6.5.B: Wider Works Aquatic Survey Report

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Contents

1. Introduction

1.1 Background

1.1.1 This appendix details the approach and findings of the aquatic ecology desk study and aquatic ecology surveys of freshwater habitats undertaken in 2024 within the Wider Works element of the Pentir to Trawsfynydd Reinforcement Project (the 'Project') and has been prepared by AECOM on behalf of National Grid Electricity Transmission plc (NGET). Baseline data presented within this appendix has been used to inform the assessment within Environmental Statement (ES) **Volume 6, Chapter 5: Likely Significant Effects.**

1.1.2 The terms of reference used to describe the proposed works in this report are broadly consistent with those defined in ES **Volume 3, Chapter 2: Wider Works**.

This appendix is supported by **Figure 6.5.B.1.**

1.2 Project Description

1.2.1 This appendix of the ES covers the Wider Works only (as shown in ES **Volume 6, Figure 6.2.2**).

1.2.2 Installation of approximately 23.5 kilometres (km) of fibre optic cable along the existing earth wire of the 4ZC overhead line between towers 4ZC070 and 4ZC140. This will involve visiting each tower with a vehicle and pulling the fibre optic between towers so that it wraps around the existing earthwire.

1.2.3 Reconductoring and replacement of fittings on the 4ZC overhead line 'coastal' circuit B and replacement of the earthwire with Optical Ground Wire (OPGW) between Towers 4ZC044 and 4ZC070 to remove existing 132 kilovolt (kV) (approximately 8 km).

1.2.4 Reconductoring and replacement of fittings on the 'coastal' circuit B between Towers 4ZC005 and Tower 4ZC027 (approximately 6.5 km) and replacement of the earthwire with Optical Ground Wire (OPGW).

1.2.5 Reconductoring involves transporting replacement 400 kV conductors (wires) to towers at intervals along the existing overhead line, removing the existing 132 kV conductors and pulling through replacement 400 kV conductors. A winch is required at one end of the length to be pulled and a brake at the other end to maintain appropriate tension. An earthing zone is required in the area of works and some temporary storage and working areas. Fittings may need replacement on some towers. Works to gain access may require temporary roads or matting or the use of tracked vehicles.

1.2.6 Based on the proposed works, the potential impacts associated with the Construction phase are:

- Habitat loss – direct impacts associated with changes in land use resulting from the proposed works. For example, temporary and permanent change in land use due to the creation of watercourse crossings.
- Habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all the species it supports, e.g. changes in water quality from construction or pollution.
- Species mortality – direct impacts on species populations associated with mortalities due to construction activities, e.g. changes in water quality from construction or pollution.
- Species disturbance – indirect impacts resulting from a change in normal conditions (i.e. light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range.
- Spread of Invasive Non-Native Species (INNS) – construction methods resulting in spread of INNS and degradation of habitats.

1.2.7 There are no anticipated impacts to aquatic receptors during both the Operational phase.

1.3 Scope

1.3.1 Surveys that were undertaken within 2 kilometres (km) of the works site have been considered within this baseline.

1.3.2 The desk study and survey work undertaken in 2024 reported in this appendix:

- Outline the legislation and guidance relevant to fish, aquatic macrophytes, and aquatic macroinvertebrates;
- Present relevant desk study information;
- Provide species data and information on the aquatic macroinvertebrate, macrophyte and fish species, and assemblages within the relevant area
- Inform the ecological impact assessment and identification of mitigation measures (where required).

1.3.3 Recommendation for any avoidance, mitigation and enhancement for aquatic species are provided in ES **Volume 6, Chapter 5: Likely Significant Effects**.

1.4 Study Area

1.4.1 The Study Area was defined to include ecological features likely to be at risk from direct and indirect impacts that might arise from the proposed works and is the initial basis for determining a Zone of Influence (ZoI). CIEEM

guidance (Ref 1.1) defines a ZoI as: "…the area over which biodiversity features may be affected by biophysical changes as a result of the proposed project and associated activities".

1.4.2 The ZoI is based on the:

- Nature of the proposed works, activities, and the potential for effects at the construction, operation and maintenance phases.
- Nature of the land use and habitats in the vicinity, the number of watercourses and water bodies, their connectivity within and outside of the proposed works area and how they may be used by different species or species groups.
- Habitats, behaviours and preferences of different species or species groups and whether these could be affected both spatially and temporally.

1.4.3 In determining the extent of the ZoI in this assessment, consideration has been given to the fact that these works form a component of a larger overall Project.

1.4.4 All designated sites, sensitive habitats, and protected and notable species that occur within the ecological ZoI of the proposed works have been considered in this assessment.

2. Legislation

2.1.1 This assessment has been undertaken within the context of some or all the following legislative instruments, planning policies and guidance documents:

- Convention on the Conservation of Migratory Species (CMS) of Wild Animals 1979 (or Bonn Convention) (Ref 2.1);
- The Trade in Endangered Species of Wild Fauna and Flora (Amendment) (EU Exit) Regulations 2018 (Ref 2.2);
- Joint Nature Conservation Committee (JNCC) Global Red List (Ref 2.3);
- The Council of Europe's Convention on the Conservation of European Wildlife and Natural Habitats 1979 (or Bern Convention) (Ref 2.4);
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') (Ref 2.5);
- Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref 2.6);
- Oslo and Paris Conventions (OSPAR) 1992 (Ref 2.7);
- Environmental Protection Act 1990 (Ref 2.8);
- Environment (Wales) Act 2016 (Ref 2.9);
- The Salmon and Freshwater Fisheries Act (1975) (Ref 2.10);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the 'Water Framework Directive' or WFD) (Ref 2.11);
- Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref 2.12);
- The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 2.13);
- The Eels (England and Wales) Regulations 2009 (Ref 2.14);
- Natural Environment and Rural Communities (NERC) Act 2006 (Ref 2.15); and
- UK Biodiversity Framework (Ref 2.16).

3. Methods

3.1 Desk Study

3.1.1 A desk-based study was conducted to identify nature conservation designations, protected and priority habitats and species relevant to the Study Area.

3.1.2 Designated sites in the Study Area were screened using the Multi Agency Geographic Information for the Countryside (MAGIC) website (Ref 3.1) and using data provided by Cofnod obtained in November 2024, the North Wales Environmental Information Service (Ref 3.2), following the below criteria:

- 10 km from the Wider Works for statutory designated sites of international nature conservation value with aquatic interest (Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Wetlands of International Importance that have been designated under the criteria of the Ramsar Convention of Wetlands (Ramsar), as well as proposed or potential sites);
- 5 km from Wider works for other statutory designated sites of aquatic interest (Site of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserve (LNR));
- 2 km from the Wider Works site for non-statutory sites for nature conservation (e.g. Local Wildlife Sites (LWS), candidate LWS (cLWS) and Sites of Importance for Nature Conservation (SINC)).
- 2 km from Wider Works for Habitats of Principal Importance (HoPI), as listed under Section 7 of the Environment Wales Act (2016);

3.1.3 Notable (protected and invasive) aquatic receptors (fish, macroinvertebrates, and macrophyte species) within 2 km from the Wider Works from the last 10 years (2014 onwards) were identified from the following sources:

- Cofnod – the Local Environmental Records Centre for North Wales (Ref 3.2);
- National Biodiversity Network Atlas database (NBN Trust, 2024) – records with licences allowing for commercial use (OGL, CCO and CC-BY) (Ref 3.3); and,
- Natural Resources Wales (NRW) DataMapWales website (Ref 3.4, Ref 3.5 and Ref 3.6)).

3.1.4 Water Framework Directive (WFD) water bodies within 2 km of the Wider Works were identified from the NRW DataMapWales website (Ref 3.8)).

3.2 Aquatic Surveys

3.2.1 Survey sites were selected according to where watercourses were being crossed within the Study Area and have the potential to be affected. 35 sites were scheduled to be surveyed (**Figure 6.5.B.1**: Aquatic Survey Locations). The survey sites comprised of both Main Rivers and ordinary watercourses proposed to be crossed by the Scheme.

3.2.2 Access to 10 sites was not possible and no surveys could be completed here.

3.2.3 All surveys where access was possible were completed in their respective optimal seasons (see subsequent sections) in 2024.

Aquatic Macroinvertebrate Surveys

3.2.4 Aquatic macroinvertebrate surveys were undertaken at 37 sites in 2024. The specific locations and dates of the surveys are shown in **Table 3-1.**

Table 3-1 - Aquatic macroinvertebrate survey locations and dates

Surface water reference	Watercourse name	Site name	National grid reference	Survey date	Season	Distance from the works site
WCX69	Afon Tafarn-helyg	1B	SH 68938 38738	02/11/2024	Autumn	0.1 km north-east
WCX61	Unnamed Trib. of Afon Prysor	1D	SH 67371 38436	05/06/2024	Spring	Within
			SH 67313 38438	02/11/2024	Autumn	Within
Crossing at Afon Prysor	Afon Prysor	1E	SH 66924 38426	05/06/2024	Spring	0.05 km north
			SH 66755 38591	02/11/2024	Autumn	0.26 km north
WCX58	Unnamed Trib. of Afon Prysor	1F	SH 66273 38173	02/11/2024	Autumn	Within
WCX57	Unnamed Trib. of Afon Prysor	1G	SH 66064 38227	02/11/2024	Autumn	Within
WCX54	Afon Elyn	1H	SH 64286 38142	05/06/2024	Spring	Within
			SH 64709 38108	02/11/2024	Autumn	0.01 km south

Surface water reference	Watercourse name	Site name	National grid reference	Survey date	Season	Distance from the works site
WCX53	Llyn Tecwyn Uchaf	1I	SH 63870 38091	06/06/2024	Spring	Within
			SH 63773 38179	02/11/2024	Autumn	0.03 km south
Crossing at Llyn Tecwyn Uchaf	Llyn Tecwyn Uchaf	1I-A	SH 64039 38342	02/11/2024	Autumn	0.19 km north
Crossing at Llyn Tecwyn Uchaf 2	Llyn Tecwyn Uchaf	1I-B	SH 63706 38144	02/11/2024	Autumn	Within
Crossing at Unnamed trib. of Nant yr Efail	Unnamed trib. of Nant yr Efail	1J	SH 63484 38133	05/06/2024	Spring	Within
			SH 63631 38128	02/11/2024	Autumn	Within
WCX52	Nant yr Efail	1K	SH 63053 38021	01/11/2024	Autumn	Within
Crossing at Unnamed trib. of Nant yr Efail 3	Nant yr Efail	1L	SH 62591 37882	01/11/2024	Autumn	Within
Crossing at Afon Bontfaen	Afon Bontfaen	3A	SH 53725 40081	04/11/2024	Autumn	0.19 km south
Crossing at Afon Cedran	Afon Cedran	3B	SH523524 0929	01/11/2024	Autumn	0.12 km north
Crossing at Unnamed trib. of Afon Rhyhalltt	Afon Rhyhalltt	3AA	SH 54739 63620	29/10/2024	Autumn	0.09 km north-west
Crossing at Afon Cegin	Afon Cegin	3AB	SH 55610 65085	30/10/2024	Autumn	1.42 km north-west
Crossing at Unnamed	Unnamed trib. of Afon Cegin.	3AC	SH 55697 65184	30/10/2024	Autumn	1.53 km north-west

Surface water reference	Watercourse name	Site name	National grid reference	Survey date	Season	Distance from the works site
trib. of Afon Cegin						
Crossing at Unnamed trib. of Afon Dwyfor	Unnamed trib. of Afon Dwyfor	3C	SH 50048 40657	01/11/2024	Autumn	0.06 km south
Crossing at Unnamed trib. of Nant yr Afon-oer	Unnamed trib. of Nant yr Afon-oer	3-Church	SH 54085 40300	04/11/2024	Autumn	0.04 km north-east
Crossing at Afon Dwyfor	Afon Dwyfor	3D	SH 49263 41271	06/06/2024	Spring	Within
			SH 49364 41570	01/11/2024	Autumn	0.19 km east
Crossing at Afon Dwyfach	Afon Dwyfach	3E	SH 48111 43657	1/11/2024	Autumn	0.03 km west
Crossing at Afon Dwyfach 2	Afon Dwyfach	3G	SH 47811 44499	31/10/2024	Autumn	Within
Crossing at Afon Dwyfach 3	Afon Dwyfach	3H	SH 47874 44670	31/10/2024	Autumn	0.09 km east
Crossing at Unnamed trib. of Afon Dwyfach	Unnamed trib. of Afon Dwyfach	3J-A	SH 47087 46922	31/10/2024	Autumn	Within
Crossing at Unnamed trib. of Afon Dwyfach 2	Unnamed trib. of Afon Dwyfach 2	3K	SH 47014 47259	29/10/2024	Autumn	Within
Crossing at Afon Crychddwr	Afon Crychddwr	3M	SH 47152 51294	30/10/2024	Autumn	Within
Crossing at Unnamed trib. of Afon Crychddwr	Unnamed trib. of Afon Crychddwr	3N	SH 46674 50246	29/10/2024	Autumn	0.08 km west

Surface water reference	Watercourse name	Site name	National grid reference	Survey date	Season	Distance from the works site
Crossing at Unnamed trib. of Afon Llyfni	Unnamed trib. of Afon Llyfni	3P	SH 47693 52423	29/10/2024	Autumn	Within
Crossing at Afon Llyfni	Afon Llyfni	3Q	SH 47729 52816	31/10/2024	Autumn	0.06 km west
Crossing at Unnamed trib. of Afon Llyfni	Unnamed trib. of Afon Llyfni	3Q-A	SH 47855 53016	31/10/2024	Autumn	0.01 km west
Crossing at Afon Llifon	Afon Llifon	3R	SH 49494 55902	31/10/2024	Autumn	Within
Crossing at Unnamed trib. of Afon Llyfon	Unnamed trib. of Afon Llyfon	3R-A	SH 49515 55933	31/10/2024	Autumn	Within
Crossing at Afon Gwyrfai	Afon Gwyrfai	3V	SH 50925 59479	29/10/2024	Autumn	0.02 km west
Crossing at Unnamed trib. of Afon Gwyrfai	Unnamed trib. of Afon Gwyrfai	3X	SH 51635 60741	31/10/2024	Autumn	Within
Crossing at Unnamed trib. of Afon 2	Unnamed trib. of Afon Gwyrfai 2	3Y	SH 51774 60816	31/10/2024	Autumn	Within

3.2.5 The aquatic macroinvertebrate surveys were undertaken by suitably qualified and experienced aquatic ecologists. Sampling procedures followed those standardised by the Environment Agency (Ref 3.8), which conform to British Standard-European Standard-International Organisation for Standardisation (BS EN ISO) 10870:2012 Water Quality – Guidelines (Ref 3.9) for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters (The British Standards Institution, 2012). These methods allow characterisation of aquatic macroinvertebrate communities and can be used to determine whether rare or notable species or communities are present. The samples were taken using a standard Freshwater Biological Association (FBA) (Ref 3.10) pattern kick net (mesh size: 1 millimetre (mm)). The habitats present were proportionally sampled through a combination of kick sampling and sweep sampling for three minutes followed by a one-minute

active search of larger substrates in accordance with the standard methods. Collected samples were subsequently preserved in Industrial Methylated Spirit (IMS) for laboratory processing. No surveys were undertaken during or immediately following periods of high flow in accordance with best practice guidance.

3.2.6 Each of the samples collected was sorted and analysed in a laboratory setting by suitably trained and experienced aquatic ecologists. Lists of the aquatic macroinvertebrate taxa present were produced in line with Environment Agency guidance (Ref 3.8). The samples were identified to 'mixed-taxon level' using a stereo-microscope and identified to species level (where practicable), except for the following:

- Worms (Oligochaeta), which were identified to sub-class; Worms (Oligochaeta), which were identified to sub-class;
- Marsh beetles (Scirtidae), which were identified to family;
- True fly larvae, which were identified to the maximum resolution possible;
- Immature or damaged specimens, which were identified to the maximum resolution possible on a case-by-case basis.

3.2.7 Aquatic macroinvertebrate species were cross referenced against the JNCC Taxon Designations list (Ref 3.11) and the Nature Recovery Action Plan Wales Section 7 Priority species list to identify if any protected and/or notable species were identified. The survey data was then used to calculate metrics that can be used to inform an assessment of relative nature conservation value, habitat condition, and general degradation as detailed below.

Community Conservation Index (CCI)

3.2.8 A Community Conservation Index (CCI) (Chadd & Extence, 2004) was calculated for each site as detailed in **Appendix A**. The CCI classifies many groups of aquatic macroinvertebrates according to their scarcity and nature conservation value in the UK as understood at the time that the classification was developed. Species scores range from 1 to 10, with 1 being Very Common and 10 being Endangered. Since its initial publication, in some cases the references used in the CCI classification to define scarcity and value have been superseded by more recent assessments. The most recent scores have been used within this report.

Lotic-invertebrate Index for Flow Evaluation (LIFE)

3.2.9 Lotic-invertebrate Index for Flow Evaluation (LIFE) scores were calculated (Ref 3.13). This is an index that links benthic macroinvertebrate data to flow regimes prevailing in UK waters. Flow scores have been allocated to various macroinvertebrates based on species/family abundance and ecological association with different flows, as detailed in **Appendix A**. The overall LIFE score for a site is calculated as the sum of the individual scores divided by the number of scoring species/families. LIFE scores increase with current velocity, scores <6.00 generally indicating sluggish or still water conditions

and score >7.50 indicate fast flows. LIFE allows the mean flow preference of invertebrates colonising a site to be determined so that effect of habitat changes such as sediment accumulation can be monitored.

Proportion of Sediment-sensitive Invertebrates (PSI)

3.2.10 Calculations were undertaken to determine the proportion of sediment sensitive macroinvertebrates present using the Proportion of Sediment-sensitive Invertebrates (PSI) index (Ref 3.14). Using this approach, individual taxa of aquatic macroinvertebrate are assigned a Fine Sediment Sensitivity Rating (FSSR) ranging from A to D, as detailed in **Appendix B.** The PSI score for each aquatic macroinvertebrate sample was derived from individual species scores and abundances. The derived PSI score corresponds to the percentage of fine sediment-sensitive taxa present in a sample and ranges from 0 to 100, where low scores correspond to watercourses with high fine sediment cover. The PSI score provides an indication of the extent to which watercourses are influenced by fine sediments, and by inference the potential sensitivity of the associated aquatic macroinvertebrate community to changes in silt load and deposition.

Whalley, Hawkes, Paisley & Trigg (WHPT)

3.2.11 The aquatic macroinvertebrate data were analysed to generate the Whalley, Hawkes, Paisley & Trigg (WHPT) score Average Score Per Taxon (ASPT), and Number of scoring taxa (NTAXA) values, which provide an indication of the ecological quality in the watercourse (Ref 3.15). These assign numerical value to taxa according to their sensitivity to organic pollution. The average of the values for each taxon in a sample, known as ASPT is a stable and reliable index of organic pollution. These assessments can indicate to what extent an aquatic macroinvertebrate community is exposed to organic pollution (further information is provided in **Appendix C** . It is important to note that these indices can vary between geological regions and habitat types. Ditches for example are unable to support many of the high-scoring taxa associated with fast flowing habitats. The resultant metrics should be reviewed with an awareness of their potential limitations, and the site-specific context, as described in this report.

3.2.12 The WHPT method has been primarily designed to respond to organic pollution, however it is suitable for monitoring other types of impact and is used for assessing the WFD classification parameter “General degradation” (Ref 3.15).

River Invertebrate Classification Tool (RICT)

3.2.13 The resultant WHPT-ASPT and NTAXA values and environmental data collected were processed through the River Invertebrate Classification Tool version 3 (RICT) web application, available on the Freshwater Biological Association website (Ref 3.10).

3.2.14 RICT predicts the WHPT-ASPT and NTAXA scores for the surveyed locations based on the site location, altitude, alkalinity, slope, discharge category, distance from source, channel dimensions and substrate composition. The predicted scores are then compared to actual scores and the output is an Ecological Quality Ratio (EQR). The EQR can be translated into a WFD classification (High, Good, Moderate, Poor, or Bad). Alkalinity data should be obtained from monthly analysis of samples from each over a period of at least one year, whereas here, alkalinity was based on the average of two samples collected during the survey visits, which is typical for an assessment of this type.

3.2.15 Analysis using RICT is only suitable for freshwater (not estuarine or marine) sites on rivers or streams that are naturally permanently flowing. RICT analysis was not undertaken for those sites identified as ditches due the nature (i.e., not naturally permanently flowing condition) of the field drain habitats comprising the survey reaches.

3.3 Aquatic Macrophyte Surveys

3.3.1 Aquatic macrophyte (plant) surveys were undertaken at seven locations by a suitably qualified aquatic ecologist in the optimal survey season (1st of June to 30th of September) - 18th and 19th September. Survey locations are detailed in **Table 3-2**. The surveys were not undertaken during or immediately after periods of high flow.

Table 3-2 - Aquatic macrophyte survey locations and dates

Surface water reference	Watercourse name	National grid reference			Distance from works site
		Upstream	Midstream	Downstream	
WCX74	Nant yr Efail 1	SH 63554 38123	SH 63521 38111	SH 63482 38136	Within
WCX52	Nant yr Efail 2	SH 62634 37905	SH 62585 37885	SH 62566 37920	Within
WCX44	Afon Dwyfor	SH 49249 41324	SH 49248 41274	SH 49244 41228	Within

Crossing at Afon Dwyfach	Afon Dwyfach	SH 48125 43810	SH 48139 43776	SH 48136 43745	Within
Crossing at Afon Crychddwr	Afon Crychddwr	SH 47228 51278	SH 47183 51285	SH 47144 51296	0.01 km east
Crossing at Afon Llyfni	Unnamed trib. of Afon Llyfni	SH 47698 52449	SH 47706 52412	SH 47675 52379	Within
Crossing at Afon Llifon	Afon Llifon	SH 49205 55826	SH 49167 55808	SH 49136 55794	0.19 km west

3.3.2 The aquatic macrophyte surveys followed guidance set out in the UKTAG River Assessment Method (Macrophytes and Phytobenthos) for use with LEAFPACS2 (Ref 3.16), which conforms to BS EN 14184:2014 Water quality - Guidance for the surveying of aquatic macrophytes in running waters (Ref 3.17). The survey was carried out by walking in the channel of each watercourse along a 100 m transect, where safely accessible. Any inaccessible areas were bypassed before re-entering the channel at the next available access point. A list of all macrophytes encountered was collated and their relative abundance was recorded using Taxon Cover Values, detailed below (**Table 3-3**).

Table 3-3 - Taxon cover value and corresponding percentage macrophyte cover

TCV	Percentage cover by macrophyte taxon
B	Bank only
C1	<0.1%
C2	0.1 to 1%
C3	1 to 2.5%
C4	2.5 to 5%
C5	5 to 10%
C6	10 to 25%
C7	25 to 50%
C8	50 to 75%
C9	>75%

3.3.3 Aquatic macrophyte data were processed through the River LEAFPACS2 calculator. Four metrics were calculated using macrophyte species and groups data:

- River macrophyte nutrient index (RMNI) – Macrophyte taxa are allocated a score based on their relative tolerance of nutrients. The overall observed RMNI score for a survey is the cover weighted average of the individual scores of the different taxa found.
- Number of macrophyte taxa (NTAXA) – The number of scoring taxa recorded in the field survey. Only true hydrophytes are included.
- Number of macrophyte taxa (NTAXA) – The number of scoring taxa recorded in the field survey. Only true hydrophytes are included.
- Cover of filamentous green algae (ALG) – The percentage cover of filamentous green algae over the whole of the surveyed section.

3.3.4 LEAFPACS2 predicts the RMNI, NTAXA and NFG scores for the surveyed reach based on altitude, alkalinity, and slope. The predicted scores are then compared to reference scores and the output is an Ecological Quality Ratio (EQR). The EQR can be translated into a Water Framework Directive (WFD) classification (High, Good, Moderate, Poor, or Bad) as shown in Appendix E.

3.3.5 River LEAFPACS2 analysis was designed to reflect the impact of nutrient enrichment on macrophyte communities, with High status indicating there is no impact and Bad status indicating there is a severe impact. The method may also be sensitive to alterations in river flow and/or modifications to morphological conditions which may impact macrophyte communities (Ref 3.16).

3.3.6 Aquatic macrophyte species were cross referenced against the JNCC Taxon Designations list (Ref 3.11) and the Nature Recovery Action Plan Wales Section 7 Priority species list to identify if any protected and/or notable species were recorded during the surveys.

3.4 Fish Surveys

3.4.1 Initial fish habitat assessments were completed on water bodies to identify their suitability for conventional fish surveys. This involved aquatic ecologists walking stretches at the crossing points, to assess habitat suitability following the methodology outlined in Hendry Cragg-Hine (1997) salmonid habitat classification criteria (Ref 3.18). Although this method primarily looks to identify salmonid habitat, it can also apply to wider species as it categorises aquatic habit more widely. The aim of these surveys was to identify a site's suitability to complete conventional fish surveys. Details of water bodies assessed are outlined in **Table 3-4** below.

Table 3-4 - Fish habitat assessment locations

Surface water reference	Watercourse name	National grid reference	Scoped in/Scoped out	Rationale
WCX74	Nant yr Efail 1	SH 63498 38111	Scoped out	Water depth less than 5 cm and wetted width 40 cm
WCX52	Nant yr Efail 2	SH 62585 37885	Scoped in	Suitable habitat for fish
WCX44	Afon Dwyfor	SH 49248 41274	Scoped in	Suitable habitat for fish
Crossing at Afon Crychddwr	Afon Crychddwr	SH 47183 51285	Scoped in	Suitable habitat for fish
Crossing at Afon Llyfni	Unnamed Trib of Afon Llyfni	SH 47706 52412	Scoped out	Channel dominated by vegetation with no open water areas.
Crossing at Afon Llifon	Afon Llifon	SH 49492 55898	Scoped in	Suitable habitat for fish

3.4.2 The locations and dates of fish surveys of scoped-in sites are shown in **Table 3-5.**

Table 3-5 - Fish survey locations and dates

Surface water reference	Watercourse name	National grid reference	Survey date	Distance from works site
Crossing at Afon Crychddwr	Afon Crychddwr	SH 47183 51285	18/09/2024	Within
Crossing at Afon Llifon	Afon Llifon	SH 49492 55898	19/09/2024	Within
WCX52	Nant yr Efail 2	SH 62585 37885	19/09/2024	Within

Surface water reference	Watercourse name	National grid reference	Survey date	Distance from works site
WCX44	Afon Dwyfor	SH 49248 41274	18/09/2024	Within

3.4.3 Electric Fishing surveys were undertaken at the four sites on the 18th and 19th September 2024.

3.4.4 A team of suitably experienced fisheries scientists followed a semi-quantitative methodological approach due to site difficulty in installing stop nets. Electric fishing surveys were completed utilising a bankside electric fishing kit in a one anode configuration. Sampling procedure followed best practice (British Standard, 2003 (Ref 3.19) and 2006 (Ref 3.20); Guidelines for Electric Fishing Best Practice (Ref 3.21) and Environment Agency guidelines (Ref 3.22).

3.4.5 During electric fishing, immobilised fish were captured in hand nets by people positioned either side of the anode and then transferred to water-filled containers. Following the completion of the survey, all caught fish were transferred into, water-filled, aerated holding tanks prior to data collection. If any European eels (*Anguilla anguilla*) were captured, they were kept in separate run specific holding tanks to all other fish species as they secrete mucus which can infest the gills of other fish. Dissolved oxygen levels within the holding tanks were monitored and maintained at optimum levels by continuous infusion using an oxygenation unit.

3.4.6 Following survey completion, all fish were identified to species level and measured to fork length (mm). After a sufficient recovery period in aerated holding tanks, the fish were returned to the survey site unharmed.

3.5 Limitations

Desk Study

3.5.1 The desk study is not exhaustive and relies on records being submitted and available within the Study Area.

Field Surveys

3.5.2 Access to some water bodies was limited due to steep-sided banks and consequently assessments were predominantly undertaken from the banktops. Macroinvertebrate samples were conducted using sweep sampling methodology in the autumn at sites 3AA, 3D, 3N, 3Q, 3V.

3.5.3 Site accessibility for aquatic macroinvertebrate sampling locations differed between seasons for spring and autumn, leading to different survey locations for the same sample site between seasons. Although locations varied between seasons, both surveyed points were on the same watercourse, less than 500 m apart and within similar habitats as such the surveys were considered to be representative. Subsequently, the impact of sampling

different site locations for macroinvertebrate sampling is considered negligible. During autumn, access limited the macroinvertebrate surveys at 1D, 1A, 3O, 3S, 3T, 3U, 3Z, 2E, 3I, 3L and due to landowner permissions, cattle and wet ground.

3.5.4 During electric fishing surveys, stop nets could not be installed due to several site limitations primarily health and safety concerns in relation to bank steepness and the presence of dense common gorse (*Ulex europaeus*) on the riverbanks. In this instance, the team identified suitable natural barriers, such as riffles, to act as the upstream survey extent, with operators fishing up to the natural barriers. Where sites deviated, these were still representative of the original site and this is not believed to represent a limitation to the data.

3.5.5 Ecosystems are dynamic and constantly changing, and species may move, or new species may be recorded in subsequent years. For this reason and in accordance with current guidance, the field survey data detailed in this report are valid for two years from the date of the survey (Ref 3.23). After this date, updated surveys may be required, and advice should be sought from an appropriately qualified ecologist to determine the survey scope and methods.

3.5.6 Some watercourses within the works site had limited visibility and access due to steep banks and dense vegetation. While this limited the ability to survey, it is believed that the watercourses were adequately accessed for the results of these surveys to be valid and sufficient to inform the ES.

4. Results

4.1 Desk Study

Statutory and Non-Statutory Designated Sites

4.1.1 The statutory designated sites for nature conservation within 10 km of the works site are presented in **Table 4-1**.

Table 4-1 - Statutory designated sites located up to 10 km of the Proposed Works Site that contain aquatic features

Statutory designation	Site name	Description	Approximate distance from the works site
SAC	Afon Gwyrfai A Llyn Cwellyn	Annex I habitats that are a primary reason for selection of this site: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*; and Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. Annex II species that are a primary reason for selection of this site: Atlantic salmon (*Salmo salar*); and Floating water-plantain (*Luronium natans*). Annex II species present as a qualifying feature, but not a primary reason for site selection: Otter (*Lutra lutra*).	Within
SSSI	Afon Gwyrfai A Llyn Cwellyn	Llyn Cwellyn supports Arctic charr (*Salvelinus alpinus*), brown trout (*Salmo trutta*), salmon (*Salmo salar*), and European eel (*Anguilla anguilla*). The lake also supports a range of macrophyte species including nationally scare species awlwort (*Subularia aquatica*), six-stamened waterwort (*Elatine hexandra*) and spring quillwort (*Isoetes echinospora*). One of the best sites for floating water-plantain (*Luronium natans*) in the UK. The late also supports a diverse community of zooplankton and notable species of macroinvertebrates.	Within
SSSI	Cors Gyfelog	Selected for its northern mesotrophic mire, other wetland (swamp) habitat and mature willow carr.	0.12 km south-west

Statutory designation	Site name	Description	Approximate distance from the works site
SSSI	Tiroedd A Glannau Rhwng Cricieth Ac Afon Glaslyn	Wetland notable for its reedswamp, grazing marsh and fen meadow supporting a range of aquatic and fen flora from fen to open water habitats.	0.86 km south
SSSI	Afon Ddu	The Afon Ddu is of special interest for its population of the freshwater pearl mussel (*Margaritifera margaritifera*) which is one of the few remaining breeding populations of this species in Wales. The freshwater pearl mussel is dependent on the local salmonid populations' sea trout spawn in the river and native brown trout are abundant. There are areas of botanically interesting mire and wet heath adjacent to parts of the river and around Llyn Du which are also important in providing a protective buffer to the river channel and the mussels therein.	1.71 km north
SSSI	Llyn Padarn	Supports a population of Arctic charr, one of three remaining natural populations. The lake also supports notable aquatic plants including floating water-plantain (*Luronium natans*) and small quillwort (*Isoetes echinospora*).	1.39 km south-east
SAC, SSSI	Migneint-Arenig-Dduallt	Annex I habitats that are a primary reason for selection of this site: Blanket bogs (* if active bog) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* Natural dystrophic lakes and ponds	1.69 km east

Statutory designation	Site name	Description	Approximate distance from the works site
SAC	Eryri/Snowdonia	Annex I habitats that are a primary reason for selection of this site: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Northern Atlantic wet heaths with *Erica tetralix* Blanket bogs Petrifying springs with tufa formation (Cratoneurion) Alkaline fens Annex II species that are a primary reason for selection of this site: Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus* Floating water-plantain *Luronium natans*	2.23 km east
NNR, SAC, SSSI	Rhinog	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea, Blanket bogs (* if active bog). Annex II species present as a qualifying feature, but not a primary reason for site selection: Floating water-plantain *Luronium natans*	3.33 km south
SSSI	Rhosgyll Fawr	Lowland acidic mire	3.23 km south-west

Statutory designation	Site name	Description	Approximate distance from the works site
SSSI	Glaslyn	This site supports a diverse range of macrophytes including uncommon and nationally rare species across river, floodplain grassland and brackish water habitats. The SSSI also supports a population of Vertigo lilljeborgi which is scares in the UK.	2.44 km north-west
SAC, SSSI	Afon Eden - Cors Goch Trawsfynydd	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Active raised bogs Annex II species that are a primary reason for selection of this site: Freshwater pearl mussel, Floating water-plantain *Luronium natans* Annex II species present as a qualifying feature, but not a primary reason for site selection: Atlantic Salmon, *Salmo salar*	3.64 km south
SAC	Corsydd Eifionydd/ Eifionydd Fens	Annex I habitats that are a primary reason for selection of this site: Transition mires, Quaking bogs, Annex II species that are a primary reason for selection of this site: Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*	0.12 km south-west

4.1.2 A total of 41 non-statutory designated sites were identified within the Study Area **Table 4-2.**

Table 4-2 - Non-statutory designated sites located within 2 km from the Proposed Works Site that contain aquatic features

Designation	Site name	Description	Approximate distance from the works site
cLWS	Ystumcegid-isaf	Marshy grassland; wet heath/acid grassland mosaic; broadleaved woodland; acid flush	Within
cLWS	Ffynnon Beuno	Acid grassland; acid/neutral flush; marshy grassland; broadleaved woodland	Within
cLWS	Afon Dwyfach	Marshy grassland; acid flush	Within
cLWS	Coed Bryn-twr/Wern	Broadleaved woodland; acid grassland; standing water;	Within
cLWS	West bank of Afon Dwyfor	Broadleaved woodland; marshy grassland; acid flush	Within
cLWS	Afon Rhythallt	Running water	Within
cLWS	Gwinllan Llystan	Dry heath/acid grassland mosaic; acid grassland; acid/neutral flush	0.08 km north-east
cLWS	Ystumcegid	Marshy grassland; basin mire; acid flush; acid grassland; broadleaved woodland	0.40 km north-east
LWS	Llyn Pant Afon	Standing water	0.28 km north-west
LWS	Nr.Talysarn	Marshy grassland; acid/neutral flush; quarry/spoil	0.24 km south-east
cLWS	Afon Dwyfor	Marshy grassland; acid flush	Within

Designation	Site name	Description	Approximate distance from the works site
cLWS	Ymwlch 1	Marshy grassland; fen; coniferous woodland; acid/neutral flush	0.32 km north
LWS	Afon Llyfni (South 1)	Running water	0.40 km west
LWS	Afon Llyfni (North 1)	Broadleaved woodland; coniferous woodland; acid/neutral flush	0.77 km north-west
cLWS	Ceunant	Acid grassland; acid/neutral flush	0.31 km south
LWS	Afon Llyfni (East)	Running water	0.43 km west
cLWS	Nasaret (East)	Semi-improved neutral grassland; marshy grassland; acid/neutral flush	0.47 km east
cLWS	Cerddymynydd	Marshy grassland; acid flush; broadleaved woodland	0.46 km north-west
cLWS	Cefnen	Acid/neutral flush	0.61 km west
cLWS	Cae-newydd	Marshy grassland; acid/neutral flush	0.32 km north-west
cLWS	Glanrafon	Bracken; acid/neutral flush	0.81 km east
LWS	Cefn Du	Acid grassland; dry dwarf shrub heath; dry heath/acid grassland mosaic; acid/neutral flush	0.87 km east
LWS	South of Llenar Fawr	Basin mire	0.90 km west
cLWS	Cerrigdruidion	Marshy grassland; acid grassland; acid/neutral flush	0.98 km south-east
cLWS	Coed Trefan (North)	Broadleaved woodland; standing water	1.13 km south-west
cLWS	Bron-y-gaer	Semi-improved neutral grassland; marshy grassland; acid/neutral flush	1.24 km north-west

Designation	Site name	Description	Approximate distance from the works site
cLWS	Upper Clynnog	Running water	1.33 km west
LWS	Rhos Broneifion	Acid grassland; acid/neutral flush	1.39 km south
cLWS	Afon Dwyfach at Bettws Bach	Marshy grassland; broadleaved woodland; standing water	1.49 km south-west
LWS	Garregwen	Rush pasture	1.45 km west
cLWS	Afon Sejont (upper)	Running water	1.47 km north-west
cLWS	Afon Seiont & Glan Gwna	Running water	1.90 km north-west
LWS	Pen-y-bryn quarries	Acid grassland; dry dwarf shrub heath; dry heath/acid grassland mosaic; acid/neutral flush	1.57 km east
cLWS	Dyffryn Nantlle	Neutral grassland; broadleaved woodland; running water	1.55 km south-east
cLWS	Broneifion Farm ponds and woods		1.64 km south-west
cLWS	Afon Llyfni (South 2)	Running water	2 km north-west
cLWS	Afon Llyfni (North 2)	Marshy grassland; acid/neutral flush; broadleaved woodland	1.68 km north-west
cLWS	Bryn Engan	Bryn Engan	2.30km south-west
cLWS	Afon Seiont (Middle)	Running water	1.95 km north-west
cLWS	Rhos Mynachdy Gwyn	Acid grassland; acid/neutral flush	2.63 km west

Designation	Site name	Description	Approximate distance from the works site
cLWS	Afon Seiont (Lower)	Running water	2.11 km north-west

Water Framework Directive Status

There are 15 Water Framework Directive (WFD) water bodies in the Study Area (shown in Table **4**-**3** and

4.1.3 Table **4-4**) that have the potential to be impacted either directly or indirectly by the proposed works.

Table 4-3 - Water Framework Directive (WFD) rivers located within 2 km of the Works Site

Water body ID	Water body name	Hydromorphological designation	Overall ecological status / potential	Biological quality elements				Approximate distance from the works site
				Fish	Macroinvertebrates	Macrophytes	Diatoms	
GB110065054190	Gwyrfai - downstream of Cwellyn	Heavily Modified	Good	High (2019)	Good (2018)		Good (2018)	Within
GB110065053520	Glyn (Dwyryd)	Natural	Good	High (2016)	High (2018)			Within
GB110065053660	Dwyfawr - lower	Natural	Good	Good (2019)	High (2015)		Good (2015)	Within
GB110065053730	Dwyfach	Natural	Good	High (2019)	High (2018)	High (2018)	Good (2018)	Within
GB110065053800	Porthmadog Cut	Heavily Modified	Moderate		Moderate (2018)			0.34 km east
GB110065053970	Llyfni	Heavily Modified	Good	High (2019)	Good (2015)		Good (2015)	Within
GB110065053990	Carrog	Natural	Good					1.84 km west
GB110065054040	Seiont	Natural	Moderate	Good (2019)	High (2015)		Moderate*	Within
GB110065053751	Prysor - downstream	Heavily Modified	Moderate	Good (2019)	High (2015)		Good (2015)	Within

Water body ID	Water body name	Hydromorphological designation	Overall ecological status / potential	Biological quality elements				Approximate distance from the works site
				Fish	Macroinvertebrates	Macrophytes	Diatoms	
	Llyn Trawsfynydd							
GB110065053690	Cwmystradllyn	Heavily Modified	Moderate	High (2019)	High (2015)		Good (2015)	1.53 km north-east
GB110065053752	Prysor - upstream Llyn Trawsfynydd	Natural	Poor	Good (2019)	Poor (2015)		Good (2015)	0.74 km south-west
GB110065054020	Caledffrwd	Natural	Good	High (2019)	High (2015)		Good (2015)	0.78 km east

*The years when the Cycle 3 classifications were completed are not available on DataMapWales website

Table 4-4 - Water Framework Directive (WFD) lakes located within 2 km of the Works Site

Water body ID	Water body name	Hydromorphological designation	Overall ecological status/potential	Biological quality elements					Approximate distance from the works site
				CPET	Littoral Macroinvertebrates	Macrophytes	Diatoms	Phytoplankton	
GB31034866	Llyn Tecwyn Uchaf	Heavily Modified	Good					High (2018)	Within
GB31033730	Llyn Padarn	Heavily Modified	Moderate	Good*	High*	Good*	Good*	High*	1.47 km south-east
GB31034870	Llyn Trawsfynydd	Heavily Modified	Moderate		High*			Moderate*	0.70 km south-west

*The years when the Cycle 3 classifications were completed are not available on DataMapWales website

Habitats of Principal Importance

4.1.4 Rivers are HoPI listed under Section 7 of the Environment (Wales) Act (2016). Afon Tafarn-helyg, Afon Prysor, Afon ElynNant, yr Efail, Afon Bontfaen, Afon Cedran, Afon Rhyhalltt, Afon Cegin, Afon Dwyfor, Nant yr Afon-oer, Afon Dwyfach, Afon Llyfni, Afon Gwyrfai and Afon Llyfon and tributaries are present in and adjacent to the Wider Works.

4.2 Notable Species

Aquatic Macroinvertebrates

4.2.1 A total of 16 notable aquatic macroinvertebrate species have been identified within 2 km of the works area (**Table 4-5**).

Table 4-5 - Notable aquatic macroinvertebrate species identified within the Study Area

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
Freshwater pearl mussel (*Margaritifera margaritifera*)	Environment (Wales) Act 2016 Section 7 Appendix III of Bern Convention 1979 Wildlife and Countryside Act 1981 Schedule 5, Annex V and II of the Habitats Directive, Global Red list post 2001-Critically endangered Nationally rare, Section 41 NERC Act 2006 (Ref 2.15) Environment (Wales) Act Schedule 7 UK Biodiversity Framework2024 (Ref 2.16)	3	2021	1.86 km north	Cofnod (Ref 3.2)
Cheilotrichia imbuta	Nationally notable	1	2015	0.98 km west	Cofnod (Ref 3.2)

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
Verbeke's spotwing snailkiller (*Chloriona dorsata*)	Nationally notable B	3	2017	0.98 km west	Cofnod (Ref 3.2)
Black-legged water-snipefly (*Ibisia marginata*)	Nationally scarce	6	2018	2.10 km north	Cofnod (Ref 3.2)
		27	2021	1.0 m north	NRW
Phylidorea abdominalis	Nationally notable	3	2017	0.98 km west	Cofnod (Ref 3.2)
P. longicornis	Nationally notable	3	2017	0.46 km east	Cofnod (Ref 3.2)
Comb-legged sedgesitter (*Platycheirus immarginatus*)	Nationally scarce	2	2017	0.43 km north	Cofnod (Ref 3.2)
Tinodes assimilis	Nationally scarce	1	2014	1.53 km east	Cofnod (Ref 3.2)
Pilaria meridiana	Nationally notable	4	2017	0.98 km west	Cofnod (Ref 3.2)
Tipula yerburyi	Nationally Notable	2	2014	1.09 km east	Cofnod (Ref 3.2)
Limnephilus fuscicornis	Nationally scarce	1	2016	1.85 km east	Cofnod (Ref 3.2)
		2	2016	0.01 km north	NRW
Scarce blue-tailed damselfly (*Ischura pumilo*)	British Odonata Red List 2008 – Near Threatened (Ref 4.1) Gwynedd Biodiversity Action Plan	1	2019	1.09 km west	Cofnod (Ref 3.2)
Antocha vitripennis	Nationally rare	4	2021	1.1 km north	NRW
Aquarius najas	Nationally scarce	1	2018	1.1 km north	NRW

Aquatic Macrophytes

4.2.2 Two notable aquatic macrophyte species have been identified within 2 km of the works area (**Table 4-6** -).

Table 4-6 - Notable macrophytes species identified in the Study Area

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
Pale scalewort (*Radula voluta*)	Global Red List post 2001 – Near Threatened, Environment (Wales) Act (2016) Section 7	6	2020	0.12 km north	Cofnod (Ref 3.2)
Corn mint (*Mentha arvensis*)	England Red List post 2001 - Near Threatened, Wales IUCN Status Vulnerable	1	2018	1.54 km south-east	Cofnod (Ref 3.2)

Fish

Five notable fish species have been identified within 2 km of the works area. Details of records of these species as well as their legislation is provided in

4.2.3 Table **4-7**.

4.2.4 *Lampetra sp.* covers both brook and river lamprey, which have different legislative protections. The larvae of these species (which are found in freshwater) are virtually indistinguishable except when nearing metamorphosis. Following the precautionary principle, it has been assumed that both species are present.

Table 4-7 - notable fish species identified in the Study Area

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
European eel (*Anguilla anguilla*)	Global Red List Post 2001 – Critically Endangered Appendix II of the Bonn Convention Section 42 species, NERC Act 2006 (Ref 2.15) Section 7 (Species of Principal Importance), Environment (Wales) Act 2016, Eels (England and Wales) Regulations Salmon and Freshwater Fishes Act (SAFFA) OSPAR European Union and Trade in Wild Fauna and Flora-AB EC CITES Appendix II	1	2014	0.42 km north-west	Cofnod (Ref 3.2)
		9	2024	1.19 km east	NBN (Ref 3.3)
		19	2024	0.22 km north	NRW
Brown/sea trout (*Salmo trutta*)	Section 7 (Species of Principal Importance), Environment (Wales) Act 2016, Section 42 species, NERC Act 2006 (Ref 2.15)	24	2024	0.04 km west	NBN (Ref 3.3)
		23	2024	0.04 km north	NRW
Atlantic salmon		13	2024	0.22 km west	NBN (Ref 3.3)

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
(*Salmo salar*)	Appendix III of the Bern Convention Annex II and V of the Habitats Directive OSPAR Section 7 (Species of Principal Importance), Environment (Wales) Act 2016, Schedule 4 species, The Conservation of Habitats and Species Regulations 2010 Section 42 species, NERC Act 2006 (Ref 2.15)	16	2024	0.23 km west	NRW
Lamprey sp. (*Lampetra sp.)*	Brook lamprey (*L. planeri*): Annex II of the Habitats Directive Appendix III of the Bern Convention River lamprey (*L. fluviatilis*): Annex II and V of the Habitats Directive Appendix III of the Bern Convention Section 7 (Species of Principal Importance), Environment (Wales) Act 2016, Section 42 species, NERC Act 2006 (Ref 2.15) Schedule 4 species, The Conservation of Habitats and Species Regulations 2010	4	2022	0.22 km west	NRW

INNS and Non-Native Species

4.2.5 Historic records of four INNS and three non-native aquatic species were found within 2 km of the works area (**Table 4-8**).

Table 4-8 - INNS and non-native species recorded within the Study Area

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
Japanese knotweed (*Reynoutria japonica*)	Wildlife and Countryside Act 1981 Schedule 9	374	2024	Within	Cofnod (Ref 3.2)
		28	2024	0.07 km east	NBN (Ref 3.3)
Himalayan balsam (*Impatiens glandulifera*)	Wildlife and Countryside Act 1981 Schedule 9, Invasive Alien Species (Enforcement and Permitting) Order 2019 Schedule 2	234	2024	Within	Cofnod (Ref 3.2)
		7	2024	0.27 km south	NBN (Ref 3.3)
		3	2024	0.02 km south	NRW
New Zealand mud snail (*Potamopyrgus antipodarum*)	Non-native	3	2018	1.04 km north	NBN (Ref 3.3)
		22	2021	0.01 km north	NRW
Crangonyx pseudogracilis/floridanus	Non-native	24	2018	0.52 km south-east	Cofnod (Ref 3.2)
		13	2021	Within	NRW
Monbretia (Crocosmia pottsii x aurea = C. x crocosmiiflora)	Wildlife and Countryside Act 1981 Schedule 9	60	2023	0.22 km north	Cofnod (Ref 3.2)
New Zealand pigmyweed (*Crassula helmsii*)	Wildlife and Countryside Act 1981 Schedule 9	18	2024	0.72 km east	Cofnod (Ref 3.2)

Common name	Conservation designation (S)	Number of records	Most recent record	Location of the closest record	Data source
American shunk-cabbage (*Lysichiton americanus*)	Non-native	10	2022	0.19 south	Cofnod (Ref 3.2)

4.3 Macroinvertebrate Surveys

4.3.1 The full aquatic macroinvertebrate taxa list is in **Appendix D**. A description of the macroinvertebrate community at each site is provided below. Cross-referenced with the JNCC Taxon Designations list revealed the presence of the notable species: *Menetus dilatatus*, *Metalype fragilis*, and *Paraleptophlebia werneri.* The non-native New Zealand mud snail *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis/floridanus* were recorded at several sites across the Study Area.

Site 1B

4.3.2 This survey was taken from the Afon Tafarn-helyg, just outside of Llyn Trawsfynydd Power Station. The channel (average width:0.8 m; average depth: 0.2 m) was heavily shaded by overhanging trees and was culverted in some sections. The riverbed was dominated by bedrock (60%), with cobble (20%) and boulder (20%) also present, with variable flow patterns including runs and riffles. Woody debris and tree roots were present during the walkovers covering 15% and 40% of the channel respectively, no macrophytes, moss nor algae were identified.

4.3.3 The autumn macroinvertebrate community of Site 1B was largely accounted for by stoneflies (29%), caddisflies (25%) and snails (16%). The sample was dominated by the stonefly *Protonemura meyeri* (27%) and most caddisflies were observed to be *Hydropsyche siltalai*. All snails within the community were identified as the non-native, non-invasive, New Zealand mud snail, *Potamopyrgus antipodarum* (16%).

Site 1D

4.3.4 This survey was taken from a tributary of the Afon Prysor. The surveyed reach (average width: 1.5 m; average depth: 0.25 m) was unshaded and characterised entirely by a run flow pattern. The riverbed was dominated by pebble (40%) and gravel (30%), with silt (20%) and cobble (10%) also present. No woody debris, tree roots, moss nor algae were present during walkover survey, however macrophytes were observed to cover 30% of the channel.

4.3.5 In spring surveys, mayflies were found to be the largest group within the channel's spring community (31%), with true flies (19%) and crustaceans

(15%) the next dominant groups. Notably, among the recorded mayflies, 13 counts of the Iron Blue Mayfly *Baetis niger* (3%) were recorded, a Biodiversity Action Plan UK List priority species and Environment (Wales) Act 2016 Section 7 priority species.

Site 1E

4.3.6 This survey reach was on the Afon Prysor, south-west of Llyn Trawsfynydd. The river (average width: 7.5 m, average depth: 0.20 m) was moderately shaded by trees. The riverbed was dominated by bedrock (75%), with gravel (5%), pebble (5%) and boulder (15%) also present, and only displayed a run flow pattern. No woody debris, tree roots, macrophytes, moss nor algae were present during walkover survey; however moss was observed covering 40% of the channel.

4.3.7 The spring surveys of Site 1E indicated mayflies were the most abundant group (31%), followed by caddisflies (27%) and true flies (26%). Of the mayflies, all were identified as *Centroptilum luteolum*, except one count of *Siphlonurus lacustris*. Additionally, one count of the non-native, non-invasive, *Crangonyx pseudogracilis/floridanus* was identified within the sample.

4.3.8 In autumn, the macroinvertebrate community of Site 1E was dominated by snails (43%), with the next dominant groups being mayflies (18%) and caddisflies (15%). Most snails were identified as the non-native, non-invasive, New Zealand mud snail and one specimen of the non-native, non-invasive, trumpet ramshorn, *Menetus dilatatus*, was also observed. Of the mayflies, the largest abundance belonged to *Ecdyonurus* species.

Site 1F

4.3.9 This survey was conducted on a tributary of the Afon Prysor, south-west of Llyn Trawsfynydd. The small channel (average width: 1 m, average depth: 0.20 m) was lightly shaded by overhanging trees. The substrate was entirely dominated by gravel (100%) and exhibited variable flow patterns including runs and glides. No tree roots, macrophytes, moss nor algae were present during walkover survey, however woody debris covered 40% of the channel.

4.3.10 In site 1F, limpets and mussels (53%) were the dominant group in autumn, followed by true flies which constituted 23% of all specimens. All limpets and mussels observed belonged to the Sphaeriidae family. Of the true flies, most belonged to the Chironomidae family, with most identified as Tanytarsini subfamily specimen. A minor abundance of stoneflies (10%) was also observed, including counts of *Leuctra nigra, Nemurella Nemoura,* and other *Leuctra* species.

Site 1G

4.3.11 This survey was conducted on a tributary of the Afon Prysor, south-west of Llyn Trawsfynydd. The channel (average width: 0.4 m, average depth: 0.1 m) was heavily shaded by overhanging trees. The substrate was dominated by gravel (98%), with pebble (2%) also present, and entirely characterised by a run flow pattern. No macrophytes, moss nor algae were

present during walkover survey, however, woody debris covered 40% of the channel whilst tree roots accounted for 5% of the channel.

4.3.12 In autumn the macroinvertebrate community of Site 1G was dominated by caddisflies (53%), with the next dominant stoneflies (16%), and mayflies (11%). Most caddisflies consisted of *Diplectrona felix* or *Wormaldia occipitalis*, though numerous other caddisfly taxa were observed, and most stoneflies comprised of *Leuctra nigra*, *Leuctra* species or *Isoperla grammatica*.

Site 1H

4.3.13 This survey was taken from the Afon Elyn, near Llyn Tecwyn Uchaf. The channel (average width: 1.2 m, average depth: 0.30 m) was unshaded, and some proportions of the watercourse was culverted. The substrate was dominated by a mixture of silt (40%) and gravel (30%), with pebble (10%) and boulder (20%) also present, with variable flow patterns including runs and glide. No woody debris, tree roots, macrophytes, moss nor algae were present during walkover survey however, macrophytes covered 50% of the channel.

4.3.14 Spring surveys identified true flies as the most abundant taxa within 1H's macroinvertebrate community (40%), followed by beetles (21%), caddisflies (13%), damselflies (9%) and true bugs (9%). Of the true flies, 81% were composed by the Orthocladiinae subfamily of Chironomidae.

4.3.15 The autumn surveys identified stoneflies (39%), true flies (25%) and caddisflies (12%) as the most abundant macroinvertebrate species in this location. Most notably, one count of the Nationally Scarce, mayfly, *Paraleptophlebia werneri* was identified, and is designated with a RDB3: Rare Conservation Score.

Site 1I and Site 1I-A

4.3.16 Site 1I and Site 1I-A's macroinvertebrate kick-samples were combined in autumn, so both site results are discussed here.

4.3.17 1I was on the western shore of the Llyn Tecwyn Uchaf reservoir, at a depth of 0.5 m. The survey area was unshaded with a substrate dominated by cobbles (54%), with pebble (30%), sand (10%), silt (5%) and boulders (1%) also present. Woody debris was present for 1% of the surveyed area, with no tree roots, macrophytes, moss nor algae were present during the walkover survey.

4.3.18 1I-A's autumn survey was conducted on the western shore of the Llyn Tecwyn Uchaf reservoir to a depth of 0.6 m. The survey area was unshaded, with substrate dominated by pebble (40%) and bedrock (40%), with silt (20%) also present. No woody debris, tree roots, macrophytes, moss nor algae were present during the walkover survey.

4.3.19 In spring, Site 1I's macroinvertebrate community was not very diverse being entirely composed of mayflies (69%) and true flies (31%). All mayflies were

observed to be *Caenis* species, and all true flies were either Chironomini or Tanytarsini. Only these three taxa were identified in the whole sample.

4.3.20 The community here in autumn was dominated by caddisflies (82%), mostly comprising of Limnephilidae. The remaining community comprised of trueflies (8%), mayflies (6%) and worms (4%).

Site 1I-B

4.3.21 This survey was taken from a spillover reservoir adjacent to Llyn Tecwyn Uchaf reservoir. The survey area was dominated by bedrock (40%) and pebble (40%), with silt (20%) also present. No woody debris, tree roots, nor moss were present during walkover survey, both macrophytes and filamentous algae were both present however, covering 30% and 20% of the surveyed area respectively.

4.3.22 In autumn, the macroinvertebrate community of Site 1I-B was dominated by crustaceans (47%), with caddisflies (28%) and mayflies (12%) the next dominant. All crustaceans were identified as Cladocera, and all caddisflies were identified to be Limnephilidae family specimen. Moreover, *Anax imperator* were identified within the community (0.14%) which has a conservation score 5: Local, but it is of Least Concern according to the UK Red List.

Site 1J

4.3.23 This survey was conducted on the Nant yr Efail watercourse west of Llyn Tecwyn Uchaf. The channel (average width: 0.3 m; average depth: 0.05 m) was unshaded and culverted at some portions of its reach. The substrate was dominated by gravel (30%) and boulder (30%), with silt (10%), pebble (20%), and cobble (10%) also present, with variable flow patterns including glide and a waterfall. No woody debris, tree roots, macrophytes, nor algae were present during walkover survey, with moss covering 5% of the channel.

4.3.24 Spring surveys found that true fly larvae (59%) were the most abundant group in this community, predominately comprising of the Orthocladiinae sub-family. These larvae were accompanied by smaller numbers of caddisflies (28%) and stoneflies (9%), including the caddis *Diplectrona felix* and the stonefly *Amphinemura sulcicollis*.

4.3.25 Autumn surveys indicated stoneflies were the most abundant group (61%), mostly comprising of *Leuctra nigra* or *Leuctra* species. Caddisflies were the second largest group (20%), mostly consisting of Limnephilidae. Furthermore, one count of the *Hydraena testacea* beetle was identified. This was a Regionally Notable species according to its conservation score, but it is now considered too widespread to qualify as Nationally Scarce and is of Least Concern.

Site 1K

4.3.26 The 1K site was on Nant yr Efail, west of Llyn Tecwyn Uchaf. The channel (average depth: 0.75 m, average depth: 0.15 m) was lightly shaded, with the substrate dominated by cobble (60%), with gravel (10%) and pebble (30%)

also present and characterised entirely by a ran flow pattern. No tree roots, macrophytes, moss nor algae were present during walkover survey, with woody debris covering 3% of the channel.

4.3.27 The autumn macroinvertebrate community at 1K was dominated by stoneflies (65%), followed by caddisflies (29%). All stoneflies consisted of Leuctridae family members, and all caddisflies were identified as Limnephilidae taxa. True flies (6%) were the only other group identified, composed by one count of Orthocladiinae subfamily taxa.

Site 1L

4.3.28 This survey was taken from the Nant yr Efail watercourse west of Llyn Tecwyn Uchaf. The channel (average width: 0.7 m, average depth: 0.2 m) was heavily shaded by overhanging trees with bridge piers also present within the channel. The substrate was dominated by boulder (50%), with gravel (20%), pebble (10%), and cobble (20%) also present, and was characterised entirely by a run flow pattern. No woody debris, tree roots, macrophytes, nor algae were present during walkover survey, though moss was recorded covering 10% of the channel.

4.3.29 The community in autumn was dominated by stoneflies (50%), followed by caddisflies (31%) and true flies (15%). Of the stoneflies, most were accounted for by *Leuctra* species or *Protonemura meyeri* and most caddisflies were composed of by *Diplectrona felix* or *Wormaldia* species.

Site 3A

4.3.30 This survey was taken from the Afon Bontfaen near Porthmadog. The channel (average width: 1.0 m; average depth: 0.6 m) was moderately shaded by trees and bramble, with downstream proportions being culverted. The substrate was dominated by gravel (60%), with sand (10%), pebble (20%), and cobble (10%) also present, with variable flow patterns including runs and glides. No tree roots, moss nor algae were present during walkover survey with woody debris and macrophytes covering 3% and 2% of the channel respectively.

4.3.31 Autumn found a diverse macroinvertebrate community with stoneflies comprising the largest group (33%). True flies (26%), caddisflies (16%) and mayflies (12%) were also present. However, a small quantity (1%) of the non-native, non-invasive, amphipod, *Crangonyx pseudogracilis/floridanus* was also discovered at the site.

Site 3AA

4.3.32 Reach 3AA was on the Afon Rhyholt, in Pont Rhyholt village. The watercourse (average width: 15.0 m, average depth: 1.0 m) was lightly shaded by overhanging trees. The substrate was dominated by gravel (40%) and pebble (30%), with silt (5%), sand (5%), cobble (10%) and boulder (10%) also present, with variable flow patterns including riffles and glides. No woody debris, tree roots, nor moss were present during walkover survey,

with macrophytes and filamentous algae present covering 5% and 20% of the channel.

4.3.33 Autumn surveys at 3AA recorded a diverse array of insects, crustaceans and molluscs. Horny orb mussels dominated the sample (31%), and further species of freshwater mussels were also present in smaller numbers. Caddisflies were the next dominant group (24%), identifying over 20 individuals belonging to at least seven different species.

Site 3B

4.3.34 The 3B survey reach was on the Afon Cedran, north-west of Porthmadog. The channel (average width: 0.5 m; average depth: 0.2 m) was lightly shaded. The riverbed was dominated by boulder (30%), pebble (20%) and cobble (20%), with sand (10%), gravel (10%), and bedrock (10%) also present, with variable flow patterns including runs, pools and glides. No tree roots, macrophytes, moss nor algae were present during walkover survey, with woody debris covering 2% of the channel.

4.3.35 Snails (26%), true flies (22%) and caddisflies (19%) were abundant in Site 3B's autumn macroinvertebrate community. Notably, all snails were accounted for by the non-native, non-invasive, New Zealand mud snail. Three counts of the non-native, non-invasive, *Crangonyx pseudogracilis*/*floridanus* were also identified in this sample.

Site 3C

4.3.36 Reach 3C was on a tributary of the Afon Dwyfor. The channel (average width: 1.3 m; average depth: 0.4 m) was lightly shaded with overhanging grasses, for some proportions of the reach the watercourse was culverted. The substrate was dominated by gravel (60%), with sand (30%), pebble (5%), and cobble (5%) also present, and entirely characterised by a smooth, glide flow. No tree roots, macrophytes, moss nor algae were present during walkover survey, with woody debris covering 2% of the channel.

4.3.37 The community at 3C during autumn was diverse, with the largest group, true flies (37%), with worms (15%), caddisflies (13%), and snails (11%) being the next dominant. Most true flies were represented by the Tanytarsini or Orthocladiinae subfamily and all snails were identified as the non-native, non-invasive, New Zealand mud snail.

Site 3-Church

4.3.38 Reach 3 – Church was a tributary of the Nant Yr Afon-Oer, surrounded by a church/cemetery, with land-use consisting of broadleaf woodland. The channel (average width: 0.5 m; average depth: 0.2 m) with moderate shading from overhanging vegetation. The substrate was dominated by pebbles (30%), cobbles (25%) and boulders (25%), with sand (10%) and gravel (10%) also present. Within the reach, riffle and glide flow types dominated. No woody debris, tree roots, macrophytes, moss nor algae were present during the walkover survey.

4.3.39 The autumn community at reach 3-Church, was dominated by stoneflies (29%) comprising predominantly of *Protonemura meyeri* which has a conservation score of local (CCI: 5). The next dominant groups were caddisflies (27%) and mayflies (24%).

Site 3D

4.3.40 Reach 3D was on the Afon Dwyfor, in an area of broadleaf woodland and semi-improved grassland. The channel (average width: 15.0 m; average depth: 1.0 m) had a substrate dominated by bedrock (60%) and boulders (30%), with gravel (5%) and sand (5%) also present, with run, glides and eddy flow types present. No woody debris, tree roots, nor algae were present during the walkover survey with macrophyte and moss present covering 10% and 15% of the channel. Areas of the bank through this reach were poached by livestock.

4.3.41 Mayflies comprised the largest community identified at 3D in spring (48%), with most consisting of *Serratella ignita*. Caddisflies were the second largest community (11%), including such examples as *Hydropsyche siltalai* and *Lepidostoma hirtum*. A minority (4%) of taxa comprised the non-native, non-invasive New Zealand mud snail.

4.3.42 The autumn community at 3D, was dominated by worms (40%), followed by caddisflies (31%) and mayflies (18%). Most caddisflies were Limnephilidae taxa, and mayflies were mostly composed of *Baetis* species or *Caenis rivulorum*. A minor abundance of non-native, non-invasive, New Zealand mud snail and *Crangonyx pseudogracilis*/*floridanus*, were also recorded with one count of the Nationally Scarce River Skater, *Aquarius najas*, was also identified at this site.

Site 3E

4.3.43 Reach 3E was on the Afon Dwyfach in an area of tilled arable land. The channel (average width: 8.0 m; average depth: 0.4 m) was lightly shaded, with the substrate dominated by boulders (30%) and gravel (30%), with sand (20%), cobble (10%) and pebbles (10%) also present. The reach was dominated by runs, with macrophytes and moss covering 2% and 5% of the channel respectively. No woody debris, tree roots, nor algae were present during the walkover survey

4.3.44 The autumn community at 3E was dominated by caddisflies (42%), with snails forming the next dominant group (32%). Notably within this community, a small abundance of the Nationally Scarce River skater (Ref 4.2), *Aquarius najas*, was identified. However, it is of “least concern” according to UK red list guidelines and only considered “Local” according to its Conservation Score (Ref 3.12).

Site 3G

4.3.45 Reach 3G was in the Afon Dwyfach adjacent to a bridge and was surrounded by arable land. The channel (average width: 7.5 m; average depth: 0.6 m), was unshaded with the substrate comprising of pebbles

(40%), gravels (33%) and cobbles (30%) with minor presence of boulders (5%) and sand (2%). The reach was dominated by riffles and glides; however, the river was in spate at the time of sampling. No woody debris, tree roots, macrophytes, nor algae were present during the walkover survey, macrophytes were present in the channel coving 5%.

4.3.46 The autumn community of Site 3G was dominated by snails (30%), with 94% of snails constituting of the non-native, non-invasive, New Zealand mud snail and 6% by the wandering snail, *Ampullaceana balthica*.The next dominant group within the community was mayflies (21%). A small abundance of the community also included non-native, non-invasive, *Crangonyx pseudogracilis*/*floridanus* (0.47%).

Site 3H

4.3.47 Reach 3H was on Afon Dwyfach in an arable landscape. The channel (average width: 10.0 m, average depth: 0.4 m), was unshaded with the substrate dominated by sand (50%), with gravel (20%), cobbles (20%) and pebbles (10%) also present. Macrophytes covered 20% of the channel during the walkover survey, with no woody debris, tree roots, moss nor algae present.

4.3.48 The autumn community at 3H, was dominated by caddisflies (41%). Nine caddisfly taxa were identified, with the Glossosomatidae taxa being the majority taxa. The next most abundant group were mayflies (39%), mostly composed by *Baetis rhodani/atlanticus* and *Rhithrogena* species. Both non-native, non-invasive species New Zealand mud snail and *Crangonyx pseudogracilis*/*floridanus* were identified at 3H.

Site 3J-A

4.3.49 Site 3J-A was a reach of a tributary of the Afon Dwyfach, the site was encompassed by moorland, heath and semi-improved grassland. The channel (average width: 0.3 m, average depth: 0.02 m) had light shading, with areas of livestock poaching. The substrate was predominantly sand (60%) and moderately gravel (30%), with some silt (10%) also present. The flow was dominated by glides with macrophytes covering 10% of the channel. No woody debris, tree roots, moss nor algae were present during the walkover survey.

4.3.50 The autumn community at 3J-A was dominated by trueflies (27%) and caddisflies (24%). Most true flies comprised of Chironomidae subfamilies, such as Orthocladiinae, with *Diplectrona felix* was the most abundant species of caddisfly observed. Moreover, both non-native, non-invasive, New Zealand mud snail and *Crangonyx pseudogracilis/floridanus* were identified within the community.

Site 3K

4.3.51 Site 3K was on an unknown watercourse surrounded by broadleaf woodland. The channel (average width: 2.5 m, average depth: 0.2 m) was lightly shaded, with no bank modification. The substrate was mostly composed of

gravel (60%), but pebbles (20%) and cobbles (20%) were also abundant. The reach was dominated by riffles and glides categories. Tree roots, woody debris and macrophytes were not during the survey each covering 5% of the channel, with no moss nor algae were present during the walkover survey.

4.3.52 During the autumn surveys, the community at Site 3K was dominated by caddisflies (33%) and mayflies (32%). Of the mayflies, the community was dominated by *Rhithrogena semicolorata* whilst the caddisflies, were dominated by *Hydropsyche siltalai*.

Site 3M

4.3.53 Site 3M was a reach of the Afon Crychddwr surrounded by arable land, the channel (average width: 6.0 m; average depth: 0.2 m) had moderate shading from overhanging vegetation and trees across the banks. The substrate was predominantly boulder (40%) and cobbles (40%) with gravel (15%) and sand (5%) also present. The reach was not turbid and was dominated by riffles and runs. Woody debris and moss were identified during the walkovers covering 2% and 10% respectively, with no tree roots, macrophytes, nor algae were present during the walkover survey.

4.3.54 Site 3M's autumn macroinvertebrate community was characterised by an abundance of mayflies (33%), caddisflies (20%), and snails (16%), with most mayflies comprising of *Baetis rhodani*/*atlanticus* or *Ecdyonurus* species. Caddisflies were very diverse, although *Silo pallipes* were most abundant. All snails were identified as the non-native, non-invasive, New Zealand mud snail.

Site 3N

4.3.55 Site 3N was an unnamed watercourse bounded by broadleaf woodland and adjacent to a road. The channel (average width: 1.0 m; average depth: 0.3 m) was unshaded despite a presence of low plants and trees across the bank. The substrate consisted of gravel (60%), with cobbles (20%), pebbles (15%), and sand (5%) also present. The reach was dominated by run flow types and was slightly turbid. No woody debris, tree roots, nor algae were present during walkover survey, with macrophytes covering 5% of the channel and moss covering 30%.

4.3.56 The macroinvertebrate community at 3N was dominated by snails (38%), with smaller abundance of crustaceans (17%), stoneflies (10%), beetles (8%), and caddisflies (8%). Of the snails observed, almost all consisted of non-native, non-invasive, New Zealand mud snail and all crustaceans were identified as the freshwater shrimp, *Gammarus pulex*.

Site 3P

4.3.57 Site 3P was on an unnamed watercourse, in an area of broadleaf woodland. The channel (average width: 1.0 m; average depth: 0.3 m) was unshaded with the substrate dominated by silt (70%) with gravel (30%) also present. The channel was slightly turbid and dominated by glides. Macrophytes

covered 40% of the channel, with no woody debris, tree roots, moss nor algae were present during the walkover survey.

4.3.58 The autumn survey at 3P was dominated by limpets and mussels (76%), followed by a minority of crustaceans (14%) and true flies (4%). All limpets and mussels comprised of *Pisidium*/*Euglesa* group species, and the crustaceans identified were evenly split between non-native, non-invasive, *Crangonyx pseudogracilis/floridanus* and the freshwater shrimp.

Site 3Q

4.3.59 Reach 3Q was on the Afon Ilyfn, surrounded by moorland and heath. The channel (average width: 0.7 m; average depth: 1.0 m) had light shading with the substrate comprising of boulders (30%), gravel (25%), sand (25%), cobbles (10%) and pebbles (10%). The habitat was dominated by glide flow. No macrophytes, moss nor algae were present during the walkover survey, with woody debris and tree roots covering 3% and 2% of the channel respectively.

4.3.60 The autumn macroinvertebrate community of Site 3Q was dominated by snails (67%), with limpets and mussels (8%) and caddisflies (8%) being the next abundant. All snails were identified to be the non-native, non-invasive, New Zealand mud snail.

Site 3Q-A

4.3.61 Reach 3Q-A was on an unnamed watercourse running adjacent to broadleaf vegetation. The channel (average width: 0.50 m; average depth: 0.05 m) was heavily shaded by bramble, nettles, trees and ivy. The substrate was mostly gravel (80%) and partly pebbles (10%) and silt (10%), with the flow dominated by runs. No tree roots, macrophytes, moss nor algae were present during the walkover survey, with woody debris covering 20% of the channel.

4.3.62 The autumn macroinvertebrate community at 3Q-A solely comprised of trueflies (82%), caddisflies (15%) and worms (3%). Orthocladiinae subfamily members (trueflies) dominated the community (76%).

Site 3R

4.3.63 Reach 3R was on the Afon Llifon, with land-use primarily accounted for by arable land. The channel (average width: 1.8 m; average depth: 0.35 m) was lightly shaded by low plants, grass and trees, with the substrate comprising of gravel (30%), sand (25%), cobbles (20%), pebbles (20%) and boulders (5%). The reach was dominated by riffle and glide habitats. Tree roots, macrophytes and moss were identified during the walkovers covering 2%, 10% and 5% of the channel respectively, with no woody debris and algae present.

4.3.64 The autumn macroinvertebrate community of Site 3R was dominated by mayflies (29%) and mostly composed by the *Ecdyonurus* species. The next largest group were the crustaceans (26%), solely constituted by the freshwater shrimp.

Site 3R-A

4.3.65 Reach 3R-A was on a tributary of the Afon Llifon east of Groeslon. The channel (average width: 1.0 m; average depth: 0.15 m) was unshaded. Physical modifications to the channel identified during the walkover survey included sediment dredging and channel realignment. The substrate was dominated by sand (80%), with gravel (10%) and pebble (10%) also present, with variable flow patterns including runs and glides. No woody debris, tree roots, moss nor algae were present during the walkover surveys, however macrophyte covered 1% of the channel.

4.3.66 The autumn macroinvertebrate community at 3R-A was dominated by crustaceans (55%), with trueflies being the next dominant (19%). Most crustaceans were identified as the freshwater shrimp (33%), and true flies were majorly composed by the Tanypodinae subfamily of Chironomidae (15%).

Site 3V

4.3.67 Reach 3V was on the Afon Gwyrfai near Waunfawr. The watercourse (average width: 12 m) was moderately shaded be overhanging trees. The depth at this survey location was unknown due the watercourse being unsafe to enter. The riverbed was dominated by gravel (50%), with sand (30%), cobble (10%) and boulder (10%) also present, entirely characterised by a running flow pattern. No woody debris and a small amount of tree roots (5%) were present during the invertebrate surveys. No macrophytes, tree roots, moss nor algae were present during the walkover surveys.

4.3.68 Autumn surveys found that the site was dominated by the non-native snail species New Zealand mud snail (68%). The next dominant groups were limpets and mussels (10%), caddisflies (10%) and worms (5%).

Site 3X

4.3.69 Reach 3X was on a tributary of Afon Gwyrfain in the farmland south-east of Caernarfon. The channel (average width: 0.5 m; average depth: 0.05 m), was unshaded, with the substrate dominated by sand (70%), with gravel (30%) also present. The reach was dominated by run habitat, with no woody debris, tree roots, macrophytes, moss nor algae were present during the walkover surveys.

4.3.70 The autumn macroinvertebrate community at Site 3X was dominated by caddisflies (38%) and minor abundance of stoneflies (16%), true flies (12%) and beetles (11%). Most caddisflies were determined to be *Diplectrona felix* and most stoneflies were *Leuctra nigra*.

Site 3Y

4.3.71 Reach 3Y was on a tributary of Afon Gwyrfain in the farmland south-east of Caernarfon. The channel (average width: 1.2 m; average depth: 0.1 m) was heavily shaded by overhanging trees. The substrate was dominated by boulder (45%), with sand (5%), gravel (5%), pebble (10%), cobble (25%) and bedrock (10%) also present, and with variable flow patterns including runs

and glides. No macrophytes, tree roots, moss nor algae were present during the walkover surveys, however woody debris covered 10% of the channel.

4.3.72 Autumn surveys recorded that the community at this site was dominated by caddisflies (62%). Of these caddisfly larvae, Diplectrona felix dominate the community with *Psychomyia fragilis*, also present which is a Nationally Scarce species considered Notable according to its conservation score. The remainder of the community was occupied by true flies, stoneflies and freshwater shrimp.

4.4 Macroinvertebrate Index Results

4.4.1 Based on the criteria outlined in the Methodology, the CCI, WHPT Average Score Per Taxon (ASPT), and Number of Scoring taxa (NTAXA), LIFE, and PSI species values for each survey are summarised in **Table 4-9**.

Table 4-9 – Macroinvertebrate index scores

Index	Season	WHPT-NTAXA	WHPT-ASPT	CCI score - interpretation	LIFE score (species) - interpretation	PSI score (species) - interpretation
1B	Autumn	27	6.60	13.3 - Fairly High conservation value	8.33 - High sensitivity to reduced flows	81.48 - Minimally sedimented / unsedimented
1D	Spring	31	6.40	14.3 - Fairly High conservation value	7.67 - High sensitivity to reduced flows	65.31 - Slightly sedimented
1E	Spring	18	5.92	10.0 - Fairly High conservation value	7.29 - Highly sensitivity to reduced flows	50.00 - Moderately sedimented
	Autumn	20	6.75	12.6 - Fairly High conservation value	7.94 - Moderate sensitivity to reduced flows	69.70 - Slightly sedimented
1F	Autumn	11	5.57	8.0 - Moderate conservation value	6.33* - Low sensitivity to reduced flows	58.82 - Moderately sedimented
1G	Autumn	19	7.44	11.5 - Fairly High conservation value	8.44 - High sensitivity to reduced flows	86.11 - Minimally sedimented
1H	Spring	10	4.89	4.5 - Low conservation value	N/A[1]	15.38 - Heavily sedimented
	Autumn	10	7.07	40.0 - Very High conservation value	N/A	62.50 - Slightly Sedimented

[1] The LIFE Index is not applicable to standing water bodies (ponds and ditches) due to the nature of the methodology

Index	Season	WHPT-NTAXA	WHPT-ASPT	CCI score - interpretation	LIFE score (species) - interpretation	PSI score (species) - interpretation
1I-A	Spring	2	3.85	Unclassifiable	N/A	0.00 - Heavily sedimented
	Autumn	6	5.40	Unclassifiable	N/A	50.00 - Moderately Sedimented
1I-B	Autumn	15	4.93	25.0 - Very High conservation value	N/A	3.45 - Heavily sedimented
1J	Spring	13	6.52	8.7 - Moderate conservation value	8.08 - High sensitivity to reduced flows	66.67 - Slightly sedimented
	Autumn	15	7.03	18.0 - High conservation value	7.91 - High sensitivity to reduced flows	62.07 - Slightly sedimented
1K	Autumn	3	5.90	Unclassifiable	7.50*- High sensitivity to reduced flows	100.00* - Minimally sedimented
1L	Autumn	15	7.29	14.4 - Fairly High conservation value	8.58 - High sensitivity to reduced flows	93.33 - Minimally sedimented
3A	Autumn	18	6.71	13.0 - Fairly High conservation value	8.25 - High sensitivity to reduced flows	74.19 - Slightly sedimented
3AA	Autumn	16	5.86	9.5 - Moderate conservation value	7.53 - High sensitivity to reduced flows	57.14 - Moderately sedimented
3B	Autumn	18	5.49	9.5 - Moderate conservation value	7.69 - High sensitivity to reduced flows	72.00 - Slightly sedimented
3C	Autumn	23	5.77	11.1 - Fairly High conservation value	7.54 - High sensitivity to reduced flows	59.26 - Moderately sedimented

Index	Season	WHPT-NTAXA	WHPT-ASPT	CCI score - interpretation	LIFE score (species) - interpretation	PSI score (species) - interpretation
3Church	Autumn	19	7.47	10.4 - Fairly High conservation value	8.31 - High sensitivity to reduced flows	86.67 - Minimally sedimented / unsedimented
3D	Spring	22	6.37	9.1 - Moderate conservation value	8.00 - High sensitivity to reduced flows	73.53 - Slightly sedimented
	Autumn	14	5.66	16.0 - High conservation value	6.82* - Moderate sensitivity to reduced flows	58.82 - Moderately sedimented
3E	Autumn	17	6.25	10.8 - Fairly High conservation value	7.77 - High sensitivity to reduced flows	72.00 - Slightly sedimented
3G	Autumn	22	6.46	7.9 - Moderate conservation value	8.12 - High sensitivity to reduced flows	69.44 - Slightly sedimented
3H	Autumn	22	7.23	9.3 - Moderate conservation value	6.29 - Moderate sensitivity to reduced flows	78.38 - Slightly sedimented
3J-A	Autumn	26	5.72	10.4 - Fairly High conservation value	7.40 - High sensitivity to reduced flows	50.00 - Moderately sedimented
3K	Autumn	19	7.39	7.7 - Moderate conservation value	8.87 - High sensitivity to reduced flows	88.89 - Minimally sedimented / unsedimented
3M	Autumn	20	7.18	8.3 - Moderate conservation value	8.50 - High sensitivity to reduced flows	86.84 - Minimally sedimented / unsedimented
3N	Autumn	21	6.40	9.0 - Moderate conservation value	8.12 - High sensitivity to reduced flows	75.68 - Slightly sedimented

Index	Season	WHPT-NTAXA	WHPT-ASPT	CCI score - interpretation	LIFE score (species) - interpretation	PSI score (species) - interpretation
3P	Autumn	14	4.66	7.2 - Moderate conservation value	5.90* - Low sensitivity to reduced flows	33.33 - Sedimented
3Q	Autumn	10	4.58	4.5 - Low conservation value	6.14* - Low sensitivity to reduced flows	15.38 - Heavily sedimented
3Q-A	Autumn	6	4.95	9.0 - Moderate conservation value	7.00 - Moderate sensitivity to reduced flows	66.67 - Slightly sedimented
3R	Autumn	23	6.91	9.7 - Moderate conservation value	8.76 - High sensitivity to reduced flows	87.76 - Minimally sedimented / unsedimented
3R-A	Autumn	15	5.73	7.0 - Moderate conservation value	8.17 - High sensitivity to reduced flows	50.00 - Moderately sedimented
3V	Autumn	12	5.53	9.0 - Moderate conservation value	6.43* - Low sensitivity to reduced flows	52.94 - Moderately sedimented
3X	Autumn	16	6.46	7.3 - Moderate conservation value	8.10 - High sensitivity to reduced flows	69.23 - Slightly sedimented
3Y	Autumn	15	6.76	17.5 - High conservation value	8.08 - High sensitivity to reduced flows	90.48 - Minimally sedimented

**Lack of scoring species may result in inaccurate scores, consequently family level scores have been presented*

4.4.2 Across both seasons, the majority of communities were representative of those with high sensitivity to reduced flows with LIFE scores between 7.25 and 8.87. During the spring surveys, the highest sensitivity to reduced flows was at 1J (LIFE: 8.08: high sensitivity to reduced flows), where he least sensitive was at 1H (LIFE: 5.83: low sensitivity to reduced flows). During the autumn surveys, the highest sensitivity to reduced flows was at 3K (LIFE: 8.87: high sensitivity to reduced flows), whilst the lowest sensitivity to reduced flows was at 3P (LIFE: 5.90: low sensitivity to reduced flows).

4.4.3 The PSI scores for the majority of reaches across both seasons were indicative of minimal to moderate sedimentation. In spring sites 1H and 1L had heavy sedimentation, with PSI scores of 18.18 and 0.00 respectively, whilst in autumn the communities at 1I-B (PSI: 3.45), and 3Q (PSI: 15.38) were indicative of the survey reaches being heavily sedimented.

4.4.4 During both survey season, the majority of sites had moderate to fairly high conservation value. In spring, there were no sites with a higher conservation value, whilst the community at 1H had low conservation value and 1I was unclassifiable due to lack of scoring species within the community. In spring all taxa recorded were of very common to local conservation value. In autumn, the highest conservation values were at 1I-B (CCI: 25.0) and 1H (CCI: 40.0), indicative of the community having very high conservation value. The lowest score was at 3Q (CCI: 4.5), which were indicative of the communities being of low conservation value. During the autumn surveys several notable macroinvertebrates of conservation value were recorded, these included the snail *Menetus dilatatus* which was recorded at 1E and 1B-1, the caddisfly *Metalype fragilis*, which was recorded at 3Y, both of which had a CCI score of 7: ‘notable but not RDB status’, and also the mayfly *Paraleptophlebia werneri* which was recorded at 1H which scores 8: RBD Rare.

4.5 RICT Results

4.5.1 **Table 4-10** display the Ecological Quality Ratio (EQR) and WFD macroinvertebrate status for the WHPT ASPT and NTAXA indices for each riverine survey site surveyed in spring and autumn 2024, alongside the most probable WFD status based on the combination of the modelled distributions for each of ASPT and NTAXA across all classes, termed MINTA (Minimum of NTAXA and ASPT EQRs). Note that whilst MINTA for Sites 1E, 1H, 1J, and 3D is based on the combination of spring and autumn EQR values, MINTA for the remaining sites, are based only on single season values and are included for interpretative purposes only.

4.5.2 Analysis using RICT is only suitable for freshwater (not estuarine or marine) sites on rivers or streams that are naturally permanently flowing. RICT analysis was not undertaken for those sites identified as ditches due to their nature (i.e., not naturally permanently flowing condition) as the application is only possible for sites on naturally and permanently flowing watercourses. Sites 1I-A and 1I-B are not included within the RICT analysis because both were sites found within the Llyn Tecwyn Uchaf reservoir.

Table 4-10 - Macroinvertebrate indicative WFD classification

Index	Season	1B	1D	1E	1F	1G	1H	1J	1K	1L	3A	3AA	3B	3C	3 Church
WHPT-NTAXA Ecological Quality Ratio (EQR)	Spring	-	1.56 (H)	0.94 (H)	-	-	0.45 (B)	0.65 (M)	-		-	-	-	-	-
	Autumn	1.52 (H)	-	1.07 (H)	0.66 (M)	1.20 (H)	0.48 (B)	0.75 (H)	0.32 (B)	0.89 (H)	0.86 (H)	0.71 (G)	0.80 (H)	1.07 (H)	0.91 (H)
WHPT-ASPT Ecological Quality Ratio (EQR)	Spring	-	0.88 (G)	0.78 (M)	-	-	0.71 (P)	0.91 (G)	-	-	-	-	-	-	-
	Autumn	0.90 (G)	-	0.92 (G)	0.89 (G)	1.12 (H)	1.04 (H)	1.02 (H)	0.83 (M)	0.98 (H)	0.97 (G)	0.8 5 (M)	0.85 (M)	0.84 (M)	1.10 (H)
MINTA most probable WFD invertebrate classification	Spring and autumn combined	G†	G†	M	M†	H†	B	G	B†	H†	G†	M†	M†	M†	H†

† *MINTA WFD classifications should be completed across the two seasons, whereas the classification presented here is based on the single-season data available and should be treated with caution.*

EQRs are valued as High (H), Good (G), Moderate (M), Poor (P), and Bad (B)

Index	Season	3D	3E	3G	3H	3J-A	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
WHPT-NTAXA Ecological Quality Ratio (EQR)	Spring	1.01 (H)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Autumn	0.70 (M)	0.75 (G)	1.00 (H)	0.93 (H)	1.62 (H)	0.88 (H)	0.96 (H)	1.19 (H)	0.57 (M)	0.43 (B)	0.45 (B)	1.01 (H)	0.67 (M)	0.68 (M)	0.71 (G)	0.88 (H)
WHPT-ASPT Ecological Quality Ratio (EQR)	Spring	0.88 (G)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Autumn	0.81 (M)	0.88 (G)	0.91 (G)	1.03 (H)	0.95 (G)	1.10 (H)	0.99 (H)	0.87 (G)	0.76 (M)	0.69 (P)	0.77 (M)	0.99 (H)	0.84 (M)	0.79 (M)	0.95 (G)	0.93 (G)
MINTA most probable WFD invertebrate classification	Spring and autumn combined	M	G†	G†	H†	G†	H†	H†	G†	P†	B†	B†	H†	M†	M†	G†	G†

† MINTA WFD classifications should be completed across the two seasons, whereas the classification presented here is based on the single-season data available and should be treated with caution.

EQRs are valued as High (H), Good (G), Moderate (M), Poor (P), and Bad (B)

4.6 Macrophyte Surveys

4.6.1 The full aquatic macrophyte taxa list is in Appendix E. Cross-referenced with the JNCC Taxon Designations list revealed that none of the macrophyte taxa identified during the surveys were protected and/or notable. The invasive Himalayan balsam *Impatiens glandulifera* was present at sites Afon Dwyfor, Crossing at Afon Crychddwr, Crossing at Unnamed trib. of Afon Llyfni and Crossing at Afon Llifon.

Nant yr Efail 1

4.6.2 The habitat at the Nant yr Efail 1 was a narrow water course cutting down a steep slope within heavy tree canopy. It did not support any higher aquatic plants. The only macrophyte species present in the narrow channel was lustrous bog-moss *Sphagnum subnitens var. subnitens*.

Nant yr Efail 2

4.6.3 The habitat at the Nant yr Efail 2 was downstream of Nant yr Efail 2 and was similarly heavily shaded, but the gradient was shallower, channel wider and with a much greater discharge. The substrate was dominated with boulders and cobbles and smaller clean rocky material. It was not suitable for higher aquatic plants and bryophytes dominated. Species present were lustrous bog-moss, glittering wood-moss *Hylocomium splendens*, notched rustwort *Marsupella emarginata var. aquatica*, overleaf pellia *Pellia epiphylla*, water earwort *Scapania undulata* and brookside feather-moss *Hygroamblystegium fluviatile*.

Afon Dwyfor

4.6.4 The habitat at the Afon Dwyfor site was a fast-flowing clear river dominated by cobble and boulder and unshaded. The boulders had extensive cover of the aquatic mosses *Fontinalis antypyretica* and *Fontinalis squamosa* which constituted greatest macrophyte abundance. Other bryophytes present in smaller quantities were great scented liverwort *Conocephalum conicum*, *Pelia sp.*, St. Winifrid's moss/pale liverwort *Chiloscyphus polyanthos/pallescens* and brookside feather-moss. Submerged higher plants present were alternate water-milfoil *Myriophyllum alterniflorum* which was abundant and a small stand of intermediate water-starwort *Callitriche brutia* subsp. *Hamulata*. Other higher plants present were emergent and in low abundances in the margins, namely; water mint Mentha sp., water-hemlock *Oenanthe crocata*, water pepper *Persecaria hydropiper* and reed canary grass *Phalaris arundinacea*.

Crossing at Afon Dwyfach

4.6.5 The habitat at the Crossing at Afon Dwyfach was a largely cobbled fast-flowing stream with very dense shade from tree canopy. As a result, the

macrophyte community had a very low species richness. This was limited to the bryophytes *Fontinalis antypyretica* and *Pelia sp.,* with the only higher plant present being very small quantities of alternate water-milfoil.

Crossing at Afon Crychddwr

4.6.6 The habitat at the Crossing at Afon Crychddwr site was a shaded and shallow relatively fast flowing shallow stream over boulder cobble and gravel substrate. It was dominated by bryophytes including St. Winifrid's moss/pale liverwort, brookside feather-moss, Fontinalis antypyretica, Fontinalis squamosa, flagellate Feather-moss *Hyocomium armoricum*, Swan's-neck Thyme-moss *Mnium hornum*, bordered thyme-moss *Mnium marginatum* and overleaf pellia *Pellia epiphylla*. Vascular plants present were fool's watercress *Heloscadium nodiflorum*, Himalayan balsam, soft rush *Juncus effusus* and lesser spearwort *Ranunculus flammula*.

Crossing at Unnamed trib. of Afon Llyfni

4.6.7 The habitat at the Crossing at Unnamed trib. of Afon Llyfni site was a largely unshaded channel running through marshy wetland with a silt substrate. The most dominant species was fool's watercress *Heloscadium nodiflorum* which was abundant. Other species present were Starwort *Callitriche* sp., yellow-flag iris *Iris pseudocorus*, soft rush, fat duckweed *Lemna gibba*, tufted forget-me-not *Myosotis laxa*, water pepper and branched bur-reed *Sparganium erectum*. Himalayan balsam was present in small quantities.

Crossing at Afon Llifon

4.6.8 The habitat at the Crossing at Afon Llifon site was a lightly shaded fast flowing river with stony substrates passing through rough pasture. The macrophytes were dominated by the aquatic mosses *Fontinalis antypyretica* and *Fontinalis squamosa*. Vascular plants were scarce and were represented by isolated stands of water horsetail *Equisetum fluviatile*, fool's watercress, water mint and water hemlock. Himalayan balsam was present in small quantities.

4.7 Macrophyte Index Results and WFD Classification

4.7.1 The River Macrophyte Nutrient Index (RMNI), number of macrophyte taxa (NTAXA), Number of Functional Groups (NFG) and cover of filamentous green algae (ALG), observed and predicted scores, overall Ecology Quality Ratio (EQR) and WFD macrophyte status for each survey reach are provided in **Table 4-11**.

Table 4-11 - Macrophyte WFD metrics

Metric		Nant yr Efail 1	N ant yr Efail 2	Crossing at Afon Dwyfach	Afon Dwyfor	Crossing at Afon Crychddwr	Crossing at Afon Llyfni	Crossing at Afon Llifon
River macrophyte nutrient index (RMNI)	Observed	1.07	3.45	4.62	5.12	4.22	7.32	5.02
	Predicted	3.93	4.82	4.82	5.63	4.69	5.22	4.81
Number of macrophyte taxa (NTAXA)	Observed	0.00	3.00	2.00	7.00	3.00	2.00	3.00
	Predicted	5.66	7.91	8.53	7.76	6.92	8.53	6.98
Number of functional groups (NFG)	Observed	0.00	2.00	2.00	5.00	1.00	2.00	2.00
	Predicted	3.80	5.11	5.46	5.02	4.54	5.46	4.57
Cover of filamentous green algae (ALG)	Observed	0.00	0.00	0.00	0.50	0.00	0.00	0.00
Overall Ecological Quality Ratio (EQR)	-	N/A	0.99	0.73	1.02	0.77	0.33	0.74
Indicative WFD macrophyte classification	-	N/A	High	Good	High	Good	Poor	Good

4.7.2 The site Nant yr Efail 1 was unclassifiable due to the lack of LEAFPACS scoring taxa at the site.

4.7.3 The sites Nant yr Efail 1and Crossing at Afon Dwyfor were classified as High with overall EQRs of 0.992 and 1.02, respectively. This indicates that these sites are minimally or unimpacted by eutrophication and/or modification to morphological conditions.

4.7.4 The sites Afon Dwyfach and Crossing at Afon Crychddwr were classed as Good, with EQRs of 0.73 and 0.772, respectively.

4.7.5 The site Crossing at Afon Llyfni was classed as Poor, with an EQR of 0.331.

4.8 Fish Surveys

4.8.1 Photographs of fish survey locations are in **Appendix G**.

Crossing at Afon Crychddwr

4.8.2 At the Crossing at Afon Crychddwr survey reach, the channel was 6 m and 0.2 m water depth on average (Appendix GPlate 1). There was heavy shading and no turbidity. The channel substrate was dominated by cobbles (75%), followed by boulders (10%), gravel (10%) and sand (5%). The habitat was 90% run and 10% cascade. There was 80% overhanging cover, a high flow, a complex bank structure and the land usage was woodland and pasture.

4.8.3 Two fish species were caught at this site, with brown trout being the most dominant species (n = 11) and five specimens of European eel (**Table 4-12** -).

Crossing at Afon Llifon

4.8.4 At Crossing at Afon Llifon survey reach, the channel was 2 m and 0.3 m water depth on average (Appendix GPlate 2). There was moderate shading and no turbidity. The channel substrate was dominated by cobbles (38%), followed by pebbles (35%), boulders (12%), gravel (9%), sand (5%) and silt (1%). The habitat was 50% run, 35% cascade and 15% pool. Furthermore, there was 30% overhanging cover, high flow, a complex bank structure and the land usage was pasture and scrub.

4.8.5 The fish community at this site was dominated by brown trout (n=38), followed by European eel (n = 2) (**Table 4-12** -).

Crossing at Afon Dwyfor

4.8.6 At the Crossing at Afon Dwyfor survey reach, the channel was 8 m wide and 0.6 m water depth on average (Appendix GPlate 3). The shading was light and the flow within the channel was high. There was no turbidity, and the channel substrate was dominated by cobbles (70%), followed by boulders (15%), gravel (10%), sand (5%) and silt (1%). The habitat was 70% run, 20%

pool and 10% cascade. There was a 5% overhanging cover, , a simple bank structure and land usage was pasture.

4.8.7 Four fish species were caught at this site, comprising brown trout, European eel, Atlantic salmon and lamprey with brown trout being the most dominant species (n = 19) (**Table 4-12** -).

Nant yr Efail 2

4.8.8 At the Nant yr Efail 2 survey reach, the channel was 0.4 m wide with an average water depth of 0.1 m (Appendix GPlate 4). The shading was heavy and flow within the channel high (10 metres per second (m/s)). There was no turbidity, and the channel substrate was dominated by pebbles (40%), followed by boulders (30%), cobbles (20%) and gravel (10%).

4.8.9 Brown trout and European eel species were the only fish species recorded at Nant yr Efail 2 (**Table 4-12** -).

Table 4-12 - Numbers of fish species at each site and the ranges and averages of fork length.

Site	**Brown/Sea Trout (*Salmo Trutta*)**	**Atlantic Salmon (*Slamo Salar*)**	**European Eel (*Anguila Anguila*)**	**Lamprey Sp. (*Lampetra*)**
Crossing at Afon Crychddwr	11	0	5	0
Crossing at Afon Dwyfor	19	7	6	5
Crossing at Afon Llifon	38	0	2	0
Nant yr Efail 2	2	0	1	0
n	70	7	14	5
Minimum length (mm)	46	85	124	60
Maximum length (mm)	162	97	404	110
Mean length (mm)	98.2	88.4	247.1	84.0

5. Discussion

5.1 Summary

5.1.1 There are 13 statutory and 41 non-statutory designated sites in the works site or its immediate vicinity with associated aquatic ecology features that could potentially be impacted by the proposed works.

5.1.2 There are ten WFD water bodies in the works site – nine rivers and one lake. Five of the water bodies were considered to be natural - Glyn (Dwyryd), Dwyfawr – lower, Dwyfach, and Carrog achieved 'Good' overall ecological status, whilst Seiont achieved 'Moderate' overall ecological status. The remaining five water bodies were considered to be heavily modified. Gwyrfai - downstream of Cwellyn, Llyfni and Llyn Tecwyn Uchaf had the potential to achieve 'Good' overall ecological status, whilst Porthmadog Cut and Prysor - downstream Llyn Trawsfynydd had the potential to achieve 'Moderate' overall ecological status.

5.1.3 An additional eight WFD water bodies are in the Study Area.

5.2 Aquatic Macroinvertebrates

5.2.1 The desk study identified 14 notable macroinvertebrate species, including freshwater pearl mussel which is protected under Welsh, UK and European legislation. The desk study also identified the Scarce blue--tailed damselfly which is listed under the LBAP and eight nationally notable and five nationally scarce macroinvertebrates.

5.2.2 Two non-native, non-invasive macroinvertebrate species were identified from the desk study: *Crangonyx pseudogracilis/floridanus* and New Zealand mud snail. These species are wide-spread and common across the UK.

5.2.3 The surveys completed on the riverine sites demonstrated that all survey locations possessed a macroinvertebrate community adapted towards minimally to moderately sedimented habitats and with a high sensitivity to flow reductions. Analysis by RICT indicated that the survey reaches had a range of water quality, with the majority of sites having moderate to high water quality. However, seven sites were identified as having bad or poor water quality.

5.2.4 In spring 2024, all sites achieved CCI scores indicative of a macroinvertebrate community with Moderate to Fairly High conservation value. Only 1H and 1I did not achieve this, with the communities indicative of Low conservation value and unclassifiable value, respectively. Similarly, in autumn the communities predominantly ranged between having moderate to fairly high conservation value. Outside of these, 1I-A and 1K, had unclassifiable CCI scores given a lack of scoring taxa.

5.2.5 Two sites had Very High conservation value (1H and 1I-B) – although both were dominated by non-scoring taxa, at 1H of the six scoring species two scored above local status, one being 6: regionally notable and the other having a conservation status of 8: RBD – Rare, whilst at 1I-B of the seven scoring taxa two were of local conservation status whilst one was notable but not RDB status. One site having a Low conservation value (3Q) was dominated by common taxa with only half of the taxa identified having a conservation score. The sites with low conservation scores likely lack variety in habitat types, limiting the variety of taxa that can be supported. Notable species in the autumn surveys included the Nationally Scarce mayfly, *Paraleptophlebia werneri*, a species also observed to achieve an RDB3 rare Conservation Score but retains an IUCN Red List Least Concern status, two records of the Nationally Scarce *Metalype fragilis*, and two counts of the River Skater, *Aquarius najas*. The iron blue mayfly, *Baetis niger* was also recorded which is designated as a priority species according to the UK Biodiversity Action Plan 2007 and as a priority species under Section 7 of the Nature Recovery Action Plan Wales.

5.2.6 Three non-native macroinvertebrate species were recorded; *the C. pseudogracilis*/*floridanus*, the bladder snail of either of the two *Physella* species, the New Zealand mud snail, *Potamopyrgus antipodarum.* All three non-native taxa are wide-spread and common across the UK.

5.3 Aquatic Macrophytes

5.3.1 Two notable aquatic macrophyte species were identified in the desk study: the near threatened bryophyte pale scalewort *Radula voluta* and the near threatened corn mint *Mentha arvensis*.

5.3.2 Three INNS species were noted in the Study Area from the desk study, with the INNS listed in Schedule 9 of the Wildlife and Countryside Act 1981 and/or the Invasive Alien Species (Enforcement and Permitting) Order 2019. These include records of the invasive New Zealand pigmyweed, Himalayan balsam and Japanese knotweed. There is the risk that the proposed works may result in their potential spread. Mitigation will be required to ensure all activities prevent their spread and where possible locally eradicate these species within the works site.

5.3.3 No notable aquatic macrophytes were identified during the surveys.

5.3.4 The range of WFD classifications for the watercourses ranged from ‘Poor’ for site Crossing at Unnamed trib. of Afon Llyfni, to ‘Good’ for Crossing at Afon Dwyfor and Crossing at Afon Crychddwr, to ‘High’ for Nant yr Efail 2 and Afon Dwyfach, while site Nant yr Efail 1 was unclassifiable due to the lack of LEAFPACS scoring taxa present.

5.3.5 The INNS Himalayan balsam was present in sites Afon Dwyfor, Crossing at Afon Crychddwr, Crossing at Unnamed trib. of Afon Llyfni and Crossing at Afon Llifon, with its respective legislation outlined above.

5.4 Fish

5.4.1 Five notable fish species were identified by the data search for the Study Area, brown trout, European eel, Atlantic salmon and *Lampetra sp*.. These species were also observed during the fish surveys in 2024. As *Lampetra sp.* covers both brook and river lamprey, it has been assumed that both species are present. The legislation for all species identified in the desk study is shown in

5.4.3 Table **4-7**.

5.4.4 Both eels and brown trout were present at all sites, with lamprey and Atlantic salmon only present at the Afon Dwyfor crossing. A greater diversity and density of fish species were identified within the surveys of the Afons Crychddwr, Dwfor and Llifon compared to the Nant yr Efail. This is likely because the larger rivers had a greater diversity in habitats, such as undercut banks, and have multiple flow types within the surveyed area including pools and riffles, supporting fish across all life stages. Additionally, the dominance of cobbles within the larger rivers provided sheltered gravel beds suitable for spawning of salmonoid species.

5.4.5 The desk study identified records of the non-native grass carp and rainbow trout; however, no invasive fish species were identified during the surveys.

6. Mitigation Measures

6.1.1 Given the presence of protected and non-native species, to inform the ecological impact assessment, mitigation measures have been identified below.

- Where possible, works should be completed at least 10 m away from watercourses;
- Works should be designed to avoid watercourses where practicable and include a 10 m standoff buffer;
- For the Wider Works, in-river works are proposed to enable the installation of temporary and permanent watercourse crossings in the form of culverts and bridges for tower access. In addition, although not in-river works, the existing 132 kV conductors which oversail water bodies in the Works area will be replaced with new 400 kV conductors. The corresponding proposed Tower Working Areas to enable this work, in many instances, are either within the 10 m standoff buffer or directly overlap with watercourses. Therefore, due to the potential for these works to disturb the protected fish population (both residential and migratory) that may inhabit impacted watercourses, as such additional mitigation measures may be required. A summary of these are outlined below:
  - Pre-construction fish and fish habitat surveys of the proposed watercourse crossing locations and Tower Working Areas to support the baseline survey findings and inform the presence of the protected fish assemblage and their respective spawning habitat. This will also help to identify any additional mitigation requirements including the presence of INNS. Where the protected fish assemblage, or suitable spawning habitat is identified, then suitable timings of works are recommended to avoid impacting the migration and spawning of these species. However, where these species or habitats are absent, then these timings will not need to be considered A summary of these specific timings have been outlined in

– **Table 6-1**~~Error! Reference source not found.~~ below.

Table 6-1 - Key ecological timings for the migratory fish assemblage identified

Receptor	Life Stage	J	F	M	A	M	J	J	A	S	O	N	D
European eel	Glass eel migration				■	■	■						
	Silver eel migration									■	■	■	
Atlantic salmon	Smolt migration			■	■	■							
	Adult migration						■	■	■	■	■		
	Spawning	■									■	■	■
Brown/sea trout	Smolt migration			■	■	■							
	Adult migration						■	■	■	■	■		
	Spawning										■	■	■
River lamprey	Transformer migration	■	■	■									
	Adult migration									■	■	■	
	Spawning				■	■							
Brook lamprey	Spawning				■	■							

  - It must be noted that these timings represent the worst-case scenarios by accounting for environmental variability that trigger migratory and/or spawning cues i.e. temperature and flow. Therefore, where all species and spawning habitat is present, it is recommended that consultation with NRW is completed to streamline these months based on their local expert knowledge to identify months that they are happy represent the least possible ecological harm.
  - This provides a worst-case window of least ecological sensitivity between December - February to complete these works. Although there is scope to reduce the seasonal restrictions following the results of habitat surveys and NRW consultation.

- Fish rescues immediately prior to the installation of temporary and permanent water crossings to ensure fish and not injured or killed as part of these works.
- Fish rescues immediately after the decommissioning of temporary water crossings to ensure fish and not injured or killed as part of these works.
- Construction Environmental Management Plan (CEMP) to be adhered to prevent pollution spills from construction or temporary site drainage. This will also cover appropriate biosecurity measures for INNS
- Any lighting as part of the construction/operation to be directed away from watercourses.
- Works to be supervised by an ECoW to identify any additional aquatic ecological constraints.

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Appendix A Community Conservation Index (CCI)

The Community Conservation Index (Ref 3.12) allows a classification of the nature conservation value associated with a macroinvertebrate community. The CCI score for one sample is derived from individual Conservation Scores (CS), assigned to some species of aquatic macroinvertebrates and relating closely to the available published Red Data Books and subsequently updated Red Lists. Conservation Scores assigned to individual species vary from 1 to 10, as detailed on **Table A-1** below. The derived CCI scores generally vary from 0 to > 20, as detailed in the below. **Table A-2** below provides a guide to interpreting CCI scores.

Table A-1 - Conservation scores from the Community Conservation Index (Ref 3.12)

Conservation score	Relation to Red Data Books
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable (but not RDB status)
6	Regionally notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10-5, which occur in up to >10-25% of all samples from similar habitats)
2	Common (species not in categories 10-5, which occur in up to >25-50% of all samples from similar habitats)
1	Very common (species not in categories 10-5, which occur in up to >50-100 % of all samples from similar habitats)

Table A-2 - General guide to CCI scores (Ref 3.12)

CCI Score	Description	Interpretation
0 to 5.0	Sites supporting only common species and/or community of low taxon richness	Low conservation value
> 5.0 to 10.0	Sites supporting at least one species of restricted distribution and/or a community of moderate taxon richness	Moderate conservation value
> 10.0 to 15.0	Sites supporting at least one uncommon species, or several species of restricted distribution and/or a community of high taxon richness	Fairly high conservation value
> 15.0 to 20.0	Sites supporting several uncommon species, at least one of which may be nationally rare and/or a community of high taxon richness	High conservation value
> 20.0	Sites supporting several rarities, including species of national importance and/or a community of very high taxon richness	Very high conservation value

The Lotic-Invertebrate Index for Flow Evaluation (LIFE) provides an assessment of the impact of variable flows on benthic macroinvertebrate communities (Ref 3.13). Under the assessment, individual species of aquatic macroinvertebrates are assigned to a flow group varying from I to VI, as detailed on the **Table A-3** below. The LIFE score for a macroinvertebrate sample is then derived (mean of individual scores) from individual taxon scores and abundances, as detailed in the **Table A-3**. LIFE scores for a macroinvertebrate sample ranges from 1 to 12, where highest scores describe communities adapted to rapid flows.

Table A-3 - Flow groups used to Derive LIFE scores (Ref 3.13)

LIFE score group	Description	Mean current velocity
I	Taxa primarily associated with rapid flows	Typically > 100 centimetres per second (cm/s)
II	Taxa primarily associated with moderate to fast flows	Typically 20 to 100 cm/s
III	Taxa primarily associated with slow or sluggish flows	Typically < 20 cm/s
IV	Taxa primarily associated with (usually slow) and standing waters	
V	Taxa primarily associated with standing waters	
VI	Taxa frequently associated with drying or drought impacted sites	

Appendix B Proportion of Sediment-sensitive Invertebrates (PSI).

The Proportion of Sediment-sensitive Invertebrates (PSI) index allows an assessment of the extent to which a water body is composed of, or covered by, fine sediments (Ref 3.14). Under this system, individual species of aquatic macroinvertebrates are assigned a Fine Sediment Sensitivity Rating (FSSR) as detailed in **Table B-1**, and an abundance rating. The PSI score for the aquatic macroinvertebrate sample is then derived from the individual species scores and abundances, as detailed in **Table B-2**. The PSI score corresponds to the percentage of fine sediment-sensitive taxa present in a sample and ranges from 0 to 100, with low scores corresponding to water bodies with high fine sediment cover (**Table B-2**).

Table B-1 - Fine Sediment Sensitivity Rating (FSSR) groups used to derive PSI scores

FSSR group	Description
A	Highly sensitive
B	Moderately insensitive
C	Moderately insensitive
D	Highly insensitive

Table B-2 - Abundance categories and scoring matrix used to derive PSI scores

FSSR group	Abundance categories			
	A (1 to 9)	B (10 to 99)	C (100 to 999)	D/E (> 1000)
A	2	3	4	5
B	2	3	4	5
C	1	2	3	4
D	1	2	3	4

Appendix C Whalley, Hawkes, Paisley & Trigg (WHPT) Metric

There are approximately 4,000 species of aquatic macroinvertebrates in the British Isles. To simplify the analysis of the samples and the data we do not identify individual species but only the major types (taxa), mostly at the family taxonomic level. A key piece of information is the number of different taxa at a site. A fall in the number of taxa indicates ecological damage, including pollution (organic, toxic and physical pollution such as siltation, and damage to habitats or the river channel).

The WHPT scoring system (Ref 3.15) is based upon the sensitivity of macroinvertebrate families to organic pollution. It replaces the Biological Monitoring Working Party (BMWP) system (Ref C.1) previously used in the UK.

The WHPT system assigns a numerical value to about 100 different taxa (known as the WHPT-scoring taxa) according to their sensitivity to organic pollution. In addition to the presence of macroinvertebrate taxa at a sampling Reach, as in the BMWP scoring system, the WHPT system also uses another type of information, this being the abundances of different scoring taxa.

Taxa abundances are classified in four categories (Class 1: 1 to 10 individuals, Class 2: 11 to 100 individuals, Class 3: 101 to 1,000 individuals, and Class 4: > 1,000 individuals). A score (Pressure Sensitivity Scores (PSs)) is then assigned to each taxa, depending of the taxa sensitivity and abundances recorded.

The total WHPT score for a sample corresponds to the sum of PSs of scoring taxa recorded. The Average Score Per Taxon (ASPT) values are calculated as the Sum PSs divided by the number of scoring taxa (NTAXA). Three metrics are calculated:

- WHPT score
- NTAXA
- ASPT

Some animals are more susceptible to organic pollution than others, and the presence of sensitive species indicates good water quality. This fact is taken into account by the WHPT metrics.

The most useful way of summarising the biological data was found to be one that combined the number of taxa and the ASPT. The best quality is indicated by a diverse variety of taxa, especially those that are sensitive to pollution. Poorer quality is indicated by a smaller than expected number of taxa, particularly those that are sensitive to pollution. Organic pollution sometimes encourages an increased abundance of the few taxa that can tolerate it. However, maximum achievable values will vary between geological regions. For example, pristine lowland streams in East Anglia will always score lower than pristine Welsh mountain streams because they are unable to support many of the high-scoring taxa associated with fast flowing habitat. WHPT scores and ASPT for different types watercourse are dependent on the quality and diversity of habitat, natural water chemistry (associated with geology, distance from source etc.), altitude, gradient, time of year the sample was taken and other factors.

Table C- 1 - LIFE scoring matrix combining flow groups and abundance categories (Ref 3.13)

Flow groups	Abundance categories			
	A (1 to 9)	B (10 to 99)	C (100 to 999)	D/E (> 1000)
I	9	10	11	12
II	8	9	10	11
III	7	7	7	7
IV	6	5	4	3
V	5	4	3	2
VI	4	3	2	1

Appendix D Macroinvertebrate Taxa List

Table D-1 - Macroinvertebrate taxa list in spring 2024

Family	Taxon	1D	1E	1H	1J	1I	3D
Flatworms							
Planariidae	*Polycelis felina*	0	0	0	0	0	2
Snails							
Hydrobiidae	*Potamopyrgus antipodarum*	2	0	0	0	0	8
Limpets and mussels							
Anyclidae	*Ancylus fluviatilis*	1	0	0	0	0	1
Sphaeriidae	Sphaeriidae (juvenile/damaged)	2	0	0	0	0	
Oligochaeta	Oligochaeta	11	0	3	1	0	17
Leeches							
Glossiphoniidae	*Glossiphonia complanata*	0	0	0	0		2
Crustaceans							
Gammaridae	*Gammarus pulex/fossarum agg.*	25	0	0	0	0	0
Gammaridae	*Gammarus pulex*	30	0	0	0	0	0
Crangonyctidae	*Crangonyx* sp. (floridanus/pseudogracilis)	0	0	0	0	0	0

Family	Taxon	1D	1E	1H	1J	1I	3D
Asellidae	*Asellus aquaticus*	0	1	0	0	0	0
Mayflies							
Baetidae	Baetis sp.	18	0	0	0	0	15
Baetidae	*Baetis rhodani/atlanticus*	1	0	0	0	0	10
Baetidae	*Alainites muticus*	0	0	0	0	0	2
Baetidae	*Baetis niger*	13	0	0	0	0	0
Baetidae	*Centroptilum luteolum*	0	14	0	0	0	0
Siphlonuridae	*Siphlonurus lacustris*	0	1	0	0	0	0
Heptageniidae	*Rhithrogena semicolorata*	0	0	0	0	0	1
Heptageniidae	Ecdyonorus sp.	2	0	0	0	0	0
Leptophlebiidae	Leptophlebiidae (juvenile/damaged)	2	0	0	0	0	0
Ephemerellidae	*Serratella ignita*	78	6	0	0	0	55
Caenidae	Caenis sp.	0	0	0	0	20	0
Caenidae	*Caenis rivulorum*	0	2	0	0	0	6
Stoneflies							
Nemouridae	Nemouridae (juvenile/damaged)	1	0	0	1	0	0
Nemouridae	Protonemura sp.	0	0	0	1	0	0
Nemouridae	*Amphinemura sulcicollis*	0	0	0	16	0	0

Family	Taxon	1D	1E	1H	1J	1I	3D
Nemouridae	*Nemurella picteti*	1	0	0	1	0	0
Leuctridae	Leuctra sp.	9	0	0	0	0	0
Leuctridae	*Leuctra geniculata*	1	0	0	0	0	1
Leuctridae	Leuctra nigra	0	0	0	1	0	0
Perlodidae	*Isoperla grammatica*	1	0	0	0	0	0
Chloroperlidae	*Siphonoperla torrentium*	1	0	0	0	0	0
Damselflies							
Coenagrionidae	Coenagrionidae (juvenile/damaged)	18	1	5	0	0	0
Calopterygidae	*Calopteryx virgo*	4	0	0	0	0	0
Dragonflies							
Cordulegasteridae	*Cordulegaster boltonii*	19	0	0	3	0	0
Libellulidae	*Libellula quadrimaculata*	1	0	0	0	0	0
True bugs							
Gerridae	Gerris sp.	1	0	0	0	0	0
Gerridae	*Gerris gibbifer*	2	0	0	0	0	0
Veliidae	Veliidae (nymph/damaged)	3	2	0	1	0	0
Veliidae	Velia sp.	0	0	4	0	0	0
Veliidae	*Velia caprai*	0	0	1	0	0	0

Family	Taxon	1D	1E	1H	1J	1I	3D
Notonectidae	Notonecta sp.	3	0	0	0	0	0
Beetles							
Gyrinidae	Gyrinus substriatus	1	0	0	0	0	0
Dytiscidae	Dytiscidae (larvae/damaged)	0	0	0	0	0	0
Dytiscidae	Hydroporus sp.	0	0	0	1	0	0
Dytiscidae	Oreodytes sanmarki	0	0	0	0	0	2
Dytiscidae	*Agabus bipustulatus*	1	0	1	0	0	0
Hydrophilidae	Helophorus sp.	0	0	7	0	0	0
Hydrophilidae	*Helophorus aequalis*	0	0	1	0	0	0
Hydrophilidae	*Helophorus brevipalpis*	0	0	1	0	0	0
Hydrophilidae	*Anacaena globulus*	0	0	1	0	0	0
Hydraenidae	*Hydraena gracilis*	2	0	0	0	0	0
Dryopidae	Dryops sp.	2	0	0	0	0	0
Elmidae	*Elmis aenea*	0	2	0	0	0	0
Elmidae	*Esolus parallelepipedus*	0	0	0	0	0	5
Elmidae	*Limnius volckmari*	11	0	0	0	0	0
Elmidae	Oulimnius sp.	10	1	0	0	0	0
Caddisflies							

Family	Taxon	1D	1E	1H	1J	1I	3D
Rhyacophilidae	Rhyacophila sp.	0	0	0	0	0	1
Glossosomatidae	Glossosomatidae (juvenile/damaged)	2	0	0	0	0	4
Glossosomatidae	*Agapetus fuscipes*	3	0	0	0	0	0
Polycentropodidae	Polycentropodidae (juvenile/damaged)	0	4	0	0	0	0
Polycentropodidae	Plectrocnemia sp.	0	0	0	1	0	0
Polycentropodidae	*Plectrocnemia geniculata*	0	0	0	2	0	0
Polycentropodidae	*Polycentropus kingi*	0	11	0	0	0	0
Hydropsychidae	*Hydropsyche siltalai*	1	0	0	0	0	6
Hydropsychidae	*Diplectrona felix*	0	0	0	44	0	0
Hydroptilidae	Oxyethira sp.	0	0	4	0	0	0
Limnephilidae	Limnephilidae (juvenile/damaged)	0	0	2	4	0	0
Limnephilidae	*Limnephilus lunatus*	8		0	0	0	0
Limnephilidae	*Halesus radiatus*	0	1	0	0	0	0
Limnephilidae	*Micropterna sequax*	0	0	0	2	0	0
Limnephilidae	*Chaetopteryx villosa*	7	1	1	3	0	0
Leptoceridae	Mystacides sp.	0	2	0	0	0	0
Leptoceridae	Adicella sp.	0	0	0	1	0	0
Goeridae	Silo pallipes	0	0	0	0	0	1

Family	Taxon	1D	1E	1H	1J	1I	3D
Lepidostomatidae	*Crunoecia irrorata*	0	0	0	3	0	0
Lepidostomatidae	*Lepidostoma hirtum*	0	0	0	0	0	4
Sericostomatidae	*Sericostoma personatum*	0	1	0	0	0	4
True flies							
Chironomidae	Chironomidae (damaged/pupea)	1	0	0	5	0	
Chironomidae	Tanypodinae	6	2	1	2	0	2
Chironomidae	Orthocladiinae	7	2	17	114	0	0
Chironomidae	Chironomini	0	2	0	2	4	1
Chironomidae	Tanytarsini	46	7	1	2	5	10
Chironomidae	Prodiamesinae	0	0	0	0	0	0
Tipulidae	Tipula sp.	0	0	0	0	0	1
Pediciidae	Dicranota sp.	0	0	1	1	0	
Simuliidae	Simuliidae (damaged/juvenile)	9	0	0	0	0	18
Simuliidae	Simulium sp.	1	0	0	0	0	
Simuliidae	*Simulium angustipes/velutinum*	0	0	0	0	0	1
Psychodidae		0	2	0	0	0	0
Ceratopogonidae		2	0	1	0	0	0
Athericidae	*Ibisia marginata*	0	4	0	0	0	2

Family	Taxon	1D	1E	1H	1J	1I	3D
Other Taxa							
	Eiseniella tetraedra	0	0	0	0	0	2
	Diptera	0	0	1	1	0	0
	Anisoptera	1	0	0	0	0	0

Table A-4 - Macroinvertebrate taxa lists (1B to 3C) in autumn 2024

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Flatworms																			
Planariidae	*Polycelis sp.*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Planariidae	*Polycelis nigra/tenuis*	0	0	0	0	0	0	6	0	0	0	0	0	1	0	0	0	0	0
Planariidae	*Phagocata vitta*	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Snails																			
Lymnaeidae	*Lymnaeidae (juvenile/damaged)*	0	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Lymnaeidae	*Ampullaceana balthica*	0	11	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Hydrobiidae	*Potamopyrgus antipodarum*	66	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	25
Succineidae	*Succinea sp.*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Planorbidae	*Planorbidae (juvenile/damaged)*	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Planorbidae	*Menetus dilatatus*	0	1	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
Limpets and mussels																			
Anyclidae	*Ancylus fluviatilis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0
Sphaeriidae	*Sphaeriidae (juvenile/damaged)*	1	0	98	0	0	0	0	0	0	0	0	1	6	0	0	0	0	3
Sphaeriidae	*Sphaerium corneum*	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0
Sphaeriidae	*Pisidium/Euglesa/Odhneripisidium*	1	0	0	0	0	0	1	0	0	2	7	13	543	4	6	7	0	0
Worms																			
Oligochaeta	*Oligochaeta*	20	6	8	8	4	3	28	1	2	4	3	12	35	22	112	0	11	34
Leeches																			
Glossiphoniidae	*Glossiphonia complanata*	4	2	0	0	0	0	0	0	0	0	1	0	5	0	0	0	1	1
Glossiphoniidae	*Helobdella stagnalis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	1
Erpobdellidae	*Erpobdellidae (juvenile/damaged)*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0
Erpobdellidae	*Erpobdella sp.*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0
Erpobdellidae	*Erpobdella octoculata*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0	0	0
Erpobdellidae	*Dina lineata*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Mites																			
Hydracarina	*Hydracarina*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oribatei	*Oribatei*	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Crustaceans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostracoda		0	0	3	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0
Cladocera		0	0	0	0	0	0	327	0	0	0	0	0	0	0	0	0	0	0
Gammaridae	*Gammarus pulex/fossarum agg.*	8	0	0	0	0	0	0	0	0	0	0	41	0	98	61	2	0	0
Gammaridae	*Gammarus pulex*	8	0	0	0	0	0	0	0	0	0	11	25	2	68	88	11	0	0
Crangonyctidae	*Crangonyx floridanus/pseudogracilis*	13	0	0	0	0	0	0	0	0	1	0	3	209	5	0	0	3	0
Asellidae	*Asellus aquaticus*	0	0	0	0	0	0	0	0	0	0	0	1	60	8	13	1	0	0
Mayflies																			
Baetidae	*Baetidae (juvenile/damaged)*	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
Baetidae	*Baetis sp.*	1	0	0	3	0	0	0	0	0	2	1	0	0	4	1	0	0	2
Baetidae	*Baetis rhodani/atlanticus*	3	3	0	0	0	0	0	0	0	1	1	0	0	6	1	1	6	0
Baetidae	*Cloeon dipterum*	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
Heptageniidae	*Heptageniidae (juvenile/damaged)*	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1
Heptageniidae	*Rhithrogena sp.*	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Heptageniidae	*Rhithrogena semicolorata*	0	2	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0
Heptageniidae	*Electrogena lateralis*	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heptageniidae	*Ecdyonurus sp.*	3	13	0	3	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Leptophlebiidae	*Leptophlebiidae (juvenile/damaged)*	0	0	0	1	1	0	11	0	0	0	0	0	0	0	0	0	0	14
Leptophlebiidae	*Leptophlebia sp.*	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae	*Leptophlebia marginata*	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae	*Paraleptophlebia sp.*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Leptophlebiidae	*Paraleptophlebia werneri*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Caenidae	*Caenis sp.*	0	0	0	0	0	3	37	0	0	0	0	0	0	0	0	0	0	0
Stoneflies																			
Nemouridae	*Nemouridae (juvenile/damaged)*	0	0	2	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0
Nemouridae	*Protonemura sp.*	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Nemouridae	*Protonemura meyeri*	110	9	0	0	0	0	0	4	25	12	0	0	0	0	0	0	7	0
Nemouridae	*Amphinemura sp.*	0	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0
Nemouridae	*Nemurella picteti*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemouridae	*Nemoura sp.*	0	0	3	2	0	0	0	2	0	0	0	1	0	0	0	0	0	0
Nemouridae	*Nemoura avicularis*	0	0	0	0	14	0	0	0	0	0	0	1	0	0	0	0	1	6

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Leuctridae	*Leuctridae (juvenile/damaged)*	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra sp.*	2	0	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra hippopus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra nigra*	0	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra fusca*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra moselyi*	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Perlodidae	*Perlodes mortoni*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perlodidae	*Isoperla grammatica*	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Chloroperlidae	*Siphonoperla torrentium*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Damselflies																			
Coenagrionidae	*Coenagrionidae (juvenile/damaged)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coenagrionidae	*Pyrrhosoma nymphula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Calopterygidae	*Calopteryx sp.*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Calopterygidae	*Calopteryx virgo*	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Dragonflies																			
Cordulegasteridae	*Cordulegaster boltonii*	1	0	0	1	9	0	0	5	0	2	0	0	0	0	0	0	0	0
Aeshnidae	*Anax imperator*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Libellulidae	*Sympetrum sp.*	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0
True bugs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corixidae	*Sigara sp.*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Corixidae	*Sigara scotti*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Beetles																			
Gyrinidae	*Orectochilus villosus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Dytiscidae	*Dytiscidae (larvae/damaged)*	0	0	1	0	0	0	11	0	0	0	0	0	1	0	0	0	1	1
Dytiscidae	*Graptodytes pictus*	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Hydrophilidae	*Helophorus sp.*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hydraenidae	*Hydraena sp.*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hydraenidae	*Hydraena gracilis*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydraenidae	*Hydraena testacea*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Dryopidae	*Dyops sp.*	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Scirtidae	*Scirtidae (larvae/damaged)*	0	2	0	2	0	0	0	0	1	3	0	0	0	0	0	0	2	0

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Elmidae	*Elmis aenea*	5	5	0	0	0	0	0	0	0	1	0	1	0	4	6	0	3	0
Elmidae	*Limnius volckmari*	21	1	0	1	1	0	0	0	0	3	2	0	1	0	0	0	1	6
Elmidae	*Oulimnius sp.*	0	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	0	0
Alderflies																			
Sialidae	*Sialidae (juvenile/damaged)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sialidae	*Sialis lutaria*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0
Caddisflies																			
Rhyacophilidae	*Rhyacophilidae (juvenile/damaged)*	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophilidae	*Rhyacophila sp.*	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Rhyacophilidae	*Rhyacophila dorsalis*	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Glossosomatidae	*Glossosomatidae (juvenile/damaged)*	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glossosomatidae	*Agapetus sp.*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Glossosomatidae	*Agapetus fuscipes*	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Philopotamidae	*Wormaldia sp.*	0	1	0	7	0	0	0	0	16	0	0	0	0	0	0	0	0	0
Philopotamidae	*Wormaldia occipitalis*	0	0	0	10	0	0	0	0	7	4	0	0	0	0	0	0	0	0
Polycentropodidae	*Polycentropodidae (juvenile/damaged)*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Polycentropodidae	*Plectrocnemia sp.*	0	0	0	0	0	0	0	6	5	0	0	0	0	0	0	0	0	0
Polycentropodidae	*Plectrocnemia conspersa*	0	0	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0
Polycentropodidae	*Polycentropus flavomaculatus*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Psychomyiidae	*Lype sp.*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Hydropsychidae	*Hydropsychidae (juvenile/damaged)*	0	3	0	1	0	0	0	2	4	0	0	0	0	0	0	0	0	0
Hydropsychidae	*Hydropsyche pellucidula*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsychidae	*Hydropsyche siltalai*	33	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Hydropsychidae	*Diplectrona felix*	0	0	0	20	0	0	0	4	38	0	0	0	0	0	0	0	6	0
Hydroptilidae	*Hydroptila sp.*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnephilidae	*Limnephilidae (juvenile/damaged)*	7	1	3	8	12	54	197	39	5	13	15	3	1	5	8	0	9	23
Limnephilidae	*Limnephilus sp.*	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnephilidae	*Potamophylax sp.*	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Limnephilidae	*Potamophylax latipennis*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Limnephilidae	*Micropterna lateralis*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnephilidae	*Micropterna sequax*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Beraeidae	*Beraeidae (juvenile/damaged)*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Beraeidae	*Beraea pullata*	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Beraeidae	*Beraea maurus*	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beraeidae	*Beraeodes minutus*	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Leptoceridae	*Oecetis sp.*	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptoceridae	*Oecetis testacea*	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goeridae	*Goera pilosa*	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Goeridae	*Silo sp.*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Goeridae	*Silo pallipes*	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostomatidae	*Crunoecia irrorata*	0	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0
Lepidostomatidae	*Lepidostoma hirtum*	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sericostomatidae	*Sericostomatidae (juvenile/damaged)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
Sericostomatidae	*Sericostoma personatum*	30	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
True flies																			
Chironomidae	*Chironomidae (damaged/pupea)*	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	*Tanypodinae*	0	0	9	1	6	0	2	14	0	3	1	1	1	1	9	0	1	9
Chironomidae	*Orthocladiinae*	22	0	3	2	8	3	2	3	20	7	0	4	0	3	4	0	13	20
Chironomidae	*Chironomini*	0	0	0	0	1	1	8	0	0	0	4	0	0	0	7	0	0	0
Chironomidae	*Tanytarsini*	2	0	26	0	1	0	0	2	15	3	0	2	0	1	49	0	3	42
Chironomidae	*Prodiamesinae*	0	0	0	0	0	0	0	0	0	1	0	1	0	0	4	0	1	0
Tipulidae	*Tipula sp.*	0	0	0	0	0	0	3	0	1	0	0	1	0	0	0	0	2	0
Pediciidae	*Pediciidae*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pediciidae	*Dicranota sp.*	0	0	1	2	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Limoniidae	*Limoniidae*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Limoniidae	*Eloeophila sp.*	0	0	1	2	0	0	0	1	0	0	0	3	0	0	0	0	0	4
Limoniidae	*Neolimnomya sp.*	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Simuliidae	*Simuliidae (damaged/juvenile)*	2	0	0	0	0	0	0	0	1	0	0	1	0	5	0	0	0	1
Simuliidae	*Simulium sp.*	0	0	0	1	9	0	0	0	1	16	1	0	0	0	0	1	4	0
Simuliidae	*Simulium ornatum group*	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Dixidae	*Dixella sp.*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Psychodidae		0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2

Family	Species	1B	1E	1F	1G	1H	1IA	1IB	1J	1L	3A	3AA	3AB	3AC	3AD	3AE	3AF	3B	3C
Empididae		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae		1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
Tabanidae		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Athericidae	*Ibisia marginata*	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Taxa																			
Collembola		0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Petromyzonidae		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Coleoptera	*Coleoptera sp.*	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Diptera	*Diptera sp.*	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Family	Species	3-Church	3D	3E	3G	3H	3-Ja	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
Flatworms																		
Planariidae	*Polycelis* sp.	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0
Planariidae	*Polycelis felina*	0	0	0	3	0	7	0	2	0	0	0	0	5	5	0	8	0
Planariidae	*Phagocata vitta*	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Snails																		
Lymnaeidae	*Stagnicola* sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lymnaeidae	*Ampullaceana balthica*	0	0	0	4	0	0	0	0	2	2	0	0	0	0	0	0	0
Hydrobiidae	*Potamopyrgus antipodarum*	0	2	49	60	17	29	0	33	90	0	50	0	0	0	100	0	0
Succineidae	*Succinea* sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Planorbidae	*Planorbis planorbis*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Limpets and mussels																		
Anyclidae	*Ancylus fluviatilis*	1	0	1	3	1	1	8	3	6	0	0	0	41	0	0	0	0
Sphaeriidae	Sphaeriidae (juvenile/damaged)	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0
Sphaeriidae	*Sphaerium* sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Sphaeriidae	*Pisidium/Euglesa/Odhneripisidium*	2	0	0	1	1	16	0	0	2	800	6	0	0	4	15	2	0
Worms																		
Oligochaeta	Oligochaeta	0	34	9	40	8	10	6	5	17	10	4	2	3	8	8	13	1
Leeches																		
Glossiphoniidae	*Glossiphonia complanata*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erpobdellidae	Erpobdellidae (juvenile/damaged)	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Erpobdellidae	*Erpobdella* sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mites																		
Hydracarina	Hydracarina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Oribatei	Oribatei	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Crustaceans																		
Ostracoda		0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	1	0
Gammaridae	*Gammarus pulex/fossarum agg.*	0	0	0	0	0	2	0	0	15	0	2	0	42	55	0	4	0
Gammaridae	*Gammarus pulex*	0	0	0	0	0	0	0	0	25	75	1	0	89	26	0	4	9
Crangonyctidae	*Crangonyx floridanus/pseudogracilis*	0	1	1	1	1	16	0	0	0	75	0	0	0	0	0	0	0
Mayflies																		
Baetidae	Baetidae (juvenile/damaged)	0	0	2	7	0	2	0	0	0	0	0	0	0	0	2	0	0
Baetidae	*Baetis* sp.	0	3	1	0	1	0	2	1	0	0	0	0	6	4	0	0	0
Baetidae	*Baetis rhodani/atlanticus*	14	3	11	7	31	3	4	43	3	0	0	0	16	7	0	0	0
Baetidae	*Alainites muticus*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species	3-Church	3D	3E	3G	3H	3-Ja	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
Heptageniidae	Heptageniidae (juvenile/damaged)	0	0	0	0	0	0	4	3	0	0	0	0	2	0	0	0	0
Heptageniidae	*Rhithrogena* sp.	0	2	0	0	39	0	0	4	0	0	0	0	10	0	0	0	0
Heptageniidae	*Rhithrogena semicolorata*	8	0	3	15	0	0	16	0	1	0	0	0	0	0	0	0	0
Heptageniidae	*Ecdyonurus* sp.	0	1	1	14	8	0	10	15	5	0	0	0	108	0	0	0	0
Leptophlebiidae	Leptophlebiidae (juvenile/damaged)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Leptophlebiidae	*Paraleptophlebia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Caenidae	*Caenis rivulorum*	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stoneflies																		
Nemouridae	Nemouridae (juvenile/damaged)	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Nemouridae	*Protonemura* sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Nemouridae	*Protonemura meyeri*	20	0	3	1	6	0	13	15	22	0	0	0	8	0	1	0	0
Nemouridae	*Amphinemura* sp.	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Nemouridae	*Nemurella picteti*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Nemouridae	*Nemoura* sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0
Nemouridae	*Nemoura avicularis*	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Leuctridae	Leuctridae (juvenile/damaged)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Leuctridae	*Leuctra* sp.	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	5	0
Leuctridae	*Leuctra nigra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	4
Leuctridae	*Leuctra fusca*	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perlodidae	*Perlodes mortoni*	0	0	0	4	2	0	3	2	2	0	0	0	5	0	0	0	0
Perlodidae	*Isoperla grammatica*	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
Chloroperlidae	*Siphonoperla torrentium*	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Damselflies																		
Coenagrionidae	*Pyrrhosoma nymphula*	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0
Dragonflies																		
Cordulegasteridae	*Cordulegaster boltonii*	1	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0
True bugs																		
Gerridae	*Aquarius najas*	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veliidae	*Velia* sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Corixidae	*Corixa panzeri*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beetles																		
Haliplidae	*Haliplus sibiricus*	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Dytiscidae	Dytiscidae (larvae/damaged)	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Dytiscidae	*Oreodytes sanmarki*	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
Dytiscidae	*Agabus bipustulatus*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Family	Species	3-Church	3D	3E	3G	3H	3-Ja	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
Hydraenidae	*Hydraena* sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Hydraenidae	*Hydraena gracilis*	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Dryopidae	Dryopidae (larvae/damaged)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Scirtidae	Scirtidae (larvae/damaged)	4	0	0	0	0	0	0	13	4	0	0	0	2	3	0	8	0
Elmidae	*Elmis aenea*	1	0	0	2	0	1	0	1	11	0	0	0	30	0	1	8	2
Elmidae	*Esolus parallelepipedus*	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Elmidae	*Limnius volckmari*	1	0	0	6	3	2	0	0	4	0	0	0	28	0	0	0	1
Caddisflies																		
Rhyacophilidae	Rhyacophilidae (juvenile/damaged)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophilidae	*Rhyacophila* sp.	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0
Rhyacophilidae	*Rhyacophila dorsalis*	0	0	0	0	0	0	2	1	0	0	0	0	2	1	0	0	0
Glossosomatidae	Glossosomatidae (juvenile/damaged)	0	0	50	0	51	0	0	1	0	0	0	0	10	0	0	0	0
Glossosomatidae	*Glossosoma boltoni*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Glossosomatidae	*Agapetus* sp.	0	0	0	4	0	1	0	0	1	0	0	0	0	0	0	0	2
Philopotamidae	*Philopotamus montanus*	0	0	0	0	0	0	4	3	0	0	0	0	0	0	0	0	1
Philopotamidae	*Wormaldia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Philopotamidae	*Wormaldia occipitalis*	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycentropodidae	*Plectrocnemia* sp.	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Polycentropodidae	*Plectrocnemia conspersa*	0	0	0	0	0	1	0	0	0	0	0	5	0	0	0	0	0
Polycentropodidae	*Plectrocnemia geniculata*	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psychomyiidae	*Metalype fragilis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Hydropsychidae	Hydropsychidae (juvenile/damaged)	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Hydropsychidae	*Hydropsyche* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Hydropsychidae	*Hydropsyche pellucidula*	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	0
Hydropsychidae	*Hydropsyche siltalai*	3	0	1	1	4	0	12	5	1	0	0	0	2	0	1	0	0
Hydropsychidae	*Diplectrona felix*	9	0	0	0	0	41	0	0	2	0	0	6	0	0	0	45	50
Limnephilidae	Limnephilidae (juvenile/damaged)	5	18	1	16	3	1	5	0	6	2	1	0	40	1	9	0	12
Limnephilidae	*Potamophylax* sp.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Limnephilidae	*Potamophylax cingulatus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Limnephilidae	*Micropterna sequax*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Limnephilidae	*Chaetopteryx villosa*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Beraeidae	*Beraea pullata*	0	0	0	0	0	3	0	0	2	9	0	0	0	2	0	0	0
Beraeidae	*Beraea maurus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Odontoceridae	*Odontocerum albicorne*	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0

Family	Species	3-Church	3D	3E	3G	3H	3-Ja	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
Leptoceridae	*Mystacides* sp.	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Leptoceridae	*Oecetis testacea*	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goeridae	*Goera pilosa*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Goeridae	*Silo* sp.	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Goeridae	*Silo pallipes*	0	0	6	2	7	0	1	12	6	0	0	0	16	0	4	0	0
Lepidostomatidae	Lepidostomatidae (juvenile/damaged)	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostomatidae	*Crunoecia irrorata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Lepidostomatidae	*Lepidostoma hirtum*	0	0	0	3	12	0	1	9	0	0	0	0	0	0	0	0	0
Sericostomatidae	Sericostomatidae (juvenile/damaged)	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
Sericostomatidae	*Sericostoma personatum*	4	0	6	7	2	1	10	2	1	0	0	0	0	0	0	0	0
True flies																		
Chironomidae	Chironomidae (damaged/pupea)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Chironomidae	Tanypodinae	0	1	0	0	0	15	0	0	0	11	0	0	0	25	0	2	0
Chironomidae	Orthocladiinae	1	1	0	0	5	16	3	10	2	5	3	58	3	0	2	2	8
Chironomidae	Chironomini	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Chironomidae	Tanytarsini	1	0	0	0	0	12	0	0	1	20	0	1	0	0	0	3	1
Chironomidae	Prodiamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Chironomidae	Diamesinae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Tipulidae	*Tipula* sp.	1	0	0	0	0	1	0	0	7	5	0	0	0	0	0	0	1
Pediciidae	*Pedicia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Pediciidae	*Dicranota* sp.	1	0	0	0	0	0	0	0	0	0	0	2	5	0	0	1	0
Limoniidae	Limoniidae	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Limoniidae	*Eloeophila* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Simuliidae	Simuliidae (damaged/juvenile)	0	0	0	0	0	2	0	1	0	0	0	0	5	1	0	8	7
Simuliidae	*Simulium* sp.	4	0	0	0	0	4	1	0	0	0	0	0	1	0	0	0	0
Simuliidae	*Simulium ornatum* group	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixidae	*Dixa* sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Psychodidae		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Empididae		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ceratopogonidae		0	0	0	0	0	1	0	0	0	4	0	1	0	2	0	0	0
Tabanidae		0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Athericidae	Athericidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Athericidae	*Ibisia marginata*	0	0	1	3	0	0	0	0	0	0	0	0	0	0	1	0	0
Other Taxa																		
Collembola		0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0

Family	Species	3-Church	3D	3E	3G	3H	3-Ja	3K	3M	3N	3P	3Q	3Q-A	3R	3R-A	3V	3X	3Y
Tricladida	Tricladida sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Coleoptera	Coleoptera sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix E Macrophyte taxa list

Table A-5 - Water Framework Directive boundary values for macrophytes in rivers

Ecological Quality Ratio (EQR)	WFD ecological status for macrophytes
≥ 0.80	High
≥ 0.60	Good
≥ 0.40	Moderate
≥ 0.20	Poor
< 0.20	Bad

Table A-6 - Macrophyte taxa list and associated cover values

Taxa	Common name	Nant yr Efail 1	Nant yr Efail 2	Crossing at Afon Dwyfach	Crossing at Afon Dwyfor	Crossing at Afon Crychddwr	Crossing at Unnamed trib. of Afon Llyfni	Crossing at Afon Llifon
Callitriche brutia subsp. Hamulata	Intermediate water-starwort				C1			
Callitriche sp.	Starwort						C3	
Chiloscyphus polyanthos/pallescens	St. Winifrid's Moss/Pale Liverwort				C1	C1		
Conocephalum conicum	Great scented liverwort				C1			
Equisetum fluviatile	Water horsetail							C1
Fontinalis antipyretica	Greater water-moss			C3	C6	C4		C4
Fontinalis squamosa	Alpine water-moss				C6	C3		C3
Heloscadium nodiflorum	Fool's watercress					C1	C6	C2

Hygroamblystegium fluviatile	Brookside Feather-moss		C 2		C 1	C1		
Hylocomium splendens	Glittering Wood-moss		C 2					
Hyocomium armoricum	Flagellate Feather-moss					C 1		
Impatiens glandulifera	Himalayan balsam				C1	C2	C1	C 1
Iris pseudocorus	Yellow-flag iris						C2	
Juncus effusus	Soft rush					C2	C5	
Lemna gibba	Fat duckweed						C2	
Marsupella emarginata var. aquatica	Notched Rustwort		C2					
Mentha sp.	Water mint				C1			C2
Mnium hornum	Swan's-neck Thyme-moss					C1		
Mnium marginatum	Bordered Thyme-moss					C1		
Myosotis laxa	Tufted forget-me-not						C2	
Myriophyllum alterniflorum	Alternate water-milfoil			C2	C5			
Oenanthe crocata	Water-hemlock				C2			C1
Pellia epiphylla	Overleaf Pelia		C2			C1		
Pellia sp.	Pelia		C2	C1	C1			
Persecaria hydropiper	Water pepper				C1		C2	
Phalaris arundinacea	Reed canary grass				C2			
Ranunculus flammula	Lesser spearwort					C1		
Scapania undulata	Water Earwort		C1					
Sparganium erectum	Branched bur-reed						C3	
Sphagnum subnitens var. subnitens	Lustrous Bog-moss	C4						
Voucheria	Blanketweed				C2			

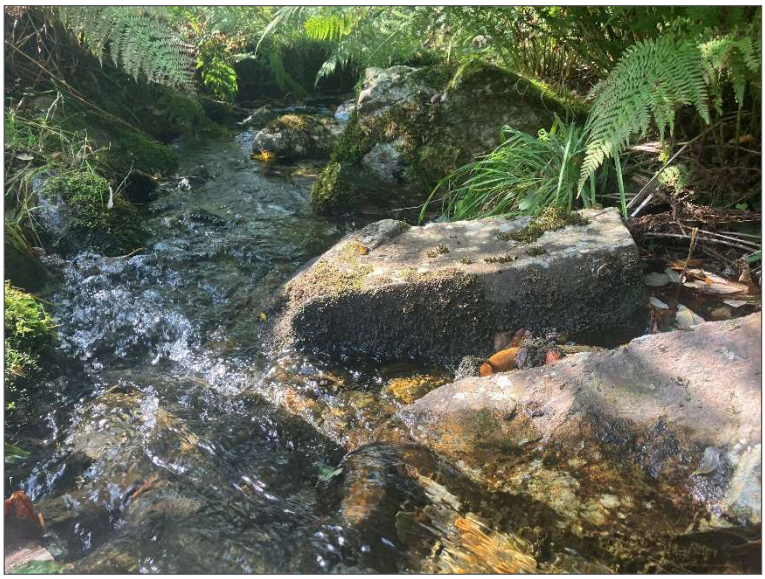
Appendix F Fish Survey Data

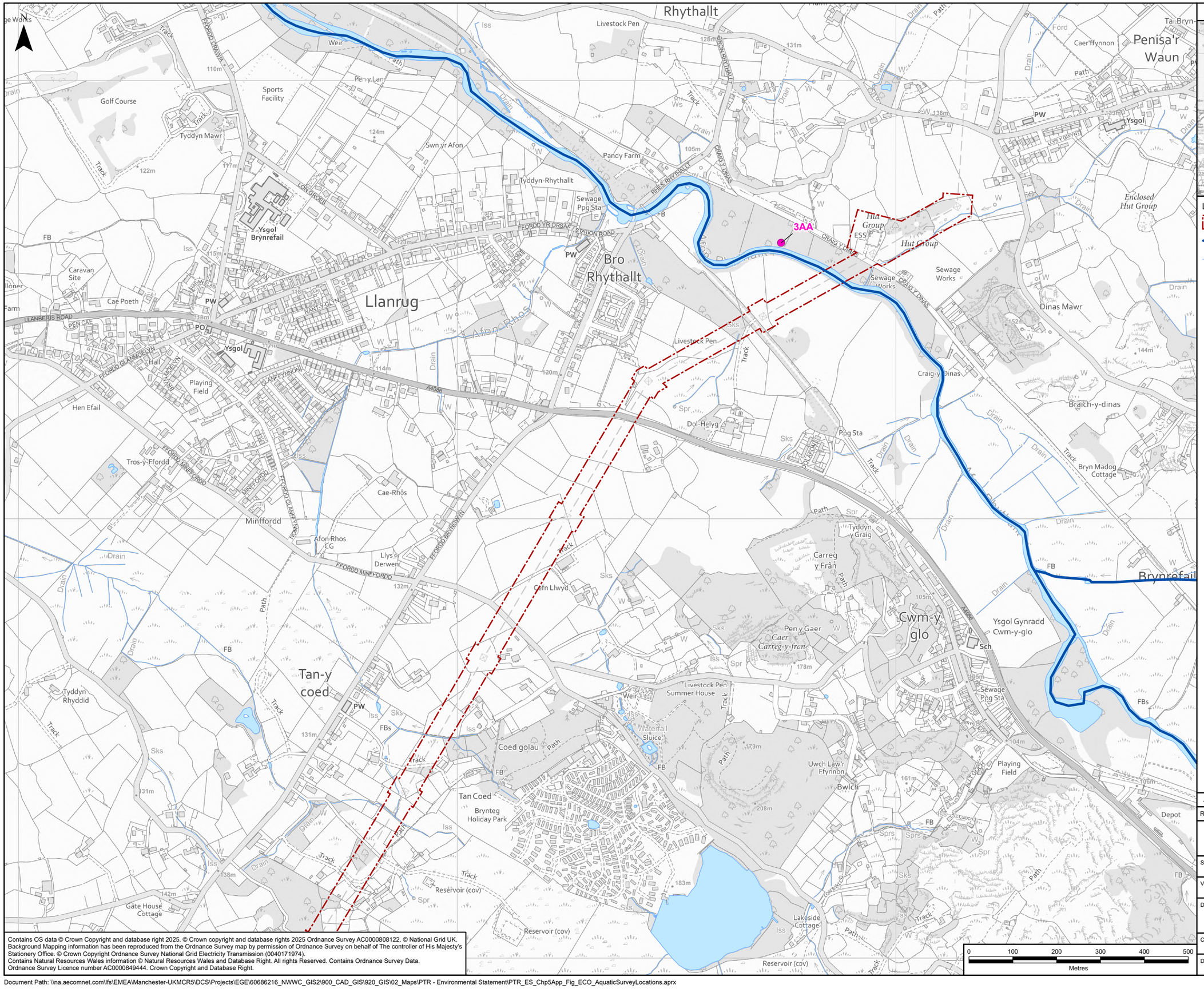
Site	Start NGR	End NGR	Common name	Scientific name	Fork length (mm)			
Nant yr el fail 2	SH 62602 37892	SH 62588 37880	Brown Trout	*Salmo trutta*	145	128		
			European Eel	*Anguilla anguilla*	189			
Afon Llifon	SH 49141 55796	SH 49172 55802	Brown Trout	*Salmo trutta*	154	104	111	52
					119	145	52	70
					64	68	86	122
					64	132	129	50
					140	129	69	119
					74	108	117	155
					46	80	126	64
					68	119	98	148
					162	131	91	67
					99	104		
			European Eel	*Anguilla anguilla*	312	124		
Crychddwr	SH 47120 51307	SH 447150 51297	Brown Trout	*Salmo trutta*	115	70	117	127
					122	64	58	78
					114	56	97	
			European Eel	*Anguilla anguilla*	150	250	404	387
					268			

Site	Start NGR	End NGR	Common name	Scientific name	Fork length (mm)			
Afon Dwyfor	SH 49261 41097	SH 49245 41165	Brown Trout	*Salmo trutta*	85	102	158	85
					100	105	100	70
					85	90	100	90
					75	90	82	85
					87	73	85	
			Salmon	*Salmo salar*	97	87	90	90
					80	90	85	
			European Eel	*Anguilla anguilla*	194	294	265	
					225	204	194	
			Lamprey	*Lampetra species*	110	60	70	80
					100			

Appendix G Plates

Plate	Photo	Description
Plate 1		Afon Crychddwr fish survey site
Plate 2		Afon Llifon fish survey site

Plate	Photo	Description
Plate 3		*Adon Dwyfor* fish survey site.
Plate 4		*Nant yr Efail 2 fish survey site*



WIDER WORKS ROUTE LEGEND

Legend

- ▭ Indicative Wider Works Site Boundary
- ━ Main River
- ─ Ordinary Watercourse
- ● Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title:
FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:8,000	A3	1 OF 19	A

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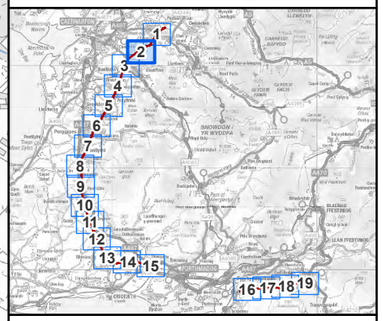
3X
3Y

WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
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3X
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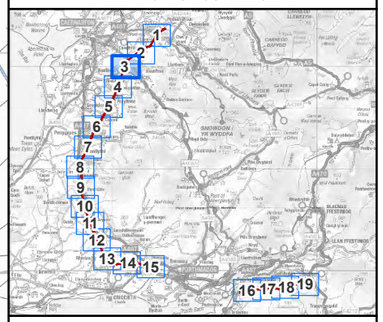
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

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WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

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MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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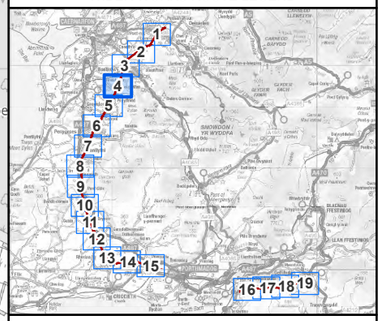
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

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WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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RHOSGADFAN

N

3R - a

3R

Afon Llifon

Afon Llifon

Penyffridd

Carmel

WIDER WORKS ROUTE LEGEND

Legend

- Indicative Wider Works Site Boundary
- Ordinary Watercourse
- Macrophyte Survey Location
- Macroinvertebrate Survey Location
- Electric Fishing Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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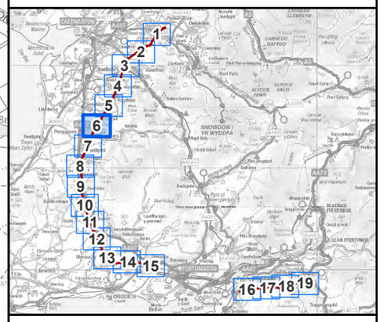

Legend

- Indicative Wider Works Site Boundary
- Ordinary Watercourse

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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Ysgol
Plas Silyn
Pant-du-bach
Turnpike
Talysarn
Bryn Dyffryn
Coed-Madoc Farm
Bodriala
Pit (dis)
Seymour House
Ty'n-y-weirglodd
Cae'r Odyn
Ystad Ddiwydiannol Penygroes
Caer Engan
Enclosure
Tan-y-bryn
Bryn-Castell
Gwynfaes Bungalow
Workings (dis)
Livestock Pen
Tanyrallt
Taldrwst Farm
Tyn Llan
Recreation Ground
Rhôs-yr-Unman
Dôl-Gau
Coed Cae Bach
Llanllyfni
Hendre-Forion
Anialwch
Pen-rhôs
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Cae Mawr
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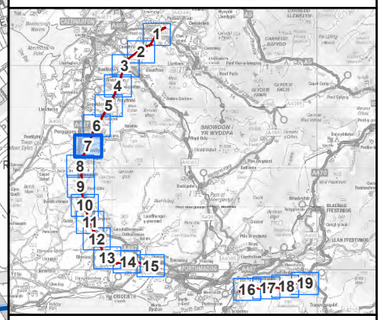

Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macrophyte Survey Location
- Macroinvertebrate Survey Location
- Electric Fishing Survey Location
- Fish Habitat Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:8,000	A3	7 OF 19	A

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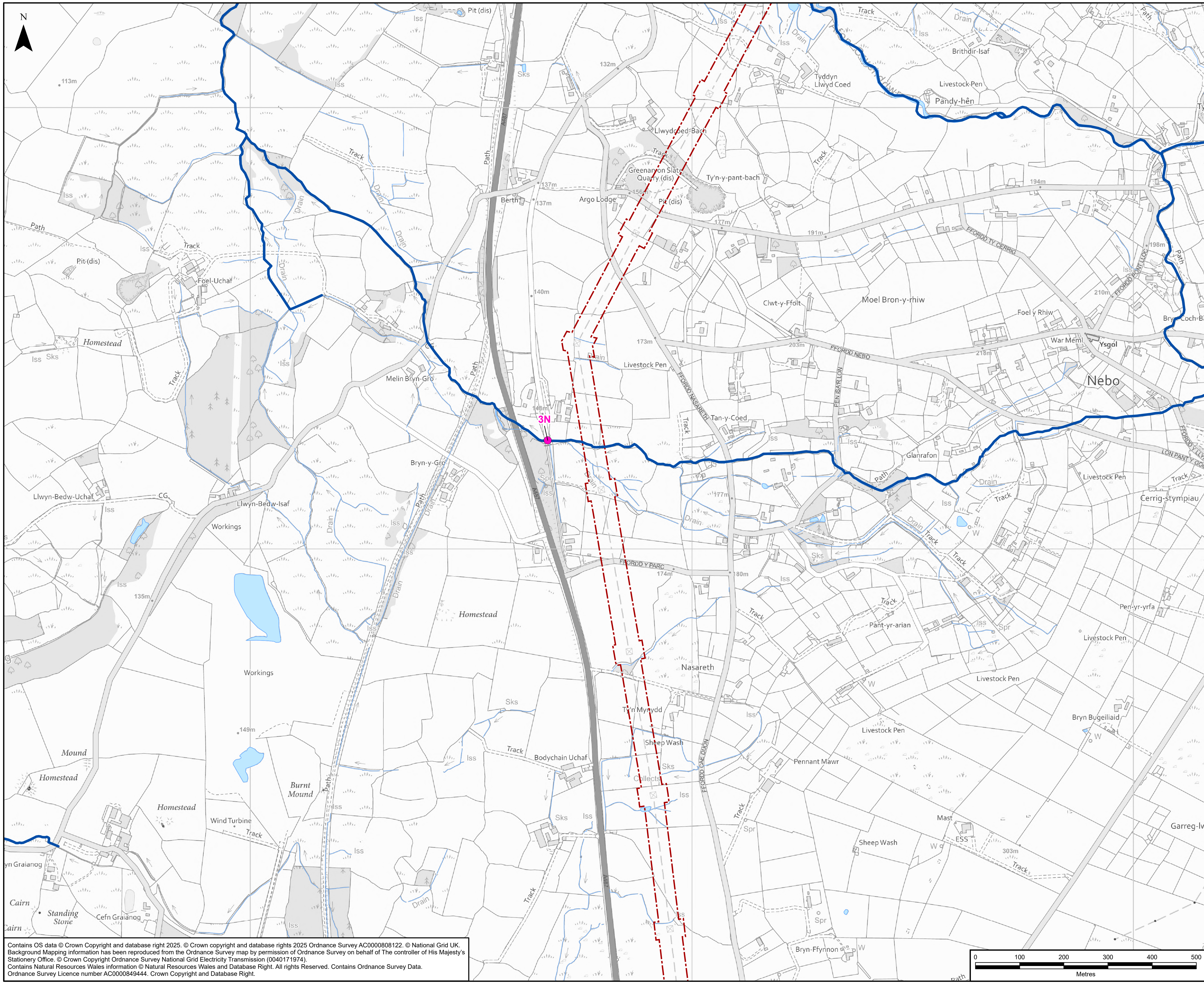

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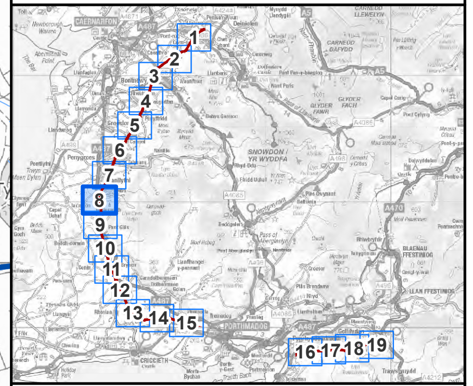

Legend

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- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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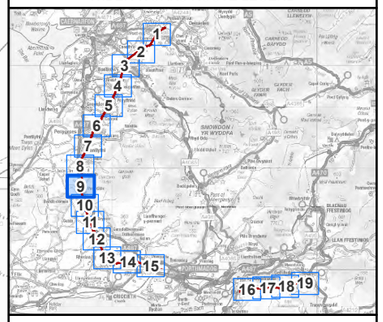

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- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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FIGURE	1:8,000	A3	9 OF 19	A

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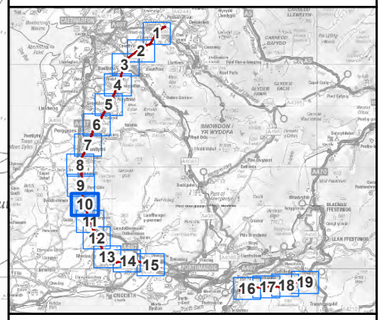

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- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title:
FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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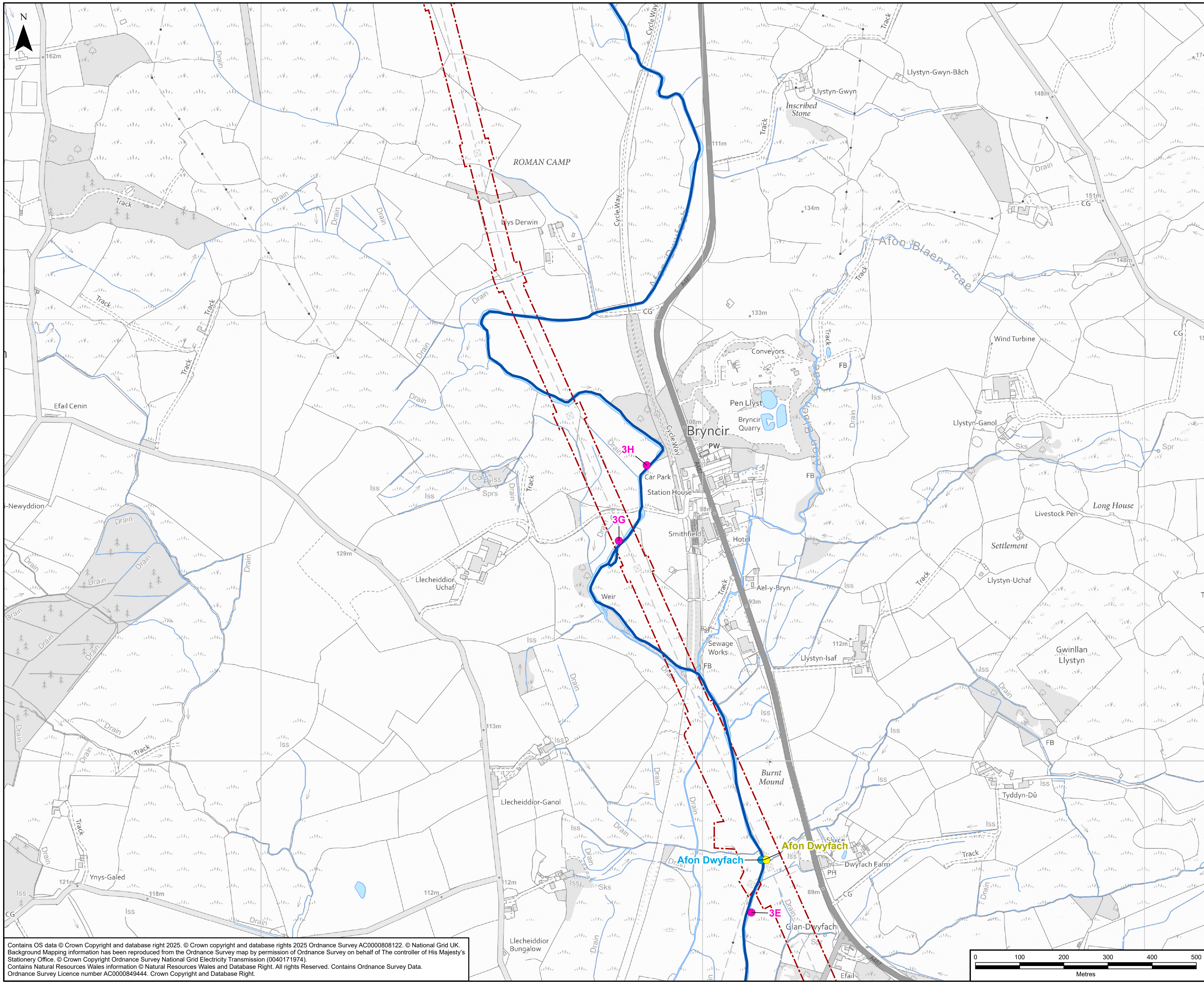

WIDER WORKS ROUTE LEGEND

Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macrophyte Survey Location
- Macroinvertebrate Survey Location
- Fish Habitat Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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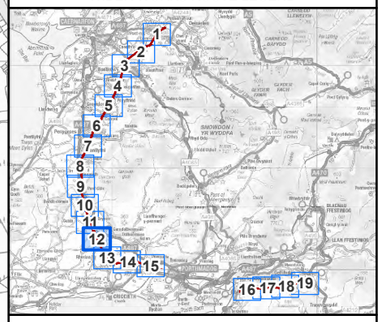

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- Main River
- Ordinary Watercourse
- Macrophyte Survey Location
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- Fish Habitat Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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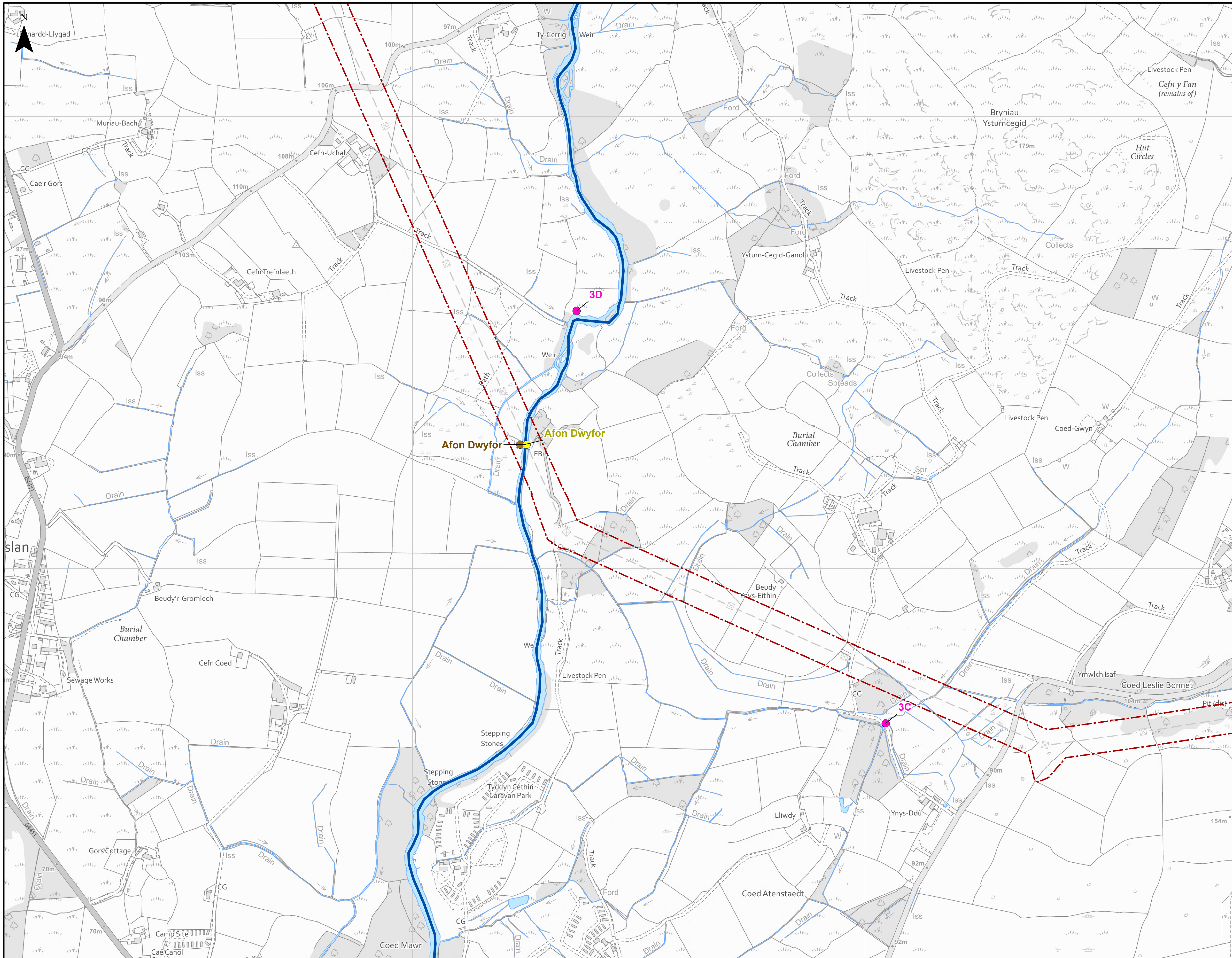

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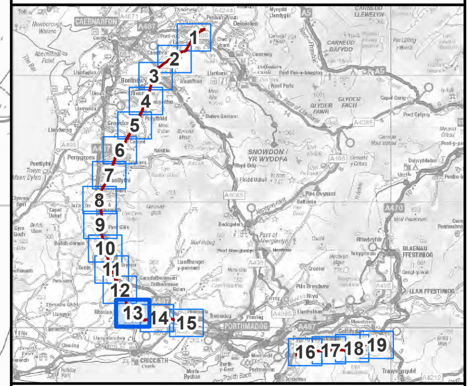

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- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macrophyte Survey Location
- Macroinvertebrate Survey Location
- Electric Fishing Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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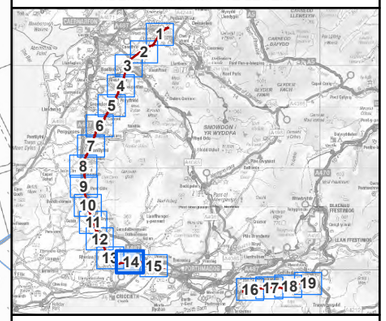

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- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

3B

3C

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

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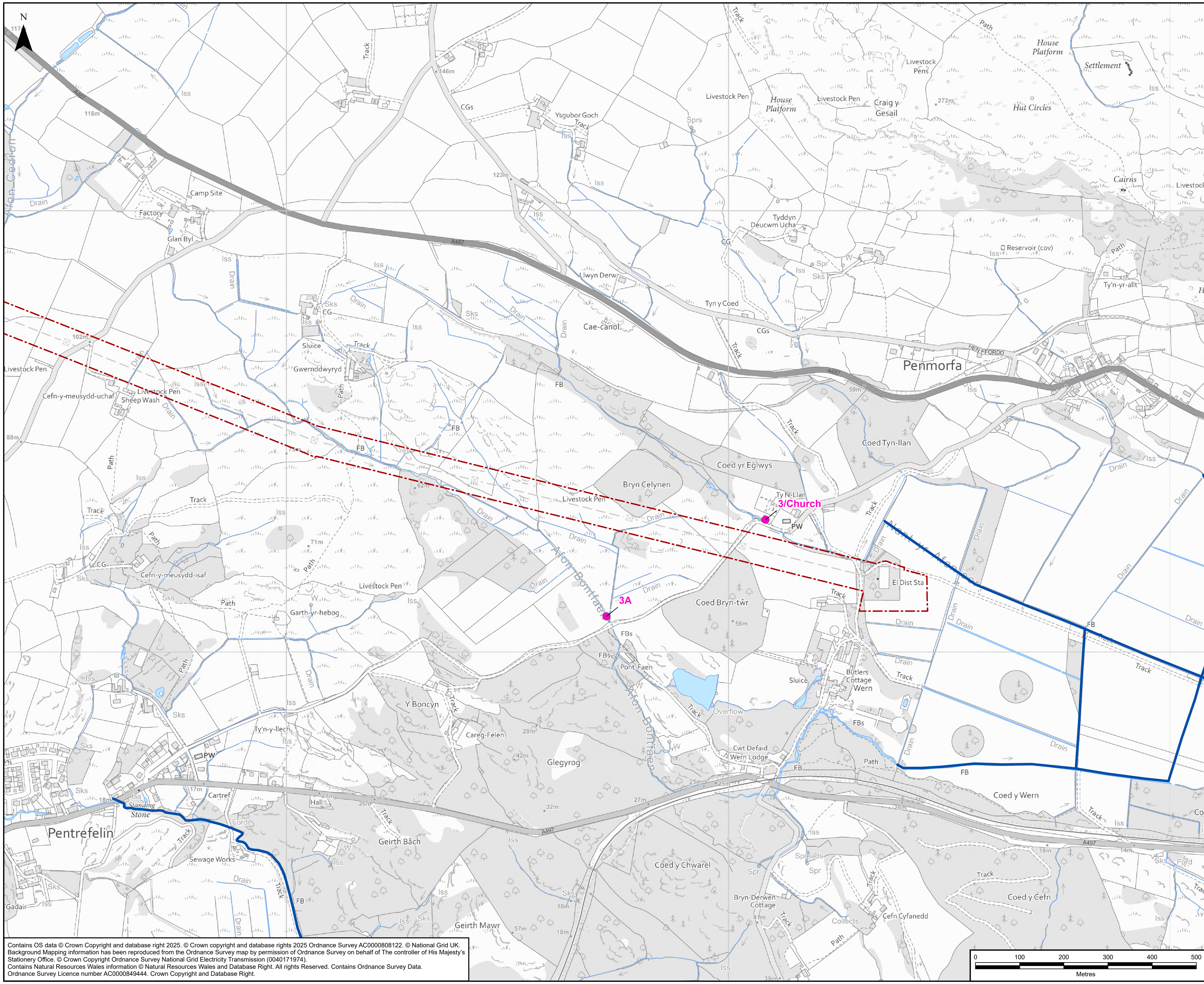

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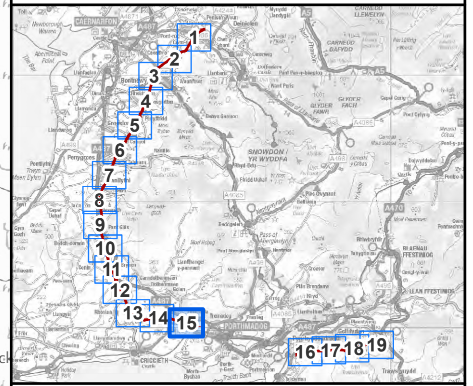

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- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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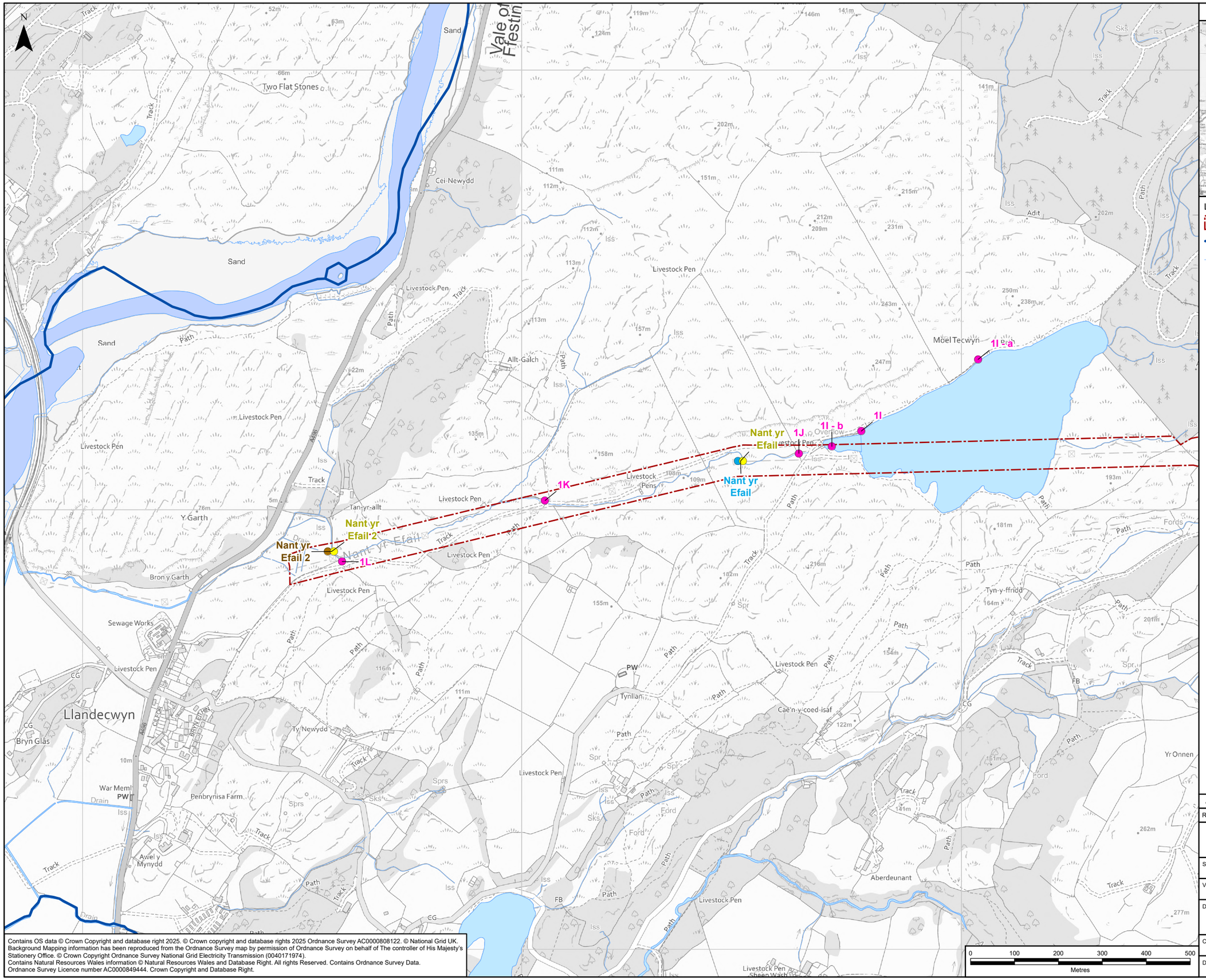

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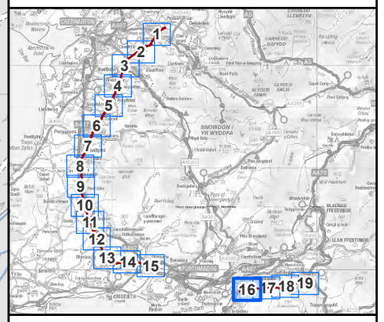

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- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macrophyte Survey Location
- Macroinvertebrate Survey Location
- Electric Fishing Survey Location
- Fish Habitat Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:8,000	A3	16 OF 19	A

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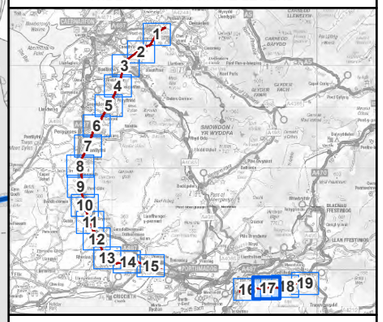

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- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.B.1
AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:8,000	A3	17 OF 19	A

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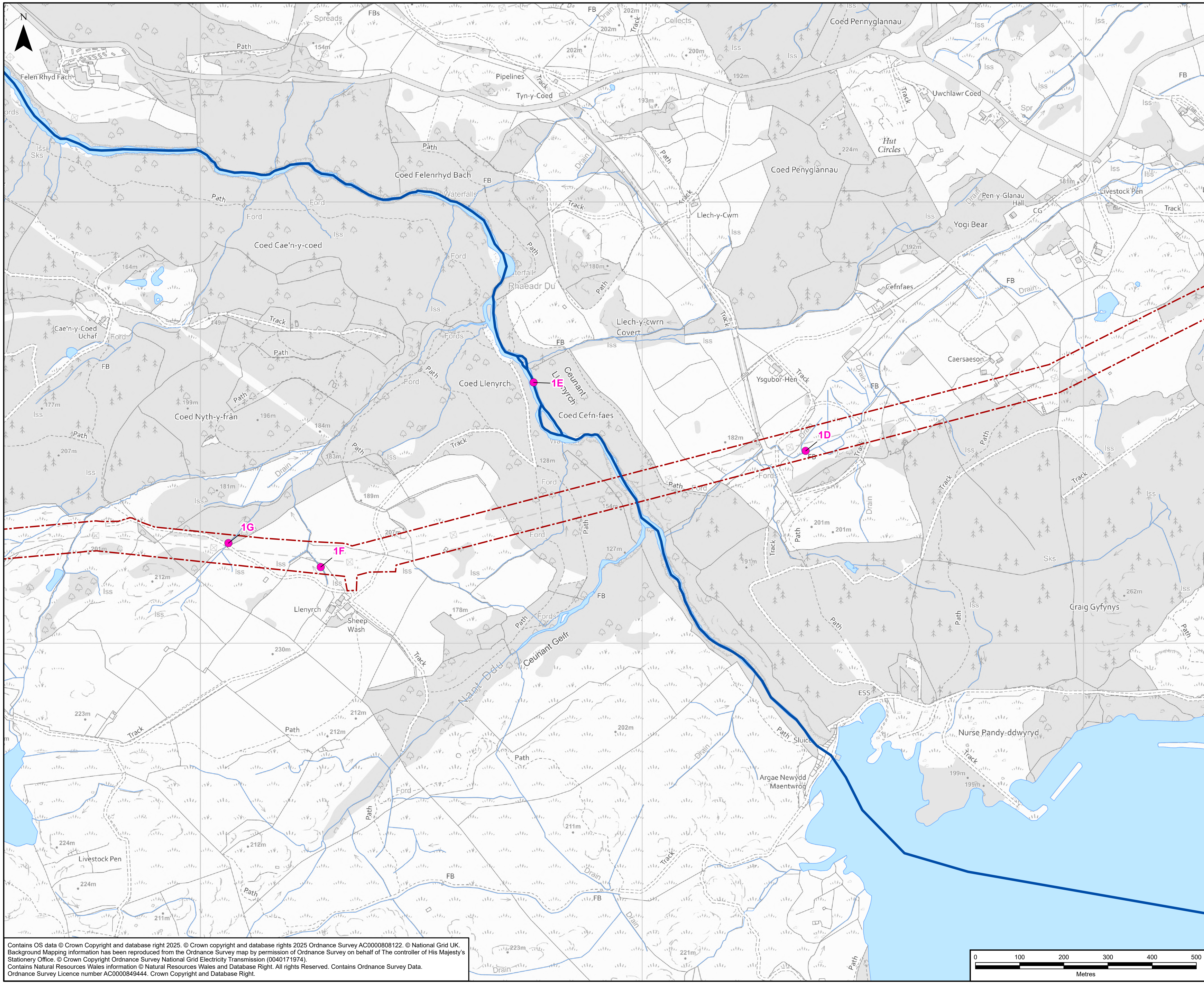

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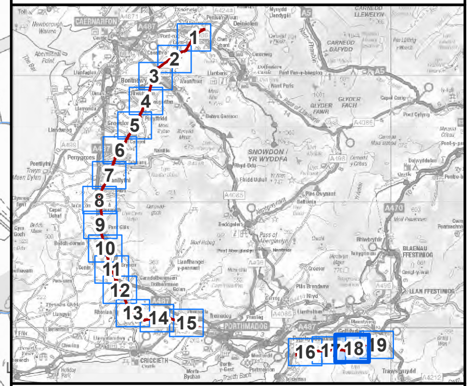


Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

Rev	Date	Description	GIS	Chk	App
A	17/08/2025	Environmental Statement	MH	RC	JS

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

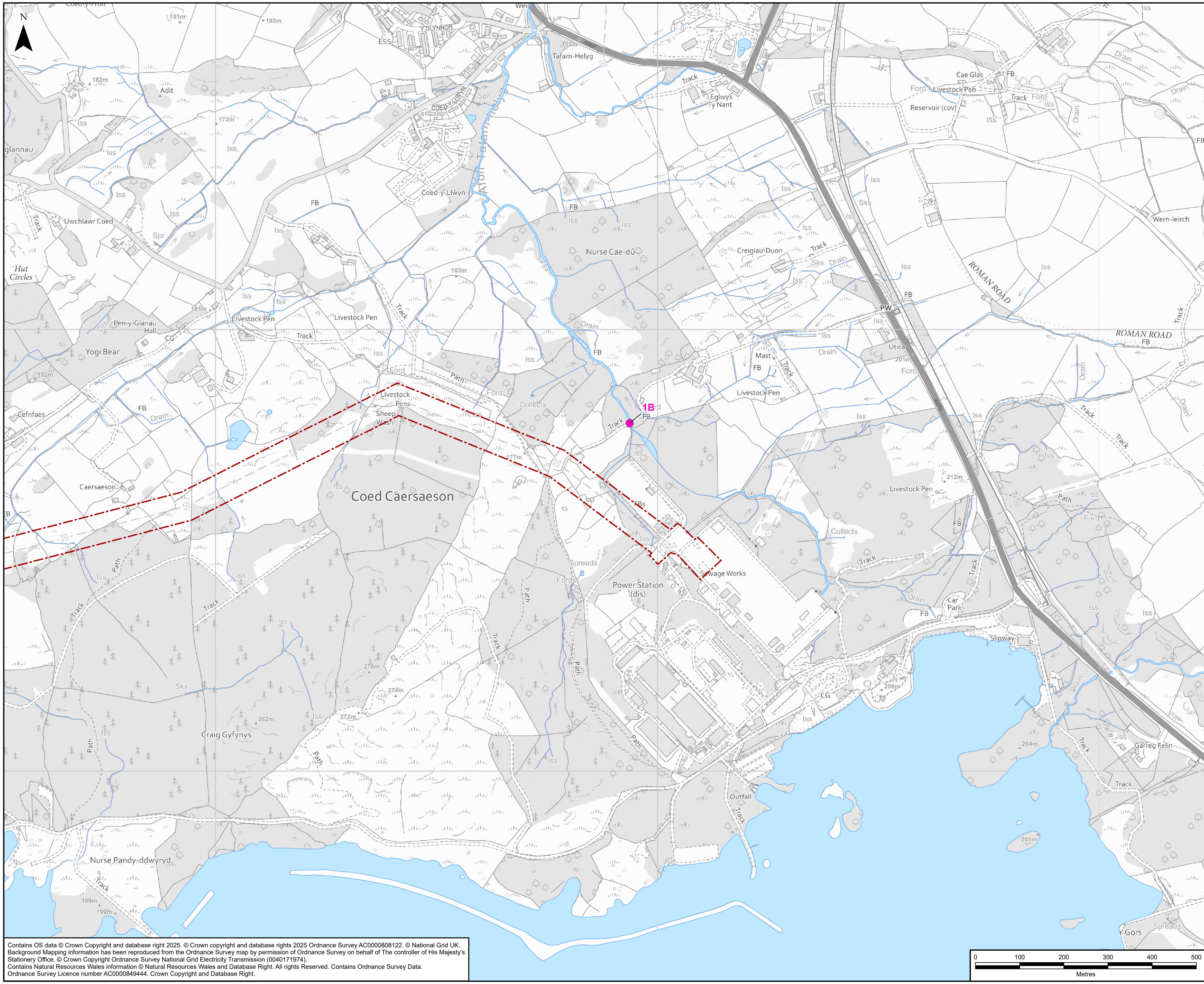
Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	17/08/2025	RC	17/08/2025	JS	17/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:8,000	A3	18 OF 19	A

Document Path: \\na.aecomnet.com\lfs\EMEA\Manchester-UKMCR5\DCS\Projects\EGE\60686216_NWWC_GIS2\900_CAD_GIS\920_GIS\02_Maps\PTR - Environmental Statement\PTR_ES_Chp5App_Fig_ECO_AquaticSurveyLocations.aprx



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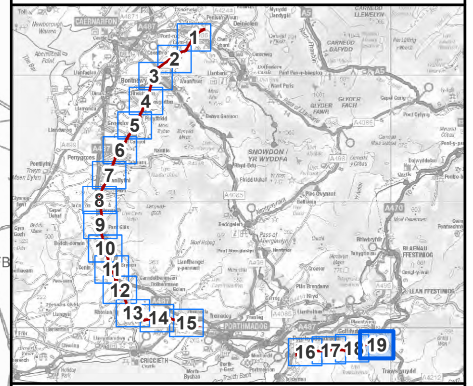

Legend

- Indicative Wider Works Site Boundary
- Main River
- Ordinary Watercourse
- Macroinvertebrate Survey Location

A	17/08/2025	Environmental Statement	MH	RC	JS
Rev	Date	Description	GIS	Chk	App

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.B.1 AQUATIC SURVEY LOCATIONS

Creator: MH	Date: 17/08/2025	Checker: RC	Date: 17/08/2025	Approver: JS	Date: 17/08/2025
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6.5.C Wider Works Bat Survey Report

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Contents

1. Introduction

1.1 Introduction

1.1.1 This report has been prepared on behalf of National Grid Electricity Transmission plc (NGET) who seek to construct and operate the Pentir to Trawsfynydd Reinforcement Project (the 'Project').

1.1.2 This report concerns the section of the Project relating to Wider Works (the proposed works) and is a Technical Appendix to the Environmental Statement (ES) **Volume 6, Chapter 5: Likely Significant Effects** being submitted as part of the Environmental Impact Assessment (EIA), which accompanies the consent applications for the Project.

1.2 Project Description

1.2.1 This report of the ES covers the Wider Works elements comprising**:**

- Installation of approximately 23.5 kilometres (km) of fibre optic cable along the existing 4ZC overhead line between Tower 4ZC070 and 4ZC140.
- Reconductoring of the left circuit between Tower 4ZC005 to 4ZC027 and Tower 4ZC044 and 4ZC070.

1.3 Introduction to the Bat Survey Report

1.3.1 Baseline information was obtained through desk-based assessments and field surveys, comprising Ground Level Tree Assessments (GLTA) and Night-time Bat Walkovers (NBW), undertaken in the Survey Area in 2024. This report details the approach and findings of bat surveys undertaken in the Wider Works element of the Project and has been prepared for NGET. Baseline data presented in this document has been used to inform the assessment in the ES **Volume 6, Chapter 5: Likely Significant Effects** This report is supported by the following figures:

- **Figure 6.5.C.1**: Relevant Designated Sites for Bats.
- **Figure 6.5.C.2**: Bat Species Desk Study Records.
- **Figure 6.5.C.3**: Bat Roost Suitability of Trees.
- **Figure 6.5.C.4**: Night-Time Bat Walkover & Automated Bat Detector Location.

1.3.2 This report refers to the relevant wildlife legislation summarised in **Section 2**.

1.4 Objectives

1.4.1 This report of the survey work undertaken in 2024:

- Outlines the legislation and guidance relevant to bats;
- Presents desk study information, such as existing records of bats in 2 km of the Wider Works site, internationally designated sites for bats up to 30 km from the

Wider Works site, and nationally designated sites for bats up to 5 km from the Wider Works site;

- Presents existing records of bat species from the last 10 years up to 2 km from the Wider Works site, using data provided by Cofnod, which was obtained and updated most recently in November 2024;
- Identifies habitats and features in the Wider Works site that have the potential to be used by bats;
- Presents the results of Ground Level Tree Assessments (GLTAs) undertaken in the Wider Works site; and
- Summarises the results of NBW and automated bat detector surveys conduction between July and September 2024.

1.4.2 Recommendations for avoidance, mitigation and enhancement for bats are provided within ES **Volume 6, Chapter 5: Likely Significant Effects**

2. Legislation and Policy

2.1 Introduction

2.1.1 This section lists the legislation, planning policy framework and guidance that is relevant to bats.

2.1.2 More detailed information can be found in **Volume 8, Appendix 1.1.A: Legislation, Policy and Guidance**.

2.2 Legislation

2.2.1 All UK bat species are protected under Regulation 43 of the Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 2.1). This makes it an offence to deliberately capture, injure or kill a bat; deliberately disturb a bat; or damage or destroy a breeding site or resting place used by a bat.

2.2.2 Deliberate capture or killing is taken to include "accepting the possibility" of such capture or killing. Deliberate disturbance of bats includes, in particular, any disturbance that is likely a) to impair their ability (i) to survive, to breed or reproduce, or to rear or nurture their young, or to hibernate or migrate; or b) to affect significantly the local distribution or abundance of the species of bat to which the individuals belong.

2.2.3 Lower levels of disturbance not covered by the Conservation of Habitats and Species Regulations 2017 (as amended) remain an offence under the Wildlife and Countryside Act 1981 (as amended) (Ref 2.2), as it is an offence to recklessly disturb, injure, or kill bats, or damage their roosts, although a defence is available where such actions are the incidental result of a lawful activity that could not reasonably be avoided.

2.2.4 A bat roost is defined as being "any structure or place that is used for shelter or protection", and since bats regularly move roost site throughout the year, a roost is protected whether or not bats are present at the time.

2.2.5 It is illegal to carry out work affecting bats or their roosts if that work would result in one of the above offences. Licences to permit otherwise illegal activities relating to bats and their roost sites can be issued for specific purposes and by the relevant licensing authority, which in Wales is Natural Resources Wales (NRW). European Protected Species Mitigation Licences (EPSMLs) are issued under the Conservation of Habitats and Species Regulations 2017 (as amended). It is an offence not to comply with the terms and conditions of an EPSML once issued.

2.2.6 The Environment (Wales) Act 2016 (Ref 2.3) provides Wales' approach to planning and managing natural resources at a national and local level (Part 1 of the Act). Section 7 of Part 1 of this Act ("Biodiversity lists and duty to take steps to maintain and enhance biodiversity") replaces the duty in Section 40 of the Natural Environment and Rural Communities (NERC) Act (2006) (Ref 2.4) in relation to Wales and provides a list of organisms and habitat types in Wales that are of key significance to sustain and improve biodiversity in relation to Wales. Eight of the UK bat species are listed as species of principal importance within Section 7 of the Act: barbastelle bat (*Barbastella barbastellus)*, Bechstein's bat (*Myotis bechsteinii)*, noctule (*Nyctalus noctula)*, common pipistrelle (*Pipistrellus pipistrellus),* soprano pipistrelle (*Pipistrellus pygmaeus)*, brown

long-eared bat (*Plecotus auritus)*, greater horseshoe bat (*Rhinolophus ferrumequinum)* and lesser horseshoe bat (*Rhinolophus hipposideros)*.

2.2.7 Section 6 of the Environment (Wales) Act 2016 (Ref 2.3) places a duty on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to "promote the resilience of ecosystems". The duty replaces the Section 40 duty in the NERC Act (Ref 2.4), in relation to Wales, and applies to those authorities that fell within the previous duty.

2.2.8 To assist in complying with this duty, public authorities must have regard to relevant evidence provided in the State of Natural Resources Report and any relevant area statement for an area in which the authority exercises functions, as well as having regard to the list of living organisms and habitats published under Section 7 of the Environment (Wales) Act 2016. Section 7 is a list of species and habitats of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. This list is currently under review by the Welsh Government in consultation with NRW.

2.3 Natural Resources Wales Licences

2.3.1 Any operations that may impact upon bats or their places of rest or shelter may require an NRW EPSML (**Error! Reference source not found.**). An EPSML is required where development or construction activity will impact bats through:

- Capturing, injury or killing.
- Damaging or destroying their breeding or resting place.
- Obstructing access to their resting or sheltering place.
- Disturbing a bat while it is in a structure, or place of shelter, or protection.

2.3.2 In the first instance, impacts to bats should be avoided by retaining known or potential roost site such as structures or trees with suitable features. In addition, through considerate construction practices (e.g. restricting work to hours of daylight, avoiding light spill, reducing noise) near to roosts, commuting routes and foraging areas, and through the implementation of buffer zones from known roosts.

2.3.3 Where such buffer zones cannot be implemented, it is likely that the works will require a licence from NRW. The licence application will include a Method Statement using a NRW template, which will stipulate how bats will benefit from mitigation measures, habitat creation, habitat management and habitat maintenance.

2.3.4 Consultation is recommended with NRW where bats may be affected.

2.4 Planning Policy

National Policy

2.4.1 Government planning policy guidance throughout the UK requires local planning authorities to take account of the conservation of protected species when determining planning or development consent applications. This makes the presence of a protected species a material consideration when assessing a development proposal.

2.4.2 In Wales this is implemented through Planning Policy Wales - Edition 12 (PPW (12), February 2024 (Ref 2.6) and is supplemented by Technical Advice Note (TAN) 5 (Ref 2.7), which sets out the land use planning polices of the Welsh Government.

2.4.3 Chapter 6 of PPW (12) sets out the Welsh Government's objectives for the natural heritage of Wales, which includes the safeguarding of protected species. It states at paragraph 6.4.35 that '*the presence of a species protected under European or UK legislation, or under Section 7 of the Environment (Wales) Act 2016, is a material consideration when a planning authority is considering a development proposal which, if carried out, would be likely to result in disturbance or harm to the species or its habitat and to ensure that the range and population is sustained*'. It further states at paragraph 6.4.35 that '*an ecological survey to confirm whether a protected species is present and an assessment of the likely impact of the development on a protected species may be required in order to inform the development management process*.'

2.4.4 Planning Policy Wales (12) includes a step-wise approach to protecting and enhancing biodiversity and building resilient ecological networks by ensuring that any adverse environmental effects are minimised and mitigated. PPW (12) also includes the following objectives:

- '*Secure the maintenance and enhancement of ecosystem resilience and resilient ecological networks by improving diversity, extent, condition, and connectivity*'
- '*The contribution of the designated site to wide resilient ecological networks should be recognised and captured as part of a strategic approach to planning policy and decision making*';
- '*Proposed SSSIs [Sites of Special Scientific Interest] will be treated in the same way as notified SSSIs*'
- '*Policies for non-statutory sites should make it clear that such designations do not preclude appropriate developments where there are no adverse impacts on the features for which a site is designated and on wider ecosystem resilience*'.

Local Policy

2.4.5 The following local planning policies set out in the Anglesey and Gwynedd Joint Local Development Plan 2011 - 2026 (Ref 2.8) relate to ecology and nature conservation, which, in combination with other planning policies, will guide local authority expectations in relation to the proposed works:

- Strategic Policy PS 19 relates to conserving and enhancing the natural environment.
- Policy AMG 5 relates to the protection and enhancement of local biodiversity.
- Policy AMG 6 relates to protecting sites of regional or local significance.

2.4.6 The following planning policy are also relevant to Ecology and Nature Conservation:

- Anglesey and Gwynedd Joint Local Development Plan Review Report (Ref 2.9).
- Eryri Local Development Plan 2016 - 2031 (Ref 2.10).
- Eryri Local Development Plan Review Report 2023 (Ref 2.11).

Biodiversity Policy

2.4.7 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK Biodiversity Action

Plan (BAP) is now focussed at a country-level rather than a UK-level. The UK BAP was succeeded in July 2012 by the UK Post-2010 Biodiversity Framework. The UK list of priority species and habitats, however, remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. In Wales the current lists are those under Part 1, Section 7 of the Environment (Wales) Act 2016 (Ref 2.3).

2.4.8 The national strategy for biodiversity is delivered at local level via Local Biodiversity Action Plans (LBAP). Species and habitats of local conservation concern or value are included in the LBAP and an action plan is created for each species and certain habitat types (respectively termed Species Action Plans (SAP); and Habitat Action Plans, (HAP)).

2.4.9 The LBAP relevant to the proposed works is the Natur Gwynedd LBAP for Gwynedd developed by a partnership of organisations and individuals (Ref 2.12). A Species Action Plans has been produced for lesser horseshoe bat within the Natur Gwynedd LBAP.

2.4.10 The Wales Biodiversity Partnership (WBP) brings together key members from the public, private and voluntary sectors to promote and monitor biodiversity and ecosystem action in Wales. WBP provides a leadership role and an expert steer on priorities for action on biodiversity and ecosystems in Wales. The WBP Steering Group has now formally disbanded, and the biodiversity action work programme has been taken on by the Wales Biodiversity Strategy Board and the WBP working groups.

3. Methodology

3.1 Desk Study

3.1.1 Desk study data relevant to bats was obtained from the following sources:

- Internationally designated sites for bats up to 30 km from the Wider Works site and nationally designated sites for bats up to 5 km from the Wider Works site, using data provided by Cofnod, the North Wales Environmental Information Service, most recently updated in November 2024;
- Existing records of bat species from the last 10 years up to 2 km from the Wider Works site, using data provided by Cofnod, most recently updated in November 2024; and
- Features of ecological interest surrounding the Wider Works site, using aerial photographs and Ordnance Survey maps.

3.2 Field Surveys

Ground-Level Tree Assessments (GLTA)

3.2.1 GLTA were undertaken in July 2024 by at least one surveyor who is registered to use the NRW bat survey licence assisted by an ecologist.

3.2.2 The GLTA surveys were carried out in accordance with guidance outlined in the Bat Conservation Trust's Bat Surveys for Professional Ecologists (Ref 3.1).

3.2.3 Trees were examined from the ground using close focusing binoculars and a high-powered torch to identify Potential Roost Features (PRF), such as loose bark, cavities and ivy (*Hedera helix)* that could be used by bats. Trees were also checked for any signs of bats such as droppings.

3.2.4 Following the inspections, each tree was either classified as having no PRF (Negligible suitability) or having one or more PRF visible (PRF).

3.2.5 At the time of GLTA, tree removal locations were unknown, however areas more likely to require trimming or tree removal, such as directly around existing pylons (between Tower 4ZC005 and 4ZC027 and between 4ZC044 and 4ZC070), were targeted. No tree clearance is anticipated between Tower 4ZC070 and 4ZC140.

Night-time Bat Walkovers

3.2.6 NBW were undertaken in an area where the edge of the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites Special Area of Conservation (SAC) overlaps with the Wider Work site between towers 4ZC014 and 4ZC016 in July, August and September 2024. This SAC is designated for lesser horseshoe bat. Habitats present in this area are scrub, unimproved acid grassland, broadleaved woodland semi-natural. The SAC area that overlaps the Wider Works site is more scrubby and has less woodland cover; the NBW was extended to also cover the open grassland fields and a

stone wall which is the only linear feature in this area (which comprises more favoured habitats for foraging and commuting lesser horseshoe bats).

3.2.7 The Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC also overlaps the Wider Works site between Tower 4ZC012 and 4ZC013 although the towers are not in the designation. Works with potential to affect habitats will be restricted to vegetation management under the towers.

3.2.8 No other NBW were carried out in the Wider Works site as there will be no permanent or temporary loss of woodland, hedgerows, watercourses or other habitats (such as linear features that are of value to foraging and commuting bats). There will be no lighting at night or works that would result in disturbance to foraging and commuting bats.

3.2.9 The walkovers commenced at sunset and continued for approximately 2-3 hours after sunset. The surveys were conducted during suitable weather conditions (i.e., without heavy rain or strong wind, and with a sunset temperature over 10°C).

3.2.10 The route is shown in **Figure 6.5.C.4: Night-Time Bat Walkover & Automated Bat Detector Location**. The route was designed to efficiently cover the area where the Wider Works site overlaps in the SAC and surrounding habitats such as grassland scrub.

3.2.11 The NBW involved two surveyors commencing the survey at sunset, they then waited between 30-60 minutes after sunset at a designated start point before proceeding to walk along a pre-determined route. The start point was positioned on potential flight lines close to potential roost sources. All bat activity encountered whilst walking between points was also noted. The direction of the route was varied during each survey visit to ensure different areas were walked at different times.

3.2.12 Surveyors carried a full spectrum bat echolocation detector (Batlogger M, Batlogger M2 or Anabat Scout) to record bat calls during the survey. The time, location, species (where possible), and direction of flight (where possible) were recorded for each bat pass (discrete burst of echolocation heard, or bat activity observed) encountered during the surveys. The echolocation calls detected for all surveys were recorded in WAV format by the detectors to allow for further analysis in Analook W (version 4.5) or BatExplorer (version 2.2.4.0).

Automated Bat Detector Surveys

3.2.13 One automated bat detector (Song Meter SM4 Acoustic Detector) was deployed in July, August and September 2024. The automated bat detector was deployed (approximate OS Grid reference SH 65962 38279), in the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC (designated for lesser horseshoe bats – see Section 3). The location is shown on **Figure 6.5.C.4:** Night-Time Bat Walkover & Automated Bat Detector Location.

3.2.14 The automated bat detector was programmed to constantly record bat activity from 30 minutes before sunset to 30 minutes after sunrise, for a minimum period of ten consecutive nights (extended from five nights to account for the presence of the SAC Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites in the Wider Works site). Data collection in July 2024 was for only seven nights.

3.2.15 The microphone was positioned at least 1 metre above the ground, on a tree, so it was clear of vegetation between the adjacent habitats and the microphone. The automated bat detector was set on default settings to record in full spectrum format.

3.2.16 Sound recordings during surveys were made in full spectrum Wave Audio File ('WAV') to allow subsequent verification of species or species groups, where required. Recordings of bat passes were subsequently analysed using BatExplorer, AnalookW 4.5 and Kaleidoscope software.

3.2.17 The term bat "pass" is defined as a single automated bat detector file made up of bat echolocation pulses of a single species; a single bat pass may be a recording of one or more bats. It is not possible to separate the pulses out to identify the number of bats involved, so the number of bat passes recorded on automated bat detectors cannot be reliably correlated to actual bat abundance. However, it provides an indication of the level of bat activity at a site over a longer period than is recorded during NBW surveys.

3.2.18 Ten percent of all pipistrelle (*Pipistrellus* sp.) species and noise recordings, in addition to all remaining species recordings, were identified by a suitably experienced ecologist. Reference was made to bat call identification guidance (Ref 3.2) where necessary. Following this, ten percent of all species verified were subject to a second check by an appropriately experienced ecologist for quality assurance purposes.

Bat Activity Indexes

3.2.19 Bat Activity Indexes (BAI) values were calculated by averaging the total number of bat passes per hour for each automated bat detector unit at each location per month. The term 'pass' is defined as a single file made up of bat pulses of a single species i.e. there may be one bat in a file or many bats in a single file.

3.2.20 Limited guidance is available on what constitutes low to high bat activity on a site based on number of passes. A relative scale was used that follows the protocol recommended by Ecobat (Ref 3.3) in this document, where for automated bat detector data:

- Low activity: 0-20th percentiles;
- Low to moderate activity: 21st-40th percentiles;
- Moderate activity: 41st-60th percentiles;
- Moderate to high activity: 61st-80th percentiles; and
- High activity: 81st-100th percentiles.

3.2.21 For NBW data, relative bat activity levels were described to aid the discussion. No guidance is available on what constitutes low, moderate or high bat activity based on number of passes during an NBW. A relative scale is used in this document where:

- Very low activity is up to 5 passes per survey;
- Low activity is 6 to 25 passes per survey;
- Moderate activity is 26 to 99 passes per survey; and
- High activity is 100 passes per survey.

3.3 Limitations

3.3.1 The aim of a desk study is to help characterise the baseline context of a project/proposed development and provide valuable background information that would not be captured by field surveys alone. Information obtained from a desk study is dependent upon people and organisations having made and submitted records for the

area of interest. A lack of records for a particular bat species does not necessarily mean that the species does not occur in the area searched. Likewise, the presence of records for particular habitats and species does not automatically mean that these still occur in the area of interest or are relevant in the context of that project/proposed development.

3.3.2 The month of July only had seven consecutive nights of data recorded due to equipment failure. Since this exceeds the guidance recommendation of a minimum of five nights of data analysis, this is not a significant limitation. Data was collected in August and September for ten consecutive nights.

3.3.3 Survey data was only captured in Summer and Autumn 2024. This limitation is further discussed in **Section 5**.

3.3.4 It is accepted that Myotis bat species are difficult to identify from echolocation alone and these species are aggregated as Myotis bat(s). This aggregation, where used, is widely accepted (Ref 3.4; Ref 3.5) and does not affect the evaluation of the results of activity surveys.

3.3.5 Similarly, long-eared bats cannot be identified to species level by their echolocation call alone. However, given the survey location is outside of the known or potentially suitable range of the grey long-eared bat (*Plecotus austriacus*), all long-eared bat calls recorded will have been of brown long-eared bat.

3.3.6 Common pipistrelle (*Pipistrellus pipistrellus)* and soprano pipistrelle have overlapping call parameters and can be difficult to separate to species when calls recorded are towards the lower end of the soprano pipistrelle peak frequency and higher end of the common pipistrelle peak frequency. Any pipistrelle bat with a peak frequency between 49 kilohertz (kHz) and 51 kHz has been classified as “Unidentified pipistrelle species”. Consequently, “Unidentified pipistrelle species” does not represent a separate species but rather a representation of either a common pipistrelle or a soprano pipistrelle.

3.3.7 The elements of the Wider Works considered here are part of maintenance of the existing overhead line and do not comprise development requiring a new consent (such as planning permission). National Grid and its contractor liaise with owners and occupiers of land on the details of works sites and accesses to be used. These details may be refined as work progresses. Where specific licences may be required because of designations or presence of protected species, these are obtained before work commences in areas where these apply.

3.3.8 Data has been gathered where possible to provide a baseline assessment of these elements of the Project. Results of surveys conducted may no longer be valid at the time of the works and pre-construction surveys may be required to provide up to date and necessary data to inform any required licence applications and mitigation requirements. These will be secured in compliance with a site-specific Construction and Environmental Management Plan (CEMP). This is not a significant limitation as the route of the existing overhead line is already fixed, with working areas known to be required around each pylon, and most works are required at height. Assessment of the likely effects on bats can be informed by the data gathered to date. Anticipated requirements for mitigation can be stated with acknowledgement that distribution of bats can change prior to construction, and may need to be informed by pre-construction surveys that refer to finalised details of works and access.

4. Results

4.1 Desk Study

Statutory designations

4.1.1 There are two statutory sites Special Areas of Conservation (SAC) designated for bats in 30 km of the Wider Works and 11 Sites of Special Scientific Interest (SSSI) in 5 km. Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC and the SSSI Coedydd De Dyffryn Maentwrog are both located in the Wider Works site.

4.1.2 **Table 4-1** details the designations behind these sites and their distance from the Wider Works site.

Table 4-1: Statutory Designated (Bat) Sites in 30 km (National Sites) and 5 km (National Sites) of the Wider Works Site

Statutory designation	Site	Reason for designation	Approximate distance from Wider Works Site
SAC	Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites	Lesser horseshoe bat This SAC includes most of the known maternity roosts in Meirionnydd and some hibernacula, and is the centre of distribution for lesser horseshoe bats in Wales. The sheltered river valleys provide excellent tree cover and numerous suitable maternity roosts.	In Wider Works site
SSSI	Coedydd De Dyffryn Maentwrog	Lesser horseshoe bat, greater horseshoe bat, brown long-eared bat, Natterer's bat *Myotis nattereri*, whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii*, soprano pipistrelle, common pipistrelle *Pipistrellus pipistrellus* and noctule populations. Covers the same area as the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	In Wider Works site
SAC	Glynllifon	Lesser horseshoe bats This single site in North Wales is both a maternity and hibernation site	0.89km north-west (at its closest point)

		for a large population of lesser horseshoe bat comprising about 6% of the UK population.	
SSSI	Glynllifon	Three summer roosts and two hibernation sites for lesser horseshoe bats. Covers the same area as the Glynllifon SAC.	0.89 km north-west
SSSI	Coedydd Dyffryn Ffestiniog (Gogleddol)	Colonies of lesser horseshoe bats with nurseries in suitable buildings	0.92 km north-east
SSSI	Dolorgan Barn	Breeding roost of lesser horseshoe bats in Dolorgan Barn. Also used as a roost site by small numbers of brown long-eared bats and unidentified bat species of the genus *Myotis*.	2.12 km south
SSSI	Coed y Rhygen	Forms part of the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites	1.1 km south
SSSI	Ysbyty Bron y Garth	Lesser horseshoe bat maternity/hibernation roosts and brown long-eared bat summer roosts	2.22 km north-west
SSSI	Mwyngloddiau Llanfrothen	Abandoned mines provide important hibernating roosts for a large population of lesser horseshoe bats	2.2 km north of the Wider Works site
SSSI	Glaslyn	Two nursery roosts of lesser horseshoe bats, and roosts from brown long-eared bats, Daubenton's bats *Myotis daubentonii* and bats from the *Pipistrellus* genus.	2.4 km north-west from Wider Works Site (at its closest point)
SSSI	Ceunant Cynfal	Forms part of the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites	2.64 km north from the Wider Works site
SSSI	Aberdunant	Hibernating and summer roosts of lesser horseshoe bats	3.8 km north-east
SSSI	Glyn Cywarch	Breeding roost of lesser horseshoe bats with additional pipistrelle and brown long-eared bat roosts	3.9 km south-west

SAC	Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Lesser horseshoe bat is a qualifying feature, but not a primary reason for site selection	19.36 km north

Existing Bat Species Records

4.1.3 At least four bat species have been recorded in the Wider Works site by Cofnod, including pipistrelle species, noctule, Myotis species, and soprano pipistrelle, as presented in **Table 4-2**. Due to the large number of existing bat records, only those records located in the Wider Works site have been included in **Table 4-2**. **Figure 6.5.C.2:** Bat Species Desk Study Records. presents all existing bat species records in 2 km of the Wider Works site.

Table 4-2: Bat records in the Wider Works Site

Common name	Scientific name	Conservation designation(s)	Number and type of records	Most recent record	Location
Common pipistrelle	*Pipistrellus pipistrellus*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (roost)	2014	In the Wider Works site - Llwyd Coed Canol, Llanllyfni
Soprano pipistrelle	*Pipistrellus pygmaeus*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (activity)	2014	In the Wider Works site - Llwyd Coed Canol, Llanllyfni
Myotis bat species	*Myotis* sp.	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (activity)	2014	In the Wider Works site - Llwyd Coed Canol, Llanllyfni
Pipistrelle bat species	*Pipistrellus* sp.	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	2 (activity)	2016	In Wider Works site – at Glaslyn

Common name	Scientific name	Conservation designation(s)	Number and type of records	Most recent record	Location
Soprano pipistrelle	*Pipistrellus pygmaeus*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	3 (activity)	2017	In Wider Works Site – at Glaslyn
Noctule	*Nycatlus noctula*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (activity)	2016	In Wider Works Site – at Glaslyn
Soprano pipistrelle	*Pipistrellus pygmaeus*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (activity)	2017	In Wider Works site
Common pipistrelle	*Pipistrellus pipistrellus*	WCA Schedule 5 CHS2 NERC S.42 HabDir 4 Bern2 Bonn2	1 (activity)	2017	In Wider Works site

4.2 Field Surveys

Ground Level Tree Assessments (GTLA)

4.2.1 **Table 4-3** details trees identified as having Potential Roost Features. Photographs of trees with PRFs can be made available on request. Trees with no PRF (*Negligible suitability*) are not included in the table. The locations of trees with PRF are presented on **Figure 6.5.C.3: Bat Roost Suitability of Trees**.

Table 4-3: GTLA results and their roost feature(s)

Tree reference	Tree description	Bat roost feature
6.T.E74	Mature ash *Fraxinus excelsior*	PRF present - knot hole on south side of tree.
6.T.E73	Mature sycamore *Acer pseudoplatanus*	PRF present - wound in trunk on south side.
6.T.E72	Mature oak *Quercus* sp.	PRFs present - split branches and hole in branch end on north side.
6.T.E71	Mature goat willow *Salix caprea*	PRF present - split in trunk.
6.T.E70	Mature goat willow	Single horizontal PRF with entrance facing south-west.
6.T.E69	Mature rowan *Sorbus aucuparia*	PRFs might be present - mature ivy growth.
6.T.E68	Semi-mature goat willow	PRFs might be present - tri-stemmed with ivy cover.
6.T.E67	Goat willow	PRF present - split in trunk.
6.T129/3.T129	Mature ash	PRFs might be present - extensive ivy cover.
6.T.E66	Mature sessile oak *Quercus petraea*	PRF present - frost crack on stem.
6.T.E65	Mature sessile oak	Unable to check for PRFs: included as a precaution.
6.T.E64	Mature sessile oak	Unable to check for PRFs: included as a precaution.
6.T.E63	Mature goat willow	Unable to check for PRFs: included as a precaution.
6.T.E62	Semi-mature oak	PRF present - callus rolls on underside of branches.
6.T.E66	Mature sessile oak	Mature sessile oak at field boundary. PRFs at height.
6.T.E51	Mature oak	Mature oak at field boundary. PRFs visible at height but cannot be assessed from ground level.
6.T.E52	Dead oak	PRFs present - split bark surrounding tree.

Tree reference	Tree description	Bat roost feature
6.T.E53	Mature hawthorn *Crataegus monogyna*	PRFs present - weld with cavity.
6.T.E54	Dead mature ash	PRFs might be present - extensive ivy cover.
6.T.E55	Mature goat willow	PRFs present - two stem cavities.
6.T.E59	Mature sweet chestnut *Castanea sativa*	PRF present - small section of flaking bark.
6.T.E60	Mature pedunculate oak	PRF present - multi-chambered cavity.
6.T.E58	Mature pedunculate oak	PRFs present - fissures in fallen stem.
6.T.E56	Dead ash	PRFs present - dead ivy and minor cavities.
6.T.E57	Semi-mature oak	PRF present - hazard beam.
6.T.E61	Mature oak	PRF present - knot hole to south and split branch to north.
6.T.E49	Semi-mature willow	PRF present - callus roll at base.
6.T.E48	Mature goat willow	PRFs present - snapped limb with fissures.
6.T.E47	Semi-mature goat willow	PRF present - rot in snapped stem.
6.T.E46	Semi-mature goat willow	PRFs present - dense ivy cover and stem wound.
6.T.E45	Semi-mature goat willow	PRFs present - hazard beam at south and two stem wounds.
6.T.E44	Mature goat willow	PRFs present - snapped limb with fissures and hazard beam.
6.T.E43	Mature pedunculate oak	PRFs present - tear out and dead limb on southern side.
6.T.E42	Mature oak	PRFs present - raised bark.
6.T.E41	Semi-mature goat willow	PRFs present - snapped limb with fissures.

Tree reference	Tree description	Bat roost feature
6.T.E39	Mature (potentially veteran) pedunculate oak	PRFs present - large, snapped limbs with fissures.
6.T.E40	Semi-mature oak	PRFs present - deadwood in crown and knot hole on western limb.
6.T.E38	Mature oak	PRFs present - splits in bark.
6.T.E37	Mature sessile oak	PRFs may be present - dense ivy cover.
6.T.E36	Mature sessile oak	PRF present - large knot hole in trunk.
6.T.E35	Mature sessile oak	PRFs present - splits in branches.
6.T.E34	Mature sessile oak	PRF present - small knot hole.
6.T.E33	Dead sessile oak	PRFs present - loose bark and cracks along trunk and branches.
6.T.E32	Mature sessile oak	PRFs may be present - dense ivy cover.
6.T.E31	Mature ash	PRF present - decayed trunk with split near base.
6.T.E30	Mature ash	PRF present -large split in decayed trunk.
6.T.E29	Mature ash	PRF present - large knot in decayed trunk.
6.T.E28	Mature ash	PRF may be present - dense ivy cover.
6.T.E27	Mature sessile oak	PRF present - large knot hole in western side of trunk.
6.T.E26	Semi-mature goat willow	PRFs present - four small knot holes facing south.
6.T.E25	Semi-mature oak	PRF present - knot hole.
6.T.E23	Immature rowan	PRFs present - exposed roots.
6.T.E24	Mature beech	PRFs present - exposed roots.

Tree reference	Tree description	Bat roost feature
6.T.E22	Coppiced hazel	PRFs present - stem cavity with gaps and rot.
6.T.E21	Mature oak	PRFs present - mature twin stemmed oak on steep bank.
6.T.E20	Mature oak	PRF present - stem cavity on southern aspect.
6.T.E19	Mature oak	PRF present - knot hole.
6.T.E18	Mature oak	PRF present - tear out on north-west aspect.
6.T.E17	Mature oak	PRFs present - two large holes at limb loss sites.
6.T.E16	Semi-mature hawthorn	PRF present - minor wound at base.
6.T.E15	Mature oak	PRFs may be present - dense ivy cover.
6.T.E14	Mature (potentially veteran) Ash	PRFs may be present - dense ivy cover.
6.T.E13	Mature oak	PRF present - cavity caused by split limb and additional wound.
6.T.E8	Mature sycamore	PRF present - basal cavity on northwest aspect.
6.T.E10	Mature oak	PRF present on NW aspect.
6.T.E11	Mature oak	PRFs present – numerous features at height.
6.T.E12	Mature oak	Mature tree on field boundary. PRF at 2 metres (m).
6.T.E9	Mature sycamore	PRF present - basal cavity and canopy damage.
6.T.E7	Mature (potentially veteran) sycamore	PRFs present - lifted and cracked bark.
6.T.E6	Mature sycamore	PRFs may be present - dense ivy cover.
6.T.E5	Mature goat willow	PRFs present - snapped stem and associated

Tree reference	Tree description	Bat roost feature
		fissures, deadwood and flaking bark.
6.T.E4	Semi-mature hawthorn	PRFs may be present - dense ivy cover.
6.T.E3	Mature sycamore	Light ivy cover potentially covering PRFs.
6.T.E1/3.T.E1	Mature hawthorn	PRFs present - welds and fluting.
6.T.E2/3.T.E2	Mature goat willow	PRF present - large horizontal stem cavity.

Night-time Bat Walkovers

4.2.2 **Figure 6.5.C.4: Night-Time Bat Walkover & Automated Bat Detector Location** presents the route walked during the NBW, with weather conditions described in **Table** .

Table 4-4: – NBW Survey Summary

Date	Sunset time	Survey start and end	Weather conditions
01/07/2024	21:44	21:44 to 23:44	16°C, overcast with light air and no precipitation
21/08/2024	20:29	20:29 to 22:30	14°C, overcast, with a strong breeze and light drizzle
18/09/2024	19:27	19:25 to 21:32	12°C, clear with a light breeze and no precipitation

4.2.3 Bat activity was recorded during all three NBWs. Bat passes were associated with areas of woodland and line of trees across all three surveys.

4.2.4 Common pipistrelle, soprano pipistrelle, lesser horseshoe bat, *Myotis* sp. and noctule were recorded and/or observed.

4.2.5 Soprano pipistrelle bat was the most abundant bat species recorded in July and August 2024 with 50 (Moderate activity) and 223 passes (High activity) respectively. Bats from the genera *Myotis* sp. were the most abundant species recorded in September with 96 passes (Moderate activity). Lesser horseshoe bats and noctule were the least recorded species with activity in August and September for noctule, and September only for noctule, assessed as very low or low activity levels respectively.

4.2.6 The highest number of bat recordings across all surveys was during the August 2024 survey with 223 passes. The lowest number of bats recordings was during the July 2024 survey with 110 passes. The September survey had the second lowest number of bat recordings with 186 passes.

4.2.7 **Table 4-5** summarises the number of calls recorded during the NBWs. The figures represent the bat observations recorded by surveyors and following analysis of the bat detector sound files resulting in additional bat calls being identified, these are not mapped on the figures however they are included in **Table 4-5**.

Table 4-5: Number of bat passes per species during NBW

Date	Number of bat passes						Total number of passes	Bat Activity Level
	Pipistrelle sp.	Common pipistrelle	Soprano pipistrelle	Lesser horseshoe bat	*Myotis* sp.	Noctule		
01/07/2024	6	34	50	0	20	0	110	High
21/08/2024	1	4	223	2	8	0	238	High
18/09/2024	8	5	70	1	96	6	186	High

Automated Bat Detector Surveys

4.2.8 **Table 4-6**: shows the date, sunrise/sunset timings, and weather conditions for each survey.

Table 4-6: Automated bat detector survey date, sunrise and sunset timings and weather conditions

Automated Bat Detector survey date	Sunrise/Sunset timings	Weather conditions
01/07/2024	21:44 – 04:56	10-15°C, overcast, moderate breeze, dry
02/07/2024	21:43 – 04:57	11-14°C, overcast, moderate breeze, intermittent light rain
03/07/2024	21:43 – 04:58	10-16°C, overcast, fresh breeze, dry
04/07/2024	21:42 – 04:58	11-14°C, overcast, moderate breeze, dry
05/07/2024	21:42 – 04:59	9-13°C, overcast, light breeze, dry
06/07/2024	21:39 – 05:00	9-12°C, scattered clouds, light breeze, dry
07/07/2024	21:41 – 05:01	5-14°C, sky clear, gentle breeze, dry
22/08/2024	20:03 – 06:42	11-16°C, overcast, fresh breeze, rain

Automated Bat Detector survey date	Sunrise/Sunset timings	Weather conditions
23/08/2024	20:00 – 06:42	12-14°C, scattered clouds, fresh breeze, dry
24/08/2024	20:00 – 06:43	10-14°C, overcast, moderate breeze, dry
25/08/2024	19:58 – 06:44	13-14°C, overcast, moderate breeze, dry
26/08/2024	19:57 – 06:45	15-16°C, overcast, strong breeze, dry
27/08/2024	19:55 – 06:46	13-15°C, overcast, moderate breeze, drizzle
28/08/2024	19:54 – 06:47	11-15°C, fog, gentle breeze, dry
29/08/2024	19:52 – 06:48	10-15°C, fog, light air, dry
30/08/2024	19:51 – 06:49	6-16°C, fog, light air, dry
31/08/2024	19:50 – 06:49	13-14°C, overcast, gentle breeze, dry
18/09/2024	19:22 – 06:57	8-16°C, sky clear, light breeze, dry
19/09/2024	19:20 – 06:58	8-18°C overcast, light air, dry
20/09/2024	19:18 – 07:02	13-16°C, fog, moderate breeze, dry
21/09/2024	19:15 – 07:02	13-16°C, overcast, gentle breeze, intermittent light rain
22/09/2024	19:13 – 07:04	12-14°C, overcast, gentle breeze, light rain
23/09/2024	19:10 – 07:05	10-13°C, overcast, light breeze, dry
24/09/2024	19:08 – 07:07	6-11°C, overcast, moderate breeze, drizzle
25/09/2024	19:06 – 17:09	10-12°C, overcast, light breeze, drizzle
26/09/2024	19:03 – 07:10	8-10°C, overcast, moderate breeze, overcast
27/09/2024	19:01 – 07:12	8-10°C, overcast, light breeze, light rain

4.2.9 July 2024 displayed the lowest level of bat activity with 852 bat passes over seven nights, yielding a BAI of 15.21. This places the July activity level within the ‘Moderate’ percentile. The most frequently recorded species were soprano pipistrelle (369 passes)

and common pipistrelle (336 passes) followed by Pipistrelle sp. (89 passes), Myotis sp. (31 passes), lesser horseshoe bat (14 passes), noctule (11 passes), Leisler's bat (one pass) and brown long-eared bat (one pass).

4.2.10 August 2024 displayed the highest level of bat activity with 7,925 bat passes over ten nights, yielding a BAI of 72.05. This places the August activity level within the 'High' percentile. The most frequently recorded species were soprano pipistrelle (4,187 passes) and *Pipistrelle* sp. (2,362 passes) followed by common pipistrelle (998 passes), *Myotis* sp. (209 passes), lesser horseshoe (107 passes), noctule (37 passes), brown long-eared bat (19 passes) Leisler's bat (five passes) and serotine (one pass).

4.2.11 September 2024 recorded 3,082 bat passes over ten nights, yielding a BAI of 25.68. This places the September activity level within the 'Moderate' percentile. The most frequently recorded species were soprano pipistrelle (2,364 passes) and *Pipistrelle* sp. (561 passes) followed by common pipistrelle (80 passes), *Myotis* sp. (36 passes), noctule (19 passes), brown long-eared bat (18 passes), and lesser horseshoe bat (four passes).

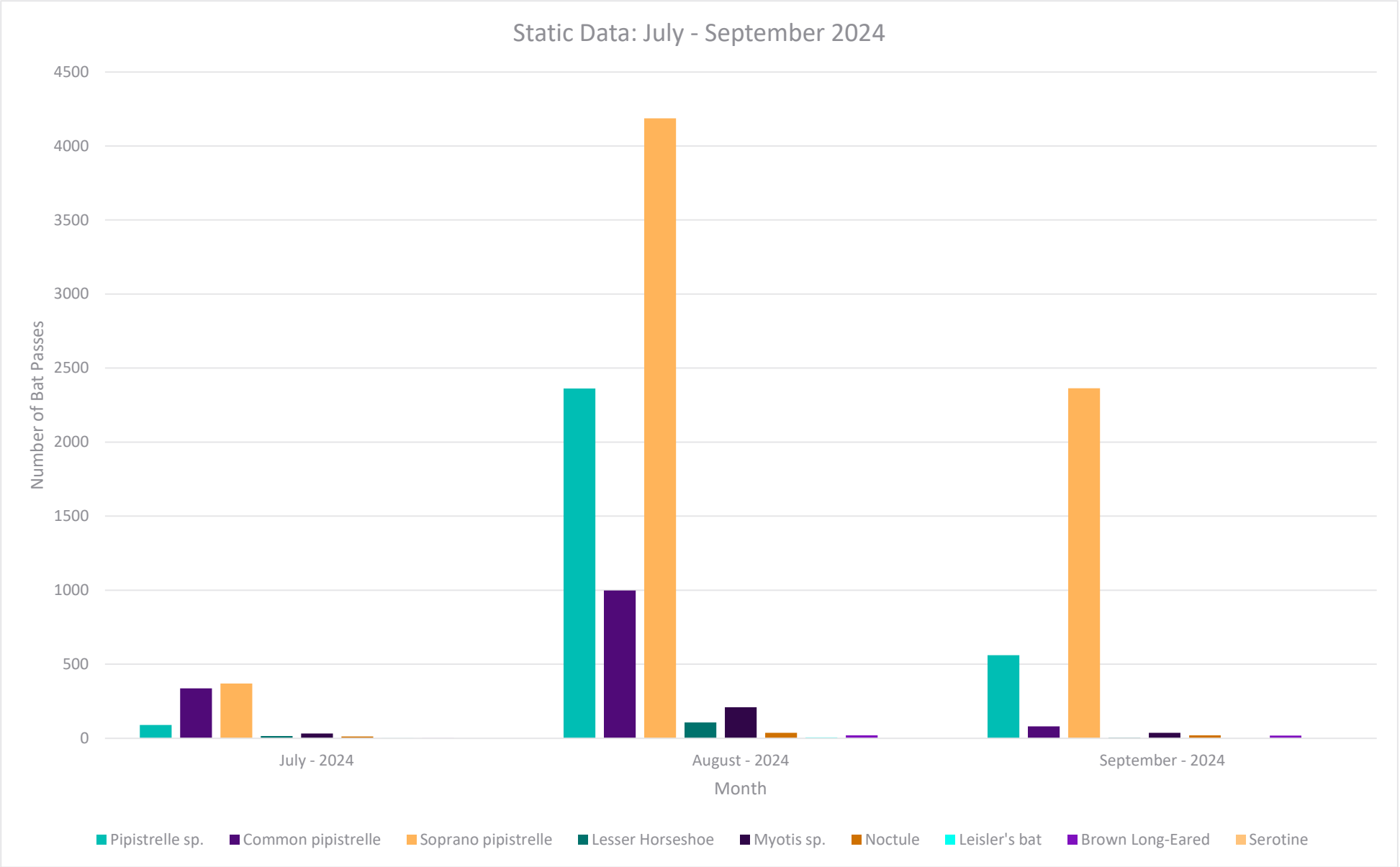
4.2.12 Overall, soprano pipistrelle were consistently the highest recorded bat species across all three months with 6,920 passes. Soprano pipistrelle activity peaked in August (4,187 passes) followed by September (2,364 passes). July activity was considerably less with just 369 passes.

4.2.13 **Graph 4-1** and **Table 4-7** below detail the quantity of bat call per species.

Table 4-7: Automated bat detector results and BAI

Month of recordings	Pipistrelle sp.	Common pipistrelle	Soprano pipistrelle	Lesser horseshoe bat	Myotis sp.	Noctule	Leisler's bat	Brown long-eared bat	Serotine	Total bat passes (over 7/10 nights)	Bat Activity Index (mean passes/hr over 7/10 nights)	Bat Activity Level (Percentile)
July - 2024	89	336	369	14	31	11	1	1	0	852	15.21	Moderate
August - 2024	2362	998	4187	107	209	37	5	19	1	7925	72.05	High
September - 2024	561	80	2364	4	36	19	0	18	0	3082	25.68	Moderate

Graph 4-1: Static data results (July - September 2024)



5. Summary and Evaluation of Results

5.1 Roosting Bats

5.1.1 There were no existing records of bat roosts in the Wider Works site.

5.1.2 Two trees (6.T.E65 and 6.T.E64) with PRF (survey work has not confirmed if these trees support roosts) were identified in the area where the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC and Wider Works site overlap. Lesser horseshoe bats are not known to roost in trees (Ref 3.1).

5.1.3 Tree removal will only be required where necessary and at the proposed locations at Towers 4ZC023, 4ZC045, 4ZC046, 4ZC059, and 4ZC061. Trees will be trimmed at 4ZC006, 4ZC016, 4ZC026 and 4ZC060. If any of these trees with identified PRFs require removal or pruning, additional surveys of these trees will be carried out as part of the pre-construction surveys.

5.2 Foraging and Commuting Bats

5.2.1 Activity levels varied per month, with a High BAI percentile level of bat activity recorded in August, and moderate BAI percentile levels of bat activity recorded in June and September. These results align with the activity observed during the bat activity surveys.

5.2.2 No tree or vegetation removal is proposed in the area that overlaps with the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC. Vegetation management will take place, which would include trimming of a small number of trees for an access road and strimming of vegetation around tower bases to allow access.

5.2.3 There will be no working at night, or use of lighting at night.

5.2.4 Additional NBW and automated bat detector surveys will be carried out as part of the pre-construction surveys in May and June of the year prior to construction, to provide additional survey data for spring in the area of the Wider Works site that overlaps in the SAC.

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N

HOLYHEAD to Dublin 3 hrs

Dublin 2 hrs

ANGLESEY / YNYS MÔN

CAERNARFON BAY / BAE CAERNARFON

Glynllifon SSSI

Glynllifon SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Aberdunant SSSI

Glaslyn SSSI

Dolorgan Barn SSSI

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Glyn Cywarch SSSI

Ysbyty Bron y Garth SSSI

Coed y Rhygen SSSI

Coedydd De Dyffryn Maentwrog SSSI

Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI

Ceunant Cynfal SSSI

Mwyngloddiau Llanfrothen SSSI

Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

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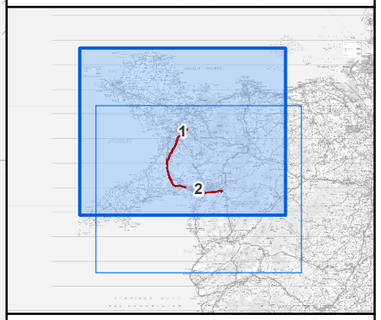
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- 5km Buffer of Indicative Wider Works Site Boundary
- 30km Buffer of Indicative Wider Works Site Boundary

Relevant[1] Designated Sites for Bats

- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)

NOTES

1: Relevant designated sites are nationally designated sites up to 5km from the Indicative Wider works site boundary and internationally designated sites for bats, up to 30 km from the Indicative Wider works site boundary.

Rev	Date	Description	GIS	Chk	App
A	20/08/2025	Environmental Statement	CA	AD	NL

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.1 RELEVANT DESIGNATED SITES FOR BATS

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CA	20/08/2025	AD	20/08/2025	NL	20/08/2025

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CAERNARFON BAY/
BAE CAERNARFON

Glynllifon SSSI

Glynllifon SAC

Glynllifon SSSI

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Aberdunant SSSI

Glaslyn SSSI

Ceunant Cynfal SSSI

Mwyngloddiau Llanfrothen SSSI

Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Glaslyn SSSI

Coedydd De Dyffryn Maentwrog

Dolorgan Barn SSSI

Traws SSSI

Glaslyn SSSI

Glyn Cywarch SSSI

Ysbyty Bron y Garth SSSI

Coed y Rhygen SSSI

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC

SNOWDONIA NATIONAL PARK/
PARC CENEDLAETHOL ERYRI

CADAIR IDRIS

TREMADOC BAY/
BAE TREMADOG

BARMOUTH BAY/
BAE BERMO

CAERNARFON
BANGOR
BETHESDA
LLANRWST
BETWS-Y-COED
PORTHMADOG
BLAENAU FFESTINIOG
BARMOUTH
PWLLHELI
Y BALA

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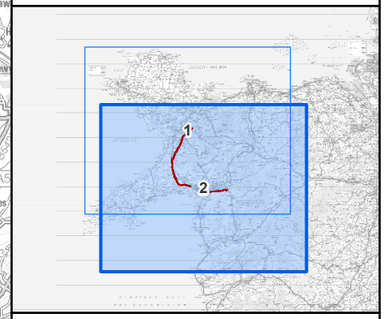
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- 5km Buffer of Indicative Wider Works Site Boundary
- 30km Buffer of Indicative Wider Works Site Boundary

Relevant[1] Designated Sites for Bats

- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)

NOTES

1: Relevant designated sites are nationally designated sites up to 5km from the Indicative Wider works site boundary and internationally designated sites for bats, up to 30 km from the Indicative Wider works site boundary.

Rev	Date	Description	GIS	Chk	App
A	20/08/2025	Environmental Statement	CA	AD	NL

nationalgrid

Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
WIDER WORKS

Document Title: FIGURE 6.5.C.1
RELEVANT DESIGNATED SITES FOR BATS

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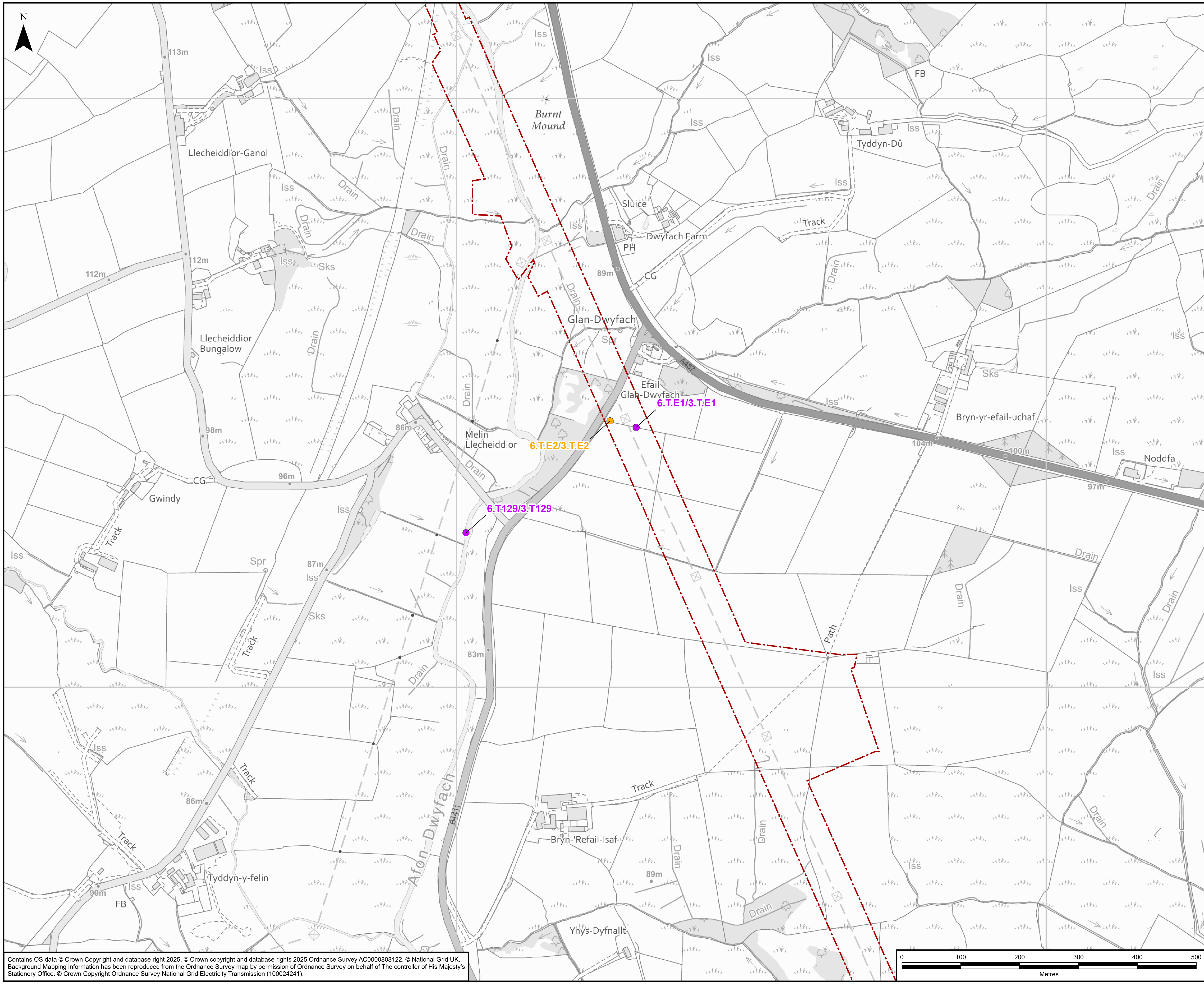
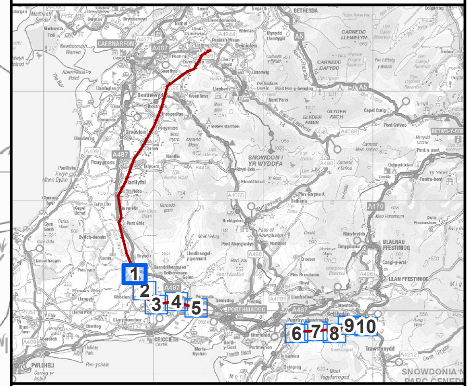


WIDER WORKS ROUTE LEGEND



Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF-M

PRF-I

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	1 OF 10	A

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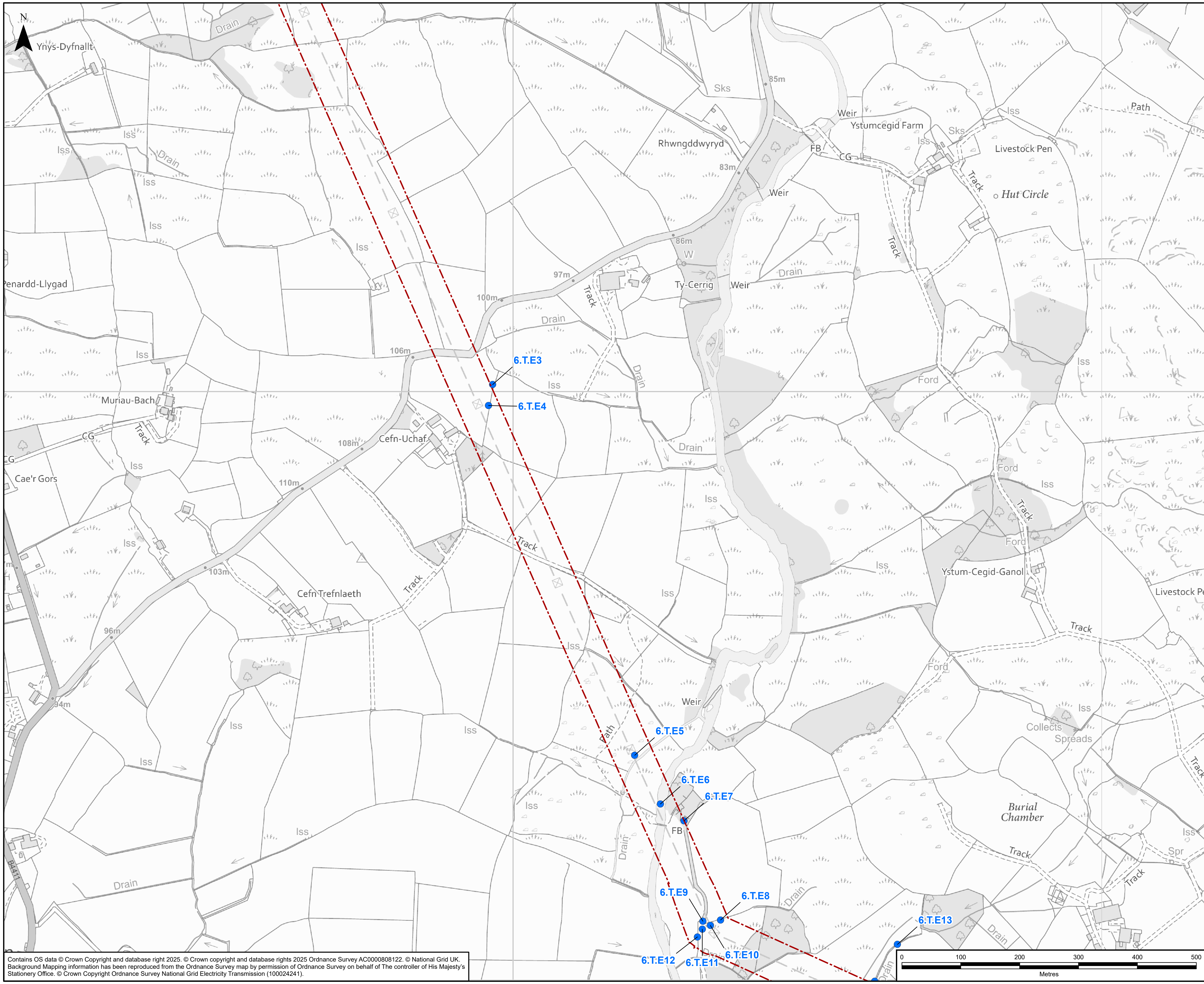

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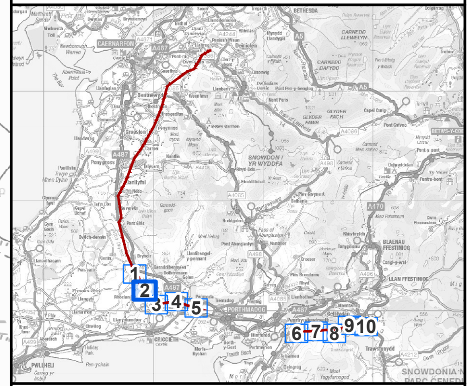


Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

nationalgrid

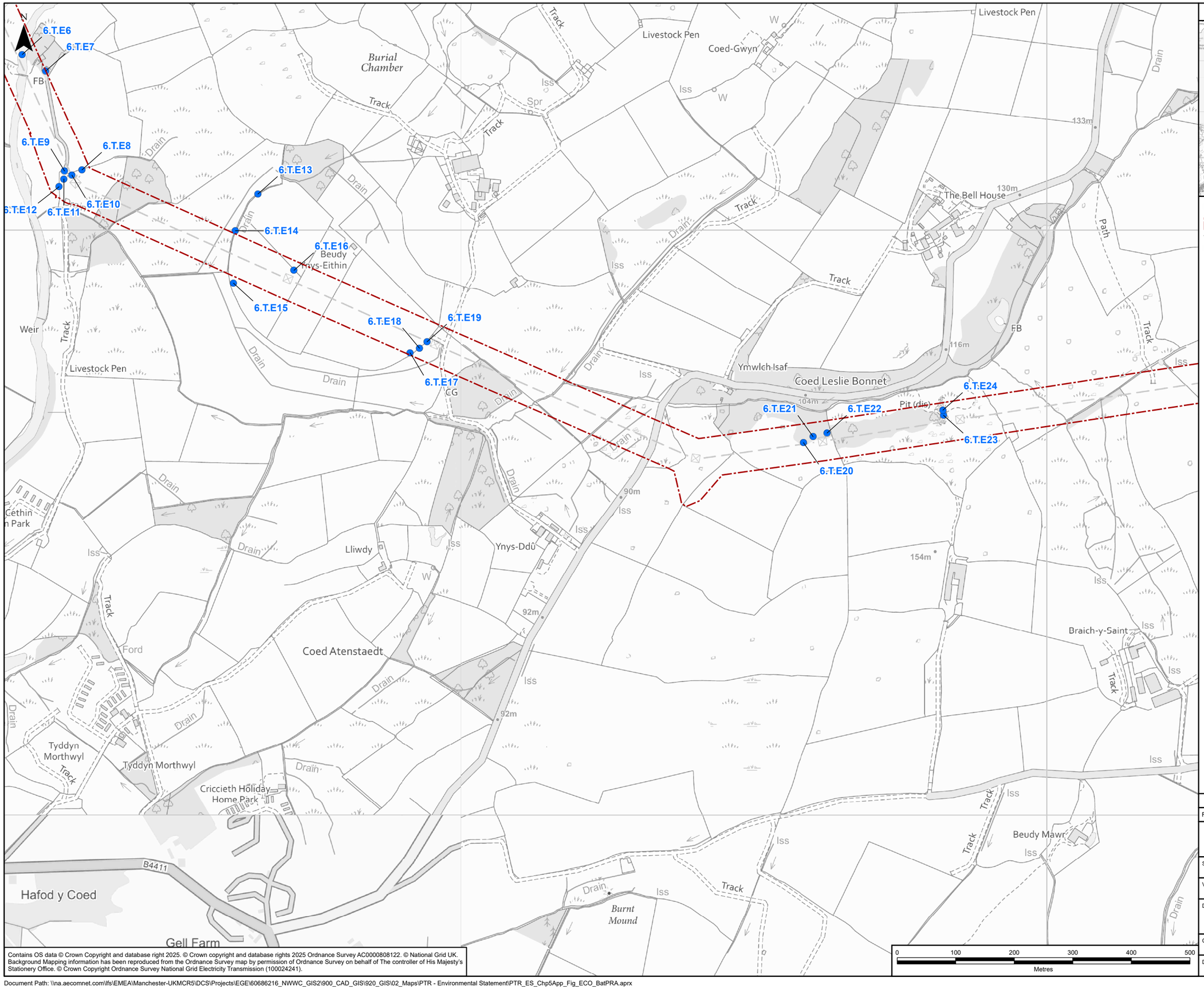
Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	2 OF 10	A



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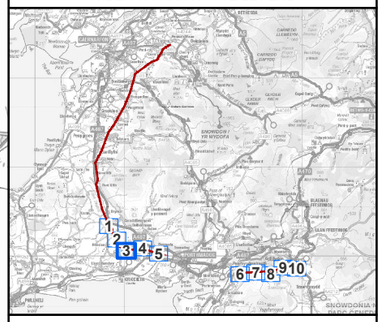

Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

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CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	3 OF 10	A

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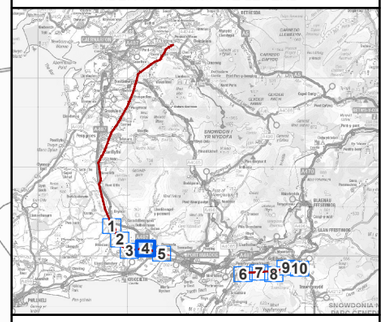

Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

6.T.E25
6.T.E26
6.T.E27
6.T.E28
6.T.E29
6.T.E30
6.T.E31
6.T.E32
6.T.E33
6.T.E34
6.T.E35
6.T.E36
6.T.E37
6.T.E38
6.T.E39
6.T.E40
6.T.E41
6.T.E42
6.T.E43

Rev	Date	Description	GIS	Chk	App
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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

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Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	4 OF 10	A

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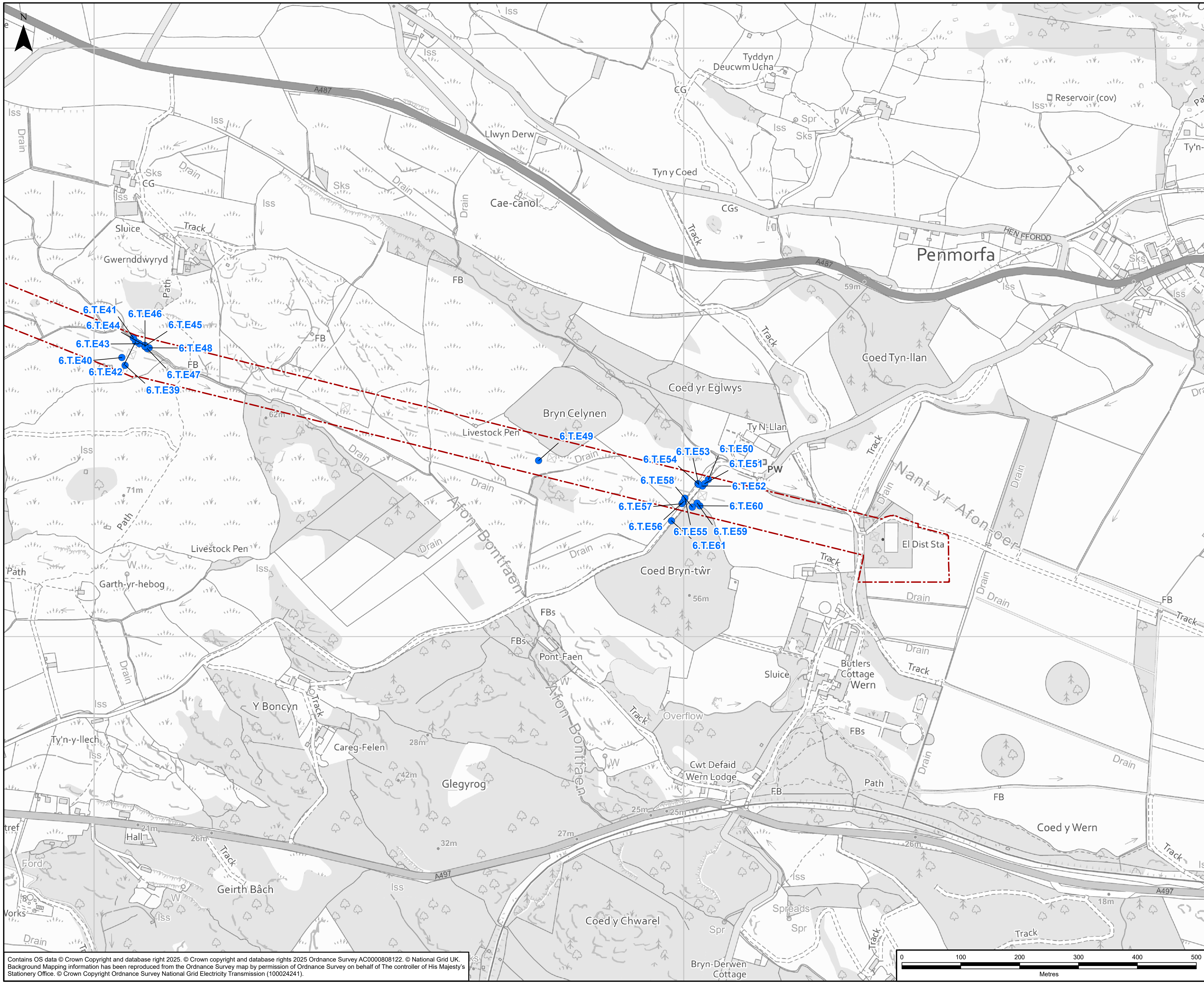

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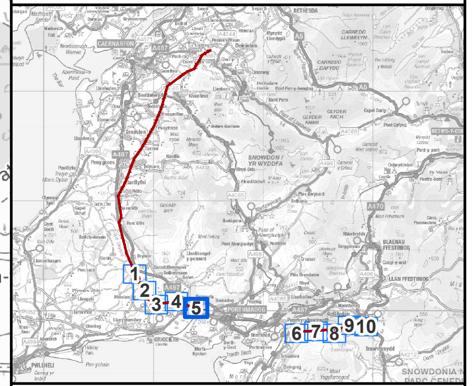

Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	5 OF 10	A

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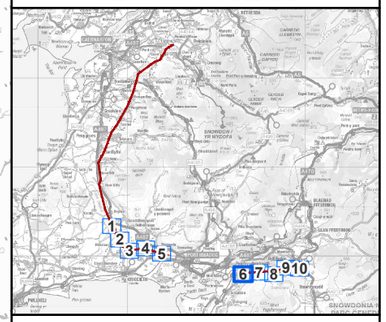

Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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BAT ROOST SUITABILITY OF TREES

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Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:6,000	A3	6 OF 10	A

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N

Coed Felinrhyd

Llyn Tecwyn Uchaf

Moel Tecwyn

Cae'n-y-Coed Uchaf

Pen-y-bryn-pwll-du

Tyn-y-ffridd

Yr Onnen

Llyn Llenyrch

6.T.E63

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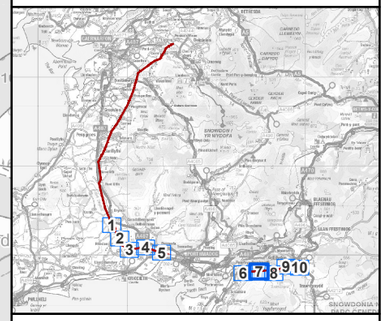
0 100 200 300 400 500
Metres

WIDER WORKS ROUTE LEGEND



Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
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Document Title: FIGURE 6.5.C.3
BAT ROOST SUITABILITY OF TREES

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CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

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N

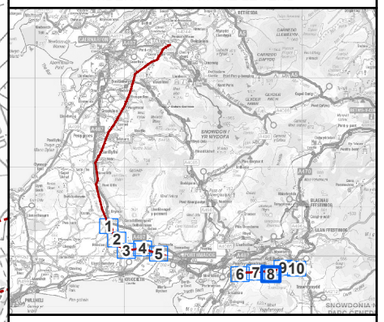
6.T.E63
6.T.E64
6.T.E65
6.T.E66

Cae'n-y-Coed Uchaf
Coed Nyth-y-frân
Coed Llenyrch
Coed Cefn-faes
Ceunant Llennyrch
Llech-y-cwrn Covert
Ysgubor-Hen
Waterfall
Llenyrch
Sheep Wash
Livestock Pen
Argae Newydd Maentwrog
Nant-Ddu
Ceunant Geifr

Track
Path
Ford
Fords
FB
Drain
Sluice
Iss

149m
212m
177m
199m
196m
184m
183m
181m
189m
207m
201m
128m
182m
154m
127m
191m
178m
230m
223m
213m
202m
211m
224m
228m
221m
236m
252m

WIDER WORKS ROUTE LEGEND



Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

0 100 200 300 400 500
Metres

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES
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Document Title: FIGURE 6.5.C.3
BAT ROOST SUITABILITY OF TREES

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CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

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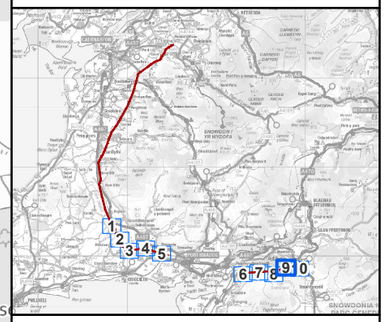

Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

6.T.E66
6.T.E67
6.T.E68
6.T.E69
6.T.E70
6.T.E71
6.T.E72
6.T.E73
6.T.E74

Coed Pennyglannau
Coed Penyglannau
Coed-y-Llŵyn
Coed Caersaeson
Uwchlawr Coed
Hut Circles
Llech-y-Cwm
Llech-y-cwrn Covert
Pen-y-Glanau Hall
Yogi Bear
Cefnfaes
Ysgubor-Hen
Caersaeson
Craig Gyfynys
Livestock Pen
Livestock Pens
Sheep Wash
Afon Tafarn-h

0 100 200 300 400 500
Metres

Rev	Date	Description	GIS	Chk	App
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Document Title:
FIGURE 6.5.C.3
BAT ROOST SUITABILITY OF TREES

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N

Coed-y-Llwyn

Afon

FB

Iss

Nurse Cae-dû

163m

Track

Drain

Creigiau-Duon

Sks

Wern-leirch

Mur-Llwyd

ROMAN ROAD

PW

Utica

201m

Mast

Livestock Pen

Ford

Path

Livestock Pens

Sheep Wash

6.T.E72

Collects

6.T.E73

6.T.E74

177m

Caersaeson

FBs

Spreads

Fords

Power Station (dis)

Sewage Works

Car Park

Slipway

212m

206m

204m

201m

274m

CG

Outfall

Garreg Felin

A470

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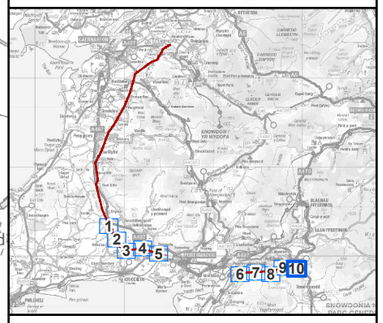
0 100 200 300 400 500

Metres

WIDER WORKS ROUTE LEGEND



Legend

Indicative Wider Works Site Boundary

Tree - Bat Roost Suitability - Potential Roost Feature (PRF)

PRF

Rev	Date	Description	GIS	Chk	App
A	11/09/2025	Environmental Statement	CA	AD	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.3 BAT ROOST SUITABILITY OF TREES

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CA	11/09/2025	AD	11/09/2025	NL	11/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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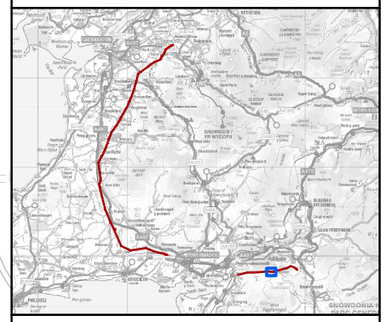
N

2x SP 22:31
1x CP 22:31
2x CP 22:26
1x SP 22:23
1x CP 22:40
Start point
End point
1x SP 21:16
1x CP 22:42
1x SP 22:42
1x CP 22:46
1x SP 22:49
1x CP 22:59
1x SP 22:53
2x SP 23:06

Coed Nyth-y-frân
Coed Llenyrch
Llenyrch
Track
Path (um)
CW
Issues
Ruin

0 50 100 150 200 250
Metres

WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- Automated Bat Detector Location
- Route
- Survey Start/End Location

Bat Species (Number of Bats and Record Time)

Pipistrelle Species

- Common pipistrelle (CP)
- Soprano pipistrelle (SP)

Rev	Date	Description	GIS	Chk	App
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WIDER WORKS

Document Title: FIGURE 6.5.C.4
NIGHT-TIME BAT WALKOVER JULY 2024
& AUTOMATED BAT DETECTOR LOCATION

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CA	15/09/2025	AD	15/09/2025	NL	15/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:3,000	A3	1 OF 3	A

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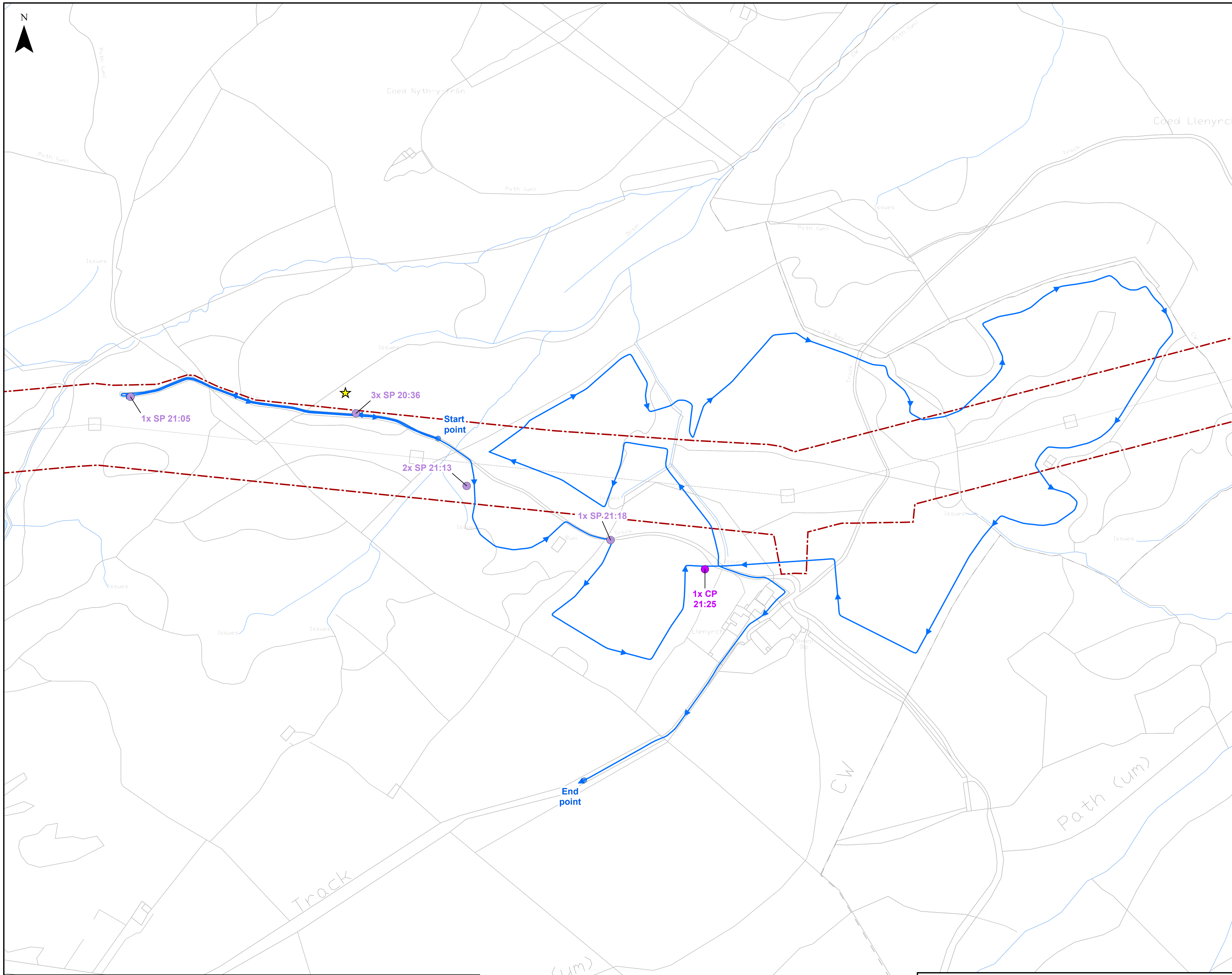

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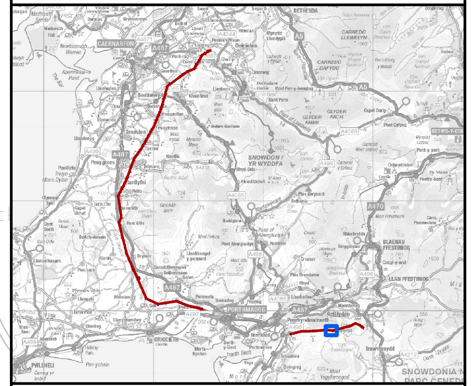
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- Automated Bat Detector Location
- Route
- Survey Start/End Location

Bat Species (Number of Bats and Record Time)

Pipistrelle Species

- Common pipistrelle (CP)
- Soprano pipistrelle (SP)

Rev	Date	Description	GIS	Chk	App
A	15/09/2025	Environmental Statement	CA	AD	NL

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Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.4 NIGHT-TIME BAT WALKOVER AUGUST 2024 & AUTOMATED BAT DETECTOR LOCATION

Creator:	Date:	Checker:	Date:	Approver:	Date:
CA	15/09/2025	AD	15/09/2025	NL	15/09/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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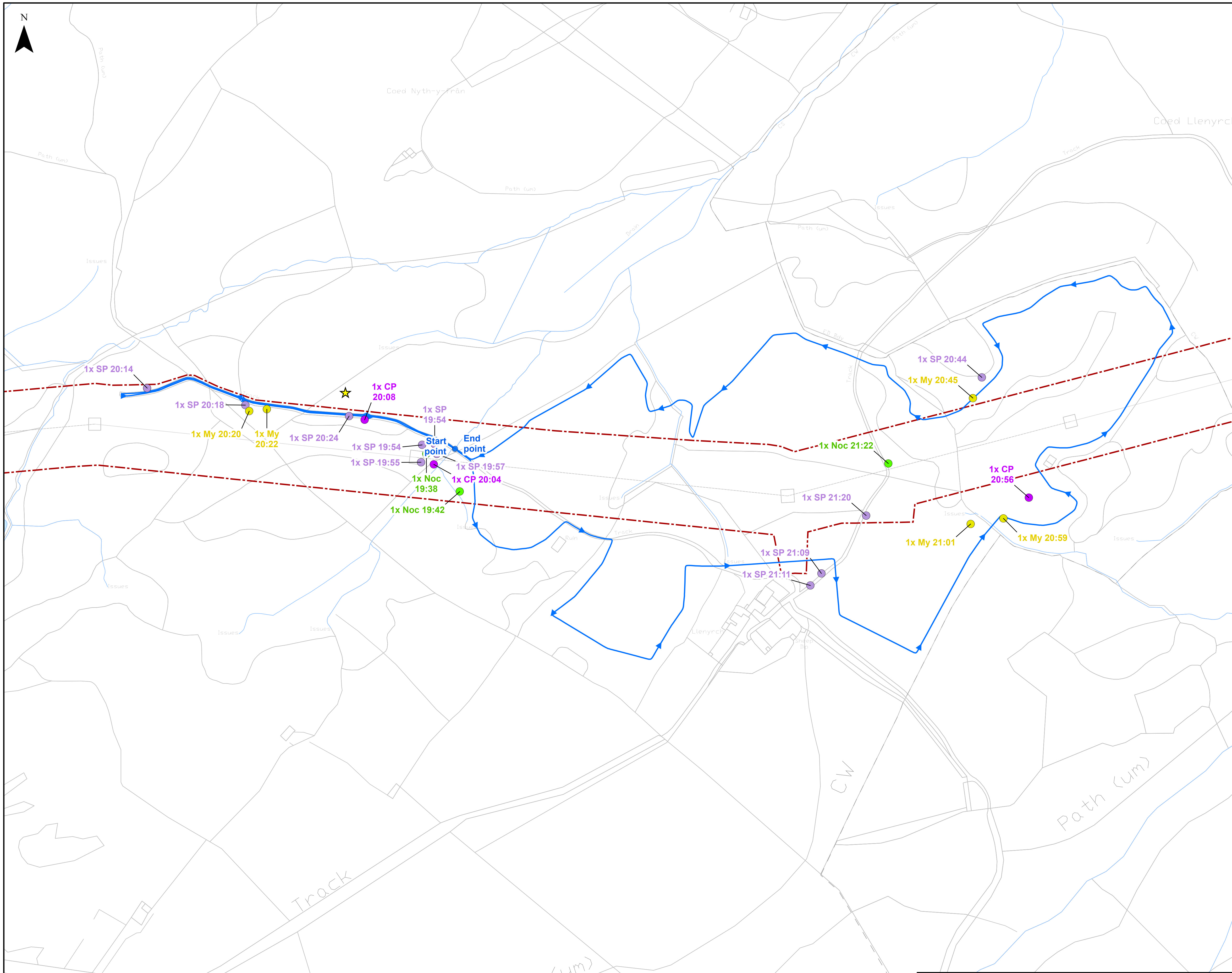

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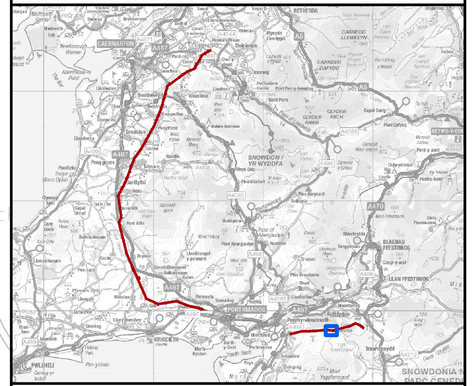

Legend

- Indicative Wider Works Site Boundary
- Automated Bat Detector Location
- Route
- Survey Start/End Location

Bat Species (Number of Bats and Record Time)

Pipistrelle Species

- Common pipistrelle (CP)
- Soprano pipistrelle (SP)

Myotis Species

- Myotis (My)

Nyctalus Species

- Noctule (Noc)

A	15/09/2025	Environmental Statement	CA	AD	NL
Rev	Date	Description	GIS	Chk	App

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Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: FIGURE 6.5.C.4 NIGHT-TIME BAT WALKOVER SEPTEMBER 2024 & AUTOMATED BAT DETECTOR LOCATION

Creator: CA	Date: 15/09/2025	Checker: AD	Date: 15/09/2025	Approver: NL	Date: 15/09/2025
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Metres

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6.5.D Badger Survey Report (Confidential)

6.5.E Wider Works Riparian Mammals Ecology Report - CONFIDENTIAL