is known as Waun ffyrdd Plantation; • A 15.1 ha area of ASWU within and extending south-west outside the Project Site. Part of this ASWU area covers the National Grid site which is currently hardstanding and the ASWU is no longer present; • A 0. 9ha area of PAWS adjacent to the south-west Project Site boundary; • A 4.3ha area of RAWS within and adjacent to the Project Site boundary in the south-west; and, • A 1.6ha ASNW, adjacent to the east of the Project Site boundary. This area is also subject to Tree Protection Orders (Appendix 8.1 of the ES).
Surrounding Land Use	The Project Site is located north of Junction 46 of the M4 Motorway close to the village of Felindre, Swansea. The Project Site has agricultural fields to the east, south and north. Areas of woodland are located to the south, east and west of the Project Site. Areas of the National Grid Power Station with associated roads and buildings are partially within and adjacent to the Project Site. A water treatment works is located in the north west outside of the Project Site.
County Ecologist	The County Ecologist was contacted by email on 9 November 2017 to gather any local knowledge of bat species and bat habitats in proximity to the Site. To date AECOM has not received a response.
Local Bat Group	The local bat group was contacted by email on 9 November 2017 to gather any local knowledge of bat species and bat habitats in proximity to the Site. To date AECOM has not received a response.
Previous Bat Roost and Activity Surveys - BSG Ecology 2014	Previous surveys have been undertaken by BSG Ecology. See Appendix 8.8 of the ES. The Site boundary included within these reports is different to the 2017 Project Site boundary. The 2017 Project Site is smaller than the red line boundary used by BSG in 2014, however lies entirely within the area covered by the 2014 BSG surveys. A summary of the previous bat species surveys is detailed below: <u>Building – Ground Level Roost Assessments and Internal Inspections</u>

Designation / Feature	Description
	Eleven buildings with bat roost potential were identified. Internal inspections of buildings confirmed non- maternity roosts in three buildings. These are shown in Appendix 2A: • BSG Building 4: A scattering of long-eared bat, pipistrelle and lesser horseshoe bat droppings were found in the store rooms; • BSG Building 8: Small piles of long-eared bat and pipistrelle droppings found in both first and second storey at the north of the building; and, • BSG Building 10: Two pipistrelle droppings were found on the floor. BSG Building 1, 2, 5 and 11 were categorised as having Moderate bat roost potential. BSG Building 7 was categorised as having Low bat roost potential. BSG Building 3 and 9 were categorised as having Negligible bat roost potential (Hundt, 2012). The buildings identified by BSG in 2014 fall outside of the 2017 Project Site. However, some of these buildings adjacent to the Project Site have been reassessed by AECOM in 2017. Details are provided in Table 1.5. <u>Tree – Ground Level Roost Assessments</u> Thirty three trees were considered to have potential to support roosting bats. 29 of these were subject to a climbed inspection. Emergence and/or re-entry surveys were carried out on eight trees. BSG Trees T3, T4 and T9 are located within the 2017 Project Site. No bats were recorded emerging or re-entering any potential roost features. No tree roosts were identified. Trees within the Project Site have been reassessed by AECOM in 2017. Details are provided in Section 1.11. <u>Bat Activity Walked Transect Surveys</u> At least seven species of bat were recorded during transect surveys; common pipistrelle, soprano pipistrelle, Myotis sp., long-eared bat, noctule, Leisler's bat, and lesser horseshoe bat. All of these species and an additional three were recorded during automated static detector surveys; Nathusius' pipistrelle *Pipistrellus nathusii*, serotine *Eptesicus serotinus* and greater horseshoe.

b) Bat Roost Survey Results

i. Bat Roosts in Buildings

Buildings - Preliminary Ground Level Roost Assessments

1.9.2 Six buildings were assessed for their potential to support roosting bats in 2017 and 11 buildings were assessed by BSG in 2014. The results of the assessment are provided in Table 1.5.

1.9.3 Building locations are provided in Figure 2. A map showing the AECOM 2017 results is provided in Figure 4.1 and a map showing the 2014 BSG building locations is provided in Figure 4.2.

1.9.4 Access was not granted to Buildings 7 and 8 (known as Abergelli Farm) in 2017 (outside the Project Site) and therefore these could not be assessed for their potential to support roosting bats in 2017. Details are given in Section 1.8 Limitations.

1.9.5 In November 2017, a trial shaft and adit, adjacent to the Project Site was identified. Underground sites can be of value to hibernating bats, including horseshoe, long-eared and Myotis species. The approximate locations mine shaft and adit are shown in Figure 6. These were assessed for their suitability to support roosting bats in March 2018. The adit is sealed, with no potential for underground hibernation and this has been capped and filled in. The adit is close to Building 4. The trial shaft entrance was located and a depression in the ground which was grassed over was visible. Historical maps had identified that the trail shaft had been dug to 57ft and 6 inches and backfilled. There were no access points for bats. The trail shaft is not suitable for hibernation.

Table 1.5 Building Ground Assessment Results

AECOM Building Number (2017)	BSG Building Number (ES Appendix 8.8)	Building Description from Ground Level Roost Assessment	Initial BRP Category
1	Not surveyed.	A residential bungalow. Approximately 120m outside of the Project Site boundary to the north-east. This was not fully assessed due to time constraints of the PEA survey (Appendix 8.1 of the ES). This is a modern building with a tiled roof. There were no obvious gaps. House sparrows were observed using spaces in the roof.	AECOM 2017: Low BSG 2014: Not Surveyed
2	BSG 8	External out building within Abergelli Farm yard. Approximately 75m outside of the Project Site boundary to the west. A brick built building with a tower and asbestos pitched roof. There are potential fly-in access points and features suitable for crevice dwelling species such as pipistrelle BSG Identified: *"Single storey brick barn with second story tower*	AECOM 2017: High BSG 2014: Confirmed Roost.

AECOM Building Number (2017)	BSG Building Number (ES Appendix 8.8)	Building Description from Ground Level Roost Assessment	Initial BRP Category
		at the northern end. Multiple fly-in opportunities to both storeys. Small piles of long-eared bat and pipistrelle droppings found in both first and second storey at the north of the building" (Appendix 8.8 of the ES of ES).	
3	BSG 7	Approximately 5m outside of the Project Site boundary to the west. A single story brick built out building with a pitched asbestos roof. There are gaps in the mortar and brick work and behind the wooden facia boards BSG Identified: *"Brick outbuilding with corrugated roof. The cavity wall may be accessible through broken vents. No signs of use by bats were observed"* (Appendix 8.8 of the ES).	AECOM 2017: Moderate BSG 2014: Moderate
4	Not surveyed	Approximately 10m outside of the Project Site boundary to the west. A single story brick built out building located within a field. There are gaps leading to a cavity wall. Gaps are present on the east and south face of this building.	AECOM 2017: Moderate BSG 2014: Not Surveyed
5	BSG 6	Modern steel barn; industrial building of steel frame construction with asbestos and transparent corrugated sheet roof and asbestos and steel walls. Within the building light enters via the transparent corrugated roof sheets. The building is used regularly for farm maintenance and horses are kept in the east section. There are openings that would allow bats to access the building (open sections to the east and west, small hole 20x20cm within wall on southern aspect, door to the east and west usually left open). No evidence of bats (droppings) was found around the outside of the building. BSG identified: "*Corrugated iron barn, used as horse stable and machinery store. No potential roost features or signs of use by bats observed"* (Appendix 8.8 of the ES).	AECOM 2017: Negligible BSG 2014: Negligible
6	BSG 3	Abergelli Farm buildings. Approximately 110m from the Project Site boundary.	AECOM 2017: Negligible BSG 2014:

AECOM Building Number (2017)	BSG Building Number (ES Appendix 8.8)	Building Description from Ground Level Roost Assessment	Initial BRP Category
		BSG identified: "*Corrugated iron barn, used as horse stable. No potential roost features or signs of use by bats were observed"* (Appendix 8.8 of the ES).	Negligible
7	BSG 4	Abergelli Farm buildings. Approximately 90m from the Project Site boundary. Not assessed by AECOM. BSG identified: *"Stone built stable block. Confirmed as a lesser horseshoe, long-eared and pipistrelle roost*" (Appendix 8.8 of the ES).	AECOM 2017: Not Surveyed BSG 2014: Confirmed Roost.
8	BSG 5	Abergelli Farm, residential buildings Approximately 65m from the Project Site boundary. Not assessed by AECOM. BSG Identified: *"Terraced housing. Some missing tiles, lifted lead flashing and access to boxed eaves due to damage could be used by bats. No signs of use by bats were observed. There was no access available to the roof void"* (Appendix 8.8 of the ES	AECOM 2017: Not Surveyed BSG 2014: Moderate
BSG 1	BSG 1	Assessment not required. Approximately 265m outside of the Project Site boundary. BSG identified: *"A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the roof void"* (Appendix 8.8 of the ES).	AECOM 2017: Not Surveyed BSG 2014: Moderate
BSG 2	BSG 2	Assessment not required. Approximately 290m outside of the Project Site boundary. BSG identified: "*Detached house. A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the*	AECOM 2017: Not Surveyed BSG 2014: Moderate

AECOM Building Number (2017)	BSG Building Number (ES Appendix 8.8)	Building Description from Ground Level Roost Assessment	Initial BRP Category
		roof void" (Appendix 8.8 of the ES).	
BSG 9	BSG 9	Assessment not required. Approximately 235m outside of the Project Site boundary. BSG identified: *"Breeze block shed with corrugated roof. No potential roost features or signs of use by bats observed"* (Appendix 8.8 of the ES).	AECOM 2017: Not Surveyed BSG 2014: Negligible
BSG 10	BSG 10	Assessment not required. Approximately 155m outside of the Project Site boundary. BSG identified: *"Brick out-house, single room, no doors or windows. Flat concrete roof. Missing bricks allow access to the cavity wall in a number of places. Two pipistrelle droppings were found on the floor"* (Appendix 8.8 of the ES).	AECOM 2017: Not Surveyed BSG 2014: Confirmed Roost
BSG 11	BSG 11	Assessment not required. Approximately 195m outside of the Project Site boundary. BSG identified: *"Derelict stone cottage, two distinct standing walls, no roof. Walls are very exposed. Some roosting opportunities between the stone, and gaps into a rubble filled wall. No signs of use by bats were observed"* (Appendix 8.8 of the ES).	AECOM 2017: Not Surveyed BSG 2014: Moderate

Buildings - Emergence/Re-entry Surveys

1.9.6 The results of the 2014 and 2017 emergence/re-entry surveys are provided in Table 1.6. The locations of the buildings and the roost results from 2017 are shown on Figure 4.1.

1.9.7 Further surveys were not undertaken on AECOM Buildings 1 and 2 due to their distance from the Project Site. Further surveys were not undertaken on Buildings 5 and 6 in 2017 as they had Negligible bat roost suitability.

Table 1.6 Building Emergence/Re-entry Survey Results

AECOM Building Number	BRP Category (AECOM 2017 and BSG 2014 combined – Table 1.5)	Roost Surveys Completed - AECOM 2017	Roost Status – (AECOM 2017 and BSG 2014 combined)
1	Low	No survey completed. Approximately 125m from the Project Site boundary	Unknown
2	Confirmed Roost	No survey completed. Approximately 70 m from the Project Site boundary	Confirmed Roost BSG confirmed this as a non-maternity long-eared and pipistrelle roost in 2014 (BSG Building 8) (Appendix 8.8 of the ES)
3	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost
4	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost
5	Negligible	No surveys required	No Roost
6	Negligible	No surveys required	No Roost BSG internal inspection did not find any evidence of use by bats (BSG Building 3) (Appendix 8.8 of the ES). Due to the lack of features suitable for bats an internal inspection is sufficient to determine if this building is a roost
7	Confirmed Roost.	No surveys completed in 2017. Three surveys are scheduled to be undertaken in 2018. Building 7 is approximately 90m from the Project Site	Confirmed Roost BSG confirmed this as a lesser horseshoe, long-eared and pipistrelle roost (BSG Building 4) (Appendix 8.8 of the ES)

AECOM Building Number	BRP Category (AECOM 2017 and BSG 2014 combined – Table 1.5)	Roost Surveys Completed - AECOM 2017	Roost Status – (AECOM 2017 and BSG 2014 combined)
		boundary.	
8	Moderate	No surveys completed in 2017. Three surveys are scheduled to be undertaken in 2018. Building 8 is approximately 65m from the Project Site boundary.	Unknown BSG internal inspection did not find evidence of bats but not all areas were accessible (BSG Building 5) (Appendix 8.8 of the ES). Due to the bat roost features identified an internal inspection only is not sufficient to determine if this building is being used as a roost

AECOM Building Number	BRP Category (AECOM 2017 and BSG 2014 combined – Table 1.5)	Roost Surveys Completed - AECOM 2017	Roost Status – (AECOM 2017 and BSG 2014 combined)
BSG 1	Moderate	No surveys completed - Assessment not required. Approximately 265m outside of the Project Site boundary.	Unknown. BSG identified: *"A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the roof void"* (Appendix 8.8 of the ES).
BSG 2	Moderate	No surveys completed - Assessment not required. Approximately 290m outside of the Project Site boundary.	Unknown. BSG identified: "*Detached house. A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the roof void"* (Appendix 8.8 of the ES).
BSG 9	Negligible	No surveys required. Also, approximately 235m outside of the Project Site boundary.	No Roost
BSG 10	Confirmed Roost	No surveys completed - Assessment not required. Approximately 155m outside of the Project Site boundary.	Confirmed Roost BSG identified: *"Brick out-house, single room, no doors or windows. Flat concrete roof. Missing bricks allow access to the cavity wall in a number of places. Two pipistrelle droppings were found on the floor"* (Appendix 8.8 of the ES).
BSG 11	Moderate	No surveys completed. Assessment not required. Approximately 195m outside of the Project Site boundary.	Unknown. BSG identified: *"Derelict stone cottage, two distinct standing walls, no roof. Walls are*

AECOM Building Number	BRP Category (AECOM 2017 and BSG 2014 combined – Table 1.5)	Roost Surveys Completed - AECOM 2017	Roost Status – (AECOM 2017 and BSG 2014 combined)
			very exposed. Some roosting opportunities between the stone, and gaps into a rubble filled wall. No signs of use by bats were observed" (Appendix 8.8 of the ES).

ii. Bat Roosts in Trees

Trees - Preliminary Ground Level Roost Assessment

1.9.8 The results of the Preliminary Ground Level Roost Assessment are provided in Appendix 1A.

Trees - Potential Roost Feature Climbed Inspections

1.9.9 All trees with Low or Moderate bat roost suitability were put forward for climbed inspection. A full table of results from the climbed inspections are provided in Appendix 1A.

1.9.10 All trees inspected were reduced to Negligible or Low bat roost suitability. No bat roosts were identified.

1.9.11 Trees 3, 19, 21, 36 and 44 could not be accessed and therefore retained their original Moderate rating. These trees were taken forward for emergence and re-entry surveys, in the absence of the climbed inspection assessment.

1.9.12 Trees with Low bat roost suitability do not require further survey but may need to be checked for roosting bats before removal.

Emergence/Re-entry Surveys

1.9.13 The results of the emergence /re-entry surveys are provide in Table 1.7. The locations of the trees and the roost results are shown on Figure 4.

1.9.14 Of the five trees surveyed, one bat roost was confirmed in Tree 19. Whilst the bat was seen entering the tree, no calls were detected. This is possibly due to the distance of the tree canopy from the surveyor, and the angle of the bat from the detector. It has been concluded that the species is likely to be a common pipistrelle, because a brief common pipistrelle pass was heard approximately nine seconds before the roosting bat was seen flying around and then disappearing into the crown of Tree 19.

1.9.15 A Photograph of Tree 19 is provided in Plate 1.1.

Table 1.7 Tree Emergence/Re-entry Survey Results

AECOM Tree Number	BRP Category	Roost Surveys Completed	Roost Status
Tree 3	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost
Tree 19	Moderate	2 X Dusk Emergence 1 X Dawn Re-entry	Confirmed Roost. Lone male or lone non-breeding female summer roost for one common pipistrelle bat
Tree 21	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost
Tree 36	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost
Tree 44	Moderate	1 X Dusk Emergence 1 X Dawn Re-entry	No Roost

Plate 1.1: Tree 19 – Confirmed Bat Roost

c) Bat Activity Survey Results from 2017

iii. Walked Transects

1.9.16 The location of the walked transects and locations of the LPs are shown on Figures 3.1 to 3.3.

1.9.17 The results of the walked transect surveys are displayed in Tables 1.8 to 1.16.

1.9.18 Tables 1.8 to 1.10 display the count of bat passes for each species or species group.

1.9.19 Tables 1.11 to 1.14 display Bat Activity Index (BAI), expressed as bat passes per hour.

1.9.20 Tables 1.11 to 1.14 display BAI (passes/hr), by Listening Point (LP).

1.9.21 Tables 1.15 to 1.16 display BAI (passes/hr), by month.

1.9.22 The results of the transect surveys and the distribution of the bat passes recorded are shown Figures 5.1, 5.2 and 5.3.

1.9.23 A Site Assessment Summary is provided in Section 1.10.

Table 1.8 Bat Activity – Walked Transect Results – Species Composition

Species	Count of Bat Passes (June to October)	Percentage %	June Bat Passes	July Bat Passes	August Bat Passes	September Bat Passes	October Bat Passes
Lesser horseshoe	1	0.1	0	0	1	0	0
Common pipistrelle	512	54.4	99	115	153	56	89
Soprano pipistrelle	302	32.1	60	54	83	58	47
Nathusius' pipistrelle	2	0.2	0	2	0	0	0
Myotis species	92	9.8	10	16	28	17	21
Noctule/Serotine	17	1.8	5	5	4	1	2
Long-eared	1	0.1	0	0	0	1	0
Long-eared (possible)	4	0.4	1	0	2	0	1
Indeterminate	9	1.0	3	0	0	3	3
All Species	**940**	**-**	**178**	**192**	**271**	**136**	**163**

Table 1.9 Bat Activity – North Transect Results – Species Composition

Species	Count of Bat Passes (June to October)	Percentage %	June Bat Passes	July Bat Passes	August Bat Passes	September Bat Passes	October Bat Passes
Lesser horseshoe	0	0.0	0	0	0	0	0
Common pipistrelle	252	59.0	53	60	66	33	40
Soprano pipistrelle	129	30.2	29	22	30	32	16
Nathusius' pipistrelle	1	0.2	0	1	0	0	0
Myotis species	33	7.7	2	6	10	5	10
Noctule/Serotine	8	1.9	2	2	2	0	2
Long-eared	1	0.2	0	0	0	1	0
Long-eared (possible)	1	0.2	0	0	1	0	0
Indeterminate	2	0.5	1	0	0	0	1
All Species	**427**	**-**	**87**	**91**	**109**	**71**	**69**

Table 1.10 Bat Activity – South Transect Results – Species Composition

Species	Count of Bat Passes (June to October)	Percentage %	June Bat Passes	July Bat Passes	August Bat Passes	September Bat Passes	October Bat Passes
Lesser horseshoe	1	0.2	0	0	1	0	0
Common pipistrelle	260	50.7	46	55	87	23	49
Soprano pipistrelle	173	33.7	31	32	53	26	31
Nathusius' pipistrelle	1	0.2	0	1	0	0	0
Myotis species	59	11.5	8	10	18	12	11
Noctule/Serotine	9	1.8	3	3	2	1	0
Long-eared	0	0.0	0	0	0	0	0
Long-eared (possible)	3	0.6	1	0	1	0	1

Species	Count of Bat Passes (June to October)	Percentage %	June Bat Passes	July Bat Passes	August Bat Passes	September Bat Passes	October Bat Passes
Indeterminate	7	1.4	2	0	0	3	2
All Species	**513**	**-**	**91**	**101**	**162**	**65**	**94**

Table 1.11 Bat Activity – North Transect Results-BAI (bat passes/hr) by Listening Point (Spatial Distribution)

Listening Point	Lesser horseshoe	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Myotis species	Noctule/Serotine	Long-eared	Long-eared (possible)	Indeterminate	All Species
1	0	4.4	2.2	0.0	0.0	0.0	0.0	0.0	0.0	6.7
1a	0	10.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	15.0
2	0	23.6	7.3	0.0	1.8	0.0	0.0	1.8	0.0	34.5
3	0	25.5	10.9	0.0	3.6	0.0	0.0	0.0	0.0	40.0
4	0	10.0	14.0	0.0	6.0	0.0	0.0	0.0	0.0	30.0
5	0	12.7	12.7	0.0	1.8	0.0	0.0	0.0	0.0	27.3
6	0	10.9	5.5	0.0	1.8	0.0	0.0	0.0	0.0	18.2
7	0	9.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	12.7
8	0	7.3	5.5	0.0	0.0	1.8	0.0	0.0	1.8	16.4
9	0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
10	0	5.5	1.8	0.0	0.0	0.0	0.0	0.0	0.0	7.3
11	0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
12	0	12.0	2.0	0.0	4.0	0.0	0.0	0.0	0.0	18.0
All LPs	**0.0**	**11.1**	**5.3**	**0.0**	**1.7**	**0.2**	**0.0**	**0.2**	**0.2**	**18.5**

Table 1.12 Bat Activity – South Transect Results – BAI (bat passes/hr) by Listening Point (Spatial Distribution)

Listening Point	Lesser horseshoe	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Myotis species	Noctule/Serotine	Long-eared	Long-eared (possible)	Indeterminate	All Species
1	0	1.8	3.6	0.0	7.3	0.0	0.0	0.0	0.0	12.7

Listening Point	Lesser horseshoe	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Myotis species	Noctule/Serotine	Long-eared	Long-eared (possible)	Indeterminate	All Species
2	0	10.9	1.8	0.0	7.3	0.0	0.0	0.0	0.0	20.0
3	0	9.1	5.5	0.0	3.6	0.0	0.0	0.0	0.0	18.2
4	0	9.1	7.3	0.0	1.8	0.0	0.0	1.8	1.8	21.8
5	0	16.4	18.2	0.0	7.3	0.0	0.0	0.0	0.0	41.8
6	0	10.9	21.8	0.0	5.5	0.0	0.0	0.0	0.0	38.2
7	0	22.2	2.2	0.0	2.2	0.0	0.0	0.0	0.0	26.7
8	0	12.7	7.3	0.0	1.8	3.6	0.0	0.0	0.0	25.5
9	0	8.9	6.7	0.0	2.2	0.0	0.0	0.0	0.0	17.8
9a	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9b	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0	1.8	1.8	0.0	1.8	1.8	0.0	0.0	0.0	7.3
11	0	5.5	5.5	0.0	1.8	0.0	0.0	0.0	0.0	12.7
12	0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
All LPs	**0.0**	**9.0**	**6.8**	**0.0**	**3.6**	**0.5**	**0.0**	**0.2**	**0.2**	**20.2**

Table 1.13 Bat Activity – Listening Point Survey Times and BAI - North

North – Listening Point	North – LP Survey Time in hours	North – All Species – BAI (Bat passes/hour)
1	0.45	6.7
1a	0.20	15.0
2	0.55	34.5
3	0.55	40.0
4	0.50	30.0
5	0.55	27.3
6	0.55	18.2
7	0.55	12.7
8	0.55	16.4
9	0.55	9.1
10	0.55	7.3

North – Listening Point	North – LP Survey Time in hours	North – All Species – BAI (Bat passes/hour)
11	0.55	1.8
12	0.50	18.0
All LPs - North	**6.60**	**18.5**

Three minutes is expressed as 0.05hrs

Table 1.14 Bat Activity – Listening Point Survey Times and BAI - South

South – Listening Point	South – LP Survey Time	South – BAI (Bat passes/hour)
1	0.55	12.7
2	0.55	20.0
3	0.55	18.2
4	0.55	21.8
5	0.55	41.8
6	0.55	38.2
7	0.45	26.7
8	0.55	25.5
9	0.45	17.8
9a	0.05	0.0
9b	0.05	0.0
10	0.55	7.3
11	0.55	12.7
12	0.5	2.0
All LPs – South	**6.45**	**20.2**

Three minutes is expressed as 0.05hrs

Table 1.15 Bat Activity – North Transect Results 2017-BAI by Month (Temporal Distribution)

Transect	All Surveyed Months	June	July	August	September	October
Transect Survey Time (Hrs)	32.3	5.9	6.4	6.3	7.1	6.5
BAI (Bat passes/hour)	**13.2**	**7.0**	**7.0**	**8.5**	**4.8**	**5.3**

Table 1.16 Bat Activity – South Transect Results 2017-BAI by Month (Temporal Distribution)

Transect	All Surveyed Months	June	July	August	September	October
Transect Survey Time (Hrs)	33.7	6.6	6.5	6.5	7.6	6.5
BAI (Bat passes/hour)	**15.2**	**2.7**	**3.0**	**4.8**	**1.9**	**2.8**

iv. Static Detector Surveys

1.9.24 The Static Detector Locations are shown in Figure 3.4.

1.9.25 The results of the static detector surveys are presented in Tables 1.17 to 1.22.

1.9.26 33,764 bat passes were recorded at the Project Site between June and October 2017. A total of 173.5 recording nights were completed.

1.9.27 Table 1.17 and 1.19 display the count of bat passes for each species or species group.

1.9.28 Table 1.18 displays the BAI for each species or species group.

1.9.29 Tables 1.20 to 1.21 display BAI, expressed as bat passes per night.

1.9.30 Table 1.20 displays BAI (passes/night), by Static Detector Location.

1.9.31 Table 1.21 displays BAI (passes/night), by month.

1.9.32 Table 1.22 displays the bat passes and BAI for each Static Detector Location Group.

1.9.33 Appendix 4A Tables 2.2 to 2.6 provide the results of the Kruskal-Wallis and Mann Whitney-Wilcoxon non parametric tests.

1.9.34 Plates 1. 2 and 1.3 displays box plots for bat passes (shown on the y axis as bat call frequency) for location and month, respectively.

1.9.35 Plates 1. 4 and 1.5 display box plots for bat species richness for location and month, respectively. Bat species richness is defined as the number of different bat species recorded at each location.

1.9.36 A Site Assessment Summary is provided in Section 1.10.

Table 1.17 Bat Activity Static Detector Results – Bat Passes and Species Composition

Month	Static Detector Location Number	Static Detector Location Name	Long-eared	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All Species
June 2017	1	North 1	0	1	2	0	0	248	3	0	0	253
	2	North 2	0	38	2	0	0	1336	72	0	0	1448
	3	North 3	0	0	1	0	0	682	43	0	0	726
	4	South 1	0	66	5	0	0	824	412	0	0	1307
	5	South 2	0	4	0	0	0	397	382	0	0	783
	6	South 3	Equipment malfunction, no results									
	7	Lane 1	0	242	2	1	0	513	40	0	0	798
	8	Lane 2	0	166	2	0	0	1158	896	0	0	2222
	9	Lane 3	0	36	3	0	0	191	117	0	0	347
	Total		**0**	**553**	**17**	**1**	**0**	**5348**	**1965**	**0**	**0**	**7884**
July 2017	1	North 1	0	16	3	0	0	43	36	0	0	98
	2	North 2	0	2	1	0	0	17	6	0	0	26
	3	North 3	0	18	2	0	0	113	9	0	0	142
	4	South 1	Equipment malfunction, no results									
	5	South 2	0	7	1	0	0	82	91	0	0	181
	6	South 3	1	7	8	0	0	13	17	0	1	47
	7	Lane 1	0	351	4	0	0	4126	216	0	0	4697
	8	Lane 2	0	365	0	0	1	4567	4656	1	0	9590
	9	Lane 3	0	38	5	0	0	45	32	0	2	122
	Total		**1**	**804**	**24**	**0**	**1**	**9006**	**5063**	**1**	**3**	**14903**
August 2017	1	North 1	0	94	3	0	0	1268	505	0	0	1870
	2	North 2	5	3	6	0	0	35	31	0	0	80
	3	North 3	2	14	8	0	1	567	70	0	0	662
	4	South 1	1	60	5	0	0	2179	393	0	0	2638
	5	South 2	3	32	2	0	0	39	37	0	6	119
	6	South 3	2	15	10	0	0	31	26	0	1	85
	7	Lane 1	1	41	5	0	0	46	29	0	1	123
	8	Lane 2	Equipment malfunction, no results									
	9	Lane 3	9	125	18	0	2	386	832	0	0	1366
	Total		**17**	**384**	**57**	**0**	**3**	**4551**	**1923**	**0**	**8**	**6943**

Month	Static Detector Location Number	Static Detector Location Name	Long-eared	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All Species
September 2017	1	North 1	0	5	0	0	0	13	9	0	0	27
	2	North 2	0	1	1	0	0	24	4	0	0	30
	3	North 3	0	64	1	0	0	253	31	0	0	349
	4	South 1	0	28	1	0	0	1893	395	0	0	2317
	5	South 2	0	0	1	0	0	7	6	0	0	14
	6	South 3	0	0	0	0	0	0	0	0	0	0
	7	Lane 1	0	4	0	0	0	17	9	0	1	31
	8	Lane 2	Equipment malfunction, no results									
	9	Lane 3	0	5	1	0	1	15	11	0	1	34
	Total		**0**	**107**	**5**	**0**	**1**	**2222**	**465**	**0**	**2**	**2802**
October 2017	1	North 1	0	0	0	0	0	0	0	0	0	0
	2	North 2	0	11	3	1	1	23	58	0	0	97
	3	North 3	0	6	2	0	0	20	11	0	0	39
	4	South 1	0	0	0	0	0	0	0	0	0	0
	5	South 2	0	3	7	0	0	104	151	0	0	265
	6	South 3	1	2	1	0	0	11	8	0	0	23
	7	Lane 1	0	9	2	0	0	26	22	0	0	59
	8	Lane 2	0	0	0	0	0	371	319	0	0	690
	9	Lane 3	3	2	8	0	0	25	20	0	1	59
	Total		**4**	**33**	**23**	**1**	**1**	**580**	**589**	**0**	**1**	**1232**
June to October 2017	**Grand Total**		**22**	**1881**	**126**	**2**	**6**	**21707**	**10005**	**1**	**14**	**33764**

N/S/L = Noctule/Serotine/Leisler's; N.Pip= Nathusius' pipistrelle, Pip = pipistrelle species, C.Pip = Common pipistrelle, S.Pip= Soprano pipistrelle, GHS = Greater horseshoe; LHS = Lesser horseshoe

Table 1.18 Bat Activity Static Detector Results – Bat Activity and Species Composition

Month	Static Detector Location Number	Static Detector Location Name	L-E	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All	Number of Recording Nights
June 2017	1	North 1	0.0	0.2	0.4	0.0	0.0	49.4	0.6	0.0	0.0	50.6	5
	2	North 2	0.0	7.6	0.4	0.0	0.0	267.2	14.4	0.0	0.0	289.6	5
	3	North 3	0.0	0.0	0.2	0.0	0.0	136.4	8.6	0.0	0.0	145.2	5
	4	South 1	0.0	22.0	1.7	0.0	0.0	274.7	137.3	0.0	0.0	435.7	3
	5	South 2											5
	6	South 3	Equipment malfunction, no results										0
	7	Lane 1	0.0	96.8	0.8	0.4	0.0	205.2	16.0	0.0	0.0	319.2	2.5
	8	Lane 2	0.0	66.4	0.8	0.0	0.0	463.2	358.4	0.0	0.0	888.8	2.5
	9	Lane 3	0.0	7.2	0.6	0.0	0.0	38.2	23.4	0.0	0.0	69.4	5
	Total		**0.0**	**16.76**	**0.52**	**0.03**	**0.00**	**162.06**	**59.55**	**0.00**	**0.00**	**238.9**	**33**
July 2017	1	North 1	0.0	3.2	0.6	0.0	0.0	8.6	7.2	0.0	0.0	19.6	5
	2	North 2	0.0	0.4	0.2	0.0	0.0	3.4	1.2	0.0	0.0	5.2	5
	3	North 3	0.0	4.0	0.4	0.0	0.0	25.1	2.0	0.0	0.0	31.6	4.5
	4	South 1	Equipment malfunction, no results										0
	5	South 2	0.0	1.4	0.2	0.0	0.0	16.4	18.2	0.0	0.0	36.2	5
	6	South 3	0.2	1.4	1.6	0.0	0.0	2.6	3.4	0.0	0.2	9.4	5
	7	Lane 1	0.0	70.2	0.8	0.0	0.0	825.2	43.2	0.0	0.0	939.4	5
	8	Lane 2	0.0	73.0	0.0	0.0	0.2	913.4	931.2	0.2	0.0	1918.0	5
	9	Lane 3	0.0	7.6	1.0	0.0	0.0	9.0	6.4	0.0	0.4	24.4	5
	Total		**0.03**	**20.35**	**03641**	**0.00**	**0.03**	**228.0**	**128.18**	**0.03**	**0.08**	**377.29**	**39.5**
August 2017	1	North 1	0.0	18.8	0.6	0.0	0.0	253.6	101.0	0.0	0.0	374.0	5
	2	North 2	1.1	0.7	1.3	0.0	0.0	7.8	6.9	0.0	0.0	17.8	4.5
	3	North 3	0.4	2.8	1.6	0.0	0.2	113.4	14.0	0.0	0.0	132.4	5
	4	South 1	0.2	12.0	1.0	0.0	0.0	435.8	78.6	0.0	0.0	527.6	5
	5	South 2	0.7	7.1	0.4	0.0	0.0	8.7	8.2	0.0	1.3	26.4	4.5
	6	South 3	0.4	3.0	2.0	0.0	0.0	6.2	5.2	0.0	0.2	17.0	5
	7	Lane 1	0.3	10.3	1.3	0.0	0.0	11.5	7.3	0.0	0.3	30.8	4
	8	Lane 2	Equipment malfunction, no results										0
	9	Lane 3	0.6	25.0	3.6	0.0	0.4	77.2	166.4	0.0	0.0	273.2	5
	Total		**0.45**	**10.11**	**1.50**	**0.00**	**0.08**	**119.76**	**50.61**	**0.00**	**0.21**	**182.71**	**38**

Month	Static Detector Location Number	Static Detector Location Name	L-E	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All	Number of Recording Nights
September 2017	1	North 1	0.0	1.7	0.0	0.0	0.0	4.3	3.0	0.0	0.0	9.0	3
	2	North 2	0.0	0.2	0.2	0.0	0.0	4.8	0.8	0.0	0.0	6.0	5
	3	North 3	0.0	12.8	0.2	0.0	0.0	50.6	6.2	0.0	0.0	69.8	5
	4	South 1	0.0	5.6	0.2	0.0	0.0	378.6	79.0	0.0	0.0	463.4	5
	5	South 2	0.0	0.0	0.3	0.0	0.0	2.0	1.7	0.0	0.0	4.0	3.5
	6	South 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
	7	Lane 1	0.0	1.0	0.0	0.0	0.0	4.3	2.3	0.0	0.3	7.8	4
	8	Lane 2	Equipment malfunction, no results										0
	9	Lane 3	0.0	1.3	0.3	0.0	0.3	3.8	2.8	0.0	0.3	8.5	4
	Total		**0.00**	**3.45**	**0.16**	**0.00**	**0.03**	**71.68**	**15.00**	**0.00**	**0.06**	**90.39**	**31**
October 2017	1	North 1	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
	2	North 2	0.0	2.2	0.6	0.2	0.2	4.6	11.6	0.0	0.0	19.4	5
	3	North 3	0.0	1.7	0.6	0.0	0.0	5.7	3.1	0.0	0.0	11.1	3.5
	4	South 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
	5	South 2	0.0	0.6	1.4	0.0	0.0	20.8	30.2	0.0	0.0	53.0	5
	6	South 3	0.3	0.6	0.3	0.0	0.0	3.1	2.3	0.0	0.0	6.6	3.5
	7	Lane 1	0.0	2.6	0.6	0.0	0.0	7.4	6.3	0.0	0.0	16.9	3.5
	8	Lane 2	0.0	0.0	0.0	0.0	0.0	74.2	63.8	0.0	0.0	138.0	5
	9	Lane 3	0.9	0.6	2.3	0.0	0.0	7.1	5.7	0.0	0.3	16.9	3.5
	Total		**0.13**	**1.03**	**0.72**	**0.03**	**0.03**	**18.13**	**18.41**	**0.00**	**0.03**	**38.50**	**32**
June-October 2017	**Grand Total**		**0.13**	**10.84**	**0.73**	**0.01**	**0.03**	**125.11**	**57.67**	**0.01**	**0.08**	**194.61**	**173.5**

Bat Activity Index = Bat Pass / Survey Nights. *L-E = Long-eared, N/S/L = Noctule*/Serotine/Leisler's; *N.Pip= Nathusius' pipistrelle, Pip = pipistrelle species, C.Pip = Common pipistrelle, S.Pip= Soprano pipistrelle,GHS = Greater horseshoe; LHS = Lesser horseshoe*

Table 1.19 Bat Activity Static Detector Results – Bat Passes by Static Detector Location (Spatial Distribution)

Month	Static Detector Location Number	Static Detector Location Name	L-E	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All Species	Number of Recording Nights
June-October 2017	1	North 1	0	116	8	0	0	1571	553	0	0	2248	19.5
	2	North 2	5	55	13	1	1	1435	171	0	0	1681	24.5
	3	North 3	2	102	14	0	1	1635	164	0	0	1918	23
	4	South 1	1	154	11	0	0	4896	1200	0	0	6262	14.5
	5	South 2	3	46	11	0	0	629	667	0	6	1362	23
	6	South 3	4	24	19	0	0	55	51	0	2	155	15
	7	Lane 1	1	647	13	1	0	4728	316	0	2	5708	19
	8	Lane 2	0	531	2	0	1	6096	5871	1	0	12502	12.5
	9	Lane 3	6	206	35	0	3	662	1012	0	4	1928	22.5
	All		**22**	**1881**	**126**	**2**	**6**	**21707**	**10005**	**1**	**14**	**33764**	**173.5**

L-E = Long-eared, N/S/L = Noctule/Serotine/Leisler's; N.Pip= Nathusius' pipistrelle, Pip = pipistrelle species, C.Pip = Common pipistrelle, S.Pip= Soprano pipistrelle, GHS = Greater horseshoe; LHS = Lesser horseshoe

Table 1.20 Bat Activity Static Detector Results – Bat Activity by Static Detector Location (Spatial Distribution)

Month	Static Detector Location Number	Static Detector Location Name	L-E	Myotis	N/S/L	N. Pip	Pip	C. Pip	S. Pip	GHS	LHS	All Species
June-October 2017	1	North 1	0.00	116.00	8.00	0.00	0.00	1571.00	553.0	0.00	0.00	2248.00
	2	North 2	5.00	44.45	10.12	0.04	0.04	1412.94	115.37	0.00	0.00	1587.96
	3	North 3	2.00	96.26	12.09	0.00	1.00	1615.87	153.48	0.00	0.00	1880.70
	4	South 1	1.00	154.00	11.00	0.00	0.00	4896.00	1200.00	0.00	0.00	6262.00
	5	South 2	3.00	43.13	4.30	0.00	0.00	529.52	522.57	0.00	6.00	1108.52
	6	South 3	3.07	22.13	18.07	0.00	0.00	44.73	43.53	0.00	2.00	133.53
	7	Lane 1	1.00	638.47	11.11	1.00	0.00	4703.37	295.16	0.00	2.00	5652.11
	8	Lane 2	0.00	531.00	2.00	0.00	1.00	5754.68	5577.52	1.00	0.00	11867.20
	9	Lane 3	3.13	204.09	27.36	0.00	3.00	638.11	992.89	0.00	3.04	1871.62
	All		**0.13**	**10.84**	**0.73**	**0.01**	**0.03**	**125.11**	**57.67**	**0.01**	**0.08**	**194.61**

Bat Activity Index = Bat Pass / Survey Nights. *L-E = Long-eared,* N/S/L = Noctule/Serotine/Leisler's; *N.Pip = Nathusius' pipistrelle, Pip = pipistrelle species, C.Pip = Common pipistrelle, S.Pip= Soprano pipistrelle, GHS = Greater horseshoe; LHS = Lesser horseshoe*

Table 1.21 Bat Activity Static Detector Results – Bat Activity by Month (Temporal Distribution)

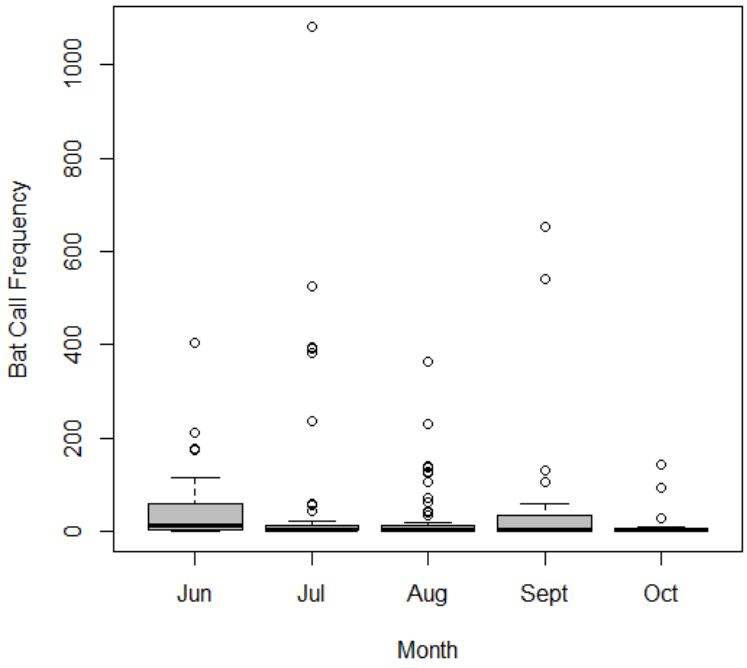
	June	July	August	September	October	All Survey Months
Bat Passes (Count)	7884	14903	6943	2802	1232	33764
Survey Time (Nights)	33	39.5	38	31	32	173.5
Bat Activity Index (BAI) (Bat passes/ Time)	238.9	377.3	182.7	90.4	38.5	194.6

Bat Activity Index = Bat Pass / Survey Time in Survey Nights

Table 1.22 Bat Activity Static Detector Results – Bat Passes and BAI by Static Detector Location Group

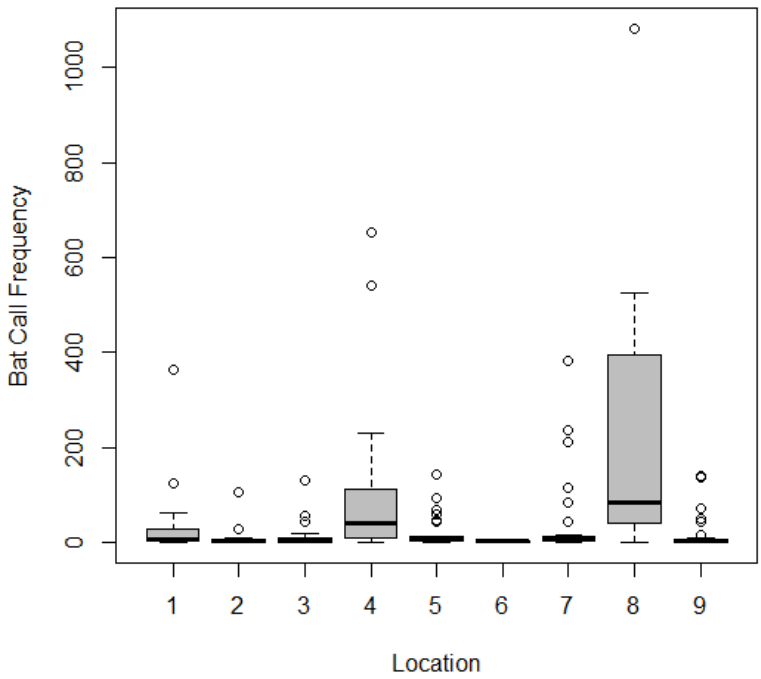
Static Detector Location Group	Total Passes	BAI
North (1-3)	5847	87.3
South (4-6)	7779	148.2
Lane (7-9)	20138	372.9

Plate 1.2: Box Plots for Static Detector Statistical Analysis - Bat passes by Month.



Bat passes is shown on the y axis as 'bat call frequency'. The boxes span the first quartile to the third quartile values (the interquartile range), with the thick black line in the box being the median value. The 'T' shape or 'Whiskers' above and below the box show the minimum and maximum values. The points on the graph show the outliers.

Plate 1.3: Box Plots for Static Detector Statistical Analysis - Bat passes by Location



KEY:
Location 1 = North 1
Location 2 = North 2
Location 3 = North 3
Location 4 = South 1
Location 5 = South 2
Location 6 = South 3
Location 7 = Lane 1
Location 8 = Lane 2
Location 9 = Lane 3

Bat passes is shown on the y axis as 'bat call frequency'

Plate 1.4: Box Plots for Static Detector Statistical Analysis - Bat Species Richness by Month.

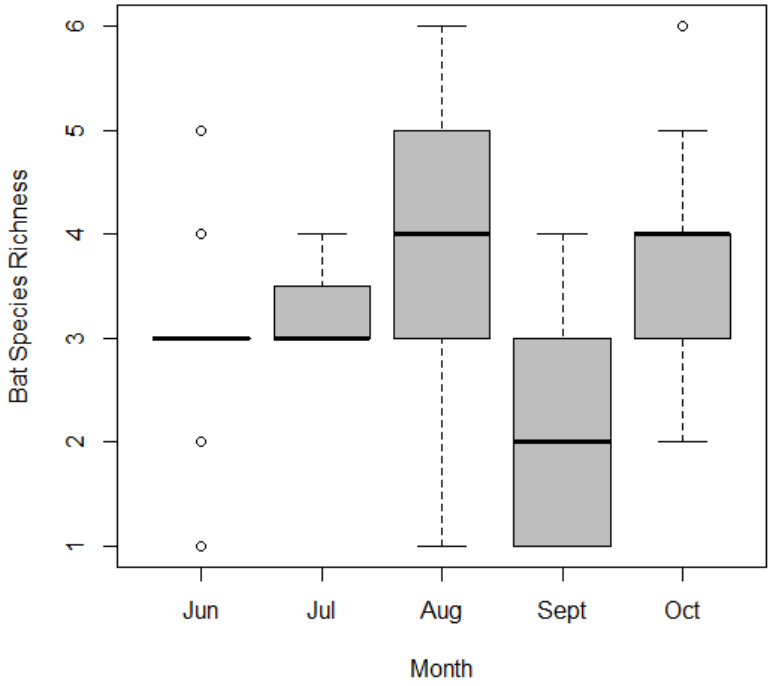
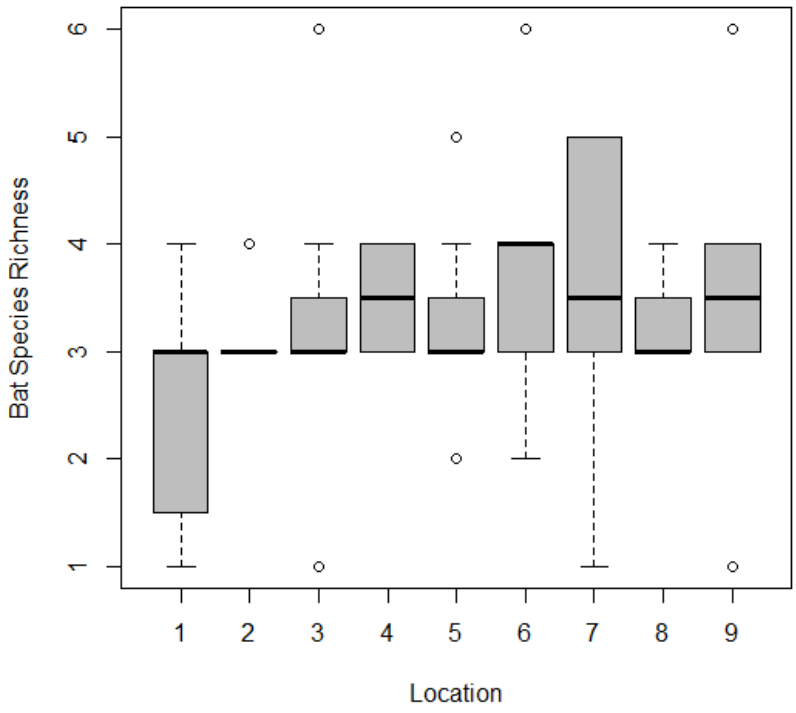


Plate 1.5: Box Plots for Static Detector Statistical Analysis - Bat Species Richness by Location.



KEY:
Location 1 = North 1
Location 2 = North 2
Location 3 = North 3
Location 4 = South 1
Location 5 = South 2
Location 6 = South 3
Location 7 = Lane 1
Location 8 = Lane 2
Location 9 = Lane 3

1.10 Preliminary Project Site Assessment

a) Bat Roosts

i. Bat Roosts in Buildings

1.10.1 There are no buildings, and hence no building bat roosts, within the Project Site.

1.10.2 Buildings adjacent to the Project Site were assessed. None of the buildings surveyed by AECOM supported bat roosts. Previous surveys by BSG in 2014 confirmed roosts in buildings not surveyed by AECOM in 2017 (Appendix 8.8 of the ES). This is expressed in Table 1.6 and shown on Figure 4.2:

ii. Bat Roosts in Trees

1.10.3 Tree 19 is a lone male or non-breeding female common pipistrelle summer roost. No other trees were identified as bat roosts. A photograph of Tree 19 is shown in Plate 1.1.

b) Bat Activity – Species Composition

1.10.4 At least 13 species of bat were recorded foraging and/or commuting in close proximity of and within the Project Site. The following species have been identified during bat surveys at the Project Site:

- Greater horseshoe
- Lesser horseshoe;
- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Daubenton's;
- Natterer's;
- Mytois species; (including calls with characteristics of Bechstein's, Brandt's *Myotis brandti* and Whiskered *Myotis mystacinus*);
- Noctule;
- Serotine;
- Leisler's;
- Long-eared species; and,
- Indeterminate species.

i. Pipistrelle species

1.10.5 Common and soprano pipistrelles were the most commonly recorded species in the Project Site. Overall pipistrelle species comprised 86.8 % of all passes recorded on the walked transect surveys and 93.9% of the static detector surveys. They were also the most commonly recorded species during the emergence/re-entry surveys. Pipistrelle species comprised of 89.5% of the passes recorded on the North Transect and 84.6% of the passes recorded on the South Transect.

1.10.6 Pipistrelle species were similarly the most commonly recorded species during the BSG 2014 transect and static detector surveys (Appendix 8.8 of the ES).

1.10.7 Two passes of Nathusius' pipistrelle were recorded during the July transect surveys, one record from the South Transect and one record from the North Transect, making up 0.2% of total bat passes.

1.10.8 One pass of Nathusius' pipistrelle was recorded at Lane 1 in June and one pass of Nathusius' pipistrelle at North 2 in October, making up <0.1% of the total bat passes.

1.10.9 One pass of Nathusius' pipistrelle was recorded during the BSG static detector surveys in 2014 at Location D8 (ES Appendix 8.8)). Location D8 is in a similar area to the AECOM South 1. Nathusius' pipistrelle were not identified during the BSG 2014 activity transect surveys (Appendix 8.8 of the ES).

ii. Myotis species

1.10.10 Myotis species comprised 9.8% of the total calls recorded on the transect surveys. Myotis species comprised 7.7% of the passes recorded on the North Transect and 11.5% of the calls recorded on the South Transect

1.10.11 Activity levels for Myotis species during the 2017 transects surveys were comparable with the activity levels recorded during the BSG 2014 transect surveys (Appendix 8.8 of the ES).

1.10.12 A total of 1881 Myotid bat passes, 5.6% of the total calls, were recorded during the static detector surveys. Myotis species were recorded in every month, with the highest level of activity recorded in July with BAI of 20.6, and the second highest level recorded in June with a BAI of 17.0.

1.10.13 Some of the Myotid bat echolocation calls from the static detector surveys were considered to have characteristics of Bechstein's (85 passes), Brandt's (50 passes) and whiskered (87 passes). BSG did not identify Myotis to species level (Appendix 8.8 of the ES).

iii. Noctule, Serotine, and Lieslers Species

1.10.14 Noctule and serotine bats comprised 1.8% of the passes recorded on walked transect surveys. Noctule and serotine bats comprised of 1.9% of the passes recorded on the North Transect and 1.8% of the passes recorded on the South Transect. BSG did not breakdown these species into percentages (Appendix 8.8 of the ES).

1.10.15 Noctule, serotine and Leisler's (N/S/L) bats comprised 0.4% of the passes recorded during the static detector surveys.

1.10.16 Noctule, serotine and Leisler's were recorded during the BSG 2014 static detector surveys Serotine were not identified during the BSG 2014 activity transect surveys (ES Appendix 8.8).

iv. Long-eared Species

1.10.17 Long-eared and possible long-eared bat comprised a total of 0.5% of the passes recorded on the North Transect and 0.6% recorded on the South Transect surveys. BSG did not breakdown these species into percentages (Appendix 8.8 of the ES).

1.10.18 Long-eared bats comprised 0.1% of the passes recorded during the static detector surveys.

v. Horseshoe Bat Species

1.10.19 There was a single lesser horseshoe bat pass recorded on the South Transect, equating to 0.2% of the total passes for the South Transect and 0.1% of the total passes for the Project Site. This was recorded in August 2017. BSG 2014 also recorded only one lesser horseshoe bat pass, again recorded on the BSG south transect (Appendix 8.8 of the ES).

1.10.20 A total of 14 lesser horseshoe passes were recorded during the static detector survey:

- Three passes recorded in July; one pass at South 3 and two passes at Lane 3;
- Eight passes recorded in August; six passes at South 2, one pass at South 3 and one pass at Lane 1:
- Two passes in September: one at Lane 1 and one at Lane 3; and
- One pass in October at Lane 3.

1.10.21 BSG recorded a single lesser horseshoe pass at Location D3 (Appendix 8.8 of the ES), which is in a similar area to AECOM South 3.

1.10.22 Greater horseshoe was not detected during the walked transect survey. A single greater horseshoe pass was recorded at Lane 2 in July during the static detector surveys. BSG recorded two greater horseshoe passes in 2014, in Locations D5 and D8 (Appendix 8.8 of the ES). Location D5 was located along the Gallops near to Abergelli Farm and is not comparable with any of the AECOM locations as this is outside of the Project Site Boundary. Location D8 is relatively close to AECOM South 1.

c) Bat Activity – Spatial Distribution

1.10.23 Figure 5.1 shows the spatial distribution of individual bat passes recorded during the transect surveys. Figure 3.4 shows the static detector locations.

1.10.24 In total 940 bat passes were recorded during the walked transects.

1.10.25 Higher levels of activity were recorded in the Southern Transect (513 bat passes; 15.2 BAI), compared to the Northern Transect (427 bat passes, 13. 2 BAI). The bat activity levels are broadly similar.

1.10.26 In total 33,764 bat passes were recorded during the static detector surveys. Table 1.22 gives the bat activity by the Static Detector Location Groups. Higher levels of activity were recorded in the Southern Static Detector Locations (7,779 total bat passes; 148.2 BAI), compared to the Northern Static Detector Locations (5,847 total bat passes, 87.3 BAI), reflecting the pattern of the walked transect.

1.10.27 Using the first night data from static detector surveys, the species richness recorded across different locations was not statistically significant (Appendix 4A: Table 2.5). Therefore, similarly to the walked transect results, the bat activity levels between North and South are broadly similar.

1.10.28 The highest level of activity was recorded in the Lane Static Detector Locations (20,138 total bat passes, 372.9 BAI). The Lane Static Detector Locations (even with the equipment malfunctions, see Limitations) had higher levels of activity compared to both the North and South Static Detector Locations combined. This may be because the Lane is likely used for foraging, along the sheltered woodland edge, and detectors may have been recording multiple passes by the same bats up and down the Lane.

1.10.29 During the walked transects bat activity was recorded across the Project Site (Figure 5.1). Vegetated stream or wet ditch corridors appear to be important for bats within the Project Site. The distribution of bat call suggests the following general patterns of activity. This is a qualitative assessment only:

- Pipistrelle bats were recorded across the Project Site;
- Myotis Species showed some association with mature tree lines and/or areas near water;
- Noctule and Serotine bats were primarily recorded at height over open fields across the Project Site;
- Long-eared bats showed some association with mature tree lines and are focused more towards the centre and south-east of the Project Site. The passes recorded are within approximately 315m to 700m of the BSG confirmed long-eared roost in Building 7 and approximately 270m and 850m of the BSG confirmed long-eared roost in Building 2;
- The single lesser horseshoe was recorded on the South Transect along a mature tree line approximately 900m south of the closest known lesser horseshoe roost in Building 2.

1.10.30 The distribution of bat echolocation calls detected during the static detector surveys suggests the following general patterns of activity. This is a qualitative assessment only:

- Pipistrelle bats were recorded across the Project Site;
- Myotis species were recorded across the Project Site;
- Noctule, Serotine and Leisler bats were recorded across the Project Site ;
- Long-eared bats were recorded at the majority of Static Detector Location except for North 1 and Lane 2;
- The single greater horseshoe was recorded at Lane 2 in the south-west of the Project Site; and
- Lesser horseshoe bats were recorded within the south and south-west of the Project Site at South 2, South 3, Lane 1 and Lane 2.

i. North Transect

1.10.31 Figure 5.2 shows the spatial spread of bat passes recorded on the North Transect.

1.10.32 Table 1.23 below provides the BAI values for the North Transect LPs and a description of the habitat at the LP.

1.10.33 LP2 and LP8 had the highest species richness, with a total of four different species recorded at each.

1.10.34 LP3 had the highest BAI, with LP4 having the second highest BAI. LP3 is located adjacent to a watercourse and riparian woodland with mature trees. LP4 is located next to a row of mature trees which are connected to the Abergelli Farm buildings to the west and a watercourse to the east.

1.10.35 LP11 had the lowest BAI, with only one bat pass was recorded over all the months.

1.10.36 Photographs highlighting some of the habitat types within the North Transect are provided in Plate 1.6.

Table 1.23 North Transect – BAI Results and Habitat Descriptions for LPs

Listening Point	BAI for All Species	Habitat Description
3	40.0	Within the corner of improved grassland field adjacent to a vegetated stream corridor with mature trees and scrub. Field is grazed by sheep.
2	34.5	On the 'cross roads' of a vegetated stream corridor with mature trees and scrub; and a mature tree line with partially wet ditch. Improved grassland field are adjacent to these linear features, grazed by horses and sheep.
4	30.0	Adjacent to a mature tree line and a wet ditch, within an improved grassland field, which has patches of soft rush.
5	27.3	On a farm track which has a mature hedgerow species, on one side including mature hawthorn and other mature trees. Surrounding the track are improved grassland fields grazed by horses and sheep.
6	18.2	On a farm track, further north than LP 5, which has a mature hedgerow species, on one side including mature hawthorn and other mature trees. Surrounding the track are improved grassland fields grazed by horses and sheep. There is a residential property nearby.
12	18.0	On a farm track, further south than LP 5, which has a mature hedgerow species, on one side including mature hawthorn and other mature trees. Surrounding the track are improved grassland fields grazed by horses and sheep. This point is an interchange between a number of hedgerows.
8	16.4	On the edge of an improved grassland field, adjacent to a wet ditch/source of a stream which is lined with mature trees.
1a	15.0	In the corner of an improved grassland field, adjacent to intact hedgerows and near to farm buildings. Fields are grazed by horses and sheep. No ditches or watercourses.
7	12.7	On the edge of an improved grassland field to a defunct hedgerow of sparsely distributed hawthorn trees. This is near the brow of the hill and near to the highest point of the site. No ditches or watercourses.
9	9.1	In the corner of improved grassland field adjacent to wire fence and species poor hedgerow, predominantly of bracken, this borders a minor road. No ditches or watercourses.
10	7.3	On the edge of an improved grassland field adjacent to a species poor hedgerow, predominantly of bracken, this borders a minor road. No ditches or watercourses.
1	6.7	On track next to corner of an improved grassland field, adjacent to intact hedgerows and near to farm buildings. Fields are grazed by horses and sheep. No ditches or watercourses.
11	1.8	On a farm track which has some mature trees and some sections of hedgerow. The track is between a solar farm and a semi-improved grassland field. No ditches or watercourses.

ii. South Transect

1.10.37 Figure 5.3 shows the spatial spread of individual bat records during the north transect surveys.

1.10.38 Table 1.24 provides the BAI values for the South Transect LPs and a description of the habitat at the LP.

1.10.39 LP4, LP8 and LP10 had the highest level of species richness, with a total of four different species recorded at each.

1.10.40 LP5 had the highest BAI, with LP6 having the second highest BAI. LP5 is located next to an area of riparian woodland and watercourse. LP6 is located at the end of a mature tree line, next to a wet ditch and marshy grassland. LP5 and LP6 are located within the south-east of the Project Site.

1.10.41 LP12 had the lowest BAI over all the months.

1.10.42 Photographs highlighting some of the habitat within the South Transect are provided in Plate 1.7.

Table 1.24 South Transect – BAI Results and Habitat Descriptions for LPs

Listening Point	BAI for All Species	Habitat Description
5	41.8	On the Gallops / farm track adjacent to semi-natural riparian woodland on the east and marshy grassland to the west. The LP is at the confluence of two riparian corridors, an unnamed stream and the Afon Llan River.
6	38.2	At the end of a line of mature trees adjacent to a wet ditch. Surrounding fields are of marshy grassland and improved grassland grazed by sheep.
7	26.7	On the edge of an improved grassland field adjacent to a woodland edge, with mature trees and running water. To the north of the LP is semi-improved neutral grassland.
8	25.5	On the edge of an improved grassland field adjacent to barbed wire fence with running water. There is no hedgerow or trees at this point on the stream. Mature trees border the stream a short distance to the south.
4	21.8	On the Gallops / farm track adjacent to marshy grassland. This is in proximity to LP6, and bats were on occasion seen flying from the tree line at LP6 across the Gallops and foraging over the marshy grassland.
2	20.0	On the ‘cross roads of three rides in the semi-natural woodland. A vegetated stream corridor is nearby.
3	18.2	On the edge of semi natural woodland (ancient woodland), adjacent to improved grassland field gazed by horses.
9	17.8	On the edge of an improved grassland field, on the end of a wet ditch, next to a wire fence.
1	12.7	On a farm track on the edge of an area of semi-natural woodland, adjacent to a small pond generated by run off from the field.
11	12.7	On the edge of a marshy grassland field adjacent to a hedgerow with trees and a wet flowing ditch.
10	7.3	In the corner of a marshy grassland field adjacent to a mature tree line. No ditches or watercourses.
12	2.0	On the farm track adjacent to a semi-improved grassland field grazed by horses. No wet ditches or watercourses.
9a	0.0	On edge of a marshy grassland field, adjacent to hedgerow. On same corridor as LP11. Ditch with running water on opposite side of hedge.
9b	0.0	Within a marshy grassland field, adjacent to a wire fence. No wet ditches or watercourses.

iii. Static Detector Surveys

1.10.43 Figure 3.4 shows the Static Detector Locations.

1.10.44 Table 1.25 provides the BAI values for Static Detector Locations and a description of the habitat at the Locations.

1.10.45 The statistical analysis shows that the number of bat passes is influenced by location (Appendix 4A: Table 2.2).

Table 1.25 Static Detector - BAI Results and Habitat Description for Locations

Static Detector Locations	BAI for All Species	Habitat Description
Lane 2	1000.2	Located with a hedgerow next on the north edge of the Access Road. The microphone faces south into the Lane. There is a row of mature trees on the north edge of the Lane and Ancient Woodland along the south. There is a matrix of semi-improved and marshy grassland adjacent to the north.
South 1	431.9	Located on a sycamore which is within a strip of broadleaved woodland on the south bank of a wet ditch. The microphone faces south-east over an improved grassland field.
Lane 1	300.4	Located on a tree on the tree lined north edge of the Access Road. The tree line stops at this location and is on the edge of a strip of scrub where the woodland has been cleared and managed and kept open below power lines. The microphone faces south-east into the Lane and scrub clearing.
North 1	115.3	Located on a fence post, on the intersection of a vegetated stream corridor with mature trees and a mature tree line with partially wet ditch. The microphone faces south along the stream. Improved grassland field are adjacent to these linear features, grazed by horses and sheep.
Lane 3	85.7	Located on an alder, within the tree lined north edge of the Access Road. There is a row of mature trees and broadleaved woodland on the north edge of the Lane and Ancient Woodland along the south. The microphone faces south-east into the Lane.
North 3	83.4	Located on a mature oak, within a row of mature trees along the vegetated stream corridor. The microphone faces south-west across the stream and towards an improved grassland field grazed by horses and sheep horses.
North 2	68.6	Located on a hawthorn tree within a defunct hedgerow of hawthorn, on the edge of an improved grassland field. The microphone faces west out over the field. This is near the brow of the hill and near to the highest elevation of the site. No ditches or watercourses.

South 2	59.2	Located on a silver birch which is within a strip of broadleaved woodland on the south bank of a wet ditch. Near the Gallops / farm track and adjacent to marshy grassland. The microphone faces south-east over the marshy grassland.
South 3	10.3	Located on a fence post adjacent to the Gallops / farm track and a partially wet ditch and a semi improved grassland field grazed by horses. The microphone faces north-east across the ditch and semi improved grassland field.

d) Bat Activity – Temporal Distribution

1.10.46 Bat activity was recorded at the Project Site between June and October 2017. Bat surveys for April and May are due to be undertaken in 2018.

1.10.47 August had the highest BAI for both transects. The North Transect had a BAI of 8.5 and the South Transect had a BAI of 4.8.

1.10.48 For the North Transect, the second highest BAI was 7.0, both in June and July.

1.10.49 For the South Transect, the second highest BAI was 3.0 in July and the third highest was 2.8 in October.

1.10.50 For the static detector surveys, July had the highest BAI of 377.3, the second highest BAI was 238.9 in June.

1.10.51 Higher levels of Myotis species activity in June and July during the 2017 static detector surveys were comparable with the higher activity levels recorded in June and July during the BSG 2014 static detector surveys (PB, 2015), although it should be noted that BSG did not have any static detectors placed within the lane area to the west of the Project Site.

1.10.52 As seen in Plate 1.4 the months of August and October have a greater level of species richness than September. This was a statistically significant result as seen in Appendix 4A: Tables 2.5 and 2.6.

1.10.53 The statistical analysis of the first night of static detector data show that bat passes is influenced by month (Plate 1.2 and Appendix 4A: Table 2.2). June has a significantly higher bat echolocation call frequency than August and October (Appendix 4A: Table 2.3). This result differs from the walked transect results which showed highest level of bat activity in July and June as the second highest. Both survey methods indicate that the summer months had the highest level of activity. This is likely due to general bat ecology, with bats being most active in mid-summer.

1.10.54 Young bats are typically born in June and July and during August the young are starting to leave the roosts to fly and feed. October is part of the bat mating period and a time when bats are extensively foraging for food as they are looking to store fat for the winter hibernation period. The general ecology of bat species is likely to influence the temporal activity for the Project Site.

Plate 1.6 North Transect – Examples of Habitat

Part of the north of the Project Site, within North Transect, near to the Electrical Connection looking south.

Example of hedgerow with mature trees and improved grassland fields, within the North Transect, near to the Electrical Connection looking west towards Abergelli Farm

Plate 1.7: South Transect - Examples of Riparian Habitat

An area of riparian woodland with mature trees, near to the South Transect, near the Ancient Woodland.

An area of riparian woodland, within South Transect, running alongside the Gallops/ farm track in the south- of the Project Site.

1.11 Preliminary Potential Effects

1.11.1 A full assessment of effects at construction and operation has been undertaken for the Ecological Impact Assessment (EcIA) and reported in the ES.

1.11.2 Figure 7 indicates the location of potential constraints / impacts. At this stage the following potential effects have been identified:

a) Bat Roosts

i. Destruction and Loss of a Roost

1.11.3 Tree 19 was the only confirmed roost within the Project Site. The Project will not require the removal of Tree 19.

ii. Killing and Injury

1.11.4 Based on the current known distribution of bat roosts within the Project Site, there is no risk of killing or injuring bats during construction and operation.

iii. Disturbance

1.11.5 Without mitigation, there is potential for disturbance to bats due to noise and vibration and external lighting during construction and operation.

b) Bat Commuting and Foraging

i. Habitat Loss

1.11.6 The Project Site is used by bats, particularly the vegetated watercourse/wet ditch corridors, followed by woodland edges and hedgerows with mature trees.

1.11.7 A proportion of the broadleaved semi-natural woodland, semi-improved grassland and marshy grassland will be removed as part of the Project. Without mitigation, hedgerows and mature trees lines will be removed for construction of the Electrical Connection and new section of Access Road. This will reduce the amount of habitat available to foraging bats.

ii. External Lighting

1.11.8 An Outline Lighting Strategy provided in Appendix 3.5 of the ES. There will be an increase in external lighting at the Project Site during construction and operation. There is currently no external lighting within the majority of the Project Site. If external lighting for the Project is poorly designed there is potential for a light spill onto hedgerows, tree lines, woodland edges and vegetated areas. Many species of bat are adverse to light, with different species having different tolerances. External lighting can make areas of previous foraging habitat unsuitable or inaccessible and therefore cause in-direct habitat loss.

iii. Noise

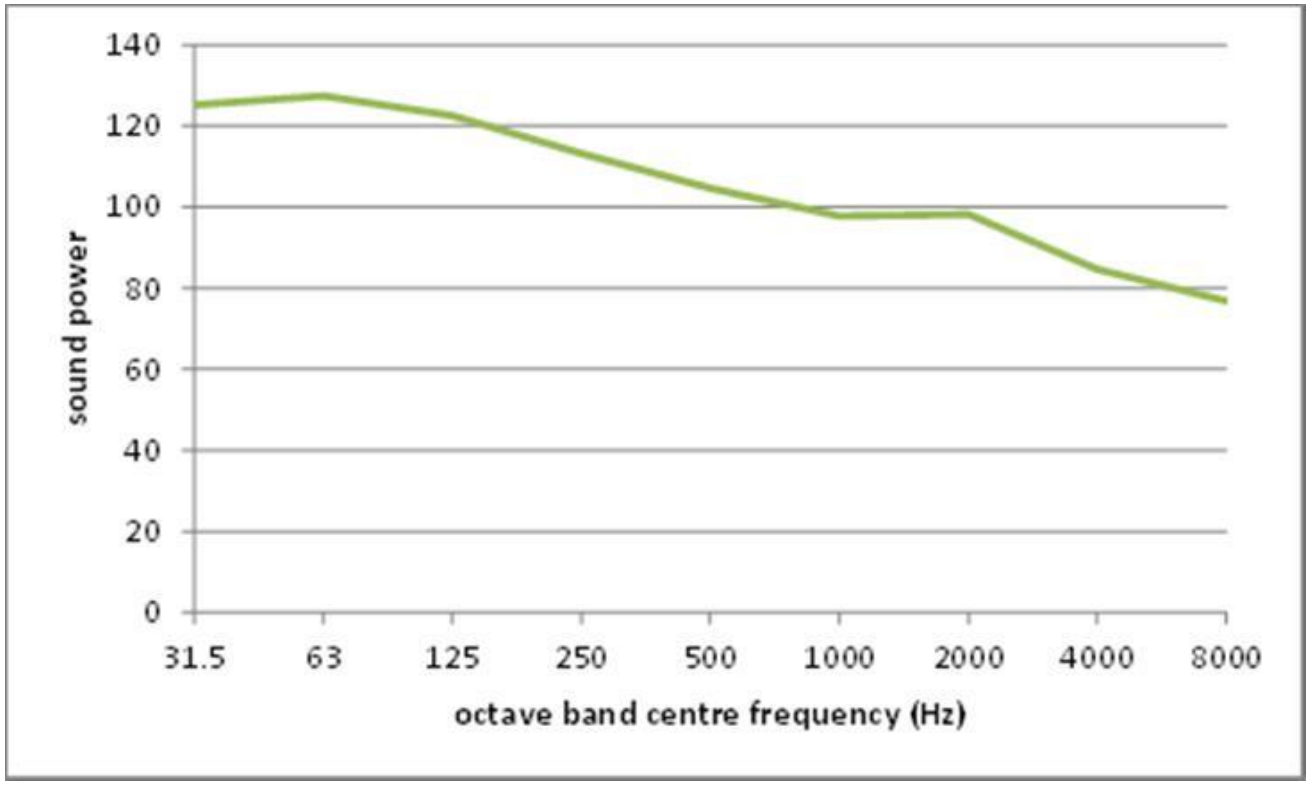
1.11.9 There will be an increase in ambient noise at the Project Site during construction and operation. Construction noise will be temporary and is considered unlikely to impact on foraging bats in the long-term. Operational noise is discussed further below.

1.11.10 The Generating Equipment will only be operational intermittently at times of peak demand and will not emit ultrasonic noise (ultrasonic being noise which is higher than the upper audible limit of human hearing, typically considered to be above 20kHz).

1.11.11 The Generating Equipment is predicted to emit a sound power level of around 100dB $_{LWA}$, the power peaks at a frequency of around 50/63 Hz and roughly halves with every doubling of frequency above that. A typical attenuated power station sound power spectrum is shown in Plate 1.8. This only goes up to 8,000Hz (8kHz) but the tail off in the spectrum continues with increased frequency, showing that there will be little sound power (dB L_A) above 10,000Hz (10kHz).

1.11.12 The specific sound level near the Project Site boundary is estimated to be approximately 55dB LAeq (ES Chapter 7 Noise – Figure 7.1) (this term is the Equivalent Continuous Level, a type of average, where noisy events have a significant influence). The theoretical average sound pressure level (dB L_A) at the Project Site boundary approximately 30m from the Generating Equipment will be approximately 55 dB L_A to 63 dB L_A. Equivalent general sounds comparisons are: 50 dB L_A is light traffic or rainfall; 60 – 65 dB L_A is normal conversation; and 85 dB L_A is heavy traffic.

Plate 1.8: A Typical Attenuated Power Station Sound Power Spectrum (Not Site Specific)



1.11.13 There is limited research on the impact of anthropogenic noise on foraging bats and no directly comparable research on the impacts of power station noise have been identified. Research that exists shows that increased anthropogenic noise can negatively impact foraging activity of some species of bats, particularly low frequency bats (<35kHz), as a result of prey masking and avoidance of noise. Two of these are summarised below.

1.11.14 Bunkley *et. al*. (2015) investigated the potential effects of gas compressor station noise in the USA on the activity levels of the local bat assemblage. The gas compressor stations run 24 hour a day, 365 days a year. The mean background sound level (dB L_A) recorded at 50m from the gas compressor site centre was between 70 and 85dB L_A. The frequency of the compressor noise was 24kHz.

1.11.15 Bunkley *et. al.* (2015) found that activity levels for the Brazilian free-tailed bat (*Tadarida brasiliensis*) were 40% lower at loud compressor sites compared to quieter well pads, whereas the activity levels of four other species (*Myotis californicus, M. cillolabrum, M. lucifugus, Parastrellus hesperus*) were not affected by noise. The assemblage of bat species emitting low frequency (<35kHz) echolocation calls showed a 70% reduction in activity levels at loud sites compared to quieter well pad sites whereas the assemblage using high frequency (>35kHz) echolocation did not exhibit altered activity levels. Bunkley *et. al*. (2015) concluded that lower activity levels of Brazilian free-tailed bats at loud sites indicate a potential reduction in habitat for this species and that this species modifies its echolocation search calls in noise, producing longer calls with a narrower bandwidth, which might affect prey detection.

1.11.16 Luo *et al.*, 2015 investigated how anthropogenic noise impairs foraging, which has direct consequences for animal survival and reproductive success, using Daubenton's bats, which find prey by echolocation. The study looked to identify the potential mechanisms of disturbance in any species capable of detecting the noise, namely acoustic masking of prey echoes, reduced attention and noise avoidance. The study used playback of traffic noise and was laboratory based. Traffic noise was played at around 76dB L_A, at nonoverlapping frequencies below 25kHz (not spectrally overlapping the minimum call frequency of Daubenton's, which is at 28kHz), and overlapping frequencies above 25kHz.

1.11.17 Luo *et al.*, 2015 found that traffic noise reduced foraging efficiency in most Daubenton's bats. This effect was present even if the playback noise did not overlap in frequency with the prey echoes. Neither overlapping noise nor nonoverlapping noise influenced the search effort required for a successful prey capture. Hence, noise did not mask prey echoes or reduce the attention of bats. Instead, traffic noise acted as an aversive stimulus that caused avoidance response, thereby reducing foraging efficiency.

1.11.18 The frequency emitted from the Generating Equipment (between 50Hz and 10,000Hz (10kHz)) is unlikely to mask the frequencies of large bat prey items, which are generally in the range of 20 - 35kHz and frequencies less than 1 kHz are probably inaudible to bats (Luo *et al.*, 2015).

1.11.19 Bunkley et. al. (2015) suggests that bat species emitting low frequency (<35kHz) echolocation calls may be more affected by noise than other species. At the Project Site, bats which echolocate at frequencies <35kHz include the large bats; noctule, serotine and Leisler's. Lower frequency bats at the Project Site make up 5.8% of the total composition of bat species, the rest are higher frequency bat species (>35kHz). However, the predicted frequencies emitted from the Generating Equipment (between 50Hz and 10,000Hz (10kHz)) were much lower than in Bunkley et. al. (2015) and, as above, are unlikely to mask prey items for any bat species.

1.11.20 There may be some noise avoidance by some bat species when the Generating Equipment is operating, as there is little research available to be able to completely rule out potential avoidance from noise of 55 – 63dB L_A . However, the generation of noise would be sporadic and the sound power anticipated at the Project Site boundary is lower than that in the studies summarised above and it would be anticipated that any impact from avoidance would therefore be comparably lower. No studies were identified which looked at potential foraging impacts from sound power (dB L_A) less than 70dB L_A to be able to draw any direct conclusion.

1.11.21 At the Project Site, the sporadic nature of the noise generated with times of peak demans most likely to occur during winter (when bats are hibernating) during the early evening (16:00 – 18:00, when people get home from work and before bats emerge from roosts), combined with the sound power peaking at a frequency well below the typical frequency used by echolocating bats, it is considered that noise will not have a significant impact on the population of foraging bats within the Project Site.

iv. Severance and Fragmentation

1.11.22 The removal of trees and woodland is required to facilitate the construction of the new section of Access Road. Without mitigation, this will sever the connectivity to habitats either side of the track, resulting in severance and fragmentation of retained areas.

1.11.23 The removal of tree lines and hedgerows may be required in order to facilitate the construction of the Gas Connection in the north of the Project Site. Removal or severance of tree lines and hedgerow will sever the connectivity they provide and create fragmentation of retained habitat.

1.11.24 During construction of the Project natural habitats including hedgerows and tree lines will be removed and converted to new areas of hardstanding and buildings. This will fragment and sever the connectivity of the habitats located to the north and to the south of the Project. This will impact on bats using the existing features in the landscape to commute and forage between these two areas.

1.11.25 An Outline Lighting Strategy provided in Appendix 3.5 of the ES. There will be an increase in external lighting at the Project Site during construction and operation. There is currently no external lighting within the majority of the Project Site. Many species of bat are adverse to light, with different species having different tolerances. External lighting can make areas of previous foraging habitat unsuitable and fragment commuting routes. If external lighting for the Project is poorly designed there is potential for a light spill onto hedgerows, tree lines, woodland edges and vegetated areas which will negatively impact on bats, severing commuting routes and impeding access to foraging habitat. Poorly designed lighting also has the potential to affect areas outside the Project Site boundary.

1.12 Preliminary Recommendations for Further Surveys and Mitigation

a) Recommendations for Further Surveys

1.12.1 A full assessment of required further surveys has been made during EcIA and reported in the ES. At this stage it is anticipated that further surveys will be required. The following recommendations have been made:

- Walked bat activity transect surveys in April and May 2018 using the same methodology for the walked bat activity surveys undertaken in 2017;
- Static detector bat surveys in April and May 2018 and assessment to augment the walked transect data;
- Building assessments and further bat surveys on Buildings 7 and 8 within the Abergelli Farm (schedule to be undertaken in 2018);
- Pre-construction checks on trees, scheduled for removal, should be assessed for their current bat roost suitability with consideration of the seasonal survey timings.

1.12.2 Although further surveys are recommended it is considered that, utilising data from 2014 and 2017 surveys undertaken to date, an accurate assessment of bat activity within the Project Site has been made. Further surveys are recommended to confirm that the most appropriate and effective mitigation measures have been determined; mitigation has been included in a Landscape and Ecological Mitigation Plan (LEMP).

b) Recommendations for Mitigation

1.12.3 A full series of recommendations for further surveys and mitigation at construction and operation has been undertaken for the EcIA and reported in the ES. At this stage the following key recommendations have been made:

- Based on the current Project proposals a European Protected Species Licence (EPSL) is not a requirement. However, should the scope of the Project change and/or if further bat roosts are identified a EPSL may be required;
- Compensate for loss of foraging habitat;
- Maintain connectivity of foraging and commuting habitats by the retention of trees and hedgerows wherever possible. Figure 7 shows areas of potential conflict;
- Utilising ‘brown hedgerows’ of brash, to maintain connectivity during construction;
- Create new green corridors to mitigate loss, provide alternative routes and enhance the local landscape;
- For construction of the Electrical Connection consider directional drilling under hedgerows and mature tree lines to avoid felling and avoid severance;
- If less important hedgerows need to be severed temporarily during construction of the Electrical Connection the severed areas should be replanted with whips and standards;
- It is recommended that reasonable avoidance measures should be taken if any trees with a Low bat roost potential need removing as part of the Project (Hundt, 2012). This is likely to include soft-felling of trees under ecological supervision from a bat licenced ecologist;

- Plant a mix of locally native species of standard trees and whips along both sides of the new section of Access Road to create a 'hedgerow with trees'; and,
- Avoid external lighting wherever possible. Only light areas which need to be lit to meet minimum standard. Where external lighting is needed it should be designed to avoid and reduce light spill following best practice guidelines for lighting and bats (Gunnell 2012, BCT 2009), and should be reviewed by an ecologist. Where external road lighting is needed the use of bollards with louveres should be considered to keep lighting directional and below head height, timer or motion sensors should be used.

c) Recommendations for Biodiversity Enhancement

1.12.4 A full series of recommendations for biodiversity enhancement has been made during the EcIA and reported in the ES. At this stage the following precautionary recommendations have been made:

- Woodcrete bat boxes on trees;
- Improve existing hedgerows by infilling with locally native species standard trees to maintain connectivity to key foraging areas; and,
- Creation of new hedgerows and green corridors of locally native species.

2. References

AECOM (2017). Abergelli Power Station Preliminary Ecological Appraisal, Stag Energy, May 2017.

Bat Conservation Trust (BCT) (2009). Bats and Lighting in the UK. Bat Conservation Trust, London http://www. bats. org. uk/data/files/bats_and_lighting_in_the_uk__final_version_version_3_may_09. Pdf.

BCT (2017). NBMP Field Survey Tutorial [online]. Available at: http://www. bats. org. uk/nbmp_tutorials/tutorial26. html.

Bunkley, J.P., McClure, C.J.W., Kleist, N.J., Francis, C.D. and Barber, J.R. (2015). Anthropogenic noise alters bat activity levels and echolocation calls. Global Ecology and Conservation 3, 62-71 [online]. Available at: https://www .sciencedirect.com/science/article/pii/S235198941400064X Accessed 1 March 2018.

CIEEM (2017). Professional Code of Conduct. Chartered Institute of Ecology and Environmental Management (CIEEM) November 2017.

Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

Forestry Commission (2005). Woodland Management for Bats. Forestry Commission, West Yorkshire.

Gunnell, K., Grant, G. and Williams, C. (2012). Landscape and urban design for bats and biodiversity. Bat Conservation Trust. Available at: http://www.bats.org.uk/pages/landscapedesign.html

Gunnell, K. , Murphy, B. and Wiiliams, C. (2013). Designing for Biodiversity: A technical guide for new and existing buildings. London.

Hundt, L. (2012) Ed. Bat Surveys: Good Practice Guidelines. 2nd Edition. Bat Conservation Trust, London.

Joint Nature Conservation Committee (2010 Ed.). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC. Peterborough.

Luo, J.H., Siemers, B. M. and Koselj, K. (2015) How anthropogenic noise affects foraging. Global Change Biology 21, 3278-3289.

Mitchell-Jones, A. J, and McLeish, A. P. Ed. , (2004). 3rd Edition Bat Workers' Manual, 178 pages b/w photos, softback, ISBN 1 86107 558 8.

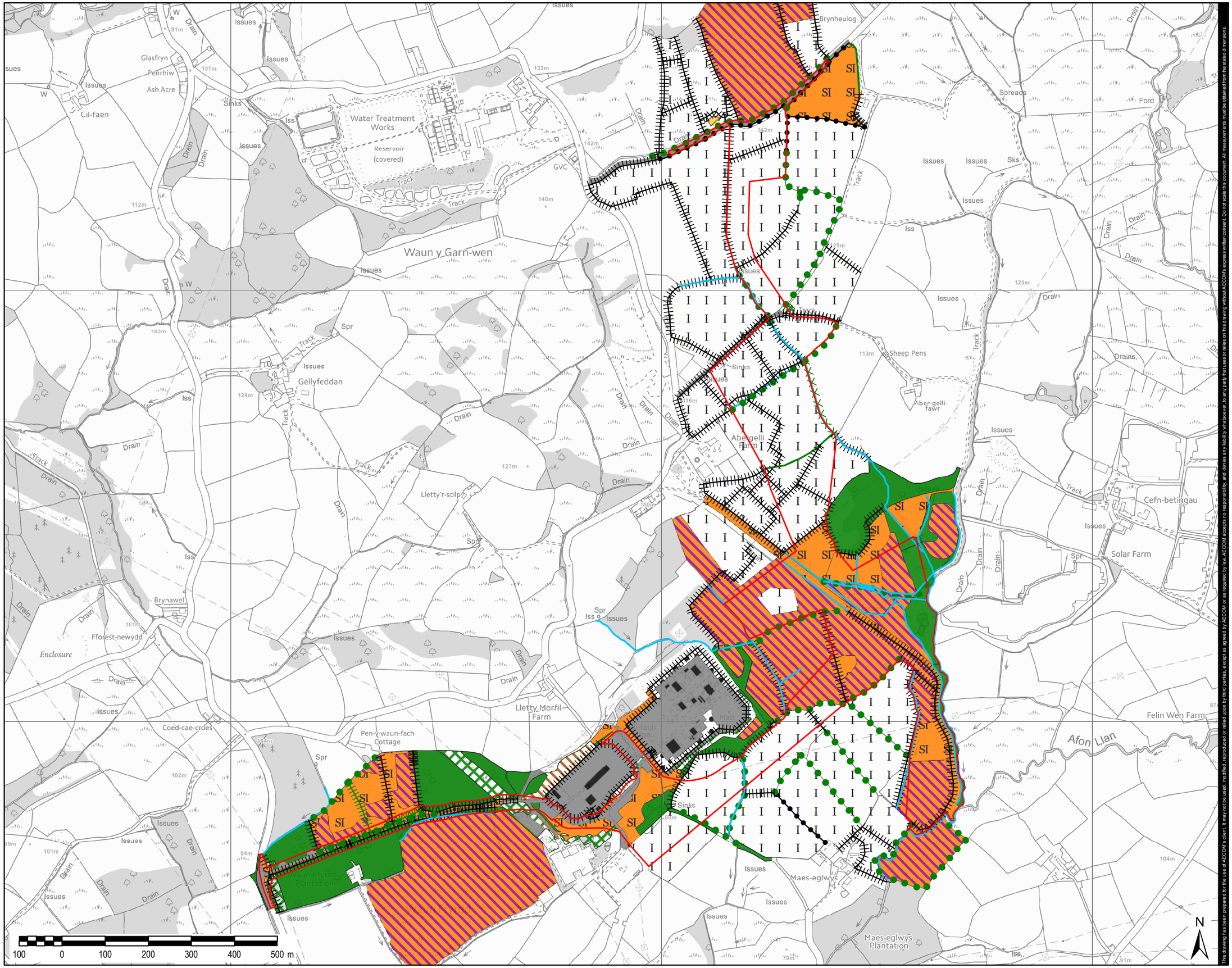
Natural England (NE) (2017). Multi Agency Geographic Information for the Countryside (MAGIC). Available at www. magic. gov. uk.

R Core Team (2013). R: A language and environment for statistical computing.

Russ, J. (2012). British Bat Calls A Guide to Species Identification.

Welsh Government (WG) and Natural Resources Wales (2017). Lle A Geo-Portal for Wales. Available at: http://lle. gov. wales/home

Figure 1 Phase 1 Habitat Map



AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Project Site Boundary

Phase 1 Habitat Linear Features

- Scrub - Scattered
- Row of trees - broadleaved
- Running Water
- Intact Hedge - Species-Poor
- Defunct Hedge - Species-Poor
- Hedge with Trees - Native Species-Rich
- Hedge with Trees - Species-Poor
- Fence
- Earth Bank

Phase 1 Habitat Areas

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Dense/Continuous scrub
- Scattered scrub
- Semi-improved - neutral grassland
- Improved grassland
- Marsh/marshy grassland
- Tall ruderal - herb and fern
- Dry heath/acid grassland mosaic
- Buildings
- Bare ground
- Hard standing

AECOM Internal Project No:

60542910

Drawing Title:

PHASE 1 HABITAT MAP

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GM	CC	CA	02/05/18

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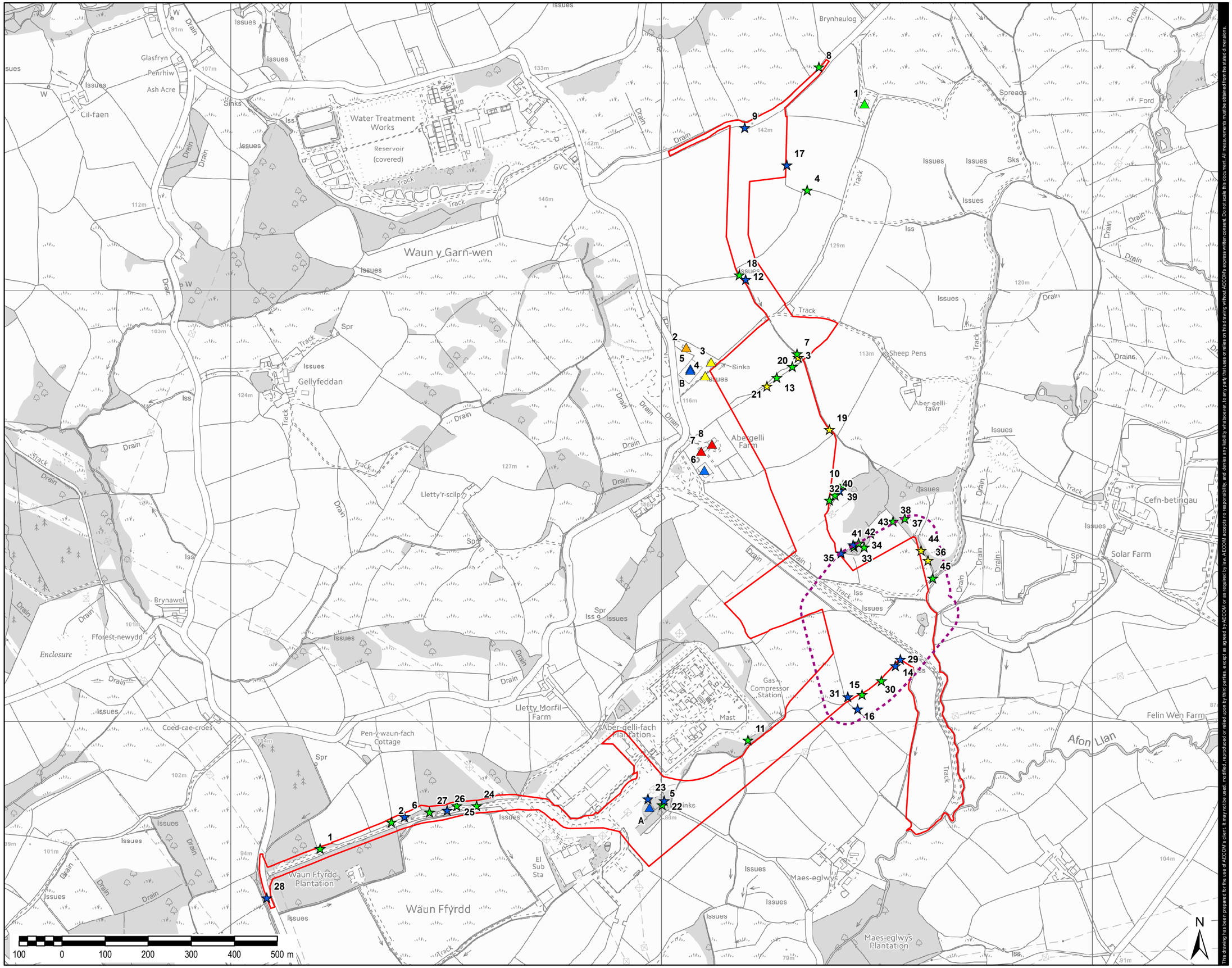
Figure 2 Building Ground Level Roost Assessment Results and Tree Potential Bat Roost Feature Climbed Inspection Results



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1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

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LEGEND

- Project Site Boundary
- 50m Zone of Influence

Potential Tree Roost Feature Climbed Inspection Results

- Moderate
- Low
- Negligible

Preliminary Ground Level Assessment Results for Buildings

- Confirmed
- High
- Moderate
- Low
- Negligible

Note:
Buildings 7 and 8 based on BSG 2014. Not assessed in 2017.

AECOM Internal Project No:

60542910

Drawing Title:

PRELIMINARY GROUND LEVEL ASSESSMENT RESULTS FOR BUILDINGS AND POTENTIAL ROOST FEATURE CLIMBED INSPECTION RESULTS

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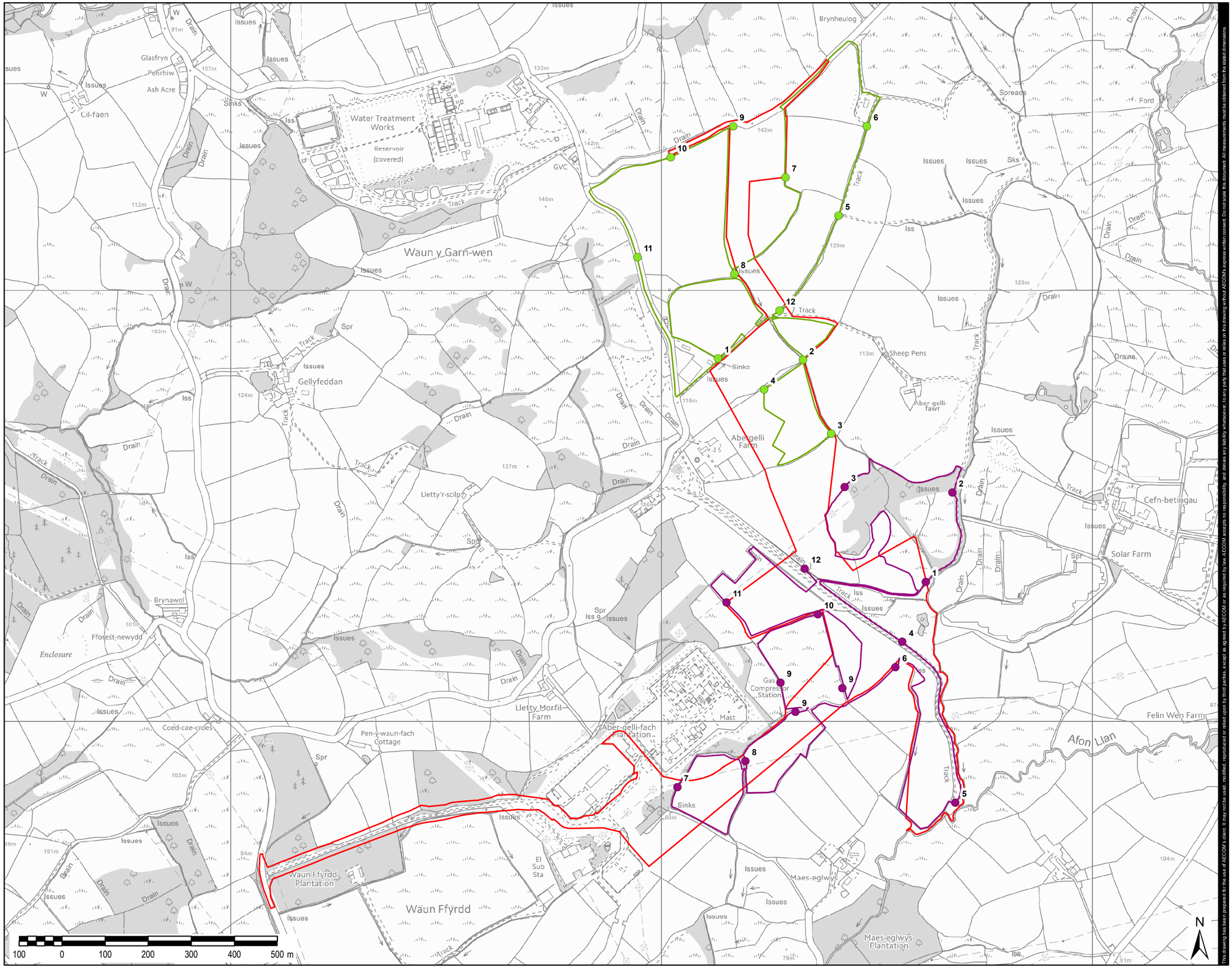
GM	CM	CA	02/05/18

Figure 3.1 Bat Activity Transects North and South with Listening Points



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1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
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Project Title:

ABERGELLI POWER PROJECT

Client:

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LEGEND

- North Transect Listening Points
- South Transect ListeningPoints
- North Transect - 4.65km
- South Transect - 6.08km
- Project Site Boundary

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY TRANSECTS WITH LISTENING POINTS

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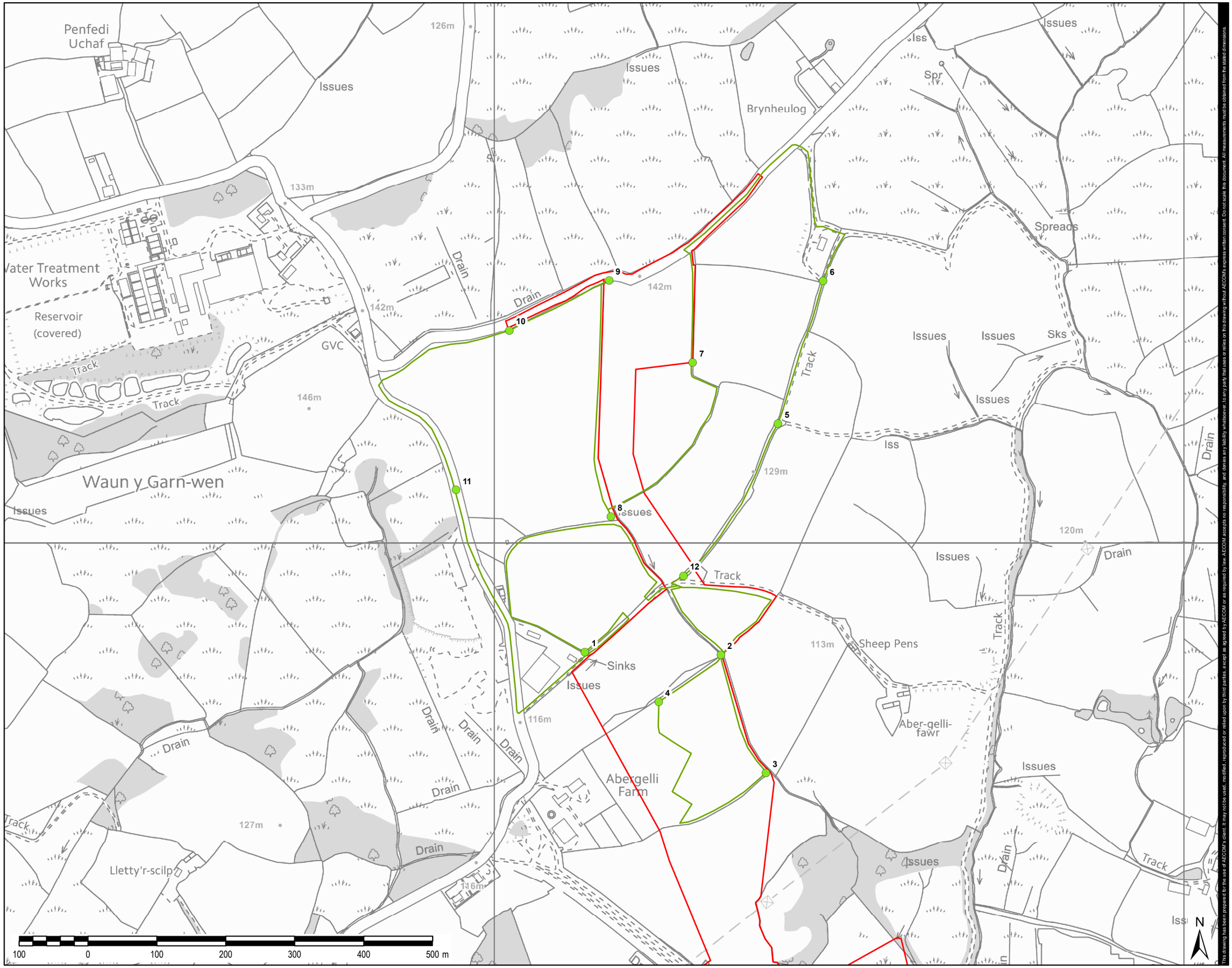
Figure 3.2 Bat Activity Transects North with Listening Points



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1 Callaghan Square
Cardiff, CF10 5BT
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LEGEND

- North Transect Listening Points
- North Transect - 4.65km
- Project Site Boundary

AECOM Internal Project No:

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Drawing Title:

BAT ACTIVITY TRANSECT NORTH WITH LISTENING POINTS

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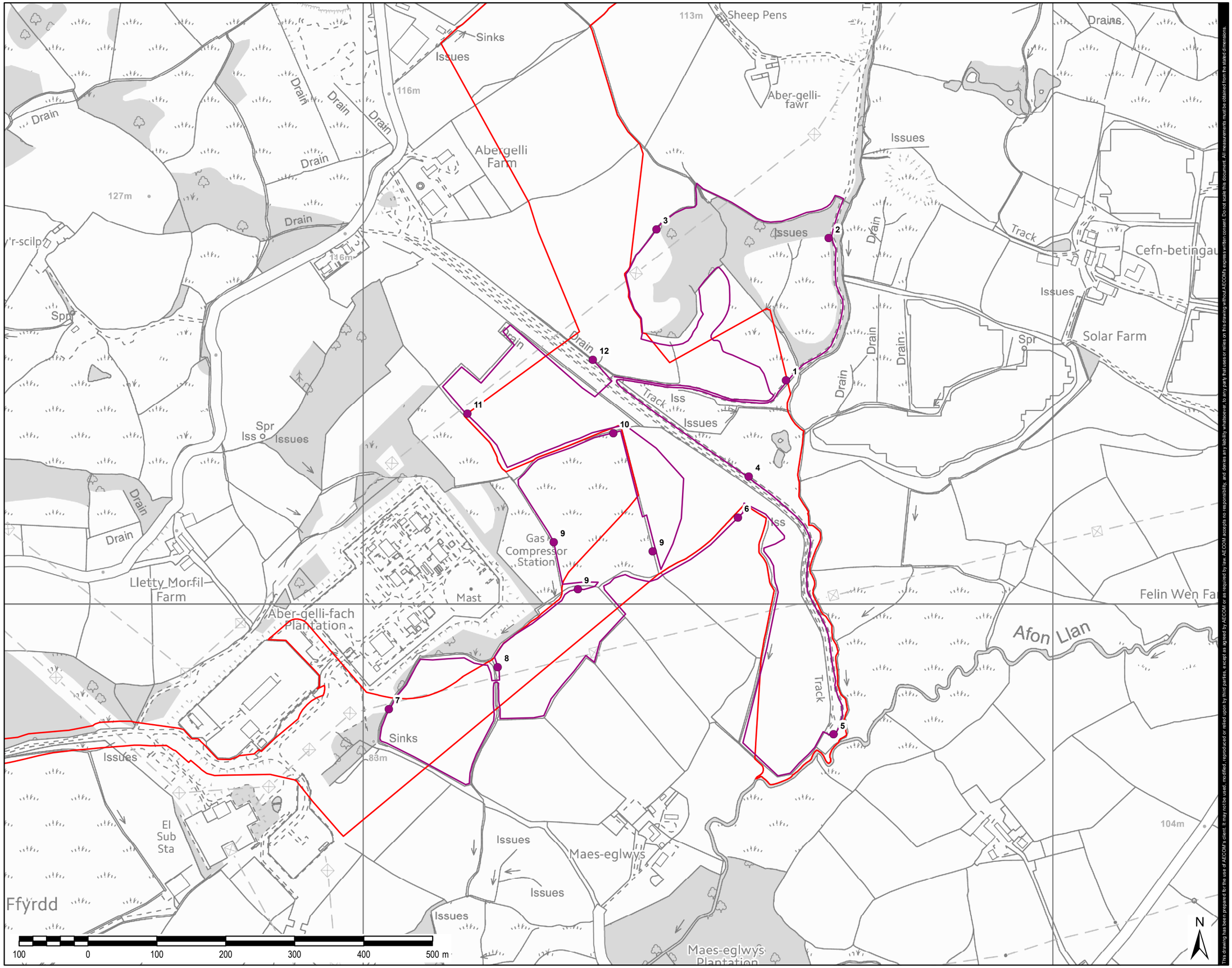
Figure 3.3 Bat Activity Transects South with Listening Points



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1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
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LEGEND

- South Transect ListeningPoints
- South Transect - 6.08km
- Project Site Boundary

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY TRANSECT SOUTH WITH LISTENING POINTS

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Figure 3.4 Bat Activity Static Detector Locations

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Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
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LEGEND

- Static Detector Location, and Direction of Microphone
- Project Site Boundary

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY STATIC DETECTOR LOCATIONS

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100 0 100 200 300 400 500 m

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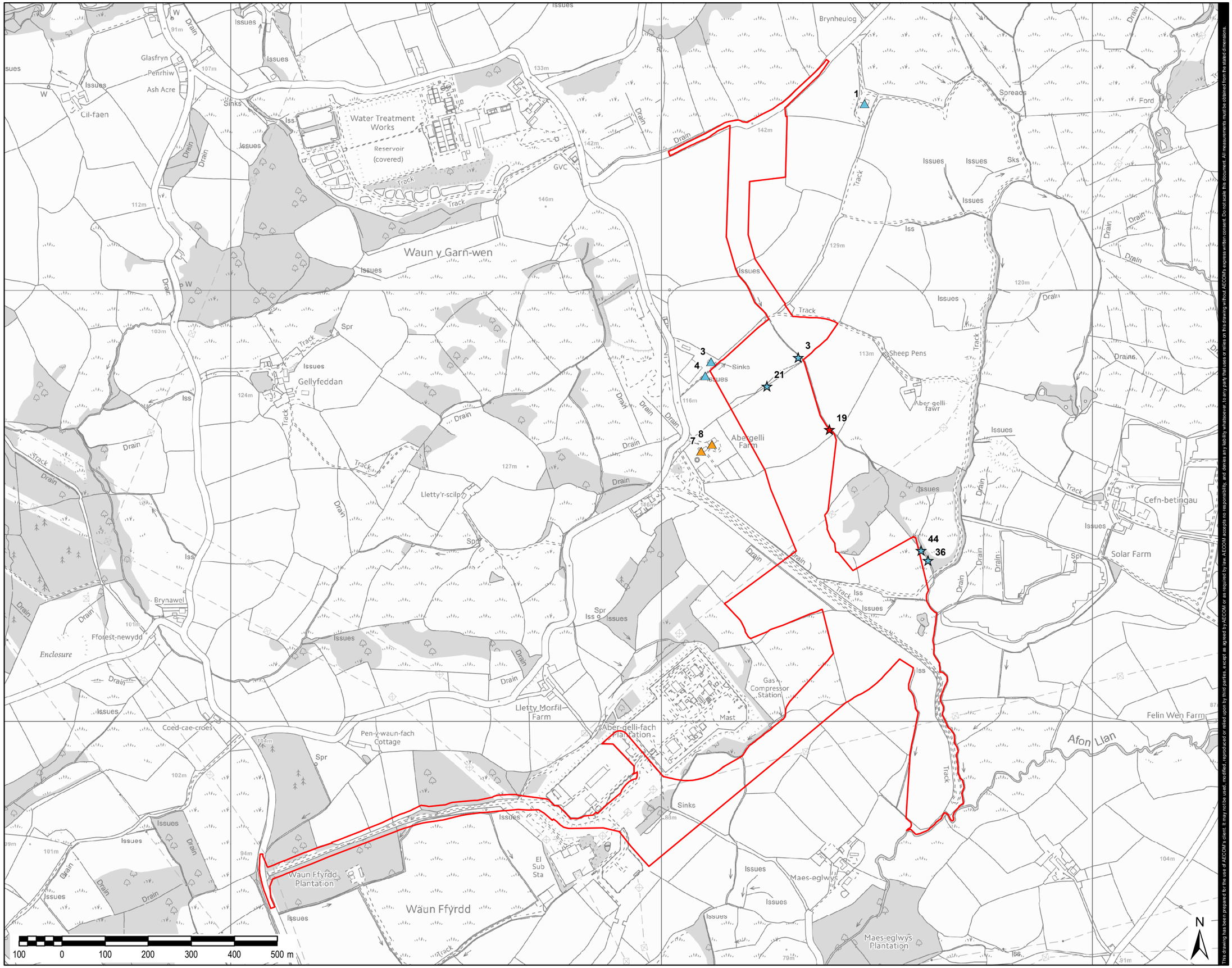
Figure 4.1 2017 Building and Tree Roost Results



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+44 (0)29 2067 4600 tel
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Project Title:

ABERGELLI POWER PROJECT

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LEGEND

- Project Site Boundary
- Trees - Confirmed roost
- Trees - No confirmed roost
- Buildings - No confirmed roost
- Not assessed in 2017

AECOM Internal Project No:

60542910

Drawing Title:

BUILDING AND TREE ROOST RESULTS

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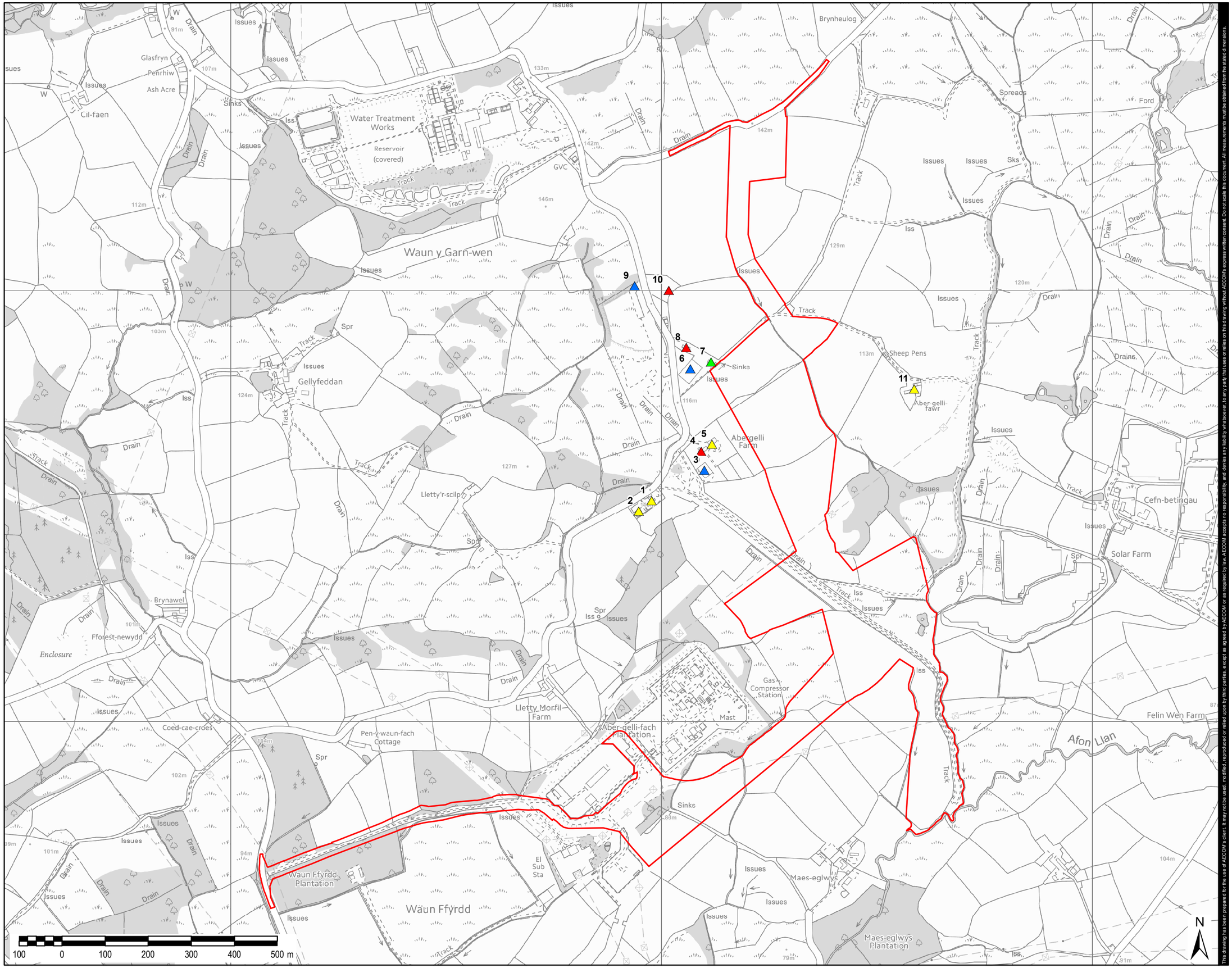
Figure 4.2 BSG Building Results 2014



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Project Title:

ABERGELLI POWER PROJECT

Client:

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LEGEND

- Project Site Boundary
- Confirmed
- Moderate
- Low
- Negligible

AECOM Internal Project No:

60542910

Drawing Title:

BSG BUILDING RESULTS 2014

Scale at A3: 1:8,000

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FIGURE 4.2			001
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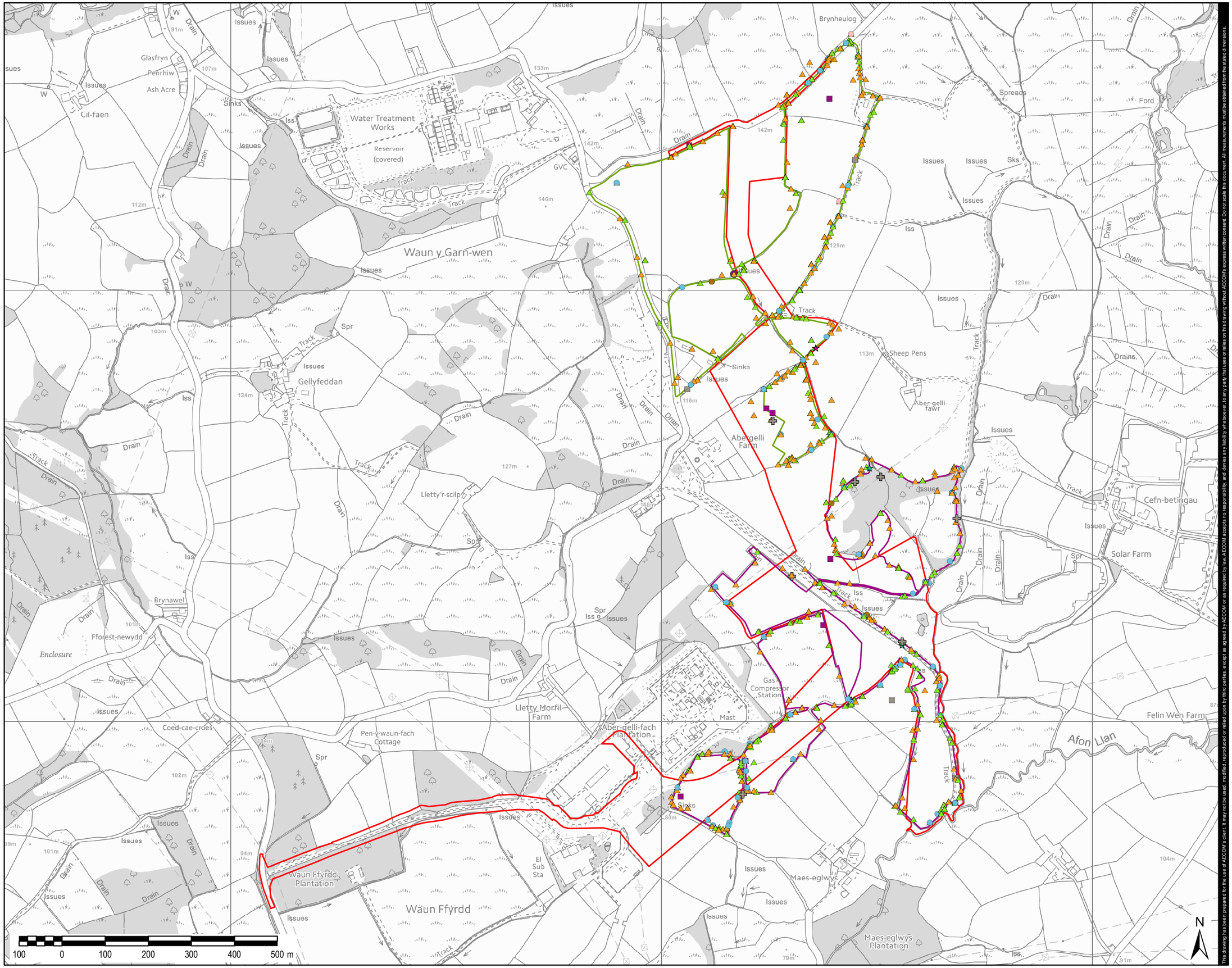
Figure 5.1 Bat Activity Transect Results



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Project Title:

ABERGELLI POWER PROJECT

Client:

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LEGEND

- Common pipistrelle
- Soprano pipistrelle
- Nathusius' pipistrelle
- Daubenton's
- Myotis species
- Natterer's
- Noctule
- Serotine
- Long-eared
- Possible long-eared
- Lesser horseshoe
- Indeterminate
- North Transect - 4.65km
- South Transect - 6.08km
- Project Site Boundary

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AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY TRANSECT RESULTS

Scale at A3: 1:8,000

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FIGURE 5.1			001
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GM	CM	CA	02/05/18

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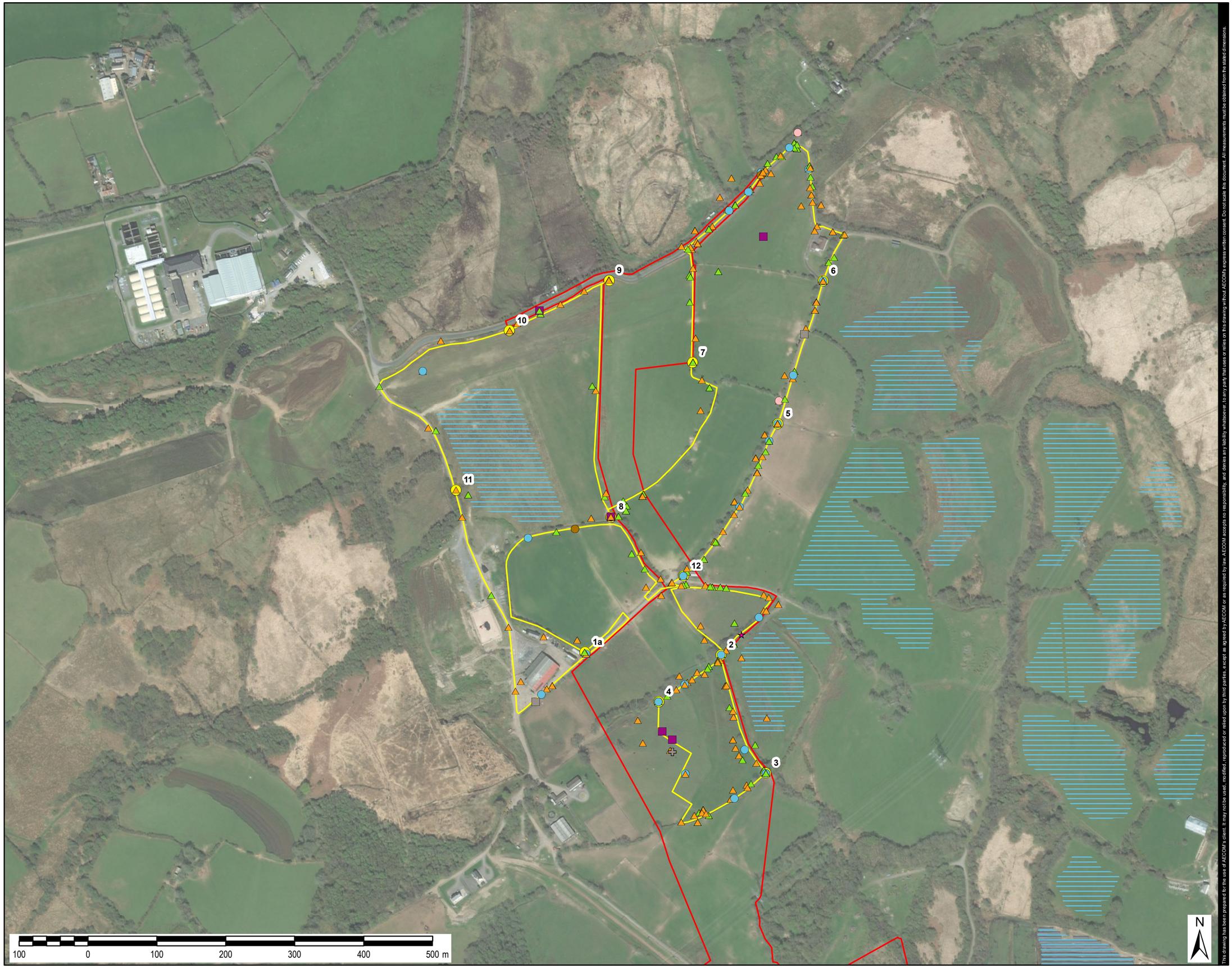
Figure 5.2 Bat Activity Transect Results – North



AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Common pipistrelle
- Soprano pipistrelle
- Nathusius' pipistrelle
- Daubenton's
- Myotis species
- Natterer's
- Noctule
- Serotine
- Long-eared
- Possible long-eared
- Indeterminate
- North Transect Listening Points
- North Transect - 4.65km
- Solar Parks
- Project Site Boundary

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY TRANSECT RESULTS NORTH

Scale at A3: 1:5,000

Drawing No:			Rev:
FIGURE 5.2			001
Drawn:	**Chk'd:**	**App'd:**	**Date:**
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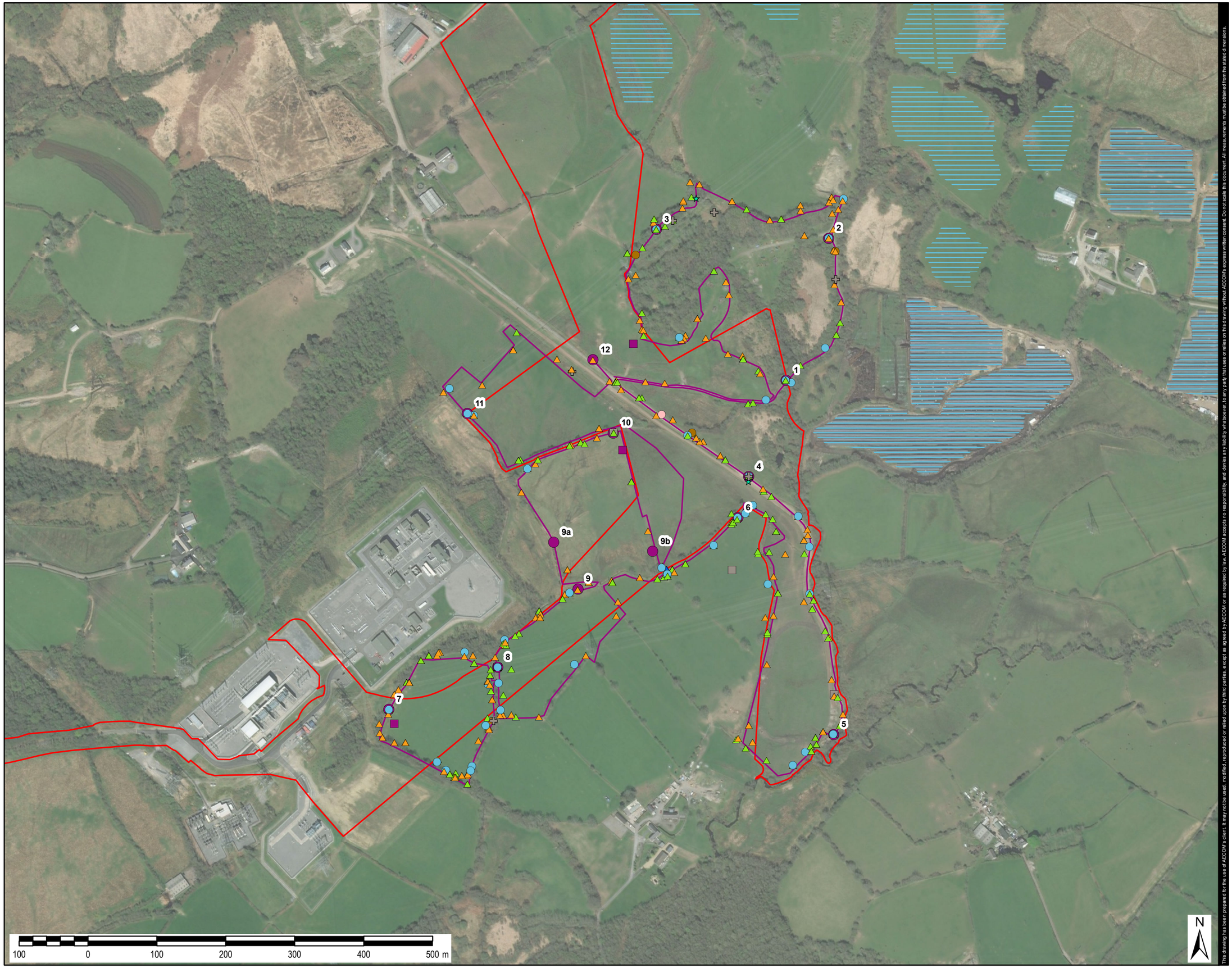
Figure 5.3 Bat Activity Transect Results – South



AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Common pipistrelle
- Soprano pipistrelle
- Nathusius' pipistrelle
- Daubenton's
- Myotis species
- Natterer's
- Noctule
- Serotine
- Possible long-eared
- Lesser horseshoe
- Indeterminate
- South Transect Listening Points
- South Transect - 6.08km
- Project Site Boundary
- Solar Parks

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY TRANSECT RESULTS SOUTH

Scale at A3: 1:5,000

Drawing No:			Rev:
FIGURE 5.3			001
Drawn:	**Chk'd:**	**App'd:**	**Date:**
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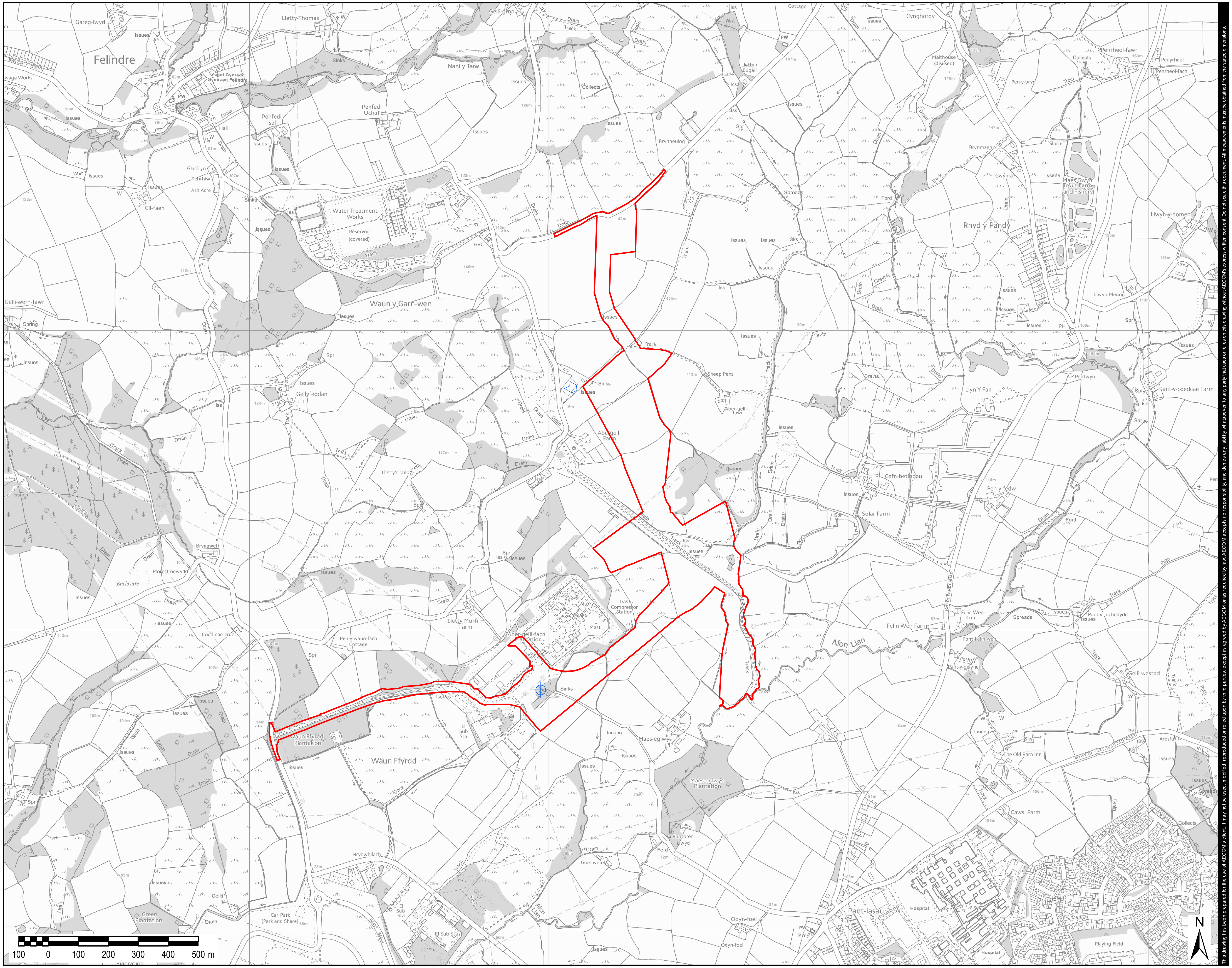
Figure 6 Mining Features – Hibernation Potential



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AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Disused adit
- Disused mine shaft
- Project Site Boundary

Copyright:

AECOM Internal Project No:

60542910

Drawing Title:

MINING FEATURES - HIBERNATION POTENTIAL

Scale at A3: 1:11,500

Drawing No:			Rev:
FIGURE 6			001
Drawn:	Chk'd:	App'd:	Date:
GM	CM	CA	02/05/18

Filename: P:\UKCDF1-IE\Projects\Environmental\Jobs - Potential\2017\2017 Q1\Abergelli Power Station\010 GIS\02_Maps\EC - Ecology\Appendices\8.7\F6_1_Mining_Hibernation_Potnetial_v1.mxd

Figure 7 Bat Activity – Areas of Potential Impact

AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Common pipistrelle
- Soprano pipistrelle
- Nathusius' pipistrelle
- Daubenton's
- Myotis species
- Natterer's
- Noctule
- Serotine
- Long-eared
- Possible long-eared
- Lesser horseshoe
- Indeterminate
- Generating Equipment Site
- Indicative Area of Potential Impacts from Lighting
- Indicative Area of Potential Impacts from Severance
- Indicative Area of Potential Impacts from Severance and Lighting
- Project Site Boundary

AECOM Internal Project No:

60542910

Drawing Title:

BAT ACTIVITY - INDICATIVE AREAS OF POTENTIAL IMPACT

Scale at A3: 1:8,000

Drawing No:			Rev:
FIGURE 7			001
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GM	CM	CA	02/05/18

100 0 100 200 300 400 500 m

Filename: P:\UKCDF1-IE\Projects\Environmental\Jobs - Potential\2017\2017 Q1\Abergelli Power Station\010 GIS\02_Maps\EC - Ecology\Appendices\8.7\F7_1_Bat_Areas _of_Impact_and_Oppertunitiy_v1.mxd

Appendix 1A Results of Preliminary Ground Level Roost Assessment – Buildings and Trees and Results of Potential Roost Feature Climbed Inspection

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
Building 1	Approximately 120m outside of the Project Site boundary to the north east This was not fully assessed due to time constraints of the PEA survey (Appendix 8.1 of the ES). This is a modern building with a tiled roof. There were no obvious gaps. House sparrows were observed using spaces in the roof.	Low	Not climbed	N/A	No further survey required – outside of Project Site boundary
Building 2	Approximately 75m outside of the Project Site boundary to the west. A brick built building with a tower and asbestos pitched roof. There are fly-in access and crevice points.	High. BSG confirmed this as a roost in 2014 (PB, 2015).	Not climbed	N/A	No further survey required – outside of Project Site boundary
Building 3	Approximately 5m outside of the Project Site boundary to the west. A brick built building with a pitched asbestos roof. There are gaps in the mortar and brick work and behind the wooden facia boards.	Moderate	Not climbed	N/A	One dusk, one dawn; at least one before end of August
Building 4	Approximately 10m outside of the Project Site boundary to the west. A single story brick built building with gaps leading to a cavity wall. Gaps are present on the east and south face of this building.	Moderate	Not climbed	N/A	One dusk, one dawn; at least one before end of August
Building 5	Modern steel barn; industrial building of steel frame construction with asbestos corrugated roof and asbestos and steel walls. Within the building there are a number of transparent corrugated sheet	Negligible	Not climbed	N/A	No further survey required

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	allowing light to enter. High disturbance as the building is used regularly for farm maintenance and horses are kept in the east section. There is an opening that would allow bats to access the building (open sections to the east and west, small hole 20x20cm within wall on southern aspect, door to the east and west usually left open). However, no evidence of bats (droppings) was found around the outside of the building.				
Building 6	Modern steel barn; industrial building of steel frame construction with double pitched asbestos corrugated roof with asbestos facia boards and asbestos and steel walls. High disturbance as the building is used regularly used to stable horses. Lighting is present internally and externally. There are entrances for bats to fly through, but no evidence of bats (droppings) was found around the outside of the building.	Negligible	Not climbed	N/A	No further survey required
Tree 1	Within the Project Site Boundary. An oak species, 14m in height with a Diameter at Breast Height (BBH) of 0. 7m. This tree has south facing split at 6m.	Low	Unable to access fully to inspect due to dense bramble – same BRP.	Low	No further survey required
Tree 2	Within the Project Site Boundary. An oak species, 12m in height with a DBH of 0. 6m. This tree had dense ivy cover which could be obscuring suitable bat features. The ivy itself did not appear to be a suitable	Low	Cannot climb on road and ivy present – same BRP.	N/A	No further survey required

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	feature for use by bats.				
Tree 3	Within the Project Site Boundary. An oak species, 17m in height with a DBH of 1. 1m. There is a knothole at 3m facing north west and a crack in the limb at 5m facing west.	Moderate	Unable to access - same BRP.	Moderate	One dusk, one dawn; at least one before end of August
Tree 4	Assessed as part of the PEA (Appendix 8.1 of the ES). Removed from this report as approximately 55m outside of the Project Site boundary.	Low	N/A	N/A	N/A
Tree 5	Approximately 20m outside of the Project Site boundary to the south. An oak species, 14m in height with a DBH of 0. 8m. A hollow at 0. 5m within the base of the tree.	Low	Not climbed – outside of Project Site boundary	N/A	No further survey required
Tree 6	Within the Project Site Boundary. A pedunculate oak, 12m in height with a DBH of 0. 7m. There is a spilt in the stem facing south towards the road and a woodpecker hole.	Moderate	Features not suitable, open, exposed and does not extend into cavity.	Negligible	No further survey required
Tree 7	Within the Project Site Boundary. A pedunculate oak, 8m in height with a DBH of 1m. There are splits in the stem facing west. .	Low	Unable to access - same BRP.	Low	No further survey required
Tree 8	Within the Project Site Boundary. An oak species, 12m in height with a DBH of 0. 6m. There is a trunk cavity at 1. 5m, viewed from the road. The tree is located within an area of no access and the other side could not be viewed.	Moderate	Feature checked with endoscope, no cavity, and open at top. Kept in as could not see/access one side of tree.	Low	No further survey required
Tree 9	Within the Project Site Boundary. An oak species 8m in height with a DBH of 0. 5m. There are thick stems of	Moderate	Ivy not dense enough to support roosting bats, no other features present.	Negligible	No further survey required

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	ivy on the east face.				
Tree 10	Approximately 25m outside of the Project Site boundary to the east. A rowan 12m in height with a DBH of 0. 4m. There is cavity approximately 1m from the ground which appears to extend upwards. There is currently an active wasp nest in the cavity which may deter bats from using it (no nest as of 28/07/17). Fallen branch in front of feature.	Moderate	Feature checked using endoscope, no bats or evidence of bats. Chance it could be used by individual/small number of bats.	Low	No further survey required
Tree 11	Within the Project Site Boundary. A multi-stem oak species 14m in height with a DBH of 0. 6m. There is some loose bark and a gap in the base.	Low	Features checked using endoscope, no bats or evidence of bats. Loose bark not suitable as too exposed. Hole at base may be suitable for roosting bats. No bats or evidence of bats recorded.	Low	No further survey required
Tree 12	A willow; 12m tall, multi stem 0. 25m average. DBH. Split on inside of main stem opens into cavity at 1m above ground. In tree line along fence.	Low	Checked with endoscope, feature not suitable, open and exposed.	Negligible	No further survey required
Tree 13	An oak; 15m tall; 0. 6m DBH; Missing limbs at 5m could open up into cavity; small gaps where stem has broken.	Low	Unable to access.	Low	No further survey required
Tree 14	An oak; 10m tall; 0. 6m DBH; knothole at 2m; cannot see if it opens up into cavity. Check with endoscope. Outside of fence line in southern field.	Low	Checked with endoscope, no cavity present, shallow does not extend, not suitable for roosting bats.	Negligible	No further survey required
Tree 15	An oak; 15m tall; 0. 75m DBH; Thick	Low	Unable to climb due to	Low	No further survey

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	ivy stems; no features observed but of suitable size/age to support BRP features that may be hidden by ivy. In treeline along fence.		ivy cover.		required
Tree 16	No ground level assessment required. Tree approximately 30m from the Project Site boundary/	N/A	N/A	N/A	N/A
Tree 17	A birch; 10m tall; 0. 4m DBH; split and cavity A0. 5m on south face.	Low	Checked with endoscope, feature does not extend, no cavity present.	Negligible	No further survey required
Tree 18	An oak; 10m tall; 0. 5m DBH; split in branch on south face.	Low	Unable to climb, unsafe.	Low	No further survey required
Tree 19	An ash; 20m tall; 1. 5m DBH; Possible cavity inside main trunk, viewable from south face, hollow on the east face approx. 1m above ground; thick ivy covering and creating gaps for bats.	Moderate	Unable to access.	Moderate	One dusk, one dawn; at least one before end of August
Tree 20	An oak; 12m tall; 1m DBH; Stems removed leaving some gaps under bark and holes approx. 6m above ground. Cannot enter field due to horses.	Low	Unable to access.	Low	No further survey required
Tree 21	An oak; 15m tall; 1m DBH; missing limb with cracks and split in stem, both facing south and approx. 1m above ground. Did not enter field in which tree is rooted due to horses.	Moderate	Unable to access.	Moderate	One dusk, one dawn; at least one before end of August
Tree 22	An oak; 8m tall; 0. 3m DBH; two knotholes on east face.	Low	Holes do not extend, too open and exposed, features not suitable.	Negligible	No further survey required
Tree 23	Edge of woodland adjacent to SI grassland containing pylon. Willows not suitable; some alder may support	Negligible/Low	Woodland not accessed.	Negligible /Low	No further survey required

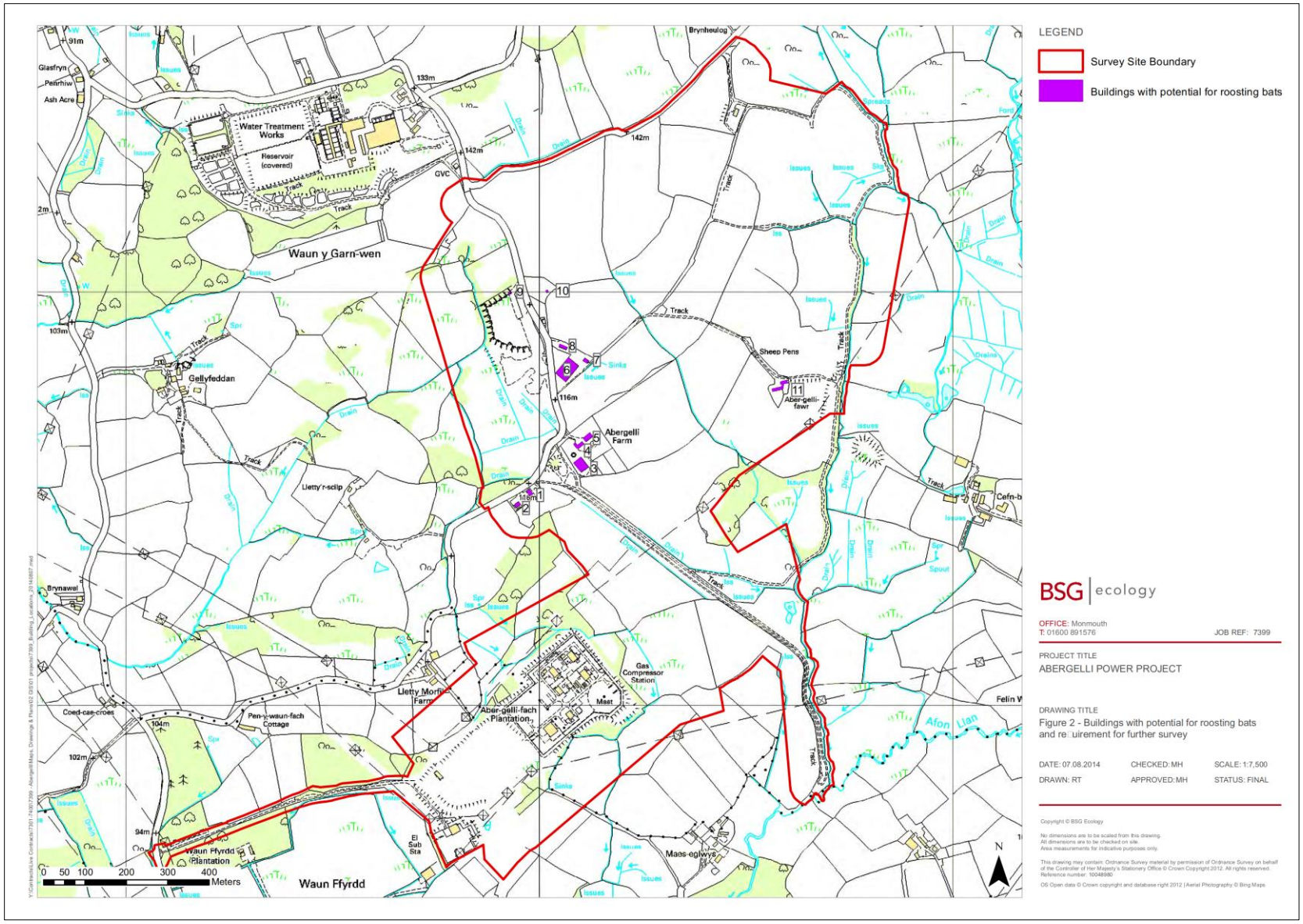
Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	low BRP features; could not access woodland to assess each tree. Recommend any felling undertaken under supervision as for Low BRP trees for alder.				
Tree 24	An unknown dead species; 10m tall; 0. 25m DBH; loose bark covering an area greater than an A4 page on south face from ground level to approx. 4m above ground level. Ivy covering trunk; only able to view south face, no access in woodland in which it is rooted.	Low	Unable to access fully – keep as Low.	Low	No further survey required
Tree 25	A birch; 15m tall; 0. 3m DBH; cavity in trunk, no access to land to be able to see if the cavity leads anywhere; feature on east face approx. 2. 5m above ground.	Low	Unable to access fully – keep as low.	Low	No further survey required
Tree 26	An oak; 12m tall; 0. 3m DBH; loose bark Approx. 2m up on west face of rotten stem; located behind fence.	Low	Exposed from above, feature not suitable.	Negligible	No further survey required
Tree 27	A dead tree possibly oak; 8m tall; 0,25m DBH; large knothole on south face approx. 2m above ground; located behind fence.	Low	Not able to access fully – keep as low.	Low	No further survey required
Tree 28	An oak; 11m tall; 0. 4m DBH; rotten and missing limbs at approx. 5m above ground on south face; adjacent to road, not climbable; viewed from opposite side of road only.	Low	No cavities present, features not suitable, open and exposed.	Negligible	No further survey required
Tree 29	A birch; 12m tall; 0. 5m DBH; Two downward facing holes on north face approx. 1m above ground; located between two fences. First tree in	Low	Holes do not extend, too wet, not suitable.	Negligible	No further survey required

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	row from track.				
Tree 30	An oak; 11m tall; 0. 6m DBH; Hole where limb is missing at approx. 2. 5m above ground on west face; access from north side of fence.	Low	Feature checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 31	An oak; 10m tall; 0. 5m DBH; downward facing hole on main stem approx. 1. 25m above ground on east face. In corner of field on own.	Low	Hole downward facing, full of water, not suitable.	Negligible	No further survey required
Tree 32	An ash (multi stemmed); 15m tall; 0. 3m DBH on average. ; knothole on north face at 3m above ground; splits on west and north faces at 1 – 2m above ground; knothole on branch overhanging woodland to south facing west at4. 5m. Located on edge of woodland.	Moderate	Does not extend, open and exposed. One upward feature may be suitable, no bats or evidence of bats.	Low	No further survey required
Tree 33	A birch; 15 m tall; 0. 3m DBH; knothole at 3m on west face. Set back into wood approx. 10m from edge.	Low	Features checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 34	A birch (multi stemmed); 15m tall; 0. 4m DBH on average; cavity on south-west at 2m; set back in woodland approx. 5m from edge.	Moderate	Feature checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 35	An oak; 20m tall; 0. 5m DBH; missing limb (part of) on south-west at 2. 5m. On edge of woodland.	Low	Open from above, exposed, feature not suitable.	Negligible	No further survey required
Tree 36	A birch; 30m tall; 0. 8m DBH. Very large cavity in trunk on west face at 2m. Next to stream in woodland.	Moderate	Unable to find.	Moderate	One dusk, one dawn; at least one before end of August

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
Tree 37	An oak; 20m tall; 0,4m DBH; woodpecker hole on east face viewed from a distance. Access to woodland not possible at the time of survey. Trees in woodland likely to have BRP features.	Low	Unable to access.	Low	No further survey required
Tree 38	An oak; 20m tall; 0. 3m DBH; knothole at 8m on west face Access to woodland not possible at the time of survey. Trees in woodland likely to have BRP features.	Low	Unable to access.	Low	No further survey required
Tree 39	A silver birch; 12m tall; 0. 5m DBH; possible cavity at 3. 5m facing south-west and thick ivy stems; multi stem.	Low	No cavity present, no other features present.	Negligible	No further survey required
Tree 40	A rowan; 10m tall; 0. 25m DBH; cavity at 1m from ground facing south-west.	Low	Feature checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 41	SN 65445 01410 (+/-4m); rowan; 12m tall; 0. 3m DBH; split at 0. 5m from ground extends up into tree, facing west. Set back from woodland edge. Photograph 55.	Moderate	Feature not suitable, does not extend, open, wet inside.	Negligible	No further survey required
Tree 42	A silver birch; 10m tall; 0. 3m DBH; cavity at 2m extends up into tree facing west.	Moderate	Feature checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 43	A birch; 8m tall; 0. 2m DBH; cavity at ground level extends up into tree; facing south-west.	Low	Feature checked using endoscope, no bats or evidence of bats, however feature may be suitable for roosting bats.	Low	No further survey required
Tree 44	An oak; 9m tall; 0. 3m DBH; cavity in	Moderate	Unable to find.	Moderate	One dusk, one

Feature	Description from Ground Based Assessment	Initial BRP Category from Ground Level	Description from Aerial Assessment	BRP Category from Climbed Survey/Endoscope	Further Survey
	main trunk from ground facing south. Endoscope. In dense woodland juts to the east of the stream.				dawn; at least one before end of August
Tree 45	An oak; 7m tall; 0. 3m DBH; loose bark all the way up the main trunk from ground level, Choked with ivy.	Moderate	Features checked using endoscope, no bats or evidence of bats, however some features may be suitable for roosting bats. Loose bark not suitable – too open and exposed.	Low	No further survey required
Tree 46	Beech. 23m tall. 1.2m DBH. Rot at base of trunk on east face, fungal growth blocking any access; block knotholes on east, south and west faces. Knotholes at 3 – 5m	Negligible	Not Required	Negligible	No further survey required
Tree 47	Oak. 25m tall. 0.8m DBH. A few missing small limbs, but no BRP	Negligible	Not Required	Negligible	No further survey required
Tree 48	Oak. 20m tall. 0.8m DBH Viewed north face only with binoculars; split in large limb at 7m. Could not access tree due to horses.	Low	Not climbed. No access due to horses.	Low	No further survey required
Tree 49	Oak. 20m tall. 1m DBH Missing limb on SE face with small hole at 4m.	Low	Not climbed. No access due to horses.	Low	No further survey required

Appendix 2A BSG Report Buildings with Potential for Roosting Bats



Appendix 3A Static Detector Limitations

Table 2.1 Static Detector Recording Time Limitations

Month	Location	Number of Recording Nights	Comments
June 2017	Lane 1	2.5	SD cards inside machine filled up preventing the recording of any more bat echolocation calls
	Lane 2	2.5	Suspected SD inside machine filled up preventing the recording of any more bat echolocation calls
	South 1	3	Suspected SD inside machine filled up preventing the recording of any more bat echolocation calls
	South 3	0	Malfunction. Static detector did not turn on.
July 2017	North 3	4.5	Suspected battery fatigue.
	South 1	0	Detector was running for 2.5 nights only, but no bat echolocation calls were recorded during this time. Due to the number of bat echolocation calls recorded at this location in other months, it is assumed that the lack of bat echolocation calls is due to equipment malfunction and not because no bats were present in this location.
August 2017	Lane 1	4	Suspected battery fatigue.
	Lane 2	0	Detector was running for 1.5 nights only; but no bat echolocation calls were recorded during this time. Due to the number of bat echolocation calls recorded at this location in other months, it assumed that the lack of bat echolocation calls is due to equipment malfunction and not because no bats were present in this location.
	North 2	4.5	Suspected battery fatigue.
	South 2	4.5	Suspected battery fatigue.

Month	Location	Number of Recording Nights	Comments
September 2017	Lane 1	4	Suspected battery fatigue.
	Lane 2	0	Detector was running for 1.5 nights only; but no bat echolocation calls were recorded during this time. Due to the number of bat echolocation calls recorded at this location in other months, it assumed that the lack of bat echolocation calls is due to equipment malfunction and not because no bats were present in this location.
	Lane 3	4	Suspected battery fatigue.
	North 1	3	Suspected battery fatigue.
	South 2	3.5	Suspected battery fatigue.
	South 3	1.5	Suspected battery fatigue.
October 2017	Lane 1	3.5	Suspected battery fatigue.
	Lane 3	3.5	Detector recorded data for 3.5 nights only; the cable attaching the microphone to the SM2 was removed by an unknown person during its deployment.
	North 1	1.5	Suspected battery fatigue.
	North 3	3.5	Suspected battery fatigue.
	South 1	1.5	Suspected battery fatigue.
	South 3	3.5	Suspected battery fatigue.

Appendix 4A Static Detector Statistical Analysis Results

Table 2.2 Kruskal-Wallis Test Results for Bat Passes by Location and Bat Passes by Month

Tests Used for Normality	Data Normally Distributed?	Test Description	Kruskal-WallisTest Results	Significant?
Histogram and Shapiro-Wilks	No	Bat Passes by Location	$\chi 2 = 47.521$, df=8, $P < 0.001$	Yes
Histogram and Shapiro-Wilks	No	Bat Passes by Month	$\chi 2 = 14.797$, df=4, $P = 0.005$	Yes

If the P value is < 0.05 then the result is significant

Table 2.3 Post-hoc Mann Whitney-Wilcoxon Test Results for Bat Pass Comparisons by Month

Months	Mann-Wilcoxon Test Results	Significant?
June vs. July	W = 855, P = 0.049	No
June vs. August	**W = 950.5, P = 0.009**	**Yes**
June vs. September	W = 528, P = 0.148	No
June vs. October	**W = 1431, P = 0.0001**	**Yes**
July vs. August	W = 1495, P = 0.419	No
July vs. September	W = 551.5, P = 0.694	No
July vs. October	W = 1443, P = 0.046	No
August vs. September	W = 615, P = 0.876	No
August vs. October	W = 1617.5, P = 0.206	No
September vs. October	W = 382, P = 0.327	No

If the P value is < 0.01 then the result is significant (P value= 0.05/number of months)

Table 2.4 Post-hoc Mann Whitney-Wilcoxon Test Results for Bat Pass Comparisons by Location

Locations	Mann-Wilcoxon Test Results	Significant?
North 1 vs. North 2	W = 322.5, P = 0.097	No
North 1 vs. North 3	W = 284.5, P = 0.182	No
North 1 vs. South 1	W = 125, P = 0.027	No
North 1 vs. South 2	W = 267, P = 0.885	No
North 1 vs. South 3	**W = 350, P = 0.003**	**Yes**
North 1 vs. Lane 1	W = 371, P = 0.718	No
North 1 vs. Lane 2	**W = 39.5, P = 0.0009**	**Yes**
North 1 vs. Lane 3	W = 468.5, P = 0.097	No
North 2 vs. North 3	W = 285.5, P = 0.975	No
North 2 vs. South 1	**W = 98.5, P = 0.0003**	**Yes**
North 2 vs. South 2	W = 242, P = 0.116	No
North 2 vs. South 3	W = 353.5, P = 0.166	No
North 2 vs. Lane 1	W = 341, P = 0.146	No
North 2 vs. Lane 2	**W = 29.5, P = 0.00004**	**Yes**
North 2 vs. Lane 3	W = 462, P = 1	No
North 3 vs. South 1	**W = 107, P = 0.001**	**Yes**
North 3 vs. South 2	W = 231, P = 0.171	No
North 3 vs. South 3	W = 313.5, P = 0.270	No
North 3 vs. Lane 1	W = 331, P = 0.252	No
North 3 vs. Lane 2	**W = 31.5, P = 0.0001**	**Yes**
North 3 vs. Lane 3	W = 420.5, P = 0.944	No
South 1 vs. South 2	W = 393.5, P = 0.010	No
South 1 vs. South 3	**W = 415.5, P = 0.00004**	**Yes**
South 1 vs. Lane 1	**W = 530, P = 0.0059**	**Yes**
South 1 vs. Lane 2	W = 89.5, P = 0.099	No
South 1 vs. Lane 3	**W = 604, P = 0.0004**	**Yes**
South 2 vs. South 3	**W = 443, P = 0.004**	**Yes**
South 2 vs. Lane 1	W = 464.5, P = 0.895	No
South 2 vs. Lane 2	**W = 52.5, P = 0.0005**	**Yes**
South 2 vs. Lane 3	W = 596, P = 0.106	No
South 3 vs. Lane 1	**W = 221, P = 0.003**	**Yes**
South 3 vs. Lane 2	**W = 18.5, P = 0.00001**	**Yes**
South 3 vs. Lane 3	W = 338, P = 0.175	No
Lane 1 vs. Lane 2	**W = 66.5, P = 0.0002**	**Yes**
Lane 1 vs. Lane 3	W = 718.5, P = 0.128	No
Lane 2 vs. Lane 3	**W = 426, P = 0.00004**	**Yes**

If the P value is < 0.006 then the result is significant (P value= 0.05/number of locations)

Table 2.5 Kruskal-Wallis Test Results for Bat Species Richness by Location and by Month

Tests Used for Normality	Data Normally Distributed?	Test Description	Kruskal-WallisTest Results	Significant?
Histogram and Shapiro-Wilks	No	Bat Species Richness by Location	$\chi 2 = 7.717$, df=8, P = 0.462	No
Histogram and Shapiro-Wilks	No	Bat Species Richness by Month	$\chi 2 = 14.789$, df=4, P = 0.005	Yes

If the P value is < 0.05 then the result is significant

Table 2.6 Post-hoc Mann Whitney-Wilcoxon Test Results for Bat Species Richness by Month

Months	Mann-Wilcoxon Test Results	Significant?
June vs. July	W = 126, P = 0.486	No
June vs. August	W = 156.5, P = 0.049	No
June vs. September	W = 90, P = 0.070	No
June vs. October	W = 53, P = 0.090	No
July vs. August	W = 172, P = 0.068	No
July vs. September	W = 112, P = 0.011	No
July vs. October	W = 66, P = 0.121	No
August vs. September	**W = 119.5, P = 0.006**	**Yes**
August vs. October	W = 103.5, P = 0.735	No
September vs. October	**W = 90.5, P = 0.008**	**Yes**

If the P value is < 0.01 then the result is significant (P value= 0.05/number of months)

Appendix 8.8

Bat Survey Report 2014

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Abergelli

Abergelli Power Project

Bat Survey Report

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Issuing office

Wyastone Business Park | Wyastone Leys | Monmouth | NP25 3SR
T: 01600 891576 | W: www.bsg-ecology.com | E: info@bsg-ecology.com

Client	Stag Energy
Job	Abergelli Power Project
Report title	Complete Bat Survey Report
Draft version/final	FINAL
File reference	7399_R_Bats_full_APPR (v3)_100315

	Name	**Position**	**Date**
Originated	Rachel Taylor	Ecologist	17 October 2014
Reviewed	Matt Hobbs	Principal Ecologist	21 October 2014
Approved for issue to client	Matt Hobbs	Principal Ecologist	21 October 2014
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1 Summary

1.1 Abergelli Power Limited (APL) is promoting a new Power Generation Plant with its associated Gas and Electricity Connections (the 'Project') on agricultural land within Abergelli Farm, north of Swansea in the City and County of Swansea (approximately at National Grid Reference 265284, 201431).

1.2 The Preliminary Ecological Appraisal (PEA) (BSG Ecology, 2014) identified records of a number of bat species within 2 km of the Project Site boundary, and suitable habitat to support these species within the Project Site boundary, as defined at the time of the survey (hereafter referred to as the 'Survey Site'). APL commissioned BSG Ecology to undertake surveys for bats within the 150 ha of pastoral farmland at and around Abergelli Farm between April and October 2014 within the Survey Site, as part of a range of ecological surveys to inform and support an application for Development Consent for the Project.

1.3 A range of surveys were carried out in accordance with published best-practice guidance focusing on investigating the distribution and variety of bat species present within the Survey Site. These included; walked transects, automated bat detector surveys, and internal and external inspections of trees and buildings.

1.4 At least seven species of bats were recorded during transect surveys; common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, *Myotis* sp., long-eared bat *Plecotus* sp., noctule *Nyctalus noctula*, Leisler's bat *Nyctalus leisleri*, and lesser horseshoe bat *Rhinolophus hipposideros*. All of these species and an additional three were recorded during automated bat detector surveys; Nathusius' pipistrelle *Pipistrellus nathusii,* serotine *Eptesicus serotinus, and* greater horseshoe bat *Rhinolophus ferrumequinum*. By far the most frequently recorded species were common and soprano pipistrelle with 90 % of calls identified as one or other of these two species. *Myotis* sp. bats were also recorded frequently with noctule recorded infrequently but regularly. The six other species of bats were recorded occasionally or singly.

1.5 Roost surveys of buildings within the Survey Site confirmed that at least three buildings contained bat droppings and were used as bat roosts. Droppings from at least three species of bats (pipistrelle sp., long-eared bat sp. and lesser horseshoe bat) were found. Thirty three trees were located within the Survey Site that are thought to have potential to support roosting bats. Emergence and / or re-entry surveys were carried out on eight trees all of which would potentially be directly affected by the Project. No bats were recorded emerging from or entering these potential tree roosts.

2 Introduction

2.1 Abergelli Power Limited commissioned BSG Ecology to undertake surveys for bats between April and October 2014 as part of a suite of ecological surveys to inform and support an application for Development Consent for the Project described below.

Site Description

2.2 The Survey Site consists of approximately 150 ha of pastoral farmland, primarily grazed by horses. The extent of the Survey Site is shown in (Figure 1, Appendix 1) and is centred at National Grid Reference 265284, 201431. The nearest settlement is Felindre, which is located approximately 2 km to the north of the Survey Site, with Swansea approximately 5 km to the south.

2.3 The Survey Site is largely agriculturally improved pasture with several areas of marshy grassland, particularly in the north, south and north-western extents of the Survey Site. The fields are bounded by fences, running along the line of defunct hedgerows, and often accompanied by ditches. There is a block of broadleaved woodland on the eastern boundary of the Survey Site and other areas of woodland around the marshy grassland to the west of the Survey Site, and around Felindre Gas Compressor Station and the two National Grid 400 kV electrical substations that lie at the south-west end of the Survey Site. The habitats in the surrounding landscape are similar to those within the Survey Site and comprise a mixture of improved and marshy grassland interspersed with occasional patches of woodland.

Description of Project

2.4 APL is promoting a new Power Generation Plant with associated Gas and Electricity Connections within Abergelli Farm. The Power Generation Plant would operate as a Simple Cycle Gas Turbine (SCGT) peaking plant and would be designed to provide an electrical capacity of up to 299 Megawatts (MW). It would be fuelled by natural gas, supplied by a new underground gas pipeline connecting Power Generation Plant to the existing National Grid Gas (NGG) National Transmission System (NTS). It would also connect to the National Grid Electrical Transmission System (NETS) via underground cable or overhead lines.

2.5 BSG Ecology has been appointed as the ecological consultant to undertake an ecology survey, which includes a PEA as well as a range of Phase 2 surveys, including bat surveys. These baseline surveys will be included in an appendix to an ecology chapter of an Environmental Statement, which is intended for submission in support of the application for Development Consent.

Aims of Study

2.6 The aims of the bat surveys within the Survey Site were to:

- Identify the bat species using the Survey Site and the activity levels of bats within the Survey Site;
- Identify whether there are any features that are capable of supporting roosting bats; and
- If the above features are likely to be affected by the Project, establish whether they are used by roosting bats.

3 Methods

Desk Study

3.1 Existing ecological information for the Survey Site and the surrounding area was requested from the South East Wales Biodiversity Records Centre (SEWBReC). Information on European and nationally protected[1] species, including bats, was requested covering the Survey Site and land up to 2 km from the Survey Site boundary.

Site Appraisal

3.2 The areas of marshy grassland, trees, scrub, woodland and streams within the Survey Site potentially provide good foraging habitat for bats, with similar habitat present in the surrounding landscape providing habitat continuity and connectivity throughout the landscape. The desk study returned records of five species of bats, which are all fairly common and widespread. In addition, the Survey Site has habitat that is capable of supporting roosting and foraging habitat for rarer species of bat that have been recorded in the Swansea area, for example lesser horseshoe bat, greater horseshoe bat and barbastelle *Barbastella barbastellus*.

3.3 Overall, the Survey Site has been assessed as being of 'Medium Habitat Quality' following consideration of the current best practice bat survey guidelines (Hundt, 2012). Therefore the following methods were used at the appropriate level of survey effort, as recommended by the guidelines:

- Walked transects; and
- Automated detector surveys.

3.4 In addition, a number of buildings and trees within the Survey Site were surveyed for presence / likely absence of roosting bats. The following methods were used:

- Internal and external building inspection or tree roost climbing inspection; and
- Dusk emergence and pre-dawn re-entry surveys of potential roosts that are likely to be affected by the Project.

Bat Activity Surveys

Walked Transects

3.5 Walked surveys of two pre-determined transect routes (northern and southern, see Figure 1) were undertaken monthly between April and October 2014. The pre-determined transect routes were largely contained within the Survey Site, with the southern route extending a short distance to the east of the Survey Site in one area.

3.6 Each transect started around sunset and took approximately 2-3 hours to complete. The timing of the surveys therefore covered the bat emergence period and the period of most intense foraging activity when invertebrate prey is most abundant (Altringham, 2003).

3.7 The same transect route was walked on each survey visit with the start points and direction changed on each visit to ensure that different parts of the Survey Site were surveyed at different times of the night. This approach was adopted to remove any bias that could be introduced into the survey data if each survey was walked in the same direction. This bias could otherwise have resulted in any given point on the transect route being visited at approximately the same interval after sunset. Static recording points were selected for each transect. At these points the surveyors were stationary for three minutes to listen and record all bat passes.

3.8 Bat activity was recorded using Anabat hand-held electronic bat detectors. This model of detector automatically records all the bat passes they detect, which significantly reduces the chances that

[1] Wildlife and Countryside Act 1981 Schedules 1, 5 & 8; Conservation of Habitats and Species Regulations 2010; Protection of Badgers Act.

bats could be missed due to human error. Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto a field proforma. This was to aid identification and also to provide additional detail on the behaviour of observed bats. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

3.9 The main aim of the transect walks was to identify areas of high bat activity, such as foraging areas and/or commuting routes (e.g. wet ditches, marshy grassland and hedgerows). Accordingly, the transect routes focussed on such areas.

3.10 When possible, all walked transects avoided heavy rain, strong winds and dusk temperatures below 10°C as recommended in the BCT guidelines (Hundt, 2012).

Automated detector surveys

3.11 In addition to the transect surveys, automated surveys were conducted using Wildlife Acoustics Song Meter 2 (SM2BAT+) bat detectors which are full spectrum detectors that are triggered automatically to record bat echolocation calls. These detectors can be deployed and left to remotely record bat activity for a period of several nights.

3.12 The BCT guidance recommends that two locations per transect route are surveyed each month. In this case, eight survey locations were used across the Survey Site with four in each half of the Survey Site (north and south). Each location was surveyed every other month to enable a larger number of survey locations to be sampled over the survey season but ensure that each location was sampled in spring, summer and autumn. Bat detectors would be deployed at four locations (two in the north and two in the south) in April, June, August and October with the other half of the locations sampled in May, July and September.

3.13 The detectors were deployed for five nights at each of the locations, which allowed continuous monitoring to take place during the period when bats are active, i.e. sunset to sunrise. They were programmed to begin recording from half an hour before sunset until half an hour after sunrise. Survey hours varied throughout the survey season according to daylight hours and have been calculated for each recording session in order to accurately calculate activity indices.

Materials and Data Analysis

Full details of the equipment used for surveys and the data analysis methods are provided in Appendix 2.

Bat Roost Surveys

Internal and External Building Inspection

3.14 The internal/external survey of eleven buildings within the Survey Site was undertaken on 25th June 2014 by Principal Ecologist and experienced bat worker Matthew Hobbs MCIEEM (Natural Resources Wales (NRW) Licence number 52240:OTH:CSAB:2014) with assistance from Rachel Taylor ACIEEM and Caitlin McCann. Eleven buildings (Buildings B1 – B11) (see Figure 2, Appendix 1) were inspected to assess their potential to support roosting bats and to search for evidence of bat activity.

3.15 The survey included all the buildings within the Survey Site, except for those contained within the Felindre Gas Compressor Station and the two National Grid 400 kV electrical substations that lie at the south-west end of the Survey Site, which were visually inspected using binoculars from boundary fences during the PEA survey in July. The buildings within these sites do not apparently have any features that could support roosting bats and it was not necessary to arrange access to these sites to carry out a more detailed inspection of any of the buildings.

3.16 During the survey a thorough search was made of the buildings including all accessible areas and crevices for bats, their droppings, food remains or characteristic grease marks at potential roost exit/entrance points. The exterior of the buildings were searched, paying particular attention to window ledges, where droppings can gather undisturbed, and under potential roost access points, such as loose tiles and gaps between boarding. Where possible, internal inspections were also undertaken.

3.17 Signs of bat activity searched for included:

- Live bats;
- Droppings;
- Urine staining;
- Feeding remains (e.g. discarded wings of flying invertebrates);
- Oil staining;
- Smell;
- Daytime vocalisations;
- Absence of cobwebs (a well-used bat roost and its access points are typically clear of cobwebs);
- Scratching; and
- Dead bats.

3.18 All buildings were assigned a category defining their potential to support roosting bats in accordance with Table 1 below.

Table 1: Categories defining the potential for buildings to support roosting bats.

Level of Bat Potential	**Rationale**
Negligible	Building with no or very limited roosting opportunities for bats, no evidence of use by bats and where the feature is isolated from foraging habitat.
Low	Building with a limited number of roosting opportunities, no evidence of current use by bats and with poor connectivity to foraging habitat.
Medium	Building with some roosting opportunities, with no evidence of current use by bats and with connectivity to moderate – high quality foraging habitat.
High	Building with multiple roosting opportunities for one or more species of bat, and with good connectivity to high quality foraging habitat.
Confirmed Roost	Presence of bats or evidence of recent use by bats.

Internal and External Tree Inspection

Preliminary Ground Level Inspection of Trees

3.19 The Preliminary Ecological Appraisal conducted (on 24 February, 14 April and 9 July 2014) included a preliminary ground-level assessment of trees for their potential to support roosting bats. Features of trees that may be used by roosting bats include:

- Natural holes;
- Woodpecker holes;
- Cracks or splits in major limbs;
- Loose bark; and
- Hollows or cavities.

3.20 Any trees with apparent roosting features were recorded and assigned a category defining their potential to support roosting bats in accordance with Table 2 below, as adapted from Hundt, 2012 (Table 8.4, p. 60). The locations of these trees are shown in Figure 3a, Appendix 1.

Table 2: Categories defining the potential for trees to support roosting bats.

Level of Bat Potential	Rationale
1*	Trees with multiple, highly suitable features capable of supporting larger roosts.
1	Trees with definite bat potential, supporting fewer suitable features than category 1* trees or with potential for use by single bats.
2	Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
3	Trees with no potential to support roosting bats.

Roped Access Survey of Trees

3.21 Any trees that were identified during the Phase 1 survey as category 2 or above, i.e. have potential to support roosting bats were further assessed by Anton Kattan[2] and Ted Bodsworth, during a roped access (or tree climbing) survey. The aim of this survey was to closely inspect features identified during the Phase 1 survey and re-categorise trees as necessary. The trees were surveyed from 15-17 July 2014. Weather conditions during the three day period were generally good with light rain on 16 July 2014.

Dusk emergence and Dawn Re-entry Surveys

3.22 Following on from the internal and external inspections described above, dusk emergence and dawn re-entry surveys were undertaken between 12 and 28 August 2014. The survey was undertaken in a smaller area than the Survey Site described above; due to refinements in the Project design and extent of the Project Site which assisted in determining which potential roosts would be affected by the Project and, therefore, would require further survey. A plan of the reduced area was provided on 8 August 2014 and the trees within this reduced area, along with their roost potential categorisation are shown in Figure 3b, Appendix 1. No buildings are anticipated to be directly affected by the Project, and therefore all the buildings were excluded from further surveys. The recommendations included in the BCT guidance (Hundt, 2012) for the level of survey effort required to determine the presence or absence of bats from a structure are shown in Table 3.

Table 3: Survey effort required for determining presence / absence of bats at a potential roost

Level of bat potential	Survey effort required
High roost potential	3 dusk emergence and/or pre-dawn re-entry surveys during May-September including 2 between mid-May and August.
Low to moderate roost potential	2 dusk emergence and/or pre-dawn re-entry surveys during May-September including 2 between mid-May and August.
Low roost potential	1 dusk emergence and/or pre-dawn re-entry surveys during May-September.

3.23 The roped access surveys are considered equal effort to one emergence or re-entry survey, therefore reducing the number of further activity surveys by one. The tree categories were split into the three roost potential categories as follows: 1* - high roost potential; 1 – low to moderate potential; 2 – low roost potential; and 3 – no roost potential. Table 4 shows the additional activity surveys required on each of the trees. Where it was not possible to carry out a roped access survey on the trees within the reduced area, namely T5, T32 and T35, an additional emergence or re-entry survey was carried out.

[2] Natural Resources Wales licence number - 51661:OTH:CSAB:2013

Table 4: Trees within the reduced area for which additional surveys were required (see Figure 3b).

Tree Number	Species	BCT Potential	BCT Tree Category	Roped access survey	Additional surveys required
T3	Birch	Low - Moderate	1	Yes	1
T4	Oak	High	1*	Yes	2
T5	Birch	Low - Moderate	2	No	2
T6	Birch	Low - Moderate	1	Yes	1
T9	Oak	Low - Moderate	1	Yes	1
T23	Oak	High	1*	Yes	2
T32	Elm	Low	2	No	1
T35	Birch	Low - Moderate	1	No	2

3.24 The dusk emergence surveys commenced approximately 15 - 30 minutes before sunset and continued until approximately 1½ - 2 hours after sunset. The dawn re-entry survey commenced approximately 1½ - 2 hours before sunrise and finished 15 minutes after sunrise.

3.25 Surveyors used two different bat detectors on each survey to supplement visual observations: a Batbox Duet detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat frequency division detector for recording calls for subsequent identification.

Limitations of Study Methods

3.26 No significant limitations to the study methods were noted. The access route in the south-west of the Survey Site (Access Road Option 2) and the western part of the land surrounding the Felindre Gas Compressor Station and the two National Grid 400 kV electrical substations were not included in the transect surveys as access to these areas could not be arranged until late in June and was not permitted at night for security reasons. This area is a small proportion of the Survey Site that does not contain habitats significantly different to those present in other parts of the Survey Site, and is unlikely to support a more diverse species assemblage than the rest of the Survey Site. As such, it is not considered that this is a significant limitation to the survey methods.

3.27 No access was granted to the roof voids of the three residential buildings (buildings 1, 2, and 5 – see Table 12) surveyed for roosting bats. This limitation to the survey is unlikely to be significant given that these buildings will not be directly affected by the Project.

4 Results

Desk Study

4.1 There were 126 bat records provided by SEWBREC from the 2 km radius search area. Of these the majority were recorded during bat transects carried out to inform a separate unrelated development proposal, named 'Felindre development site' in the records which was located approximately 1 km to the south west of the Survey Site boundary.

4.2 The bat species recorded from the desk study include brown long-eared bat *Plecotus auritus*, common pipistrelle, Natterer's bat *Myotis nattereri*, noctule, and whiskered bat *Myotis mystacinus*. There were also records of unidentified *Pipistrellus sp*. and other records where the bat species was not specified.

4.3 There are four bat roosts amongst the records provided. The closest of these is a record of 50 unspecified bat species 1.8 km to the south-east of the Survey Site at Ynystawe, Swansea from 1992. The next closest is a night / feeding roost of an unspecified species 1.9 km south west of the Survey Site boundary in Tredegar-Fawr farm buildings from 1998. A record of a roost of 87 whiskered bats also comes from approximately 1.9 km to the north west of the Survey Site boundary in Felindre, Swansea from 1993. The fourth record is a roost of 70 bats of unspecified species, 2.5 km to the south east of the Survey Site in Ynysforgan, Swansea from 1993.

Bat Activity Surveys

Walked transects

4.4 Details of transect surveys along with survey timings and weather conditions are provided in Table 5. A map of walked transect routes is presented in Figure 1, Appendix 1, with maps showing the number of passes and species recorded during each transect survey presented in Figures 4a – c (north transect) and 5a – c (south transect), Appendix 1.

Table 5: Details of walked transect surveys. (GL – Gareth Lang, MH – Matt Hobbs, RT - Rachel Taylor, ST – Stuart Thomas, CMC – Caitlin McCann, NL – Niall Lusby)

Date	Survey Area	Surveyor	Time	Weather[3]
24/04/14	North	GL, MH	20:28-22:42	START: Wind F0-1 SE, 70% cloud, no rain, 12.5˚C FINISH: Wind F0-1 SE, 70% cloud, no rain, 8.8˚C
30/04/14	South	RT, ST	20:15-22:45	START: Wind F1, 100% cloud, light rain, 14.2˚C FINISH: Wind F1 SW, 90% cloud, no rain, 10.4˚C
22/05/14	North	GL, RT	21:17-00:33	START: Wind F1-2 NW, 50% cloud, no rain, 11.3˚C FINISH: Wind F2-3 SW, 50% cloud, no rain, 10.8˚C
03/06/14	South	GL, MH	21:25 – 23:56	START: Wind F0 SE, 60% cloud, no rain, 15.0˚C FINISH: Wind F0-1 SE,9 0% cloud, no rain, 13.0˚C
19/06/14	North	RT, CMC	21:22-00:28	START: Wind F0-1 SE, 5% cloud, no rain, 15.3˚C FINISH: Wind F0-1 SE, 0% cloud, no rain, 11.9˚C
25/06/14	South	RT, CMC	21:19-00:24	START: Wind F0, 70% cloud, no rain, 16.0˚C FINISH: Wind F0, 0% cloud, no rain, 16.0˚C
17/07/14	South	CMC, GL	21:11-23:45	START: Wind F1, 60% cloud, no rain, 23.0 ˚C FINISH: Wind F0, 80% cloud, moderate rain, 23.0 ˚C

[3] Wind strength is given in the Beaufort scale. This is an empirical measure that relates wind speed to observed conditions at sea or on land.

Date	Survey Area	Surveyor	Time	Weather[3]
30/07/14	North	CMC, NL	20:52-23:31	START: Wind F2, 50% cloud, no rain, 17.0 ˚C FINISH: Wind F2, 80% cloud, no rain, 18.0 ˚C
19/08/14	South	GL, RT	20:20-23:05	START: Wind F1-2W, 20% cloud, no rain, 11.4 ˚C FINISH: Wind F1, 10% cloud, no rain, 7.0 ˚C
26/08/14	North	GL, CMC	20:00-22:41	START: Wind F1-2, 40% cloud, no rain, 16˚C FINISH: Wind F2-3 NW, 0% cloud, no rain, 14˚C
03/09/14	South	GL, NL	19:43-22:21	START: Wind F1, 50% cloud, no rain, 18 ˚C FINISH: Wind F1, 50% cloud, no rain, 19 ˚C
18/09/14	North	RT, CMC	19:09-21:40	START: Wind F0-1, 100% cloud, no rain, 21˚C FINISH: Wind F1-2NE, 40% cloud, no rain, 20˚C
01/10/14	South	GL, NL	18:40-21:20	START: Wind F2, 25% cloud, no rain, 14 ˚C FINISH: Wind F1, 25% cloud, no rain, 12.5 ˚C
06/10/14	North	RT, GL	18:35-20:54	START: Wind F0-1, 30% cloud, no rain, 9˚C FINISH: Wind F0-1, 90% cloud, no rain, 8˚C

4.5 In total 958 bat passes (B) of at least seven species of bats were recorded during walked transect surveys in 2014. Table 6 summarises the relative activity level (Bat passes per hour (B/h)) recorded during walked transects for all species; for the definition of B and B/h used in this analysis see 'Materials and Data Analysis' in Appendix 2.

Table 6: Number of passes recorded (B) and relative activity (B/h) for each species during all walked transects.

Species	B	B/h
Common pipistrelle	577	15.4
Soprano pipistrelle	240	6.4
Myotis species	67	1.8
Noctule	26	0.7
Leisler's bat	1	>0.1
Long-eared bat sp.	1	>0.1
Lesser horseshoe bat	1	>0.1
Total	**958**	**25.6**

4.6 There were 43 *Pipistrelle* sp. passes recorded during the walked transect that could not be identified to species level, as the peak frequency of the calls were within a frequency range used by more than one species (see 'Materials and Data Analysis' in Appendix 2 for details of how pipistrelle bats were identified). These have not been included in the results tables.

4.7 A total of 464 bat passes (B) were recorded during the north transect, including at least five species, a total of 494 bat passes were recorded during the south transect, including at least seven species. The relative activity level (Bat passes per hour (B/h) for the definition of B and B/h used in this analysis see 'Materials and Data Analysis' in Appendix 2) recorded during the north and south transects is recorded in Table 7.

Table 7: Number of passes and relative activity recorded during walked transect surveys.

Species	North		South	
	B	**B/h**	**B**	**B/h**
Common pipistrelle	318	16.9	259	13.9
Soprano pipistrelle	86	4.6	154	8.3
Myotis species	29	1.5	38	2.0
Noctule	9	0.5	17	0.9
Leisler's bat	0	0	1	>0.1
Long-eared bat sp.	1	>0.1	0	0
Lesser horseshoe bat	0	0	1	>0.1
Total	**464**	**24.7**	**494**	**26.6**

Relative Activity of Bats

4.8 Across the survey season, common pipistrelle was the most frequently encountered species during walked transects with 15.4 B/h and 60.2 % of all passes recorded as this species (B = 577). Soprano pipistrelle was the second most numerous with 6.4 B/h. When passes from unidentified pipistrelles are added to the total, 89.8 % of all the recorded passes were identified as bats from the Pipistrellus genus[4]. Activity levels of 1.8 B/h and 0.7 B/h were recorded for *Myotis* sp. and noctule respectively with one pass recorded for Leisler's bat, lesser horseshoe bat and long-eared bat sp.

4.9 Bat activity levels varied between transects, with a mean of 26.1 B/h (range; 7.3–70.4 B/h). Fluctuations between surveys are within normal limits, being influenced by factors such as short-term variations in weather conditions and prey availability and seasonal variations. During April, an average across both surveys of 49.8 B/h was recorded, which then declined in May to 22.3 B/h and in June (14.4 B/h) and then rose again in July (36.5 B/h). In the autumn bat activity declined again with an average of 24.2 B/h recorded in September, which dropped again in October (12.2 B/h). The highest level of activity recorded during a single transect survey occurred during the April transect in SA2 when an activity rate of 70.4 B/h (B = 176) was recorded.

Spatial Distribution of Bats

4.10 Common and soprano pipistrelle bats were recorded during every survey and occurred in most of the Survey Site. The highest number of passes was recorded along linear features such as hedges or streams, with lower activity over open fields. Passes were recorded throughout transect surveys, with the majority being recorded later in the night; however, 12 passes were recorded within 20 minutes of sunset.

4.11 A total of 67 passes of *Myotis* bats were recorded, with a relatively wide scatter of records throughout the Survey Site. The highest proportion of passes was recorded along the stream to the east and woodlands in the south of the Survey Site. No passes were recorded within 20 minutes of sunset.

4.12 Noctule was recorded infrequently and in low numbers with just 26 passes recorded. Most passes were recorded during the southern transect, with single passes scattered throughout the Survey Site. Twelve of the passes recorded were within the first 20 minutes after sunset.

4.13 One pass of lesser horseshoe bat was recorded on 3 June near the woodland at the north corner of the National Grid gas compressor station. This was recorded 67 minutes after sunset.

Automated Detector Surveys

4.14 Automated bat detectors were operating for a total of 132 nights, equating to 1,266 hours and 50 minutes of survey time between April and October 2014. Table 8 gives details of automated bat detector deployment dates and locations with the latter illustrated in Figure 1, Appendix 1. Table 9

[4] See Appendix 2 for identification parameters used for the *Pipistrellus* genus.

gives details of the number of passes and relative activity recorded during automated detector surveys.

Table 8: Numbers and deployment dates of automated detectors.

No.	OS Grid Ref	Apr	May	Jun	Jul	Aug	Sep	Oct
D1	SN6482401614	24-29/04		17-22/06		19-24/08		01-05/10
D2	SN6517902032	24-29/04		17-22/06		19-24/08		01-05/10
D3	SN6538401492	26-30/04		17-22/06		19-24/08		01-05/10
D4	SN6567100799	24-26/04		17-22/06		19-24/08		01-05/10
D5	SN6506701490		16-21/05		17-22/07		18-22/09	
D6	SN6582902329		16-19/05		17-22/07		18-22/09	
D7	SN6494702070		16-21/05		17-22/07		18-22/09	
D8	SN6525501006		16-21/05		17-19/07		18-22/09	

Table 9: Number of bat passes (B) and relative activity (B/h) at automated detector locations.

Detector number	B	B/h
D1	416	2.0
D2	3573	32.8
D3	4273	115.7
D4	3898	157.9
D5	3257	77.2
D6	843	11.1
D7	3249	46.8
D8	2613	75.9
Total	**22122**	**56.2**

Relative Activity of Bats

4.15 A total of 27,634 passes from at least ten species of bat were recorded. Figure 6 illustrates the proportion of activity recorded for different species at each automated survey location, for the whole survey period as well as spring (April-May), summer (June-August) and autumn (September-October) in Figures 7 to 9. Data for bats not identified to species-level (e.g. common/soprano pipistrelle), or for which there were so few calls recorded that the activity rate cannot be meaningfully illustrated (e.g. greater and lesser horseshoe bat), have not been illustrated in the Figures provided in Appendix 1. The relative activity of bat species recorded at all detector locations is recorded in Table 10.

Table 10: The relative activity of bat species recorded at all detector locations.

	Detector Number								
Species	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**Total B/h**
Nathusius' pipistrelle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.01	**<0.01**
Common / Nathusius' pipistrelle	0.0	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Common pipistrelle	1.5	14.6	19.1	13.4	20.7	5.5	19.5	22.7	**14.2**
Common / soprano pipistrelle	0.1	0.2	0.6	1	0.8	0.4	1.1	0.7	**0.6**
Soprano pipistrelle	0.6	5.2	2.6	13.0	3.0	2,6	3.1	9.5	**4.8**
Greater horseshoe bat	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	<0.1	**<0.1**
Lesser horseshoe bat	0.0	0.0	<0.1	<0.1	<0.1	0.0	<0.1	0.0	**<0.1**
Long-eared bat sp.	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Myotis / long-eared bat sp.	<0.1	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	**<0.1**
Myotis species	0.1	0.9	1.6	2.7	5.0	1.5	1.8	2.2	**1.8**
Noctule	0.2	0.2	0.3	0.2	0.1	0.3	<0.1	0.1	**0.2**
Noctule / Leisler's bat	<0.1	<0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Leisler's bat	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	<0.1
Serotine / Leisler's bat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	**<0.1**
Serotine	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	<0.1	**<0.1**
Noctule / Leisler's bat / serotine	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.2	**<0.1**
Unidentified bat species	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.2	**<0.1**
Total B/h	**2.6**	**21.1**	**24.4**	**30.5**	**29.9**	**10.4**	**25.6**	**35.7**	**21.8**

4.16 Across the survey season, the highest relative activity rate recorded was for common pipistrelle, at an average of 14.2 B/h (B = 17975) followed by soprano pipistrelle (4.8 B/h) with 90.0% of all the recorded passes identified as bats from the Pipistrellus genus. The next most frequently recorded species were *Myotis* sp. with 1.8 B/h (B = 2328) and noctule (0.2 B/h). There were also 45 long-eared bat *Plecotus* sp. passes recorded, with six passes for lesser horseshoe bat, two for greater horseshoe bat, three for serotine *Eptesicus serotinus* and just one Nathusius' pipistrelle *Pipistrellus nathusii* pass.

4.17 The data presented in Table 11 indicates that overall bat activity dropped from spring (April and May; 43.0 B/h) to summer (June - August; 19.1 B/h) and again in autumn (September and October 11.4 B/h). The pattern of activity was the same for all species of bats except long-eared bat sp. which increased from <0.1 to 0.1 B/h from spring to summer, and serotine and Nathusius' pipistrelle which were only recorded in the spring and autumn respectively.

Table 11: Number of passes (B) and relative activity (B/h) of bats at each detector location.

Detector number	Spring (April-May)		Summer (June-August)		Autumn (September-October)		Total
	B	**B/h**	**B**	**B/h**	B	B/h	
D1	75	1.6	341	4.0	86	1.4	2.6
D2	1240	26.3	2333	27.3	547	8.8	21.1
D3	3252	87.1	1021	11.9	258	4.1	24.4
D4	1508	79.2	2390	27.9	1198	19.2	30.5
D5	2546	62.0	710	17.9	895	15.4	29.9
D6	184	7.4	659	16.6	439	7.5	10.4
D7	1542	37.5	1707	42.9	312	5.4	25.6
D8	2501	60.9	112	4.7	1778	30.5	35.7
Total	**12848**	**43.0**	**9273**	**19.1**	**5513**	**11.4**	**21.8**

Distribution of Bats

4.20 The highest activity levels came from three detectors that each recorded 29.9-35.7 B/h as follows:

- D5 (29.9 B/h) - located at the corner of a patch of woodland to the west of the Survey Site. The large majority of passes were from common pipistrelle bats (20.7 B/h). Two of the six lesser horseshoe bat passes were recorded at this location, as was one of two greater horseshoe bat passes. The highest *Myotis* activity (5.0 B/h) was recorded at this location.
- D4 (30.5 B/h) - located at the south corner of the Survey Site in trees along a stream corridor. High activity levels of common (13.4 B/h) and soprano (13.0 B/h) pipistrelle bats were recorded, as well as two of the six lesser horseshoe bat passes were recorded at this location.
- D8 (35.7 B/h) – located on the corner of woodland surrounding the National Grid Gas compressor station to the west of the Survey Site. High levels of activity were recorded from common (22.7 B/h) and soprano (9.5 B/h) pipistrelle bats. One of two greater horseshoe bat passes was recorded.

Myotis bats

4.21 In total, 2,328 *Myotis* sp. passes were recorded at an average rate of 1.8 B/h. *Myotis* bats were recorded at all of the static locations and during every deployment. Higher activity rates were recorded in the spring (4.0 B/h) than the summer (0.9 B/h) with a slight increase again in autumn (1.4 B/h).

4.22 Higher levels of activity were recorded in the south of the Survey Site than the north (2.8 B/h and 1.0 B/h, respectively). The highest relative activity was recorded at D5 (5.0 B/h), in the most southerly part of the Survey Site.

4.23 The nocturnal activity of *Myotis* bats showed that passes were typically being recorded first by detectors at around 40 minutes after sunset, with a peak around one hour after sunset and consistent activity throughout the night until around 40 minutes before sunrise.

Noctule bats

4.24 In total, 228 Noctule passes were recorded at an average rate of 0.2 B/h. Noctule bats were recorded at all of the static locations. Higher activity rates were recorded in the spring (0.5 B/h) which then dropped away during the summer (0.1 B/h) with a further drop in autumn (<0.1 B/h).

4.25 Higher levels of activity were recorded in the south of the Survey Site compared to the north (0.2 B/h and 0.2 B/h, respectively). The highest relative activity was recorded at D3 and D6 (0.3 B/h), along the eastern side of the Survey Site.

4.26 The nocturnal activity of Noctule bats showed that passes were typically being recorded first by detectors at around 20 minutes after sunset, with three calls in total recorded before sunset, and a peak in activity around 40 minutes after sunset followed by consistently low activity throughout the night until around 20 minutes before sunrise.

Leisler's and Serotine bats

4.27 In total four Leisler's bat and three serotine bat passes were recorded on the Survey Site, with an additional 24 passes that were identified as either Leisler's bat or serotine.

4.28 Leisler's bat passes were recorded at detector numbers D5 and D6, in the west and north-east of the Survey Site respectively. Serotine passes were recorded at detectors D3 and D8, in the woodland in the east of the Survey Site and the woodland around the Gas Compressor Station in the west respectively. All passes of Leisler's bat / serotine occurred at detector D8.

4.29 All of the bat passes were recorded within the first 60 minutes after sunset with the exception of one Leisler's bat pass and one Leisler's bat / serotine pass which were both recorded in the middle of the night.

Pipistrelle bats

4.30 This section covers common, soprano and Nathusius' pipistrelles and also any pipistrelle calls that could have been from either species (see Appendix 2). In total, 17,975 common pipistrelle passes were recorded (14.2 B/h), with 6,019 soprano pipistrelle (4.8 B/h), and a total of 772 unidentified pipistrelle passes (0.6 B/h); 97% of all pipistrelle calls were therefore recorded to species level. Common and soprano pipistrelle bats were recorded from all detectors during every deployment. Much higher activity rates were recorded for common pipistrelle in the spring (29.6 B/h) than the summer (12.2 B/h) and autumn (11.4 B/h). This was also true for soprano pipistrelle, with 7.4 B/h in spring, 5.3 B/h in summer and 2.7 B/h in autumn. Only one Nathusius' pipistrelle pass was recorded, during the autumn at D8 (in the south east of the Survey Site).

4.31 Higher levels of common and soprano pipistrelle activity were recorded in the south of the Survey Site than the north (25.5 B/h and 12.9 B/h, respectively). The highest relative activity for common pipistrelle was recorded at D8 (22.7 B/h). For soprano pipistrelle highest relative activity was at D4 (13.0 B/h), the only location at which soprano pipistrelle levels nearly matched common pipistrelle, along the eastern side of the Survey Site.

4.32 The nocturnal activity of pipistrelle bats showed that passes were typically being recorded first by detectors at around 20 minutes after sunset, with a peak from 40 to 80 minutes after sunset. There was constant activity recorded throughout the night until around 20 minutes before sunrise, with a secondary peak around 60 to 40 minutes before sunrise.

Long-eared bat sp.

4.33 In total, 45 long-eared bat sp. passes were recorded at an average rate of 0.04 B/h. Long-eared bat sp. were recorded at low levels at all of static locations, with a peak activity level of 0.1 B/h at D1. A higher number of passes were recorded in the summer (31 passes) than the autumn (13 passes) and the spring when only one pass was recorded.

4.34 Long-eared bat sp. was recorded at all detectors with peak activity levels at D1 and D3, both on the western side of the Survey Site next to woodland.

Horseshoe bats

4.35 Six lesser horseshoe bat passes were recorded across four detector locations, D3, D4, D5 and D7, located in the centre of the Survey Site. Four of these passes were recorded in spring, with one in the summer and one in autumn. A single pass was recorded from D3 on 18 June, with two passes recorded from D4 on 25 April, single passes recorded on 18 and 19 May from D5 and a further single pass recorded at D7 on 20 September. Bat passes were recorded between 1-1.5 hours after sunset or 55 minutes – 1.5 hrs before sunrise in spring and summer, and in the middle of the night (23:45) in autumn.

4.36 Two greater horseshoe bat passes were recorded at detector locations D5 and D8 during the middle of the night in July and September respectively.

Bat Roost Surveys

Internal and External Building Inspection

4.37 The results of the building inspection are included in Table 12, which shows the category assigned to each building. Full descriptions of the buildings are included in Appendix 3 and Photographs of each building in Appendix 4.

Table 12: Potential of the surveyed buildings to support roosting bats.

Building Number	Bat roost potential	Brief description	Key features and evidence of use by bats
Building 1	Moderate	Detached house.	A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the roof void.
Building 2	Moderate	Detached house.	A number of missing slates and gaps under ridge tiles offer potential for roosting bats. No signs of use by bats were observed. There was no access available to the roof void.
Building 3	Negligible	Corrugated iron barn, used as horse stable.	No potential roost features or signs of use by bats were observed.
Building 4	Confirmed roost	Stone built stable block	Numerous roosting opportunities and access points under missing slate, through broken windows, gaps above door frames. A scattering of long-eared bat, pipistrelle and lesser horseshoe bat droppings were found in the store rooms, with no piles of droppings found anywhere.
Building 5	Moderate	Terraced housing	Some missing tiles, lifted lead flashing and access to boxed eaves due to damage could be used by bats. No signs of use by bats were observed. There was no access available to the roof void.
Building 6	Negligible	Corrugated iron barn, used as horse stable and machinery store.	No potential roost features or signs of use by bats observed.
Building 7	Low	Brick outbuilding with corrugated roof.	The cavity wall may be accessible through broken vents. No signs of use by bats were observed.
Building 8	Confirmed	Single storey brick barn	Multiple fly-in opportunities to both

	roost	with second story tower at the northern end.	storeys. Small piles of long-eared bat and pipistrelle droppings found in both first and second storey at the north of the building.
Building 9	Negligible	Breeze block shed with corrugated roof.	No potential roost features or signs of use by bats observed.
Building 10	Confirmed roost	Brick out-house, single room, no doors or windows. Flat concrete roof.	Missing bricks allow access to the cavity wall in a number of places. Two pipistrelle droppings were found on the floor.
Building 11	Moderate	Derelict stone cottage, two distinct standing walls, no roof.	Walls are very exposed. Some roosting opportunities between the stone, and gaps into a rubble filled wall. No signs of use by bats were observed.

4.38 None of the buildings will be affected by the Project and therefore no further survey has been carried out on the buildings.

Internal and External Tree Inspection

Preliminary Ground Level Inspection of Trees

4.39 A total of 33 trees were identified during the preliminary ground level inspection of trees as having potential bat roosting features. The details of each tree are recorded in Table 13 below with their locations shown in Figure 3a, Appendix 1.

4.40 All but four of the trees that were identified were further assessed during the roped access survey (see below).

Roped Access Survey of Trees

4.41 A total of 29 trees were climbed using ladders or rope access. Four trees were inaccessible or unsafe to climb. Table 13 includes descriptions of the potential roosting features and the BCT category (see Table 1) assigned to each tree following the roped access survey.

Table 13: Categorization of trees assessed during preliminary ground level survey and subsequently during roped access survey.

Tree	Grid Reference	Species	Bat Roost Feature	Evidence of bats	Potential	BCT Category
T1	SN 65384 02528	Oak	Ivy - Extensive ivy cover on stem with lifted plates	None	Moderate	1
T2	SN 65249 01932	Birch	Decay in dying tree - Cavity- small hollows on both stems	None	Negligible	3
T3	SN 65249 01916	Birch	Woodpecker rot hole	None	Moderate	1
T4	SN 65340 01850	Oak	Two splits in large limbs	Unconfirmed dropping	High	1*
T5	SN 65451 01405	Birch	Single rot hole in trunk	None	Moderate	1
T6	SN 65471 01413	Birch	Single rot hole in trunk	None	Moderate	1
T7	SN 65398 01677	Oak	Thick ivy and hollow trunk near ground level	None	Low	2
T8	SN 64862 01980	Oak	Splits in small limbs	None	Moderate	1
T9	SN 65170 02031	Oak	Split limb - Single feature with high potential	None	Moderate	1
T11	SN 64722 02068	Oak	2 woodpecker holes	None	High	1*
T10	SN 64703 02063	Oak	Single cavity at base of trunk	None	Low	2
		Oak	Split in branch	None		
T12	SN 64844 02030	Oak	Split in trunk	None	Low	2
		Oak	Split limb	None		
T13	SN 64843 02034	Oak	Dense ivy	None	Low	2
T14	SN 64843 02040	Alder	Rot hole and Woodpecker hole	Unconfirmed droppings	High	1*
T15	SN 64857 01978	oak	Rot hole - hollow trunk	None	Moderate	1

Tree	Grid Reference	Species	Bat Roost Feature	Evidence of bats	Potential	BCT Category
T16	SN 64868 01915	Oak	Woodpecker rot hole in trunk	None	Moderate	1
T17	SN 64987 01560	Birch	Thick stem ivy	None	low	2
T18	SN 64994 01468	Ash	Rot hole in trunk	None	low	3
		Ash	Hollow limb	None		
T19	SN 65513 02439	Oak	Decay in canopy - one cavity with potential	None	Moderate	1
		Oak	Cavity in main stem	None		
		Oak	Split / hollow limb	None		
T20	SN 65632 02412	Oak	Slit in main stem	None	Low	2
		Oak	Rot hole /hollow	None		
T22	SN 65620 01318	Willow	Broken trunk	None	Low	2
T23	SN 65506 01089	Oak and nearby rowan	Rot holes in limbs	None	High	1*
T24	SN 65460 01068	Oak	Dense ivy plate lifted from trunk	None	Low	2
T25	SN 65112 01204	Oak	Hollow at base, cut limb.	None	Low	2
T26	SN 64979 01428	Rowan	Cavity in dead limb	None	Moderate	1
T27	SN 65147 01494	dead Oak	Standing dead wood	None	Low	2
		dead Oak	Hollows in trunk	None		
		dead Oak	Hollow Branch	None		
T28	SN 65061 01605	Oak	Large rip out scar with possible fissures behind scar regrowth	None	Moderate	1
T30	SN 64863 01925	S. Birch	Branch rip out scar with upwards leading cavity	None	None	3
T31	SN 64825 02000	Oak	Rot hole in split	None	Low	2
T32	SN 64190 00698	Elm	Small plates of lifted bark	None	Low	2
T33	SN 64387 00771	Oak	Small snapped branch	None	none	3
T34	SN 64418 00785	Oak	Crack at base of overhanging branch	None	none	3
T35	SN 64448 00798	Birch	Two woodpecker holes	None	Moderate	1

Emergence/re-entry surveys

4.42 Additional survey was considered necessary for a total of eight trees within the updated Survey Site boundary. The location and category assigned to each of these trees is shown in Figure 3b, Appendix 1. Details of the emergence and re-entry surveys are shown in Table 14 below. Photographs of each tree are included in Appendix 5.

Table 14: Details of the emergence / re-entry surveys of potential tree roosts. (GL – Gareth Lang, RT - Rachel Taylor, CMC – Caitlin McCann, NL – Niall Lusby).

Tree	Date	Emergence / re-entry	Time	Surveyor	Weather conditions
T3	21/08	Emergence	20:15-22:10	CMC	START: Wind F2 NW, 100% cloud, light rain, 12.2˚C FINISH: Wind F1 NW, 50% cloud, no rain, 13.2˚C
T4	12/08	Emergence	20:28-22:20	CMC, RT	START: Wind F2 NE, 90% cloud, light rain, 14˚C FINISH: Wind F2 NE, 50% cloud, no rain, 12.8˚C
	29/08	Re-entry	04:15-06:30	RT, NL	START: Wind F1-2 NW, 50% cloud, no rain, 14.4˚C FINISH: Wind F1-2 NW, 60% cloud, no rain, 13.7˚C
T5	13/08	Re-entry	04:00-06:15	RT	START: Wind F0-1, 50% cloud, no rain, 9.8˚C FINISH: Wind F0-1, 10% cloud, no rain, 10.7˚C
	28/08	Emergence	20:00-21:45	GL	START: Wind F1-2 NW, 60% cloud, no rain, 16.3˚C FINISH: Wind F1-2 NW, 40% cloud, no rain, 15˚C
T6	13/08	Re-entry	04:00-06:15	CMC	START: Wind F0-1, 50% cloud, no rain, 9.8˚C FINISH: Wind F0-1, 10% cloud, no rain, 10.7˚C
T9	21/08	Emergence	20:15-22:10	RT	START: Wind F1-2 NW, 60% cloud, no rain, 16.3˚C FINISH: Wind F1-2 NW, 40% cloud, no rain, 15˚C
T23	21/08	Emergence	20:15-22:10	GL	START: Wind F2 NW, 100% cloud, light rain, 12.2˚C FINISH: Wind F1 NW, 50% cloud, no rain, 13.2˚C
	29/08	Re-entry	04:15-06:30	GL	START: Wind F1-2 NW, 50% cloud, no rain, 14.4˚C FINISH: Wind F1-2 NW, 60% cloud, no rain, 13.7˚C
T32	22/08	Re-entry	04:15-06:15	RT	START: Wind F0-1, 0% cloud, no rain, 12.2˚C FINISH: Wind F0-1, 90% cloud, no rain, 11.8˚C
	28/08	Emergence	20:00-21:45	RT	START: Wind F1-2 NW, 60% cloud, no rain, 16.3˚C FINISH: Wind F1-2 NW, 40% cloud, no rain, 15˚C
T35	22/08	Re-entry	04:15-06:15	CMC	START: Wind F0-1, 0% cloud, no rain, 12.2˚C FINISH: Wind F0-1, 90% cloud, no rain, 11.8˚C

	28/08	Emergence	20:00-21:45	NL	START: Wind F1-2 NW, 50% cloud, no rain, 14.4˚C FINISH: Wind F1-2 NW, 60% cloud, no rain, 13.7˚C

4.43 No bats were recorded emerging or re-entering the potential tree roosts during the surveys.

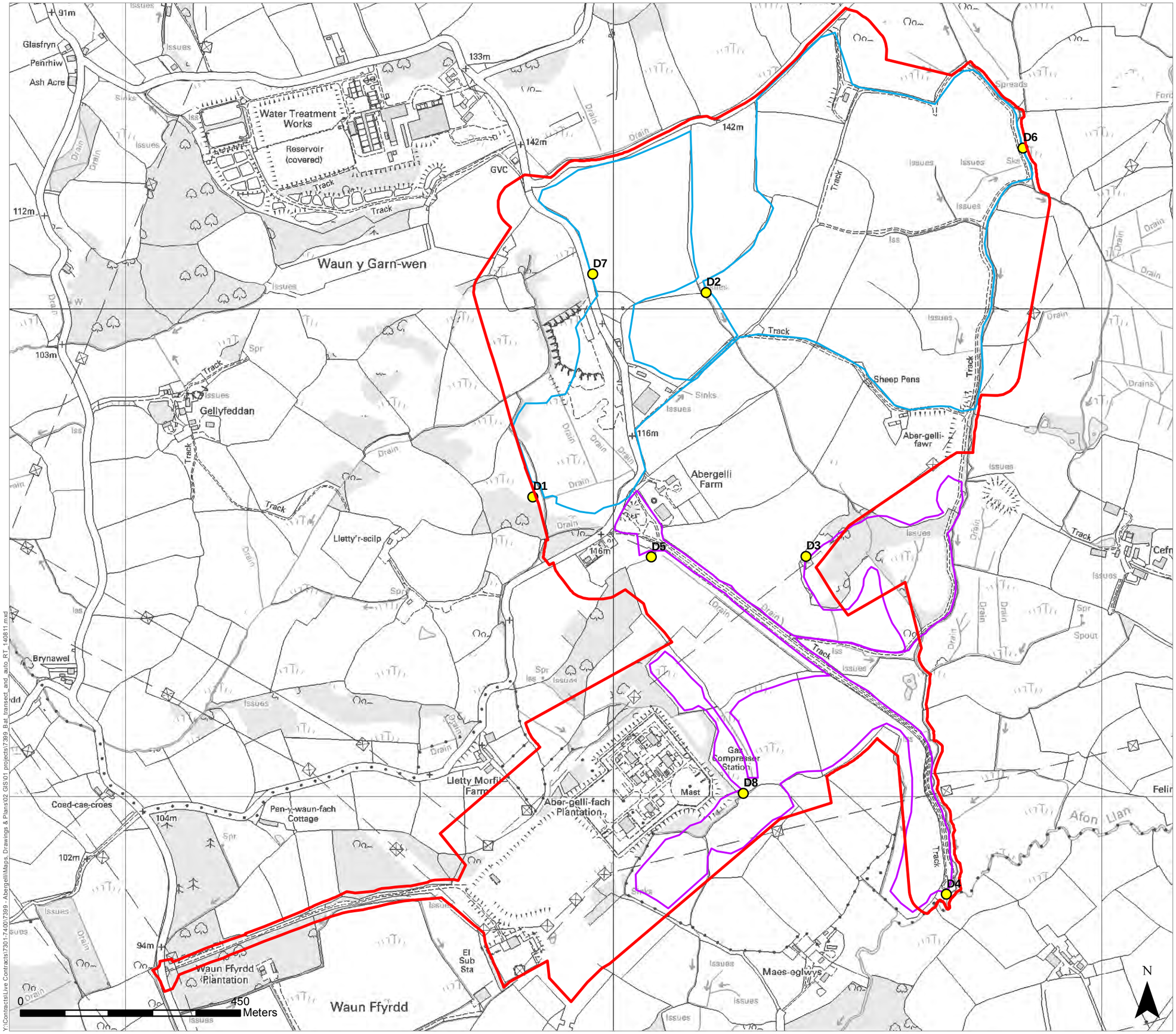
5 References

Altringham, J.D. (2003). *British Bats*. HarperCollins. London.

BSG Ecology (2014). Abergelli Power Project: Preliminary Ecological Appraisal.

Hundt, L. (2012) Ed. Bat Surveys: Good Practice Guidelines. 2nd Edition. Bat Conservation Trust, London.

Appendix 1: Figures



LEGEND

- Survey Site boundary
- Bat detector locations
- North Transect
- South Transect

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T: 01600 891576

JOB REF: 7399.00

PROJECT TITLE

ABERGELLI POWER PLANT

DRAWING TITLE

Figure 1 - Bat transect route and automated detector locations

DATE: 11.08.2014 CHECKED: MH SCALE: 1:7,500

DRAWN: RT APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

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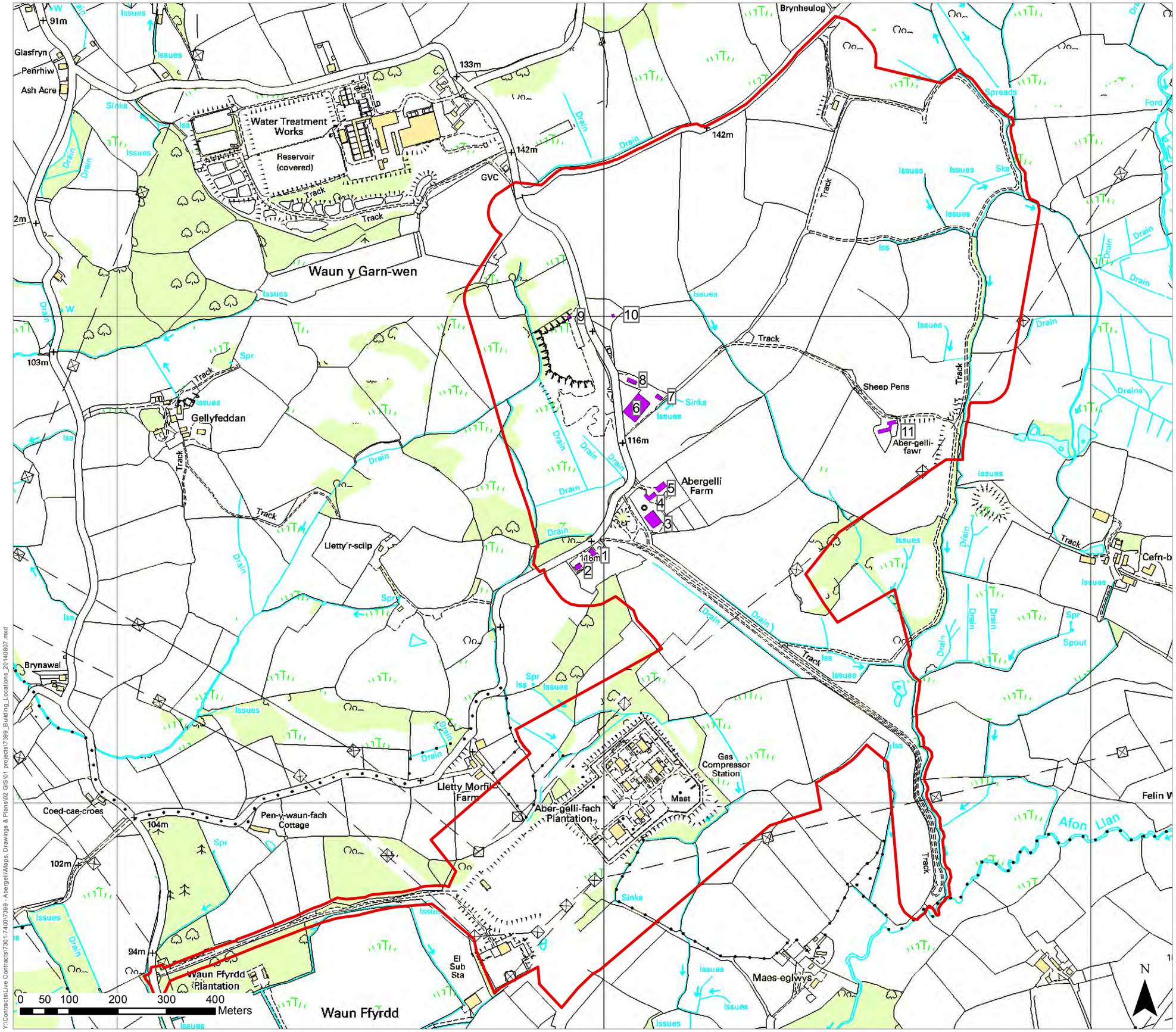

LEGEND

Survey Site Boundary

Buildings with potential for roosting bats

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T: 01600 891576

JOB REF: 7399

PROJECT TITLE
ABERGELLI POWER PROJECT

DRAWING TITLE
Figure 2 - Buildings with potential for roosting bats and re□uirement for further survey

DATE: 07.08.2014 CHECKED: MH SCALE: 1:7,500
DRAWN: RT APPROVED: MH STATUS: FINAL

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LEGEND

Survey Site Boundary

Potential Tree Roost - BCT Category

- 1
- 1
- 2
- 3

0 50 100 200 300 400 Meters

N

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Figure 3a - Potential tree roost locations within accessible areas of the Survey Site

DATE: 07.08.2014 CHECKED: MH SCALE: 1:8,000

DRAWN: RT APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

Y:\Contracts\Live Contracts\7301-7400\7399 - Abergelli\Maps, Drawings & Plans\02 GIS\01 projects\Interim Bat Report\7399_fig3a_trees_140904.mxd

LEGEND

Amended Survey Site boundary

Potential Tree Roost - BCT Category

- 1*
- 1
- 2

T9
T3
T4
T5
T6
T23
T35
T32

Water Treatment Works
Reservoir (covered)
Waun y Garn-wen
Gellyfeddan
Lletty'r-scilp
Sheep Pens
Aber-gelli-fawr
Abergelli Farm
Lletty Morfil Farm
Gas Compressor Station
Mast
Aber-gelli-fach Plantation
Pen-y-waun-fach Cottage
Coed-cae-croes
Waun Ffyrdd Plantation
El Sub Sta
Maes-eglwys
Waun Ffyrdd

0 45 90 180 270 360 Meters

N

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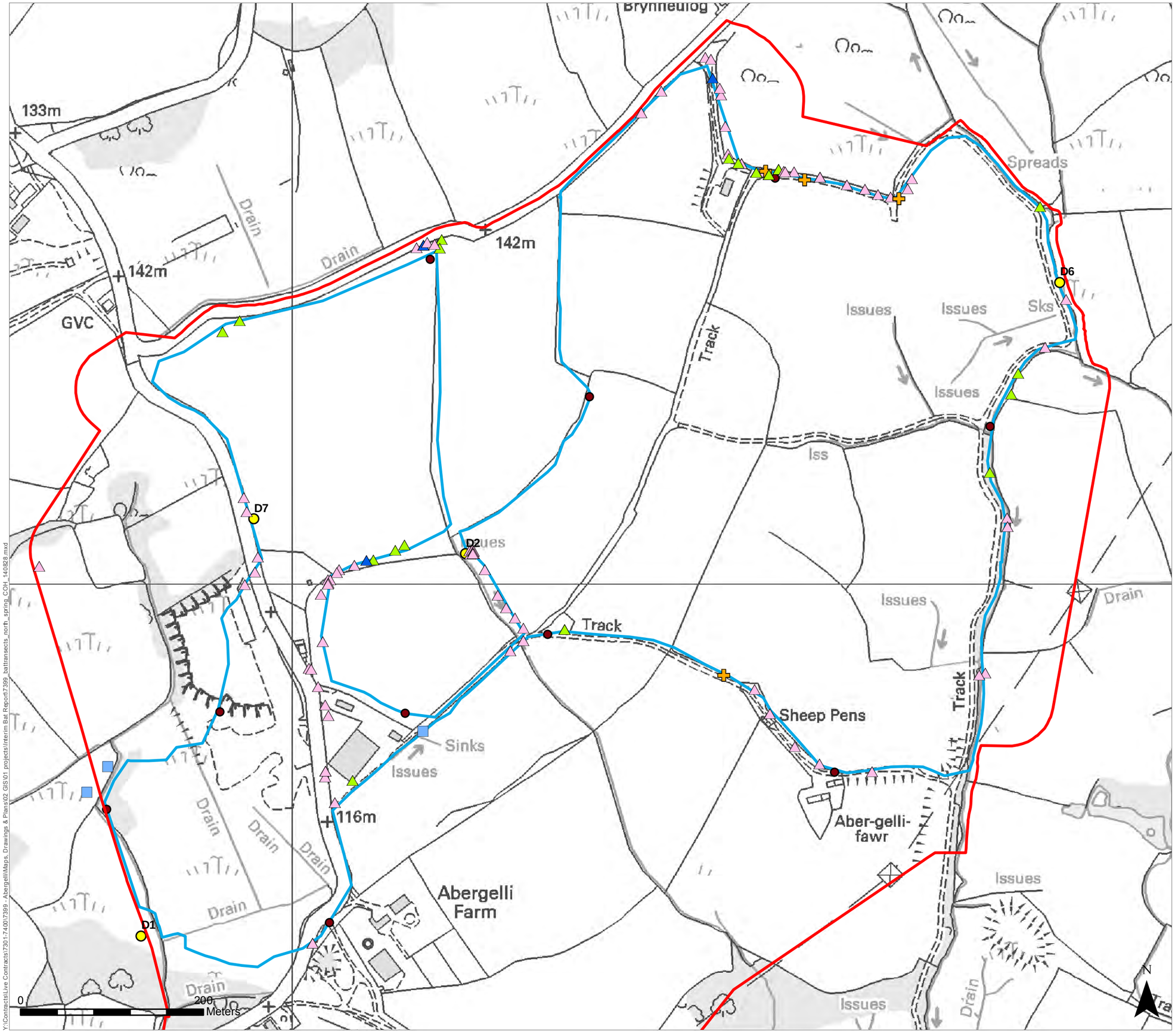
Figure 3b - Potential tree roost locations where emergence / re-entry surveys were carried out'

DATE: 07.08.2014 CHECKED: MH SCALE: 1:7,000

DRAWN: RT APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- North Transect

Bat observations

- Common pipistrelle
- Soprano pipistrelle
- Common □Soprano pipistrelle
- Noctule
- Myotis species

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PROJECT TITLE
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DRAWING TITLE
Figure 4a - Number of passes plotted along northern walked transect. Spring 2014 □April-May□

DATE: 28.08.2014 | CHECKED: RT | SCALE: 1:4,000
DRAWN: COH | APPROVED: MH | STATUS: FINAL

Sources: BSG Ecology survey data

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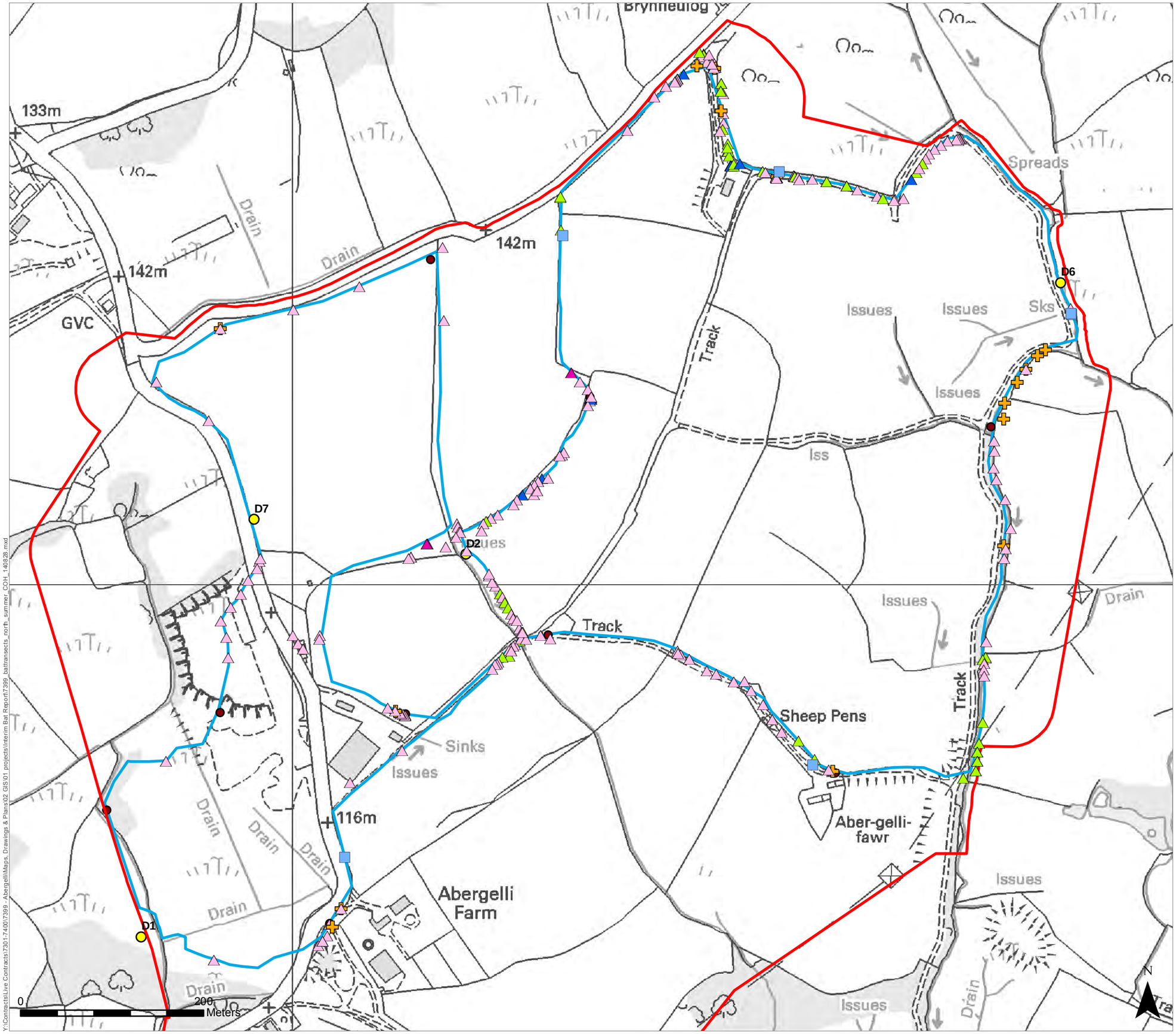

LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- North Transect

Bat observations

- Common pipistrelle
- Soprano pipistrelle
- Common □Soprano pipistrelle
- Common □Nathusius□ pipistrelle
- Noctule
- Myotis species

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PROJECT TITLE
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DRAWING TITLE
Figure 4b - Number of passes plotted along northern walked transect. Summer 2014 □June-August□

DATE: 28.08.2014 | CHECKED: RT | SCALE: 1:4,000
DRAWN: COH | APPROVED: MH | STATUS: FINAL

Sources: BSG Ecology survey data

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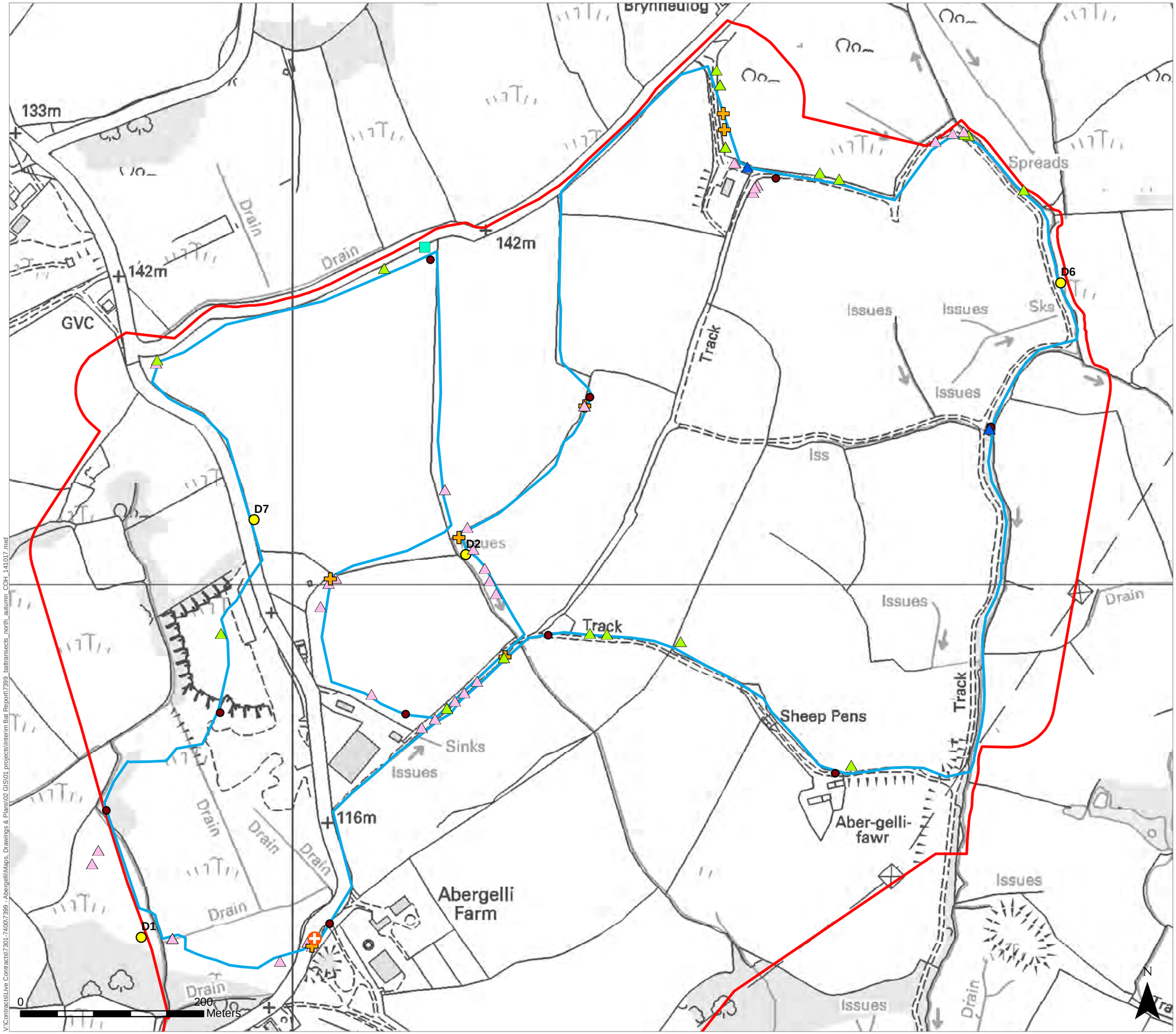

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LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- North Transect

Bat observations

- Long eared bat sp.
- Common pipistrelle
- Soprano pipistrelle
- Common / Soprano pipistrelle
- Noctule / Leisler's bat
- Myotis species

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PROJECT TITLE

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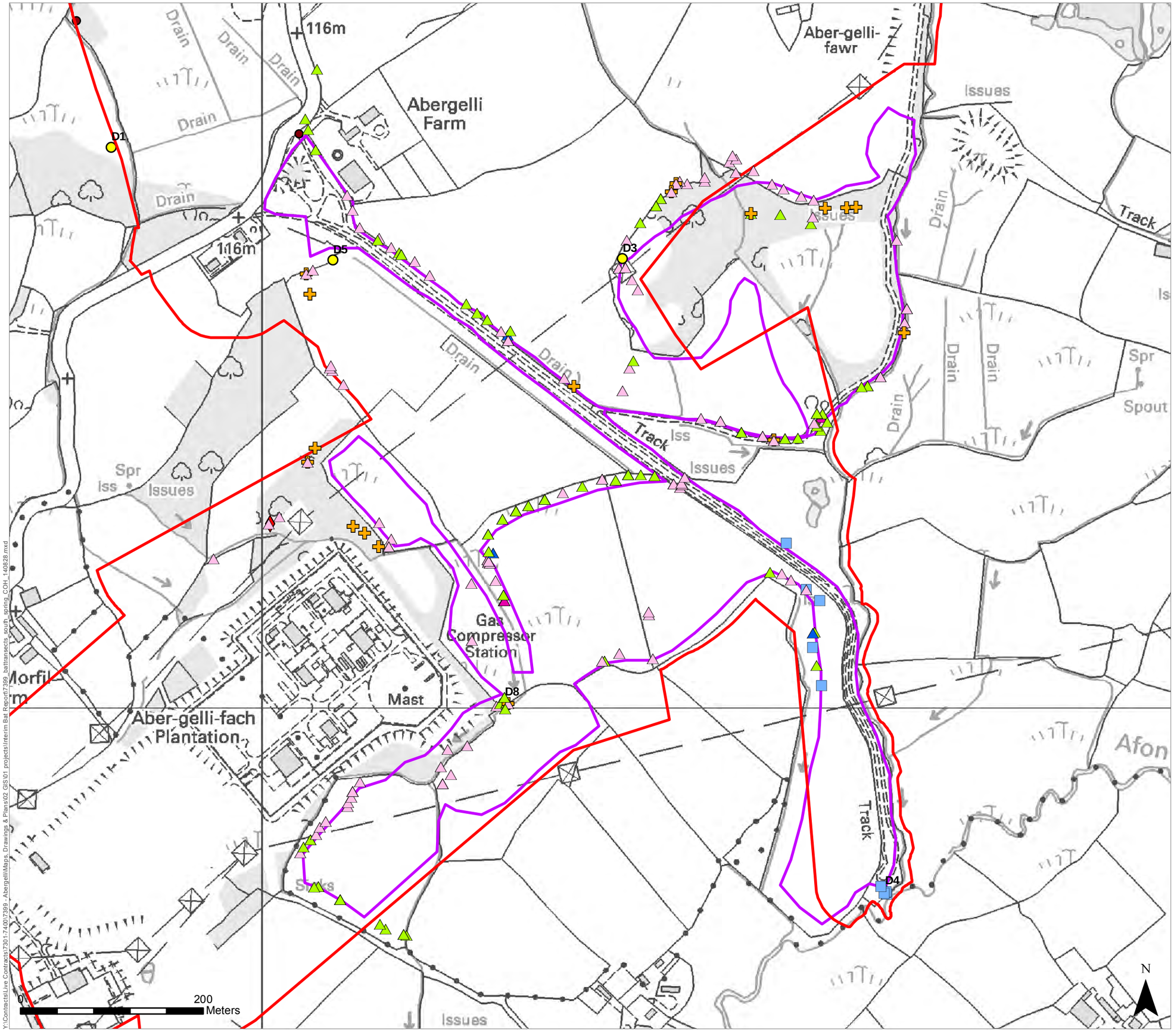
DRAWING TITLE

Figure 4c - Number of passes plotted along northern walked transect. Autumn 2014 (September-October)

DATE: 28.08.2014 CHECKED: RT SCALE: 1:4,000

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- South Transect

Bat observations

- Common pipistrelle
- Soprano pipistrelle
- Common □Soprano pipistrelle
- Common □Nathusius□ pipistrelle
- Noctule
- Myotis species

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PROJECT TITLE
ABERGELLI POWER PROJECT

DRAWING TITLE
Figure 5a - Number of passes plotted along southern walked transect. Spring 2014 □April-May□

DATE: 03.09.2014 CHECKED: RT SCALE: 1:4,000
DRAWN: COH APPROVED: MH STATUS: FINAL

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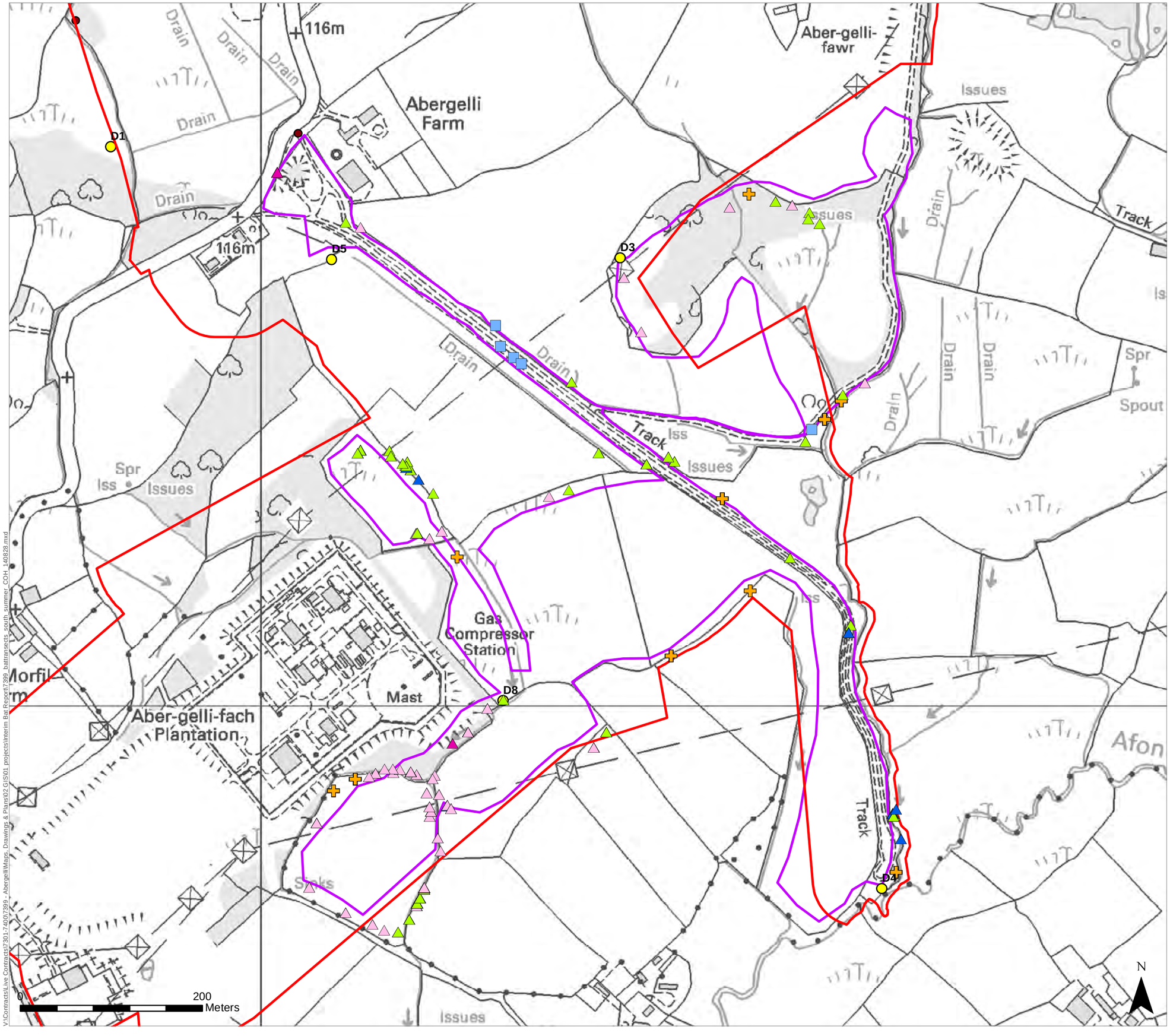

LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- South Transect

Bat observations

- Lesser horseshoe bat
- Common pipistrelle
- Soprano pipistrelle
- Common / Soprano pipistrelle
- Common / Nathusius' pipistrelle
- Noctule
- Myotis species

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PROJECT TITLE

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DRAWING TITLE

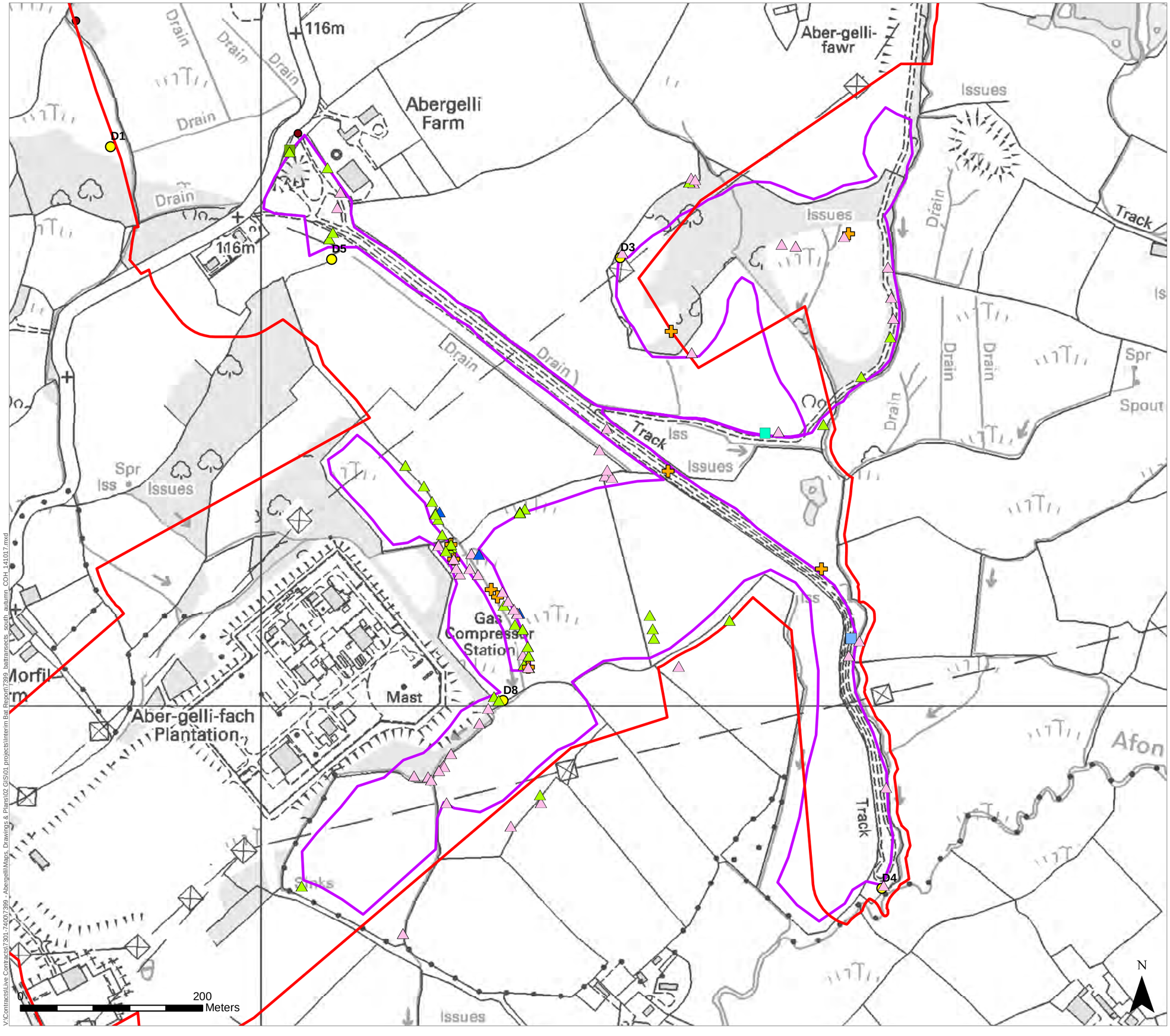
Figure 5b - Number of passes plotted along southern walked transect. Summer 2014 (June-August)

DATE: 28.08.2014 CHECKED: RT SCALE: 1:4,000

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

V:\Contracts\Live Contracts\7301-7400\7399 - Abergelli\Maps, Drawings & Plans\02 GIS\01 projects\Interim Bat Report\7399_battransects_south_summer_COH_140828.mxd



LEGEND

- Survey Site boundary
- Bat detector locations
- Stopping Points
- South Transect

Bat observations

- Leisler's bat
- Noctule
- Common pipistrelle
- Soprano pipistrelle
- Common / Soprano pipistrelle
- Noctule / Leisler's bat
- Myotis species

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PROJECT TITLE

ABERGELLI POWER PROJECT

DRAWING TITLE

Figure 5c - Number of passes plotted along southern walked transect. Autumn 2014 (September-October)

DATE: 17.10.2014 CHECKED: RT SCALE: 1:4,000

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

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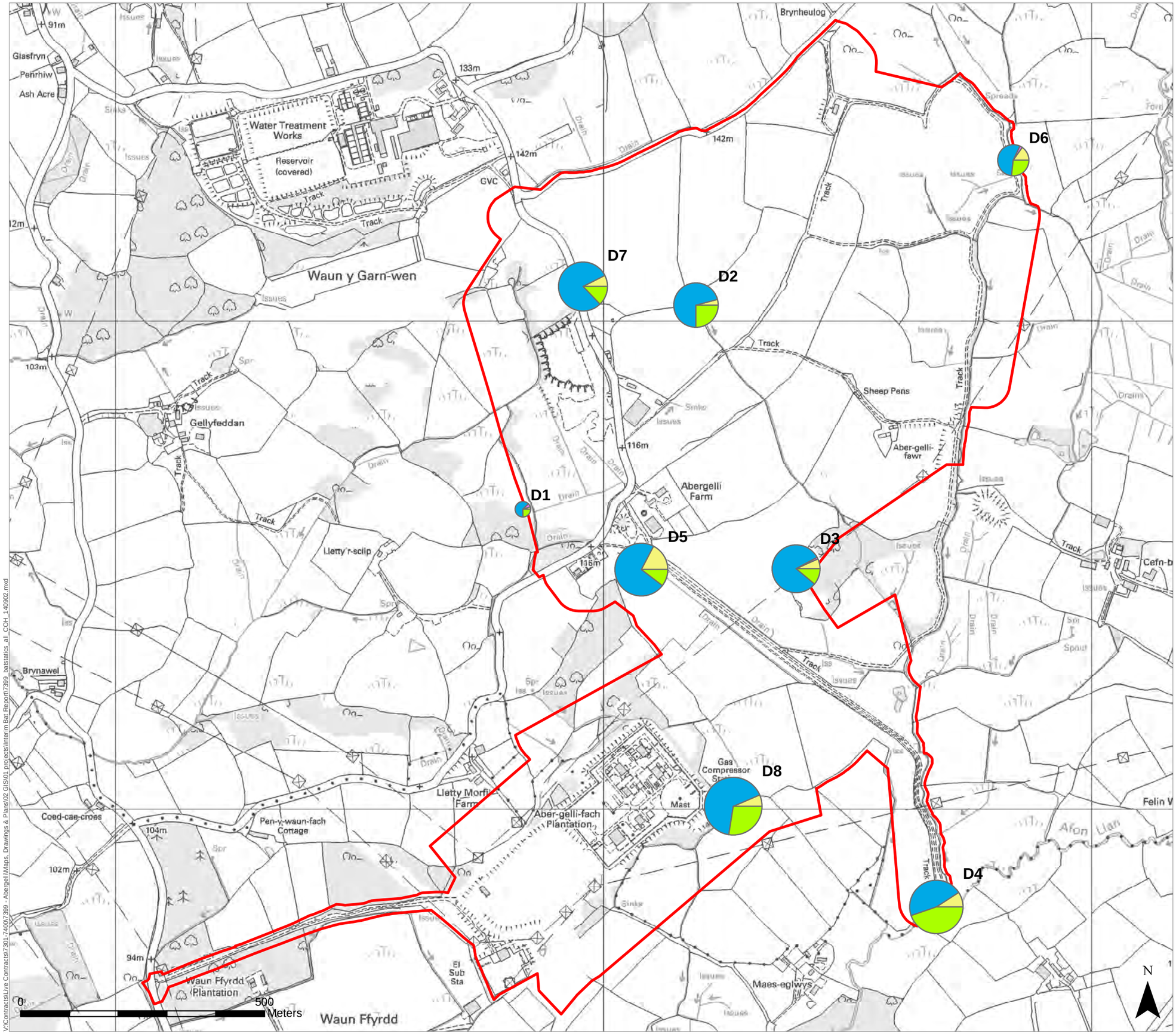

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LEGEND

- Survey Site boundary
- Relative acitivy (b/h) at automated locations
- *Myotis* species
- Noctule
- Common pipistrelle
- Soprano pipistrelle

Circle size proportional to B/h

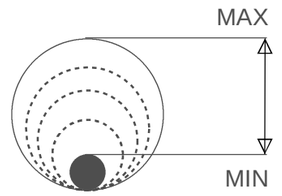

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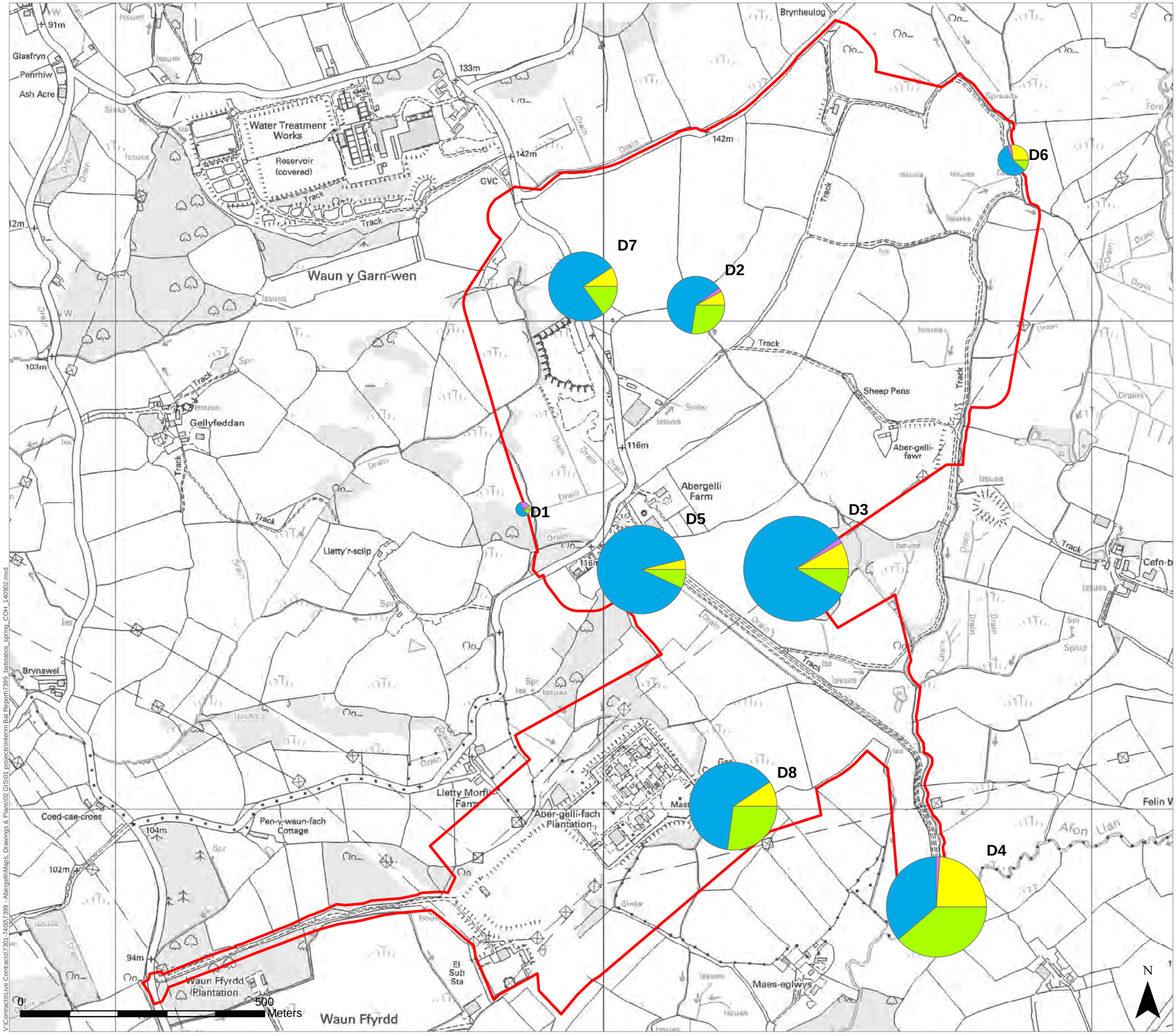
Figure 6 - Proportion of bat activity (by species) at automated survey locations in 2014

DATE: 17.10.2014 CHECKED: MH SCALE: 1:7,500

DRAWN: COH APPROVED: MH STATUS: FINAL

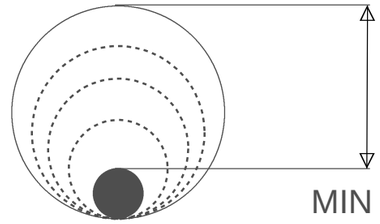
Sources: BSG Ecology survey data



LEGEND

- Survey Site boundary
- Relative acitivy (b/h) at automated locations
- *Myotis* species
- Noctule
- Common pipistrelle
- Soprano pipistrelle

Circle size proportional to B/h



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PROJECT TITLE

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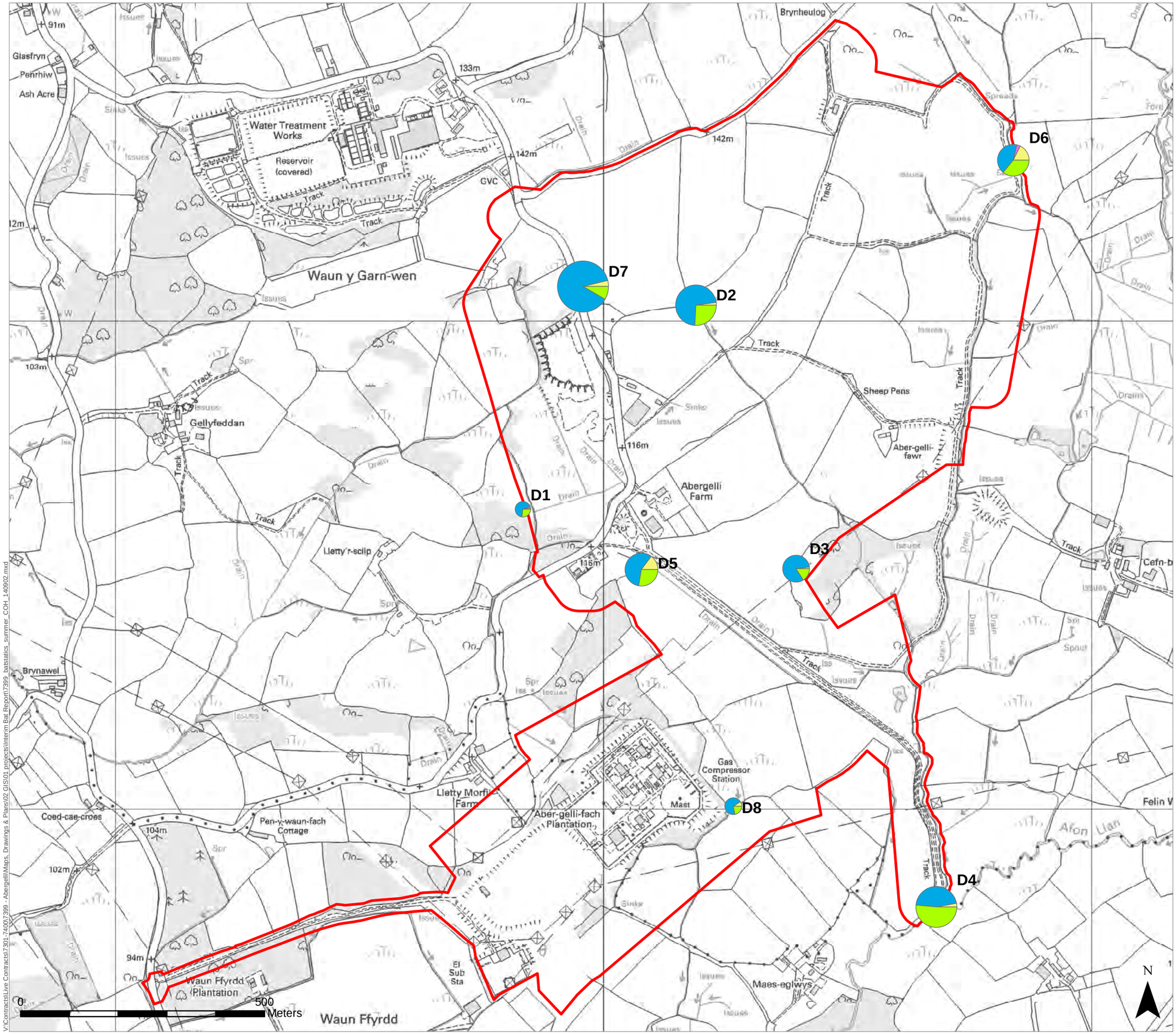
Figure 7 - Proportion of bat activity (by species) at automated survey locations in Spring 2014 (April-May)

DATE: 17.10.2014 CHECKED: MH SCALE: 1:7,500

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

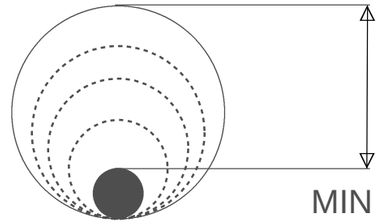
V:\Contracts\Live Contracts\7301-7400\7399 - Abergelli\Maps, Drawings & Plans\02 GIS\01 projects\Interim Bat Report\7399_batstatics_spring_COH_140902.mxd



LEGEND

- Survey Site boundary
- Relative acitivy (b/h) at automated locations
- *Myotis* species
- Noctule
- Common pipistrelle
- Soprano pipistrelle

Circle size proportional to B/h



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PROJECT TITLE

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DRAWING TITLE

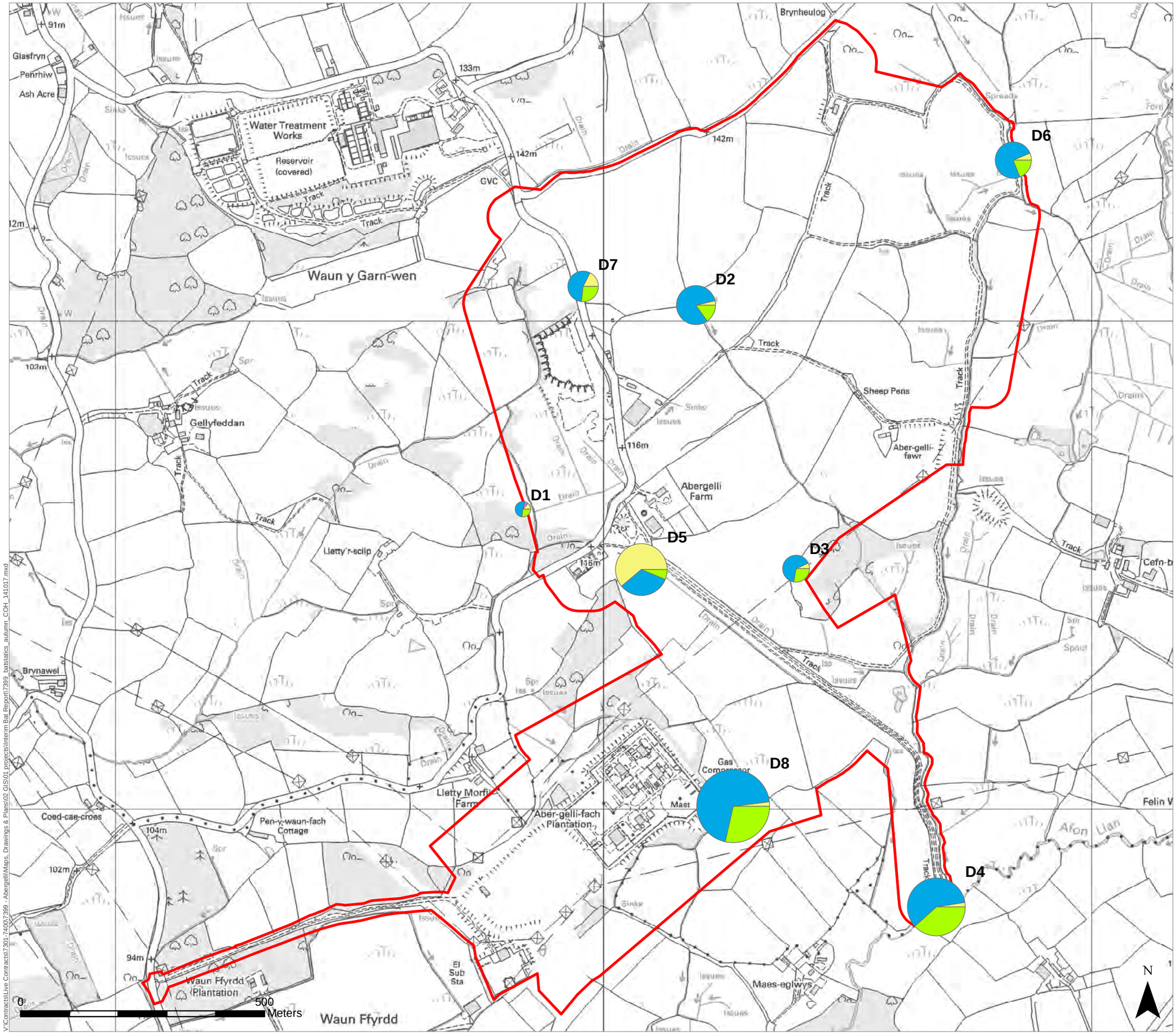
Figure 8 - Proportion of bat activity (by species) at automated survey locations in Summer 2014 (June-August)

DATE: 17.10.2014 CHECKED: MH SCALE: 1:7,500

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

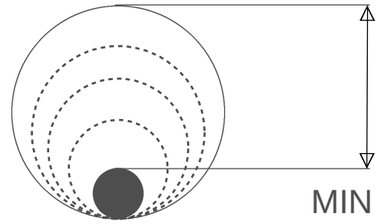
V:\Contracts\Live Contracts\7301-7400\7399 - Abergelli\Maps, Drawings & Plans\02 GIS\01 projects\Interim Bat Report\7399_batstatics_summer_COH_140902.mxd



LEGEND

- Survey Site boundary
- Relative acitivy (b/h) at automated locations
- *Myotis* species
- Noctule
- Common pipistrelle
- Soprano pipistrelle

Circle size proportional to B/h



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PROJECT TITLE

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DRAWING TITLE

Figure 9 - Proportion of bat activity (by species) at automated survey locations in Autumn 2014 (September-October)

DATE: 17.10.2014 CHECKED: MH SCALE: 1:7,500

DRAWN: COH APPROVED: MH STATUS: FINAL

Sources: BSG Ecology survey data

V:\Contracts\Live Contracts\7301-7400\7399 - Abergelli\Maps, Drawings & Plans\02 GIS\01 projects\Interim Bat Report\7399_batstatics_autumn_COH_141017.mxd

Appendix 2: Materials and Data Analysis

Use of Bat Detectors

The bat detectors used for automated surveys were Wildlife Acoustics SM2Bat and SM2Bat+. These are 16-bit full-spectrum bat detectors with internal storage and computing power that allows the unit to be used as a remote fixed-point detector. Recording is triggered by ultrasound, such as bat calls, in the vicinity of the detector, and any bat calls are stored as sound files on an internal SD card.

SM2 detectors were placed in water-proof boxes connected by a 10 m cable to an omnidirectional Wildlife Acoustics SMX-US microphone. The microphones were attached to a telescopic pole at 3.5 m above ground level on, and angled at 45° to the ground to allow water to run off, as recommended by the manufacturers.

For walked transect surveys and emergence/re-entry surveys, surveyors used two different bat detectors on each survey to supplement visual observations: a Batbox Duet detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat (SD1 or SD2) detector or Wildlife Acoustics Echo Meter 3 (EM3) for recording calls for subsequent identification.

Assessment of data from bat detectors

The likelihood of detecting bats acoustically depends on the propagation of sound through air, the characteristics of bat calls, and the way sound is received and processed by the bat detector. Recent unpublished collaborative research by BSG Ecology and Bristol University has shown that bat detectors detect calls from some species of bats at greater distances than others. In general, bats with calls that can be detected over greater distances are larger bats which use calls that are both high amplitude and low frequency such as the noctule and the most difficult to detect are those which use low amplitude calls, such as the brown long-eared bat and barbastelle, or high frequencies, such as horseshoe bats (Rhinolophus spp.). Table 1 shows the mean frontal detection range of SM2 detectors for echolocation calls from UK bat species based on research undertaken by BSG Ecology in collaboration with Bristol University.

Table 1: Estimated mean frontal detection ranges for selected bat species using SM2 detectors at standard 'field' settings and converting to zero-crossing recordings.

Species	Mean Frontal Detection Range (m)
Noctule	47
Soprano pipistrelle	17
Myotis sp.[5]	6
Long-eared bat	4
Lesser horseshoe bat	5

Data Analysis

Bat Call Identification

Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. For species of long-eared bats records were not identified to species level due to the overlapping call parameters of each species but were assumed to refer to brown long-eared bats. It is unlikely that grey long-eared bat (*Plecotus austriacus*) occurs in Swansea, given the species' known distribution and rarity (Harris & Yalden, 2008). Species of the genus *Myotis*[6] were grouped together as many of the species have overlapping call parameters, making species identification problematic (BCT, 2012).

For Pipistrelle species the following criteria, based on measurements of peak frequency, were used to classify calls:

Common pipistrelle	≥42 and <49 kHz
Soprano pipistrelle	≥51 kHz
Nathusius' pipistrelle	<39 kHz

[5] Refers to any bat species of the genus *Myotis*.

[6] This genus includes several regularly occurring species in the UK that include, Natterer's bat, Daubenton's bat *Myotis daubentonii*, Brandt's bat *Myotis brandtii*, whiskered bat and Bechstein's bat *Myotis bechsteinii*.

Common pipistrelle / Soprano pipistrelle ≥49 and <51 kHz

Common pipistrelle / Nathusius' pipistrelle ≥39 and <42 kHz

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

Calculation of relative activity

The SM2 detectors were configured to record above the level of ambient noise, such as from wind or rain, and set to define a bat pass (B) as a call note of >2ms which is separated from another by more than one second.

AnalookW (Version 3.8, 2010) software was used for all analysis of bat calls. It enables analysis of the relative activity of different species of bats by counting the number of bat passes (B) recorded within a unit of time – hour (h) was used. More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies up and down the edge of forestry. Although relative abundance cannot be estimated from this analysis, the number of bat passes does reflect the relative importance of a feature/habitat to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity.

Analysis by sunset-sunrise times

As part of the analysis of nocturnal patterns of behaviour for bats the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

TC 0 = before sunset

TC 1 = 0-20 min after sunset

TC 2 = 20-40 min after sunset

TC 3 = 40-60 min after sunset

TC 4 = 60-80 min after sunset

TC 5 = 80-100 min after sunset

TC 6 = 100-120 min after sunset

TC 7 = Middle of night (varies across seasons)

TC 8 = 120-100 min before sunrise

TC 9 = 100-80 min before sunrise

TC 10 = 80-60 min before sunrise

TC 11 = 60-40 min before sunrise

TC 12 = 40-20 min before sunrise

TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

Appendix 3: Building Descriptions

Internal/External inspection

The building layouts and referencing as described in the following section is illustrated in Appendix 1: Figures. In order to assist with the building descriptions, each building has been given a letter/number combination identifier.

B1

This is a two storey domestic property approximately 40-50 years old. It sits east to west on the Survey Site, with footprint dimensions 20 m x 8 m. The roof is constructed from hanging slate tiles and has a pronounced pitch, with boxed-in eaves on the gable ends. There are sections of lead flashing around the chimneys and eaves. There are opportunities for bat roosting in the following external features:

- Under gaps in the eaves where boxed in sections have sagged or are broken;
- Under lead flashing;
- Under broken or missing hanging slate tiles; and
- In space under ridge tiles.

No internal inspection of this building was undertaken as it is currently inhabited and access was not granted.

The building is considered to have moderate bat roosting potential. Although there are a number of features with potential to be used as bat roosts, there is no evidence that it is currently being utilised as a roost.

N.B. A shed in close proximity to B1 is constructed of wood cladding and has an open soffit into its roof space under felt. Owing to its high exposure and well-lit features, it was also deemed to have low potential for bat roosting potential.

B2

This property is a two storey domestic abode, approximately 40-50 years old but sitting 90° N of B1. This is an identical build to B1 but varies in specific features for roosting potential. There are opportunities for bat roosting in the following external features:

- Under broken or missing hanging slate tiles on south facing roof and water heater to the east side of the property;
- Under lead flashing around entrance, on the roof and gable ends;
- Under lifted ridge tiles where lifted; and
- In gaps between boxed eaves and flashing.

No internal inspection of this building was undertaken as it is currently inhabited and access was not granted.

The building is considered to have moderate bat roosting potential. Although there are a number of features with potential to be used as bat roosts, there is no evidence that is currently being utilised as a roost.

B3

This building is a corrugated metal framed agricultural building, its footprint dimensions are approximately 30 mx20 m and it is situated on the south side of the Survey Site at the top of a track leading to a gallops track. The building is single storey with lower block curtain walling and with low profile metal sheet on the upper side of the walls and roof. It is currently being utilised as a stable for horses.

Although there is lead flashing below the corrugated metal roof, upon internal inspection, an exposed interior with a lack of suitable roosting features means this building is considered to have negligible bat roosting potential. The building was however, considered to have some feeding potential.

B4

This is a stable block of stone, a solid wall construction, one storey tall. The roof is pitched with felt lined hanging tiles concluding in boxed eaves. There is considerable over hang in the boxed eaves. On internal inspection of the building there is a false ceiling made of plywood.

- Room with partition and false ceiling, very dark;
- Gaps above door frames;

- Cracks in existing stable walls;
- Space between breeze block gable ends (roof); and
- Several open windows (1m in width, opening 1ft wide) and garage doors often ajar.

B4 is a confirmed roost. There were stains and droppings (pipistrelle sp., long-eared bat sp. and lesser horseshoe) found upon internal investigation in one room of the stable block, and the majority of the building lends itself to roosting and feeding potential.

B5

This is a two storey terraced house approximately 50-60 years old. The roof is constructed from hanging slate tiles and has a pronounced pitch, with boxed-in eaves on the gable ends. There are sections of lead flashing around the chimneys and eaves. There are opportunities for bat roosting in the following external features:

- Under gaps in the eaves where boxed in sections have sagged or are broken;
- Under lifted lead flashing;
- Under broken or missing hanging slate tiles; and
- In space under ridge tiles.

No internal inspection of this building was undertaken as it is currently inhabited and access was not granted.

The building is considered to have moderate bat roosting potential. Although there are a number of features with potential to be used as bat roosts, no signs of roosts were found.

B6

This building is a corrugated metal framed agricultural building with lower block curtain walling and with low profile metal (and some plastic) sheet on the upper side of the walls and roof. The building is currently being utilised as storage for farm equipment such as disused vehicles & tools and hay bales. The footprint dimensions are roughly 30 m x 20 m and it is one storey tall. The area behind the hay bales at the far end of the building which is being used as stables for several horses could not be accessed for further investigation.

No evidence of bats roosting was found during the internal/external search and no potential roost features were identified. Therefore this building is considered to have negligible potential for roosting bats.

B7

This is a single storey brick outbuilding with a corrugated metal roof. The building has several small vents and cavity walls. There are opportunities for bat roosting in the following features:

- Accessible cavity walls through external vents.

No evidence of bat roosting was found during the internal/external search and therefore this building is considered to have low potential for roosting bats.

B8

This building is comprised of three sections. The first two are part of the original structure which is over 100 years old (est. 1900) and is constructed from brick walls with a corrugated, pitched metal roof with a series of fly ins and open access points on the roof apex. There is also a second storey tower on the north end of the building. The far north section is a single storey porta cabin style building approximately 4 m x 2 m with open windows and doors. There are opportunities for bat roosting in the following features:

- Gaps under the corrugated metal roof;
- In the stone vents/access points at the apex of the structure;
- In the series of lead flashing found around the top of the tower portion of the main brick building;
- Multiple fly-in opportunities in both storeys; and
- In the tower block, historic roost evidence, several small piles of disintegrated droppings, identified as long-eared bat *Plecotus auritus* droppings and at least one Pipistrelle sp. in both first and second storeys.

B8 is a confirmed roost. There were droppings from at least two bat species found upon internal investigation of both storeys and the majority of the building lends itself to roosting and feeding potential.

B9

This building is a single storey breeze block shed of recent build with a footprint of 3 m x 3 m. The building has solid walls and a flat corrugated metal roof. No evidence or potential or actual roost points were noted upon internal or external investigation.

Owing to the lack of signs and potential roosting features this building is considered to have negligible bat roosting potential.

B10

This property is a single storey, one-room brick outbuilding with footprint dimensions of 4 m x 3 m. The building has no doors or windows and the roof is concrete and flat with the internal ceiling exhibiting cracks and fissures. The brick walls are cavity walls with many missing bricks and openings. Although there is no door, there is an east facing entrance. Upon internal investigation two Pipistrelle sp. droppings were found on the floor. There are opportunities for bat roosting in the following features:

- Cavity walls with missing bricks;
- East facing entrance, fly-in;
- Cracked ceiling; and
- Also, bat droppings found in building.

This building is a confirmed roost owing to the discovery of bat droppings and a variety of optimal features for roosting potential.

B11

This is a derelict stone cottage over 100 years old. Its footprint dimensions are 15 m x 10 m. There are two distinct standing walls and there is no roof remaining. The walls are rubble filled and many stones are missing. There are opportunities for bat roosting in the following features:

- Missing stones leading to rubble filled internal wall.

Because the structure sits in a cluster of trees and has some notable roosting features, this building is considered to have moderate roosting potential.

Appendix 4: Photographs of Buildings

Photograph 1: Buildings 1 and 2. These houses are the same design.

Photograph 2: Building 3.

Photograph 3: Building 3.

Photograph 4: Building 4.

Photograph 5: Building 4.

Photograph 6: Building 5.

Photograph 7: Building 6.

Photograph 8: Building 7.

Photograph 9: Building 7.

Photograph 10: Building 8 – tower.

Photograph 11: Building 8 – droppings in tower.

Photograph 12: Building 8 – ground floor.

Photograph 13: Building 9.

Photograph 14: Building 9.

Photograph 15: Building 10.

Photograph 16: Building 10.

Photograph 17: Building 11.

Photograph 18: Building 11 – Wall structure.

Appendix 5: Photographs of Trees

Photograph 1: Tree 3.

Photograph 2: Tree 4.

Photograph 3: Tree 5.

Photograph 4: Tree 6

Photograph 5: Tree 9.

Photograph 6: Tree 23.

Photograph 7: Tree 32

Photograph 8: Tree 35.

Appendix 8.9

Dormouse Survey Report

Abergelli Power Project
Dormouse Survey Report

Abergelli Power Limited
May 2018

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Prepared for:

Abergelli Power Limited

Prepared by:

AECOM Limited
3rd Floor
Portwall Place
Portwall Lane
Bristol
BS1 6NA
UK

T: +44 117 901 7000
aecom.com

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1. Introduction

1.1 Introduction

1.1.1 AECOM was commissioned to undertake a suite of ecological survey work to inform the Abergelli Power Project (the "Project").

1.1.2 The Project Site is located near to the village of Felindre, Swansea, as shown in Figure 1, and the central grid reference for the Project Site is SN65280143. A full description of the development is provided in Chapter 3 (Project and Site Description) of the Environmental Statement (ES).

1.1.3 The Preliminary Ecological Appraisal Report (ES Appendix 8.1) identified that surveys for hazel dormouse *Muscardinus avellanarius* hereafter called 'dormouse' or 'dormice', were required at the Project Site.

1.1.4 This baseline report describes the status of dormouse within the dormouse survey area and makes initial indications of potential effects and outlines initial recommendations for further surveys, mitigation and enhancement.

1.1.5 The dormouse survey area encompasses all suitable and accessible areas of woodland, hedgerows and scrub within proximity of and within the Project Site boundary, as shown on Figure 1 and Figure 2.

1.1.6 Previous surveys have been undertaken by BSG Ecology which are presented in the ES Appendix 8.15.

a) Objectives of the Study

1.1.7 The objectives of this study were:

- To identify any designated nature conservation sites within or in the vicinity of the Project Site boundary that have the potential to support dormouse;
- To identify any known records and/or populations of dormouse in the vicinity of the Project Site boundary;
- To record and map evidence of dormouse activity;
- To make a population estimate of dormouse within the Project Site;
- To make an initial ecological assessment of the Project Site in respect to dormouse;
- To highlight any initial potential ecological constraints in respect to dormouse;
- To outline further survey work that may be required; and,
- To make initial suggestions for mitigation, compensation and enhancement of the natural features identified within the Project Site in respect to dormouse.

1.2 Legislation

1.2.1 The dormouse is a fully protected species under both United Kingdom and European law. It is also included in the Environment Act (Wales) 2016 Section 7 List as a species of principal importance. This is a brief summary of the legislation and is not to be regarded as a definitive legal opinion. When dealing with individual cases, the client is advised to consult the full texts of the relevant legislation and obtain further legal advice.

1.2.2 The dormouse was given partial protection under the Wildlife and Countryside Act (WCA) 1981. Schedule 5 of this Act was amended in 1988 making it a fully protected species. Protection is also afforded by Schedule 2 of the Conservation (Natural Habitats &c.) Regulations 1994, making the dormouse a European Protected Species. These two pieces of legislation operate in parallel, although there are some small differences in scope and wording.

1.2.3 The WCA 1981 transposes into UK law the Convention on the Conservation of European Wildlife and Natural Habitats (commonly referred to as the 'Bern Convention'). The 1981 Act has been amended several times, most recently by the Countryside and Rights of Way ((CRoW)) Act 2000, which added 'or recklessly' to Section 9(4)(a) and (b). Dormice are listed on Schedule 5 of the 1981 Act, and are therefore subject to the provisions of Section 9, which makes it an offence to:

- Intentionally kill, injure or take a dormouse ((Section 9(1)));
- Possess or control any live or dead specimen or anything derived from a dormouse ((S 9(2))) (unless it can be shown to have been legally acquired);
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a dormouse ((S 9(4)(a))); and,
- Intentionally or recklessly disturb a dormouse while it is occupying a structure or place which it uses for that purpose ((S9(4)(b))).

1.2.4 The Conservation (Natural Habitats &c.) Regulations (known as the Habitats Regulations) transpose into UK law Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (often referred to as the 'Habitats ((and Species)) Directive'). Dormice are listed on Annex IV ('European Protected Species') of the Directive meaning that member states are required to put in place a system of strict protection as outlined in Article 12; this is done through inclusion on Schedule 2 of the Regulations. Regulation 39 makes it an offence to:

- Deliberately capture or kill a dormouse (Regulation 39(1)(a));
- Deliberately disturb a dormouse (R. 39(1)(b));
- Damage or destroy a breeding site or resting place of a dormouse (R. 39(1)(d)); and/or,
- Keep, transport, sell or exchange, or offer for sale or exchange a live or dead dormouse or any part of a dormouse (R. 39(2)).

1.3 Quality Assurance

1.3.1 This survey and subsequent report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to establishing and maintaining our certification to the international standards BS EN ISO 9001:2008 and 14001:2004 and BS OHSAS 18001:2007. In addition, our IMS requires careful selection and monitoring of the performance of all sub-consultants and contractors.

1.3.2 All AECOM Ecologists who worked on this project are members of (at the appropriate level) the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2013) when undertaking ecological work.

2. Methodology

2.1 Desk study

2.1.1 The objective of the desk study is to review the existing information available in the public domain concerning species and habitats to identify the following:

- Internationally and nationally designated sites for dormouse, up to 2 km from the Site using the Multi Agency Geographic Information for the Countryside (MAGIC) website (NE, 2017);
- Dormouse records and records of locally designated sites for dormouse up to 2 km from the Site, using the South East Wales Biodiversity Records Centre (SEWBReC);
- Dormouse within the Section 7 list of Principal Importance for Conservation of Biological Diversity in Wales;
- Ancient Semi-Natural Woodland (ASNW), Plantation on Ancient Woodland Site (PAWS), Restored Ancient Woodland Site (RAWS) or Ancient Woodland Site of Unknown category (AWSU) within or adjacent to the Project Site using Ancient Woodland Inventory 2011 dataset downloaded from the Lle website (WG and NRW, 2017);
- Local knowledge of dormouse species and habitats from the County Ecologist;
- Local knowledge of dormouse species and habitats from the South Wales Mammal Group (SWMG) and,
- Features of ecological interest surrounding the Project Site, nearby areas of ecological interest and features connecting these habitats (hedgerows, watercourses, railway lines) using aerial photographs and Ordnance Survey (OS) maps.

2.1.2 The reports of previous surveys undertaken by BSG Ecology were provided by the client and were reviewed.

2.2 Dormouse Survey

2.2.1 Dormouse surveys were undertaken paying due regard to the Dormouse Conservation Handbook (Bright, *et al*., 2006). Nest survey tubes (n=129) were installed on 24 and 25 May 2017 in suitable habitat as shown in Figure 2. The survey tubes were retrieved on 20 November 2017.

2.2.2 Bright, *et.al*. (2006) provides guidance on survey effort requirements, using an Index of Probability of finding dormice present in nest tubes in any one month. The Index of Probability is based on using 50 nest tubes as a standard. A copy of The Index of Probability scores is provided in Table 1.1.

2.2.3 Chanin and Woods (2003) recommend that assumed absence of dormice should not be based on a Search Effort Score of less than 20. The Search Effort Score is calculated by adding the Index of Probability scores for the months in which the survey was undertaken. For example using the values in Table 2.1. If all surveys were undertaken in all months the Search Effort Score would be 25.

Table 2.1 Index of Probability of Finding Dormice Present in Nest Tubes

Month	Index of Probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

Table taken from Bright et al., 2006.

2.2.4 Tubes were inspected in June, August, September October and November 2017 (see Section 1.5 in Limitations) for any presence of dormouse and any signs, particularly for recently constructed nests. One licensed dormouse surveyor was present during all visits. Tube inspection was undertaken using flashlight or by sliding the nest tube trays open. Survey dates and personnel are given in Table 2.2.

Table 2.2 Survey Dates and Survey Personnel

Survey date	Survey Personnel
26 June 2017	Ben Walsh Licence Holder
2 August 2017	Ben Walsh Licence Holder
29 August 2017	Ben Walsh Licence Holder
29 September 2017	Ben Walsh Licence Holder

Survey date	Survey Personnel
17 October 2017	Ben Walsh Licence Holder
20 November 2017	Ben Walsh Licence Holder and Sam Braine Assistant Ecologist

2.2.5 Using Table 2.1, the Search Effort Score for the 2017 dormouse surveys meets the minimum score of 20. As the minimum score has been met and considering that the number of tubes used for the surveys is greater than the minimum of 50 used to calculate the Index of Probability score, the survey provides a robust assessment of presence or likely absence of dormouse in the survey area.

2.3 Limitations

2.3.1 Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with a survey, they can contribute to a robust ecological assessment of a site.

2.3.2 Following best practice guidelines (Bright, *et al.*, 2006) the best time to set out dormouse tubes is in March and it is best to leave dormouse tubes out for an entire season from March onwards, for checking in November. However this could not be achieved as access to the suitable areas for dormouse nest tube deployment was not granted until late May 2017 and time constraints of the Project meant that they could not be left for an entire season. However, the tubes were deployed and surveyed within suitable survey months and will still be suitable to determine the presence or absence of dormice within the Project Site. Furthermore, Chanin and Woods (2003) identified that the length of time tubes are deployed is less important than the time of year. Leaving them out from early March to the end of November will give the highest probability of detecting dormice if they are present. With a minor peak of tube use in May and a more substantial one in August and September, it would be best to ensure that tubes are installed no later than April and finally checked no earlier than October. As an absolute minimum they recommend that tubes are installed before the end of July and finally checked after the end of September. Given the evidence above and meeting the minimum Search Effort Score of 20, the deployment of the nest tubes in May is not deemed to be a significant limitation. A survey was not undertaken in July. Instead, two surveys were undertaken in August; one at the beginning of the month and one at the end of the month. Therefore, this is not deemed to be a significant limitation.

2.3.3 On 26 June 2017 not all the tubes could be located due to extensive vegetation cover; 93 tubes were checked on this occasion, on all other occasions all of the tubes were checked. On 29 August 2017 three tubes had to be repositioned as they had fallen. On 29 September three tubes had to be repositioned as they had fallen. On 17 October 2017 it was noted that one of the tubes had fallen and snapped in half. These incidents are not deemed to be a significant limitation.

3. Baseline Environment

3.1 Desk Study Results

3.1.1 The designated habitats, sites and features within proximity to the Project Site are listed in Table 1.3 below.

Table 3.1 Desk Study Results

Designation / Feature	Description
Nationally and Internationally Designated Sites for Dormice within 2 km	There are no national or international designated sites for dormice within 2 km.
Locally Designated Sites within 2 km	The AECOM PEA did not identify any locally designated sites for dormice within 2 km (ES Appendix 8.1).
Dormice Records from the last 10 years within 2 km	No records of dormice were returned from SEWBReC within the last 10 years (ES Appendix 8.1).
Priority Species – Listed on The Environment Act (Wales) 2016 Section 7	Dormouse is listed on the Wales Section 7 list.
Surrounding Land Use	The Project Site is located to the north of Junction 46 of the M4 Motorway close to the village of Felindre, Swansea. The Project Site has agricultural fields to the east, south and north. Areas of woodland are located to the south, east and west of the Site. Areas of the National Grid Power Station with associated roads and buildings are partially within and adjacent to the Project Site boundary. A water treatment works is located in the north west outside of the Project Site boundary.
Previous Surveys undertaken by BSG Ecology	The client provided AECOM with the reports of previous surveys undertaken in 2014 by BSG Ecology within the Site (ES Appendix 8.15). The Site boundary included within these reports is different to the 2017 Project Site boundary. It was noted that the 2017 Project Site boundary is smaller than the red line boundary used by BSG Ecology in 2014. However, the current Project Site boundary is within the same area as the 2014 red line boundary provided to BSG Ecology and therefore the surveys undertaken would have captured the current Project Site area. The 2014 BSG Ecology Dormouse Report did not identify any dormice or evidence of dormice in the 2014 survey period. A total of 143 tubes were deployed across the months of May and June 2014, and checked on six occasions between the months of June and November (ES Appendix 8.15).

3.2 Dormouse Survey Results

3.2.1 No dormice or evidence of dormice was identified during the surveys.

3.2.2 One wood mouse *Apodemus sylvaticus* in a nest was identified in tube 49 on 29 August 2017.

3.2.3 One wood mouse nest was identified in tube 49 on 29 September 2017.

3.2.4 One wood mouse in a nest was identified in tubes 64 and 111 and one wood mouse nest was identified in tube number 81 on 17 October 2017.

3.2.5 One wood mouse nest was identified in tube 65 on 20 November 2017.

4. Conclusions and Recomendations

4.1.1 No dormice or evidence of dormice have been identified within the Project Site.

4.1.2 Given the negative results of the field surveys from 2017, the negative results of the BSG Ecology surveys from 2014 (ES Appendix 8.15), and the lack of records from SEWBReC of dormouse from within 2 km it is likely that dormouse is absent from the Project Site.

4.1.3 A full assessment of required further surveys has been made during EcIA and will be reported in the ES. At this stage it is anticipated that no further surveys will be required for dormouse.

4.2 Recommendations for Mitigation

4.2.1 A full series of recommendations for further surveys and mitigation at construction and operation has been undertaken for the EcIA and will be reported in the ES. At this stage a European Protected Species Licence (EPSL) for dormice is not required and no recommendations are required for mitigation as dormice are considered likely absent from the Project Site.

4.3 Recommendations for Biodiversity Enhancement

4.3.1 A full series of recommendations for biodiversity enhancement has been made during the EcIA and reported in the ES. At this stage the following preliminary recommendations have been made for general biodiversity enhancements:

- Maintain connectivity within the landscape by avoiding the severance of tree lines, woodland edges, hedgerows and dense scrub; and,
- Improve the connectivity of the Project Site by planting new hedgerows, infilling current gaps in hedgerows with whips and creating green corridors. It is recommended to use native species.

5. References

Bright P., Morris P., Mitchell-Jones T. (2006). The dormouse conservation handbook second edition. English Nature. Peterborough.

Chanin, P. and Woods, M.(2003). Surveying dormice using nest tubes. Results and experiences from the South West Dormouse Project. *English Nature Research Report no. 524.*

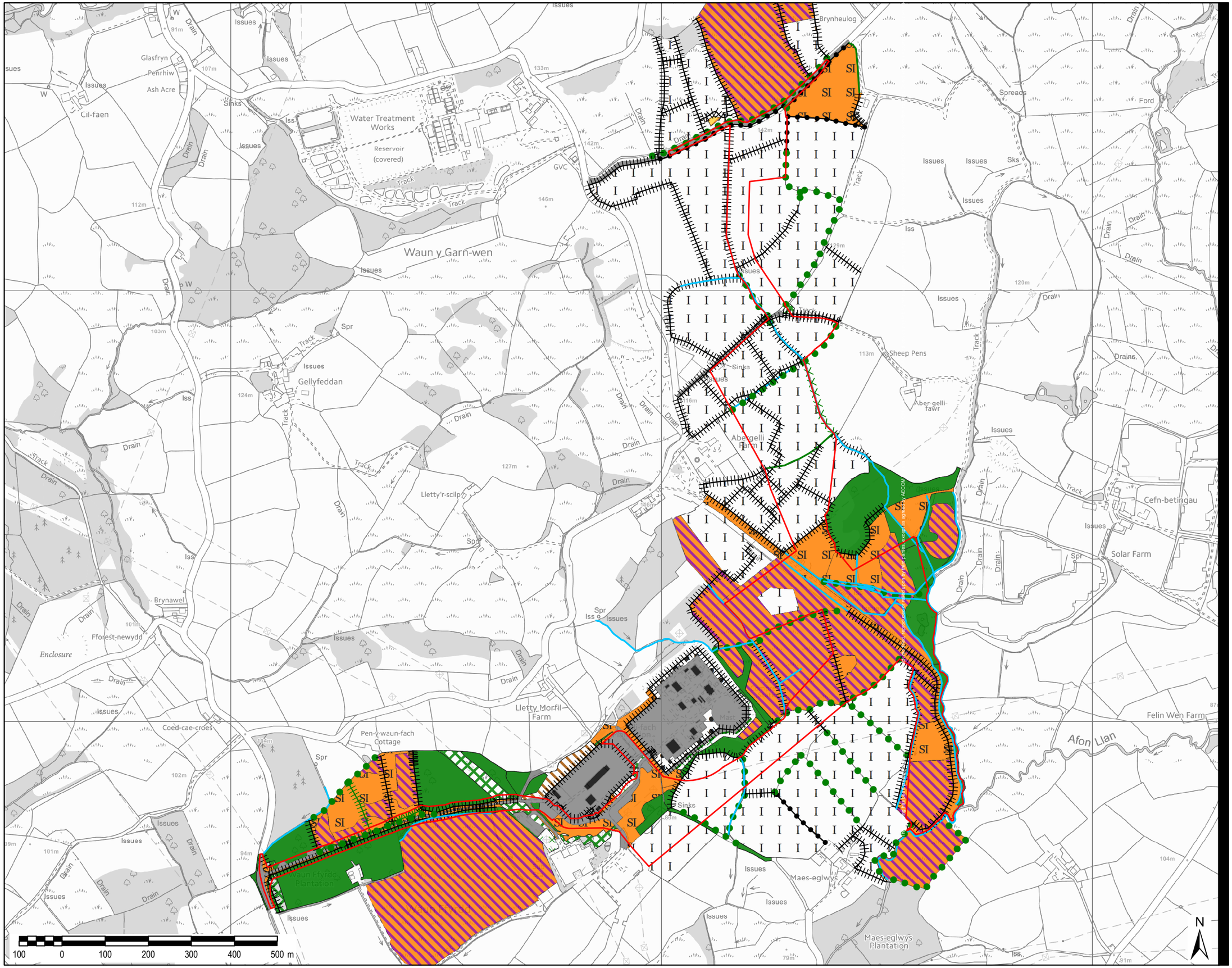
CIEEM (2013). Professional Code of Conduct. Chartered Institute of Ecology and Environmental Management (CIEEM) June 2013

Joint Nature Conservation Committee (2010 Ed.). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC. Peterborough

Natural England (NE) (2017). Multi Agency Geographic Information for the Countryside (MAGIC). Available at www. magic. gov. uk

Welsh Government (WG) and Natural Resources Wales (2017). Lle A Geo-Portal for Wales. Available at: http://lle. gov. wales/home

Figure 1 Phase 1 Habitat Map



AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Project Site Boundary

Phase 1 Habitat Linear Features

- Scrub - Scattered
- Row of trees - broadleaved
- Running Water
- Intact Hedge - Species-Poor
- Defunct Hedge - Species-Poor
- Hedge with Trees - Native Species-Rich
- Hedge with Trees - Species-Poor
- Fence
- Earth Bank

Phase 1 Habitat Areas

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Dense/Continuous scrub
- Scattered scrub
- Semi-improved - neutral grassland
- Improved grassland
- Marsh/marshy grassland
- Tall ruderal - herb and fern
- Dry heath/acid grassland mosaic
- Buildings
- Bare ground
- Hard standing

AECOM Internal Project No:

60542910

Drawing Title:

PHASE 1 HABITAT MAP

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FIGURE 1			005
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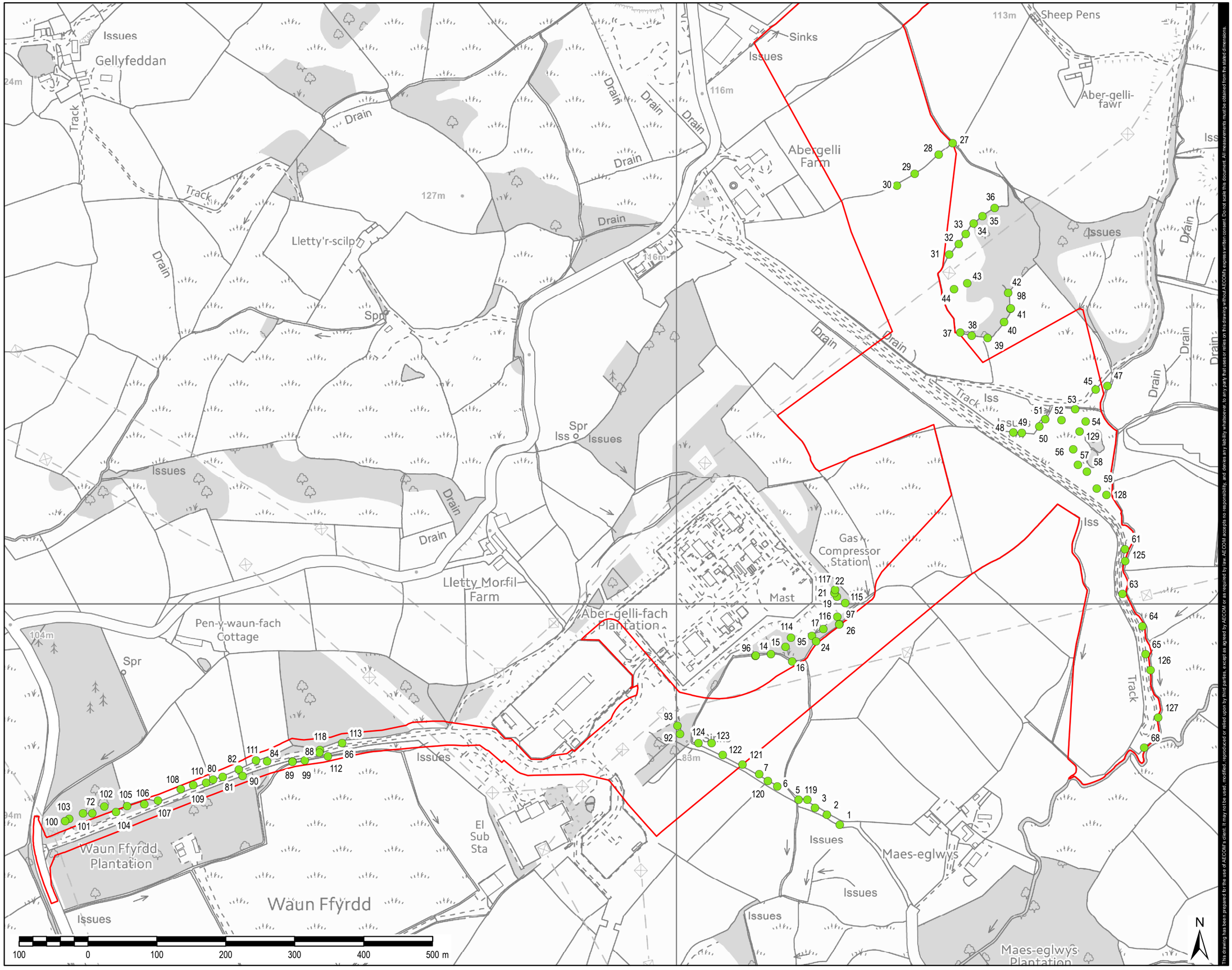
Figure 2 Dormouse Tube Locations



AECOM Limited
1 Callaghan Square
Cardiff, CF10 5BT
+44 (0)29 2067 4600 tel
www.aecom.com

Project Title:

ABERGELLI POWER PROJECT

Client:

ABERGELLI POWER LTD.

LEGEND

- Project Site Boundary
- Dormouse Tube Locations

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DORMOUSE TUBE LOCATIONS

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FIGURE 2	002

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