Plas Power Solar and Energy Storage Project

4.3 Environmental Statement Volume 3: Appendices

Part 12 of 14

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Schedule of appendices included in this document

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Appendix 6.8
Outline Landscape and Ecology Management Plan

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OUTLINE LANDSCAPE AND ECOLOGY MANAGEMENT PLAN

Plas Power Solar and Energy Storage Project

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Document status

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1 INTRODUCTION

1.1 General Summary

1.1.1 RPS was commissioned by Lightsource bp to prepare an outline Landscape and Ecological Management Plan (oLEMP) for the installation of a solar farm and energy storage facility at the Plas Power site. The site lies within the Plas Power Estate at Wrexham, North Wales.

1.1.2 Landscape and ecology elements, and their management, are intrinsically linked. As such, this report includes input from both landscape and ecology professionals to ensure the management meets the required aims and objectives intended following the related survey work, and the design and habitat provision intentions. Expectedly there is some overlap and repetition within the guidance provided.

1.1.3 The purpose of this report is to provide details for the long-term management and maintenance requirements of landscape and ecology elements that will be incorporated into the landscape scheme at the Plas Power Solar and Energy Storage facility, from herein referred to as 'Proposed Development'. The Illustrative Landscape and Ecology Masterplan and Typical Planting Schedule are included within this report at **Drawing 1** and **Appendix B** respectively. The detailed landscape design will be prepared in consultation with Wrexham Council and this oLEMP will be updated accordingly.

1.1.4 The report defines general species protection measures that will be implemented as part of the Proposed Development. Species specific mitigation measures which will be implemented during the construction and decommissioning of the Proposed Development are also provided.

1.1.5 This report details the biodiversity and landscape aims and objectives for the habitats at the site during the operation of the Proposed Development. It sets out the proposed management actions / specifications which are designed to achieve these objectives. The report also details the monitoring programme and targets which will assess the outcomes of initial habitat creation and the ongoing management. It also provides a detailed landscape maintenance schedule within **Appendices C – G.** Standard management considerations are detailed within **Appendix H**.

1.1.6 Monitoring will inform future management decisions, confirming where the specific target habitat conditions are being achieved and identifying if there are shortfalls to be addressed through remedial actions or modifications to management. This process of habitat management for biodiversity, supported by monitoring, will be a long-term commitment that will continue over the lifetime of the Proposed Development.

1.2 Site Description

1.2.1 The Proposed Development is approximately 136 ha in size located to the west of Wrexham, North Wales, centred at grid reference SJ 301 501.

1.2.2 The site comprises two sections of land located to the north and south of the A525. The majority of the survey area lies to the south of the A525 and covers majority farmland, most of which is pasture. A section of the survey area lies to the north of the A525 and largely comprises arable farmland (grass ley fields). Small sections of amenity grassland and tall ruderal are present.

1.2.3 The fields are bounded by hedgerows, mature and semi-mature trees and woodland.

1.2.4 Big Wood Wildlife Site (WS) adjoins the survey area to the south with the River Clywedog flowing through this block of woodland. Higher Berse Marsh WS adjoins the survey area at the north and Afon Gwenfro WS lies beyond the B5430 (Higher Berse Road) to the north of the survey area.

1.2.5 The A483 dual carriageway is located to the east of the survey area, adjoining the site boundary to the south-east.

1.2.6 The wider landscape comprises farmland, the city of Wrexham to the east and smaller villages to the north and east.

1.3 Delivery Mechanism

1.3.1 Implementation and maintenance of all hard and soft landscape areas (including planting) shall be covered by the main contractor under the terms of the 12-month defects period. The defects period will commence following the agreed Practical Completion (PC) date. The main contractor shall be responsible for all reasonable plant failures and defects with the landscape and ecology works for the duration of this period. Following completion of the 12-month defects period, at an agreed date, responsibility for all future maintenance and management shall be passed to Lightsource bp.

1.3.2 Lightsource bp will be responsible for the full implementation of the management actions and monitoring activities in accordance with the plan and work schedule. Lightsource bp will document progress in relation to the nature conservation aims and objectives and monitoring reports will be circulated to the LPA.

1.3.3 The implementation of the management prescriptions at the correct time of year will continue over the lifetime of the Proposed Development. Lightsource bp will appoint suitably experienced contractors and ecologists as required to assist in the delivery.

1.3.4 The mechanism through which the long-term funding can be guaranteed will be agreed with the local planning authority prior to the start of construction. Funding will cover the physical management on the ground following good ecological practice, targeted biological monitoring and the associated reporting and when necessary remedial measures.

1.4 Responsibilities for Management

1.4.1 All maintenance and management of soft landscape areas within the Proposed Development will be undertaken by a suitably qualified landscape management contractor and/or other specialist contractors (as required) on behalf of Lightsource bp, following the end of the 12-month defects period and satisfactory completion of any landscape defects or necessary reinstatement works. Due to the presence of protected species, the ecology parts of this oLEMP detail protection and management requirements during the construction phases as well.

1.4.2 Periodically the landscape and ecology maintenance and monitoring works shall be inspected by suitably qualified and experienced persons to ensure that the landscape management operations are being completed in accordance with the approved report.

1.4.3 The nature of soft landscape elements as a dynamic entity means that the management requirements shall be required to be reviewed periodically to ensure that they are still achieving the overarching objectives and any adjustments made to practices and / or frequency to bring the scheme in line with the management requirements.

2 LANDSCAPE DESIGN OBJECTIVES AND MANAGEMENT AIMS

2.1 Landscape Design Objectives

2.1.1 The landscape design was developed in co-ordination with the other related environmental disciplines including ecologists, flood risk, heritage and arboricultural teams to ensure a responsive and multi-functional design was created.

2.1.2 The overall design objectives of the landscape proposals are as follows;

- **Landscape Integration and Local Character:**

  To respond to the setting, scale and character of the site and to provide screening to the Proposed Development from within the local area and from elevated areas to the west. Provide an appropriate setting for the proposals, responding to adjacent pastoral/arable land uses where appropriate, ensuring that the landscape proposals include native species planting appropriate to the local area. Enhancing and protecting the existing landscape fabric.

- **Landscape Amenity:**

  Enhance the local residents and visitors experience within this landscape, including the retention and enhancement of public access along waymarked footpaths and introduction of interpretation boards, and some flexible amenity and recreation areas.

- **Biodiversity:**

  To protect, manage, enhance and monitor the nature conservation value of the site, creating a biodiversity rich environment – in line with all biodiversity objectives listed in Section 8 below. Provision of designated Biodiversity Enhancement Areas which are areas designed for habitats and have low human intervention.

2.2 Management Aims

2.2.1 The management of the site shall seek to balance the integration of the Proposed Development and its operational objectives / needs within the existing mature vegetation and context of the locality. It will lead to the retention, enhancement and management of the existing hedgerows and trees. Particularly strengthening and maintaining hedgerow boundaries at 3m high. Ensure longevity of new tree and hedge planting, and the establishment of species rich grassland, tussock grassland and wildflower meadow areas.

2.2.2 To ensure the longevity of the landscape scheme to provide the biodiversity enhancements proposed and the required screening to the Proposed Development, the recommendations contained within this report should be implemented post practical completion of all soft landscape elements within the site.

3 LANDSCAPE ELEMENTS

3.1.1 For the purposes of this oLEMP, the landscape elements have been grouped into hard and soft landscape elements, these have been identified below and the various elements shall be managed in accordance with best practice guidance and specific works outlined in **Appendix C – G** (Landscape and Ecological Maintenance Schedule). Due to the intrinsic nature of landscape and ecology, there is an overlap with the biodiversity features listed on the following page.

3.2 Soft Landscape Elements

3.2.1 The landscape elements listed below have been incorporated into the Illustrative Landscape and Ecology Masterplan. Mixes of tree and shrub species that could be included in the planting areas are given in the Typical Planting Schedule included in **Appendix B** along with recommended planting densities and mature heights.

- Existing Hedgerow and Trees (individual and groups);
- Existing Wooded Areas;
- Proposed Native tree and shrub planting;
- Native hedgerows;
- Tussocky grassland field margins;
- Wildflower grassland incl. hedgerow and woodland meadow, wet meadow and amenity meadow;
- Amenity Grass Areas (within informal recreation area);

3.3 Hard Landscape Elements

3.3.1 The various hard landscape elements are listed below, for further detail regarding the maintenance of these areas refer to **Appendix C – G** (Landscape and Ecological Maintenance Schedule).

- Permeable Crushed Stone Pedestrian Pathways
- Vehicular Access Asphalt Areas (non-adoptable);
- Fencing; and,
- Interpretation boards

4 BIODIVERSITY FEATURES

4.1 Habitats

4.1.1 The Proposed Development will comprise the following retained/enhanced and created habitats which will be subject to management to specifically promote their value for biodiversity. These habitats and the location of the Biodiversity Areas are shown on the Illustrative Landscape and Ecology Masterplan (**Drawing 1**) and Typical Planting Schedule (**Appendix B**).

Solar Arrays

- Grassland beneath solar arrays – previously improved grassland fields
- Grassland beneath solar arrays – previously arable fields
- Tussocky grassland field margins
- Retained hedgerows (some with mature and semi-mature trees)
- Winter cover crop
- New native species-rich hedgerows

Biodiversity Areas

- Wildflower grassland
- Tussocky grassland
- Winter cover crop
- Native tree and shrub planting
- New native species-rich hedgerows
- Three new ponds with native marginal planting
- Invertebrate banks

4.1.2 The majority of fields within the existing site comprise short-grazed improved grassland with a low species diversity. The remaining fields comprise ryegrass leys and fields used for potato crop production.

4.1.3 The fields will be sown with a grazing mixture and once established can be grazed by sheep during the operational life of the Proposed Development.

4.1.4 The existing field boundaries comprise both species-rich and species-poor hedgerows with limited hedgerow base flora. The species-poor hedgerows, many of which have gaps, will be enhanced through the planting of a mixture of native species shrubs. The hedgerows will be sensitively managed to promote the development of dense structure with fruiting and flowering shrubs. New hedgerows will be created using a mixture of native species.

4.1.5 Hedgerows at the north of the site include mature and semi-mature trees which will be retained. The sensitive management of mature trees will minimise tree surgery operations.

4.1.6 The strips of field boundary grassland between the perimeter fence and hedgerow will be managed as tussocky grassland, allowing them to develop a more varied structure and greater species diversity compared to the short, grazed pasture.

4.1.7 Areas of winter cover crop will be sown with a mixture of species to create a replacement foraging resource for wintering birds.

4.1.8 In the Biodiversity Areas the following habitats will be created on formerly arable fields: new ponds, wildflower grassland, tussocky grassland, winter cover crop, dense scrub and tree planting and invertebrate banks.

4.1.9 New ponds will be created, and a range of marginal native species planted at the edges. A wildflower rich seed mixture and tussocky grassland mixture will be sown and sensitively managed to promote the biodiversity value of the habitat. Native shrubs will be planted and managed to promote the development of dense scrub. An area of winter cover crop will be created at the north of the area. Individual native trees will also be planted. Invertebrate banks will also be created in the area as per the specification in **Appendix A.**

4.2 Species

Great Crested Newt

4.2.1 Breeding populations of great created newts (GCN) *Triturus cristatus* have been recorded in nearby ponds, the closest being pond P3, 60 m west of the site boundary (RPS, 2023a, ES Appendix 6.4 and Appendix 6.5). The short-grazed improved pasture and arable, which constitutes the majority of the existing site, is considered to have low value for GCN. Taller grassland along the hedgerow margins provides greater cover and is more likely to be used by this species.

4.2.2 The majority of the construction activity will be located within arable and short grazed pasture where there is a very low likelihood of GCN being present. There is a low likelihood of GCN being present within the field margins and works within this habitat have potential to result in harm to GCN if present.

4.2.3 Species specific mitigation will be undertaken to protect GCN during construction and decommissioning.

4.2.4 The changes in the management of field boundaries will create a tussocky grassland structure which will provide significant cover and support a higher abundance of invertebrate prey than the close grazed pasture increasing the value of the field margins for GCN.

4.2.5 The planting of new hedgerows and creation of additional tussocky grassland strips will further increase the habitat extent. The tussocky grassland will improve the connectivity for GCN and other fauna across the site.

4.2.6 New ponds being created within the Biodiversity Areas will be designed to provide additional breeding habitat for amphibians. The deepest areas of open water will be designed to be at least 1m deep (as an average water depth) and a range of marginal native species for territorial display and egg-laying respectively.

4.2.7 Wildflower grassland will also provide a potential foraging habitat for amphibians with areas of dense scrub also providing cover.

Bats

4.2.8 Mature and semi-mature sycamore, oak and ash trees are distributed within hedgerows and boundary woodland throughout the site and, rarely, as stand-alone trees within the fields (RPS, 2023b, ES Appendix 6.1). These trees are of a sufficient age and size to contain potential roost features which may support bats.

4.2.9 The majority of trees within the site and the offsite woodland will be retained and protected.

4.2.10 A small number of trees may be felled to facilitate access into the site. None of the trees proposed for removal have features suitable for roosting bats.

4.2.11 The landscape proposals include several features which will benefit bats. The planting of new hedgerows will create new potential flight lines between areas of woodland and the planting of new shrubs within the Biodiversity Areas will create new habitat boundaries suitable for foraging bats. The creation of new ponds and wildflower and tussocky grassland will promote the abundance of invertebrate prey.

Badger

4.2.12 Badgers are present in the wider area though there are no setts within the site and activity recorded within the site has been limited (RPS, 2023b, ES Appendix 6.1). They are considered to use the site infrequently.

4.2.13 General species protection measures will be undertaken to protect badgers and other species during construction and decommissioning works.

Dormouse

4.2.14 There is potential for dormouse to be present in hedgerows bounding the onsite fields and adjoining woodland (RPS, 2023b, ES Appendix 6.1).

4.2.15 The majority of hedgerows within the site are intact, dense and scrubby providing suitable cover for dormouse and food sources. The have good connectivity to areas of offsite woodland.

4.2.16 There are several treelines and defunct hedgerows which are less suitable due to their poor connectivity and lower levels of cover. The area of Big Wood immediately adjoining the Proposed Development has a sparse understorey shrub layer, limiting its potential value for dormouse.

4.2.17 The retention of the hedgerows and trees and protection of offsite woodland limit the potential for impacts on dormouse to be associated with the localised widening of existing access points/gateways in hedgerows.

4.2.18 The loss of small sections of hedgerow (and a few hedgerow trees) will be compensated through the planting of new hedgerows and areas of scrub. These measures will result in an increase in the extent of suitable habitat for dormouse within the Proposed Development.

4.2.19 Species specific mitigation will be undertaken to protect dormouse during construction and decommissioning.

Wintering Birds

4.2.20 The existing arable and improved fields along with boundary hedgerows and woodland provide a foraging resource for wintering birds which feed (RPS, 2023c, ES Appendix 6.3).

4.2.21 The grassland beneath solar panels will be retained and can continue to be sheep grazed. The planting of new shrubs, trees and hedgerows and sensitive management of these habitats will increase the abundance of berries available in autumn and early winter.

4.2.22 The arable fields (sown as ryegrass and potato crop in 2023) will be converted to grassland. New areas of winter cover crop will be sown with a mixture of cereal species to provide a winter food resource for farmland passerines including meadow pipit, skylark, linnet and yellowhammer. The winter cover crop will be resown annually with a mixture of crop species valuable to wintering birds.

Breeding Birds

4.2.23 Up to two pairs of skylark and one pair of meadow pipit were recorded as probably breeding within the pasture fields during the breeding bird survey undertaken by RPS (RPS, 2021, ES Appendix 6.2).

4.2.24 The following birds of conservation concern have also been recorded as confirmed, probable or possible breeding species within adjoining woodland: kestrel, whitethroat, goldcrest, willow warbler, grey wagtail, house sparrow, mistle thrush, song thrush and dunnock (RPS, 2021, ES Appendix 6.2).

4.2.25 The majority of the breeding species recorded during the survey were using the off-site woodlands adjoining the boundary of the site.

4.2.26 Ground nesting birds were the only species recorded as probably breeding within the development footprint (skylark and meadow pipit) and are both assumed to be nesting in the fields in low numbers.

4.2.27 The removal of small sections of hedgerow or trees may be required to facilitate access into the site. The retained hedgerows and trees will continue to provide nesting habitat during the operation of the Proposed Development. New hedgerows, trees and dense scrub will increase the extent of habitat available.

4.2.28 Species specific mitigation will be undertaken to protect nesting birds during construction and decommissioning, both ground nesting birds in fields and species nesting in hedgerows.

4.2.29 Dense scrub, hedgerows and trees will be sensitively managed to promote fruiting and flowering providing foraging resources.

4.2.30 New and retained habitats will be associated with invertebrate abundance providing food for nesting birds and their fledglings.

Reptiles

4.2.31 The short-grazed pasture fields and arable which constitute the majority of the site have very low value for reptiles (RPS, 2023b, ES Appendix 6.1). Taller vegetation alongside hedgerows and ditches provide areas of cover and potential foraging habitat and provide a narrow extent of higher value reptile habitat.

4.2.32 The small sections of hedgerow and tree removal required will affect the taller grassland field margins where reptiles may be present.

4.2.33 Species specific mitigation will be undertaken during construction and decommissioning where works could affect reptiles.

4.2.34 The creation of areas of grassland, scrub and ponds within the Biodiversity Areas will significantly increase areas of habitat suitable for reptiles within the site.

Invertebrates

4.2.35 The range of habitats which will be created in the Biodiversity Areas will provide promote invertebrate diversity:

- Ponds with open water and a range of native marginal species
- Native species-rich dense scrub
- Native trees
- Invertebrate banks close to wildflower grassland which will be of value for soil-dwelling solitary bees and wasps
- Wildflower grassland subject to low intensity grazing.

4.2.36 Tussocky grassland and hedgerows around the fields containing solar panels will also be managed to promote their value for invertebrates by increasing the diversity of native plant species, creating a more varied grassland structure and promoting fruiting and flowering of shrubs.

4.2.37 The sensitive management of trees in hedgerow and retention of deadwood will also retain habitat of value for invertebrates.

4.2.38 The sowing of a grazing mix throughout the fields where solar panels will be installed has potential to increase the niches and food sources for invertebrate populations.

5 GENERAL SPECIES PROTECTION MEASURES

5.1.1 An Ecological Clerk of Works (ECoW) will provide advice and undertake ecological supervision where required and where specified in the protection measures detailed below. The ECoW will be experienced in site work supervision including issues relating to the species affected and the specific task being undertaken (e.g. checks for nesting birds, dormouse etc).

5.1.2 Work carried out under a Natural Resources Wales EPS mitigation license for GCN will be supervised by the ecologist named on the licence or their accredited agent.

5.1.3 Prior to any works being carried out which risk harming animals, the landscape management contractor and his operatives will be given a toolbox talk by the project ecologist, ECoW, or licensed ecologist if the work relates to an EPS mitigation licence. The toolbox talk will brief all staff on the following:

- Species of animals that may be encountered and their legal status;
- How the work could affect animal species that may be present;
- Summary of EPS mitigation licensing (where relevant) including levels of protection, potential offences and how the licence conditions relate to the work being carried out;
- Any specific working method required to minimise harm to animals;
- What to do if any animals are encountered while carrying out the work; and,
- The ecologist's role in the work.

5.1.4 The ecologist will provide contractors (and Lightsource bp) with an information pack containing contact details of the project ecologist and all the material used for the toolbox talk. The information pack will be kept securely in the site office for reference for the duration of the works.

5.1.5 Any new staff arriving after the toolbox talk will be expected to attend a toolbox talk briefing delivered either by the ecologist or the landscape management contractor's site manager, before starting work.

5.1.6 Hedgerows, trees and offsite woodland will be protected during construction. The tree protection fencing will provide an effective barrier ensuring any fauna (particularly dormice, reptiles and birds) using the protected hedgerows and field margin will not be harmed during construction. Fencing will be fixed to the ground to prevent disturbance of the root protection area (RPA) and the canopy in accordance with BS 5837:2012 Trees in relation to design, demolition and construction.

5.1.7 Best practice in construction site hygiene management will minimise the risk of harm to animals which may stray into the construction area. The following measures apply mostly to badgers but will also minimise the risk of harm to other small mammals.

5.1.8 All excavations left overnight will either be covered, or if left open will be provided with a means of escape such as a shallow sloping scaffolding plank, earth slope or similar, to allow any individuals that enter excavations to easily escape.

5.1.9 Open pipework larger than 150mm external diameter will be blanked off at the end of each working day.

5.1.10 In the unlikely event that a trapped badger or small mammal is encountered, an ecologist will be contacted immediately for further advice.

5.1.11 Chemicals or other hazardous materials will be contained and stored so they cannot be accessed or knocked over by roaming animals.

5.1.12 To minimise the risk of animals being attracted into the working area, food and litter will not be left overnight in the construction zone.

5.1.13 Storage mounds of soft material into which badgers or other animals could dig to establish setts (such as topsoil) will be kept to a minimum. Where such storage is essential the materials will be subject to daily inspections to ensure badgers have not established setts.

5.1.14 If any burrows are found that may be badger setts, excavation within 30m of the burrow should cease temporarily and an ecologist contacted as to how to proceed.

6 SPECIES SPECIFIC MITIGATION MEASURES

6.1.1 Where there is potential for impacts on protected species, the species-specific mitigation measures described below will be implemented during the construction and decommissioning of the Proposed Development.

6.2 Great Crested Newt

6.2.1 Measures which will be undertaken to protect GCN are detailed in the GCN Mitigation Strategy (RPS, 2023, ES Appendix 6.9). The GCN Mitigation Strategy will be fully implemented during the installation of the solar arrays, access tracks and infrastructure to ensure that the Proposed Development avoids any harm to GCN.

6.2.2 A Welsh Government species mitigation licence for GCN will be obtained for the site.

6.2.3 Many of the measures detailed in the licence will be implemented prior to the start of any site works that have the potential to affect habitats in which GCN could be present.

6.2.4 The method statement attached to the licence will include precautionary species protection measures which will be implemented during the excavations for foundations, construction of new sections of road and piling of the solar panel supports designed to protect individuals and maintain the favourable conservation status of GCN in the locality.

6.2.5 Fingertip searches will be undertaken by an ecological clerk of works (ECoW) where foraging habitat will be disturbed during the active season.

6.3 Bats

6.3.1 All trees subject to removal to enable access will be surveyed by a suitably experienced ecologist to confirm whether potential roost features are present.

6.3.2 Should potential roost features be present, further inspection undertaken by a qualified tree climber who also holds a Natural Resources Wales bat survey and handling licence to confirm whether these are in use by bats.

6.3.3 In the event that bats, or signs of bats are found indicating a roost, tree felling would be postponed and no works affecting the trees, or which could indirectly affect the roost would be carried out until a Welsh Government bat mitigation licence has been obtained.

6.4 Dormouse

6.4.1 If dormouse are present within the on-site hedgerows there is potential for individuals to be harmed during localised works to hedgerows at access points if the works are not carried out sensitively and at the appropriate time of year.

6.4.2 Where short sections of hedgerow removal (up to 10m) are required to widen the access points precautionary working measures will be undertaken. This will follow a non-licenced method statement.

6.4.3 Vegetation clearance will be supervised by a licensed ecologist. The ecologist will undertake hand search of areas of dense canopy where necessary to ensure no dormice are present prior to and throughout the vegetation clearance.

6.4.4 Hedgerows and dense scrub will first be cut to between 150mm and 300mm above ground level. Cutting will be carried out using only hand tools (i.e. chainsaws and brush cutters) and ensuring that there is no ground disturbance.

6.4.5 Hedgerows and scrub will be cut systematically in the direction of retained habitat to enable any active dormice to move away from harm.

6.4.6 The second stage of clearance to ground level will be carried out only once the licensed ecologist has confirmed it is safe to do so. This will be between April – October when daytime temperatures are over 9°C.

6.4.7 In the very unlikely event that a dormouse is encountered during vegetation removal, it would be carefully captured by the licensed ecologist and placed in suitable habitat away from the works. Any works which could affect dormouse would be postponed until a Natural Resources Wales EPS mitigation licence has been obtained.

6.5 Nesting birds

6.5.1 Works affecting hedgerows, trees or within pasture fields have potential to impact upon nesting birds if carried out during the main breeding season (March to August inclusive).

6.5.2 Where possible all hedgerow removal and tree felling will be undertaken outside of the main bird nesting period (March to August Inclusive). Provided this is the case, the risk of damage or disturbance of active nests within this habitat will be negligible, and no ecological supervision is required.

6.5.3 If for any reason this is not possible, the ECoW will check the vegetation for active nests or nesting activity indicating birds are buildings nests. Checks will be carried out no more than 48 hours prior to vegetation removal.

6.5.4 Where works are planned within pasture fields during the active season, a walkover should be undertaken prior to works commencing in the field by the ECoW to check for the presence of ground nesting birds.

6.5.5 Any active nests found will be protected and must remain undisturbed until the ECoW has confirmed and they are no longer in use.

6.5.6 The ECoW will define an appropriate exclusion area around the nest within which no works would be permitted.

6.6 Reptiles

6.6.1 In the absence of mitigation there is a risk of harming reptiles during habitat removal. This risk is greatly increased in late autumn through to early spring when reptiles are hibernating. Animals present at this time would be likely to be hibernating and would be unable to escape harm during habitat clearance.

6.6.2 During the active season, measures to protect great crested newts will also provide protection to reptiles.

7 ECOLOGICAL TRENDS AND CONSTRAINTS

7.1 Establishment of Created Habitats

7.1.1 A series of new habitats will be created on formerly arable land. During the initial establishment phase (initial five years) there is potential for the natural colonisation of undesirable species (ruderals and bramble scrub in grassland; algae, bulrush and duckweed in new ponds) or for some of the sown species to poorly establish.

7.1.2 Habitat monitoring will assess the establishment of each habitat and inform where remedial measures are required to achieve the biodiversity objectives and targets defined in Section 4 of this report.

7.2 Mature and Semi-Mature Trees

7.2.1 The mature and semi-mature trees within the hedgerows have high existing value with a wide range of niches that will be associated with a diversity of invertebrates. This existing value will continue to develop over time as more deadwood features and cavities form in the structure of the trees.

7.2.2 Areas of decay on trees can have specific value for biodiversity and in the absence of management these features will naturally form in old trees increasing the value of the tree. Conversely the removal of rot, cavities and deadwood would reduce the importance of the tree and could adversely affect legally protected nesting birds and roosting bats if present (see Section 7.3).

7.3 Wildlife Legislation

Great Crested Newt

7.3.1 Great created newts are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (and as amended), which affords the species protection under Section 9. The species is also listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2017. In combination, this makes it an offence to:

- intentionally kill, injure or take (capture etc.) a great crested newt;
- possess a great crested newt; or,
- intentionally or recklessly damage, destroy, obstruct access to any structure or place used by Great Crested Newt for shelter or protection, or disturb any animal occupying such a structure or place; and sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative) or advertise for buying or selling such things.

7.3.2 Great crested newts are also a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016. This legislation requires the conservation of great crested newt and their habitats to be given consideration in planning decisions.

7.3.3 There is potential for the new ponds within the Biodiversity Area to be colonised by GCN. Monitoring surveys will assess whether the species is present in the ponds. The management of the ponds outside of the GCN breeding season will avoid impacts on breeding GCN.

7.3.4 In the event that essential works are required on the ponds during the GCN breeding season, the advice of a licenced ecologist will be sought to ensure that all work is lawful and complies with wildlife legislation.

7.3.5 The newly created invertebrate banks, as well as tree roots, rocks, and deadwood such as logs have potential to be used as hibernacula by amphibians, reptiles and invertebrates and will be left

undisturbed during winter (broadly mid-October to mid-March though dependent on the weather conditions each year).

Bats

7.3.6 All British bat species are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981, as updated by the Countryside and Rights of Way Act 2000. All British bats are also included on Schedule 2 of The Conservation of Habitats and Species Regulations 2017 as European Protected Species. It is an offence to:

- intentionally or recklessly kill, injure or capture bats;
- deliberately or recklessly disturb bats (whether in a roost or not); and
- damage, destroy or obstruct access to bat roosts.

7.3.7 A roost is defined as 'any structure or place which [a bat] uses for shelter or protection'. As bats tend to reuse the same roosts, legal opinion is that a roost is protected whether or not bats are present at the time of survey.

7.3.8 A licence will therefore be required by those who carry out any operation that would otherwise result in offences being committed.

7.3.9 The following bat species are listed as being of principal importance for the conservation of biodiversity in Wales: barbastelle, Bechstein's bat, noctule, soprano pipistrelle, common pipistrelle, brown long-eared bat, greater horseshoe bat and lesser horseshoe bat.

7.3.10 In the future bats could be present in cavities in any of the semi-mature or mature trees within the Site. Therefore, should any essential arboricultural works be required on semi-mature or mature trees during the operation of the Proposed Development, the absence of bat roosts will be confirmed prior to works commencing to ensure that the work is lawful and complies with wildlife legislation.

Dormouse

7.3.11 Hazel dormice *Muscardinus avellanarius* receive full protection under Schedule 2 of The Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended). In combination, this makes it an offence to:

- intentionally, recklessly or deliberately kill, injure or take a dormouse;
- intentional or reckless disturbance of dormouse (at any level);
- damage or destroy a breeding site or resting place (nest);
- obstruct access to any place of shelter, breeding or rest; and
- possess or transport dormice or any other part of.

7.3.12 Dormouse are also a UK Biodiversity Action Plan (UKBAP) priority species and listed as Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016. This legislation requires the conservation of dormouse and their habitats to be given consideration in planning decisions.

Nesting Birds

7.3.13 All birds, their nests and eggs are afforded protection under the Wildlife and Countryside Act 1981, as updated by the Countryside and Rights of Way Act 2000. It is an offence to:

- intentionally kill, injure or take any wild bird;
- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built; and

- intentionally take or destroy the egg of any wild bird.

7.3.14 In addition, Schedule 1 birds cannot be intentionally or recklessly disturbed when nesting and there are increased penalties for doing so. Licences can be issued to visit the nests of such birds for conservation, scientific or photographic purposes but not to allow disturbance during a development even in circumstances where that development is fully authorised by consents such as a valid planning permission.

7.3.15 The bird nesting season generally runs from March to the end of August inclusive, but some species can be nest outside this period.

7.3.16 Woodland, scrub, hedgerows, tall ruderal and pond margins will be managed outside of the nesting season to avoid potential damage of active nests in accordance with the requirements of the legislation.

7.3.17 Any management within the nesting season would be subject to ecological checks in advance of the works.

7.3.18 No Schedule 1 bird species have been recorded at the site and it is not anticipated that any of these species would nest within the site in the future.

Reptiles

7.3.19 All UK reptiles are protected from intentional or reckless injuring or killing through part of Section 9(1 and 5) of the Wildlife & Countryside Act 1981 (as amended).

7.3.20 There is potential for new habitats within the Biodiversity Areas to be colonised by reptiles, primarily slow worm *Anguis fragilis*, grass snake *Natrix helvetica* and common lizard *Zootoca vivipara*.

7.3.21 All three species are also a Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016. This legislation requires the conservation of reptiles and their habitats to be given consideration in planning decisions.

7.3.22 The protection of potential hibernacula features during winter will protect reptiles alongside other species.

8 BIODIVERISTY OBJECTIVES AND TARGETS

8.1 Biodiversity Aims

8.1.1 The key aims for biodiversity are defined as:

- Create and maintain areas of grassland supporting a mixture of grasses and wildflower species within the Biodiversity Areas.
- Develop tussocky grassland around the boundaries of fields within the solar farm which will provide habitat for invertebrates and amphibians.
- Create and maintain new areas of scrub, hedgerows and trees providing nesting habitat and foraging resources for birds.
- Create and maintain new ponds providing additional habitat for amphibians and invertebrates.
- Protect the mature tree resource and allow deadwood features (invertebrates, bats and nesting birds).
- Promote habitat connectivity across the site.
- Maintain areas of grassland suitable for ground-nesting birds.
- Maintain winter food source for farmland birds.
- Maintain the accessibility of habitats across the solar farm for fauna species including badgers.
- Identify any negative habitat trends and effectively address through management and/or remedial actions.
- Ensure that all management actions comply with all wildlife legislation.

8.2 Biodiversity Objectives

Grasslands

- Maintain moderate wildflower diversity in the wildflower grassland within the Biodiversity Areas.
- Maintain varied sward height tussocky grassland as continuous habitat corridors on the field perimeters.
- Maintain the health and structure of wildflower grassland below and between solar panel arrays.
- Meet the target conditions set for each area of retained and created grassland (see Section 6) including the frequency/abundance of positive and negative indicator species.
- Ensure that grassland habitats within the Biodiversity Areas provide food, cover and prey for faunal species (invertebrates, amphibians and reptiles)

Native Shrub and Tree Planting

- Maintain dense, closed structure of scrub.
- Establish and maintain trees and scrub comprising a mixture of native species.
- Promote flowering/ fruiting of shrubs and trees through low intensive management.

Hedgerows

- Increase the diversity of native woody species in species-poor hedgerows.

- Establish and maintain new native species-rich hedgerows.
- Increase the diversity of hedgerow ground flora.
- Establish and maintain new hedgerows with a dense structure.
- Promote flowering/ fruiting of shrubs and trees through sensitive management.
- Protect mature and semi-mature trees allowing them to continue to develop value for biodiversity.
- Avoid all unnecessary tree management works maintaining a balance between health and safety, arboricultural value and biodiversity value.

Winter Cover Crop

- Recreate areas of mixed crops each spring and leave uncropped to provide foraging resources for wintering birds.

Ponds

- Create and maintain areas of open water over 1m in depth.
- Establish and maintain a diversity of non-competitive herbaceous wetland plant species on the pond margins.
- Control algal blooms.
- Avoid establishment of invasive non-native species and fish populations in all of the ponds.
- Identify any negative trends and implement remedial actions.

9 HABITAT MANAGEMENT

9.1 Grassland

New Grassland Establishment (Year 1)

9.1.1 Newly sown grassland should be cut monthly throughout the first year of establishment to a height of 40-60mm. Any residual perennial weeds such as docks, thistles, and common nettle should be carefully dig out or spot treated.

9.1.2 As the sown wildflowers and grass species are perennial they will be slow to germinate and grow and will not usually flower in their first growing season. There will often be a flush of annual weeds from the soil in the first growing season which may grow up and obscure the meadow seedlings beneath. The management actions will control annual weed growth, prevent significant spread and help maintain balance between faster growing grasses and slower developing wildflowers.

Grassland Management (Year 2 onwards)

9.1.3 In all subsequent years, the grassland should be managed as described in **Table 9-1**.

9.1.4 The soil fertility of the arable field will increase the growth of a few species and over time would be likely to adversely affect the populations of wildflower species. Consequently, weed growth should be managed at a higher rate during the first five years to control the growth of the most dominant grasses.

Table 9-1 Grassland Management Specifications

Grassland types	Management Specification	Timing
Wildflower tussocky grassland	The grassland should be cut up to three times per year. A hay cut of the whole of each grassland area should be undertaken annually between mid-August to mid-September. The grassland should be cut close to ground level (50mm). Arising should be left for 1-7 days to shed seed before being collected and removed from site. Additional cuts in April and mid-July may be undertaken as required where coarse grasses are prevalent.	August November (as required) March (as required)
Tussocky grassland	Removal of weeds as required throughout the year. No mowing between May and the end of August to promote the development of a tussocky structure and flower growth – except for access strips and around buildings as necessary for operational purposes. Cut once annually in August to a height of 50mm. Cut the re-growth through late Summer to 50mm and again in Spring if needed.	September - April
Grazed grassland beneath solar arrays	Removal of weeds as required throughout the year. Low intensity sheep grazing, or cutting regime, with an initial cut in early spring and again in August-September, and additional cuts if needed.	April – September

9.2 Native Tree and Shrub Planting

9.2.1 Patches of native shrubs and individual trees will be planted within the Biodiversity Areas. The shrubs will be managed to create dense patches of scrub which will provide areas of cover while individual trees will be allowed to mature into larger trees.

9.2.2 To maximise the chances of the successful establishment of new planting, any bare root stock would have their whole root system dipped in mycorrhizal fungi slurry following approved concentrations. Where rabbit or deer grazing results in the loss of planted stock, protection measures would be employed such as fencing. All dead, dying or diseased plants recorded during the first five years will be replaced in the following winter planting season with stock of similar specification to the original. Formative pruning would be adopted in the first five years to promote dense growth follow methods in accordance with BS:3998.

9.2.3 Low key management actions include annually cutting back bramble where there is potential for encroachment into neutral grassland and the maintenance of any fencing for as long as the shrubs are at risk could be damaged by grazing/browsing animals.

9.2.4 The rate of establishment of self-seeded and planted shrubs; and the structure they develop will inform management decisions following on from the initial aftercare period. Where practical, long term management decisions will promote the extent of dense scrub cover for nesting birds. Options would include the coppicing of selected shrub species including hazel.

9.3 Hedgerows

New Hedgerows

9.3.1 New native species hedgerows will be planted in the Biodiversity Areas and in the Proposed Development area, providing additional links between blocks of off-site woodland.

9.3.2 A mixture of native species will be used.

9.3.3 During the aftercare period both sides of the whole of the new hedgerow will cut after the first growing season at the end of Year 1 and again at the end of Year 3 to encourage dense growth and maintain an even shape. Where gaps occur, infill with native stock appropriate to planted hedge.

9.3.4 From Year 5 onwards the sides of the hedgerow will be trimmed back on a 3-year rotation in late Autumn (i.e. with a third-fifth of the hedgerow cut each year). The hedgerow will be maintained as a broadly A shaped structure to continue to encourage dense growth to ground level and avoiding creating a wide flat top.

9.3.5 Trees within hedgerows should be allowed to continue to mature and should be protected during hedgerow cutting. Minimal management of larger trees is required, and deadwood features should be allowed to develop where safe and practical. Where limb removal is required, the wood should be retained within the site to provide habitat for invertebrates.

9.3.6 Cavities in trees may provide potential roost features for bats and should be left undisturbed. If works affecting tree cavities are planned, an inspection should be undertaken by an ecologist prior to the works to ensure no roosts will be affected.

9.3.7 Works should be undertaken outside of the bird nesting season (March-August inclusive) or after confirmation by an ecologist that no active nests are present in the affected habitat.

Retained Hedgerows

9.3.8 Gappy and species-poor hedgerows will be supplemented by species infill planting. A mixture of native species will be used.

9.3.9 The hedgerows will be trimmed back on a 3-year rotation in late autumn (i.e. with a third-fifth of the hedgerow cut each year) to a broadly A shape structure and arisings removed off site.

9.4 Winter Cover Crop

9.4.1 A tailored mix of plants will be selected and sown into the winter cover crop areas providing a food source for wild birds in late summer, autumn and winter.

9.4.2 Existing grassland / arable will be stripped and shallowly ploughed prior to the sowing of the crop in spring. The plants will be left uncropped for 12 months and will provide food in winter. Every spring over the lifetime of the Proposed Development the area with the previous years' crop will be shallowly ploughed in spring and resown with the wild bird seed crop.

9.4.3 The control of injurious weeds (docks, thistles) could become a requirement if there is significant spread from the areas of cover crop but this would be through mechanical means with no use of herbicides or pesticides.

9.5 Ponds

9.5.1 There is potential for algal booms in the new ponds after their creation due to the release of nutrients from the excavated arable soil. A bale of barley straw will be placed in each pond following its creation to discourage algae formation.

9.5.2 Highly competitive emergent plant species (including common reed, bulrush) and any non-native invasive species should be uprooted and removed with caution to allow a wider diversity of plants to establish. Algae and duckweed should also be removed from the pond surface.

9.5.3 All plant removal should be undertaken between October to November, avoiding the GCN breeding period (March-June). Removed material should be left on the pond bank adjacent to water edge for 24 hours before removal from site.

9.5.4 Where non-native invasive or competitive species are present in a pond, equipment should be cleaned prior to use in further ponds to prevent the spread of the species.

9.5.5 Where a significant amount of sediment has accumulated within the pond, this should be removed during winter (November to January).

9.6 Invertebrate Banks

9.6.1 Areas of bare ground are desirable on the invertebrate banks, providing opportunities for insects to burrow into the bank.

9.6.2 Depending on the level of vegetation growth, annual scarification using hand tools may be beneficial to provide areas of bare ground.

10 MONITORING PROCEDURE

10.1 Grassland Monitoring

Post-development Grassland Areas

10.1.1 The long-term monitoring of habitats and their biodiversity value will specifically assess the extent to which the management actions are achieving the defined objectives. Each of the grassland areas in the operational site will be subject to condition assessment monitoring. The monitoring will assess the following categories of grassland within the operational site:

- Wildflower grassland in Biodiversity areas
- Tussocky grassland in Biodiversity areas and field margins
- Grazed grassland beneath solar arrays – previously improved grassland fields
- Grazed grassland beneath solar arrays – previously arable fields

Outline Monitoring Method

10.1.2 Monitoring data for grasslands will be collected using a whole habitat assessment, multiple presence/absence point counts (1m x 1m) for positive and negative indicator species. DAFOR recording will be carried out for the four different grassland habitat types.

10.1.3 A minimum of ten 1m x 1m quadrats will be completed for the tussocky grassland field margins and a minimum of ten 1m x 1m quadrats or five 2m x 2m quadrats will be recorded in the Biodiversity Areas.

10.1.4 Data will be collected on the percentage cover of grasses, herbs, bryophytes and bare ground averaging out patchiness. In tall grassland where the grasses form a canopy the cover of herb species will be assessed below the canopy.

10.1.5 The monitoring data will be supported by photography to provide a visual record of each of the grassland areas, their structure and cover.

Target Conditions

10.1.6 Measurable targets have been set for each habitat type. The targets for each grassland habitat at Year 10 are defined in Table 10.1.

10.1.7 The key measurable values will relate to the extent, structure and botanical species composition of each habitat.

Table 10-1 Grassland target conditions at Year 10

Attribute	Wildflower grassland in Biodiversity Areas	Tussocky grassland	Grazed grassland beneath solar arrays – previously improved grassland fields	Grazed grassland beneath solar arrays – previously arable fields
Species diversity per m2 (i.e. average number of species present in a 1m^2 area).	8+	6+	4+	4+

Attribute	Wildflower grassland in Biodiversity Areas	Tussocky grassland	Grazed grassland beneath solar arrays – previously improved grassland fields	Grazed grassland beneath solar arrays – previously arable fields
Grass / herb ratio	Minimum 20% herb cover	Minimum 10% herb cover	N/A	N/A
Sward \composition – negative indicators*	Species no more than occasional Overall no more than 5% cover	Species no more than occasional	Species no more than occasional	Species no more than occasional
Sward height	Sward height is varied with at least 20% of the sward less than 7 cm and at least 20% is more than 7 cm	Sward height is varied with at least 20% of the sward less than 7 cm and at least 20% is more than 7 cm	N/A	N/A
Scrub	<5%	<5%	<5%	<5%
Bare ground	No more than 5%	No more than 5%	No more than 10%	No more than 10%

** Undesirable species include injurious weeds and all invasive non-native plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). Secondary negative indicator species will be considered where their abundance is a negative factor reducing the overall species diversity. Secondary negative species include the most widespread coarse grasses (false oat-grass and cock's-foot) and ubiquitous herbs that can become abundant within a grassland sward (white clover and creeping buttercup).*

10.2 Native Tree and Shrub Planting

10.2.1 Native trees and shrubs planted within the Biodiversity Areas will be monitored to assess the establishment and growth of the different planted species.

10.2.2 Any failures will be recorded along with negative factors requiring remedial measures such as excessive grazing/browsing pressure.

10.3 Hedgerows

10.3.1 The new and retained hedgerows will be monitored to assess their condition and the establishment of newly planted areas.

10.3.2 The following attributes will be recorded:

- Height and width of hedgerows
- Density
- Number of woody species present and their abundance
- Structure of hedgerow base flora

10.3.3 Any failed areas of planting will be recorded along with negative factors requiring remedial measures such as excessive grazing/browsing pressure.

10.4 Ponds

10.4.1 Each of the new ponds within the Biodiversity Areas will be monitored to assess the condition of the habitat and its value for wildlife. A visual inspection will be undertaken from the pond margin.

10.4.2 The following attributes will be recorded:

- Water depth;
- Extent and diversity of marginal vegetation;
- Extent of invasives specie such as bulrush, common reed and duckweed;
- The presence of non-native invasive species such as New Zealand pygmyweed and water fern;
- The presence of fish; and
- The presence of algae.

10.5 Invertebrate Banks

10.5.1 The invertebrate banks will be monitored on an annual basis to assess their condition and value for invertebrates.

10.5.2 The monitoring will check for any changes to the structure of the banks and levels of vegetation cover.

10.6 Great Crested Newt

10.6.1 The monitoring programme will also assess the continued use of pond P4 within the wider landholding by great crested newt. New ponds within the Biodiversity Enhancement Area will also be assessed for their suitability for and presence of GCN.

10.6.2 The retention of grassland habitats and creation of new ponds and terrestrial habitats suitable for GCN should result in the continued use of breeding ponds near the Proposed Development by great crested newt.

10.6.3 Surveys will be undertaken between mid-March – June through eDNA and population size class assessment surveys.

10.6.4 Monitoring will be undertaken in Years 1, 2, 4, 6 and 10, after which it will continue at five year intervals.

10.6.5 The suitability of each pond will be assessed using Habitat Suitability Index (HSI) assessment.

10.6.6 The findings of the monitoring will be presented in a letter or short report supported by plans and photographs indicating locations of all GCN populations.

10.6.7 The monitoring will confirm the continued presence or likely absence of GCN populations in the operational site and nearby pond and the suitability of the ponds to support GCN.

11 MONITORING PROGRAMME

11.1.1 All monitoring will be undertaken in Years 1, 2, 4, 6 and 10, followed by once every 5 years. The proposed monitoring programme is set out in Table 11.1.

Table 11-1: Programme of Habitat and Species Monitoring

Feature	Monitoring	Timing
Habitats		
Grassland: • Wildflower grassland in Biodiversity Area • Tussocky grassland in Biodiversity Areas and field margins • Grazed grassland beneath solar arrays – previously improved grassland fields • Grazed grassland beneath solar arrays – previously arable fields	Habitat condition survey	June
Native shrub and tree planting	Habitat condition survey	September
Hedgerows: • Retained species-rich hedgerows • Retained species-poor hedgerows • New hedgerows	Habitat condition survey	September
Ponds	Habitat condition survey	June
Invertebrate banks	Habitat condition survey	June
Species		
Great Crested Newt	eDNA and population size class estimated survey	Mid-March – June

12 MANAGEMENT REVIEWS AND ACTIONS

12.1.1 The review will consider the extent to which the objectives and aims are being achieved through the ongoing implementation of management actions over the lifetime of the Proposed Development.

12.1.2 The effectiveness of the prescriptions, methods and timing of works will be assessed based on the status of habitats.

12.1.3 The assessments will consider trends in habitat change, drawing upon the results of previous years and the known the pre-development habitat conditions.

12.1.4 The monitoring results will be compiled in monitoring reports. The report will highlight positive and negative outcomes for biodiversity, nature conservation and species. The monitoring reports will highlight any unforeseen changes to factors influencing management decisions and actions and the continued relevance of each of the management prescriptions.

12.1.5 Any shortfalls in achieving the management objectives will be highlighted such as adverse habitat changes and trends or habitat establishment failures or damage. The monitoring reports would include additional management actions in the work schedules to address unexpected changes such as the colonisation of invasive non-native plants, actions to repair the adverse effects of prolonged drought or where a current management specification is not effective.

12.1.6 Remedial measures could also become a requirement with examples listed in **Table 12.1** below. The need for the implementation of any of these would be triggered by monitoring. This Management Plan will be a working document with flexibility allowing the management prescriptions can be tailored to achieving the biodiversity objectives and targets.

Table 12-1: Example of Modifications to Management and Remedial Measures

Feature	Example of Management Modifications and Remedial Measures
New Wildflower Grassland	Supplemental wildflower seeding Changes to levels of grazing stock or timing of grazing Removal of areas of coarse grass and nutrient rich topsoil and reseed native grass mix into prepared subsoil
Tussocky Grassland	Changes in frequency and timing of grass cutting Strip back areas with high % cover coarse grasses Supplemental wildflower seeding
Hedgerows	Selective cutting back of dominant species to promote diversity Adapting cutting regime/method to promote dense growth to ground level; and Supplementary planting to infill gaps and replace losses
Ponds	Removal of any fish if introduced into ponds Removal of any non-native species if introduced into ponds Removal of bulrush, common reed, duckweed or algae Placement of barley hay bale to reduce algae

Feature	Example of Management Modifications and Remedial Measures
	Removal of sediment / leaf litter
New shrub and tree planting	Supplement planting to infill gaps and replace losses Adapting cutting regime/method to promote dense growth to ground level
Invertebrate banks	Repairs to structure if damaged

12.1.7 The management prescriptions and timing will be reviewed after each monitoring visit. The review will focus on the structure, features and nature conservation value of habitats, to ensure that they remain an important resource for wildlife within the Proposed Development and make a contribution to nature conservation value in the local area.

12.1.8 The review will inform if changes are required to the future management prescriptions, actions and/or timing. Additional management actions could be added to the work schedule to address unexpected changes or where additional remedial measures not listed in this plan become a requirement.

12.1.9 Maintaining flexibility will be essential in ensuring that the management prescriptions can be tailored as necessary to achieve the desired outcomes. Many of the management prescriptions during the first five years post construction will be undertaken as required based on the checks and monitoring to assess the habitats condition specified in the plan.

REFERENCES

- RPS (2023a). Great Crested Newt Report: Plas Power Estate.
- RPS (2023b). Preliminary Ecological Appraisal: Plas Power Estate.
- RPS (2023c). Wintering Bird Survey: Plas Power Estate.
- RPS (2021). Breeding Bird Survey: Plas Power Estate.
- RPS (2023). Landscape and Visual Impact Assessment: Plas Power Solar and Energy Storage

DRAWINGS

Notes

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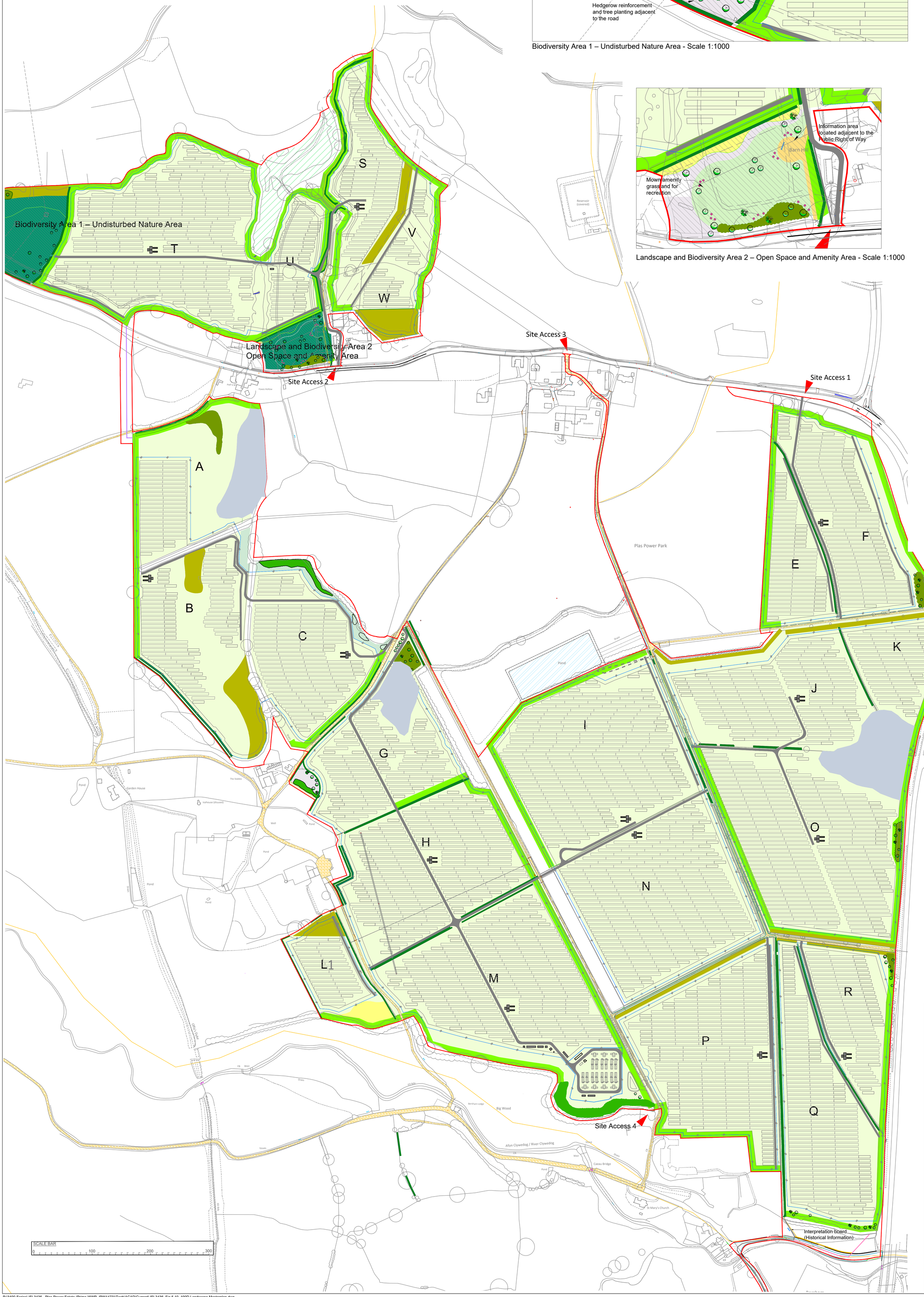
Biodiversity Area 1 – Undisturbed Nature Area - Scale 1:1000

Landscape and Biodiversity Area 2 – Open Space and Amenity Area - Scale 1:1000



Key

Proposed elements

- APPLICATION SITE BOUNDARY
- SITE ACCESS
- MODULE PANELS (See Layout for further details)
- SECURITY FENCE TBC
- PROPOSED ACCESS TRACK
- STRUCTURES (See Layout for further details)
- A — FIELD REFERENCE For LVIA and G&G

SOFT LANDSCAPE

Proposed elements

- DECIDUOUS TREE Varied native species and stock sizes
- CONIFEROUS TREE Varied native species
- SPECIMEN SHRUB In shrub border or gravel area
- NATIVE HEDGEROW (WITH SPACED STANDARD TREES) Complementing existing hedge lines and providing new field boundaries
- NATIVE CLIPPED HEDGEROW Complementing existing hedge lines and providing new field boundaries
- STRUCTURAL WOODLAND AND SHRUB Varied structure native woodland planting
- WOODLAND EDGE SHRUB Varied structure native shrub planting
- GRAZING GRASSLAND
- FIELD MARGIN MEADOW
- TUSSOCKY GRASSLAND
- WOODLAND MEADOW
- WILDFLOWER MEADOW
- WETLAND MEADOW
- MOWN AMENITY GRASS
- SPRING FLOWERING BULB PLANTING

HARD LANDSCAPE

Proposed elements

- INTERPRETATION BOARD Varied information, refer to notes for details
- FOOTPATH Compacted gravel

BIODIVERSITY ENHANCEMENTS

- WILD BIRD SEED CROP 6m wide on southern side of hedgerows
- ECOLOGICAL ENHANCEMENTS As per ecological reports
- ECOLOGICAL ENHANCEMENT AREA See inserts for details

Existing features

- TREES To be retained and protected. New tree planting would complement existing species and provide ongoing variation and structure.
- WOODLAND To be retained, protected and managed appropriately for longevity
- HEDGEROW / SCRUB To be retained, protected and gapped up where appropriate and managed on rotational basis to a height of 2.5-3m
- PUBLIC RIGHTS OF WAY Maintained and opportunities to further connect (As traced from OS Explorer 1:25,000)
- ANCIENT WOODLAND CLASSIFICATION Ref to Arb reports for further detail
- WATERBODY To be retained, protected and enhanced as possible and recommended within ecological reports
- GRAVEL TRACK Existing gravel track to be retained

Note

The illustrated landscape treatment would not alter if the proposed development included PVs instead of the BESS

Field D has been removed from the development

N

Rev	Description	By	CB	Date
D	REVISED LAYOUT	PL	GL	01.24
C	REVISED LAYOUT	CL	KH	11.23
B	OPEN SPACE AMENITY AREA	CL	KH	10.23
A	REVISED LAYOUT 2023	CL	KH	09.23

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Client: Lightsource bp

Project: Plas Power Solar and Energy Storage Project

Title: Illustrative Landscape and Ecology Masterplan

Status	Drawn By	PM/Checked by
Planning	KH	GL

Job Ref	Scale @ A0	Date Created
JSL3436	See Scale Bar	Feb 2024

RPS Drawing / Figure Number: Figure 5.10

Rev: D

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Appendix A Invertebrate Bank Specification

- The banks should be situated in sunny areas away from trees and hedgerows to provide a warm and light environment, ideally south-facing.
- The banks should measure be no more than 1m height, approximately 4m in length and 2m in width.
- Locally sourced soils should be used where possible, such as that from the excavated ponds within the Biodiversity Area. Land adjoining the bank may also be excavated to create a ditch and bank.
- The centre of the bank should be constructed from clean, un-contaminated rubble, hardcore or small logs.
- Where possible, a steep south-facing bank should be created to allow the bank to be warmed up by sunshine and to provide a range of niches.
- The bank should be capped with subsoil and topsoil. Enough soil should be used to ensure that there are only small holes into the interior.

Appendix B Typical Planting Schedule

Typical Planting Palette

Client: BP Lightsource
Project: Plas Power Solar Park
Dwg Ref: JSL3436_100
Doc Ref: JSL3436_550

Status: For Comment
Date: Sept 2023
Revision: A

Abbr	Botanical name	Common name	Girth / size	Stock	Density / %
A. Trees					
i. Specimen Native Tree Planting					
	Acer campestre	Field Maple	10-12cm/12-14cm	C / SR / RB	
	Alnus glutinosa	Alder	10-12cm/12-14cm	C / SR / RB	
	Fagus sylvatica	Common Beech	10-12cm/12-14cm	C / SR / RB	
	Quercus robur	English Oak	10-12cm/12-14cm	C / SR / RB	
	Salix caprea	Goat Willow	10-12cm/12-14cm	C / SR / RB	
ii. Specimen Native Evergreen Planting					
	Pinus syvelstris	Scots Pine	2m	C	
B.Hedge Planting					
i. Native Hedgerow Mix (with spaced Standard Trees) (2m wide)					
	Acer campestre	Field Maple	60-80cm	B	10%
	Cornus sanguinea	Dogwood	60-80cm	B	5%
	Corylus avellana	Hazel	60-80cm	B	10%
	Crataegus monogyna	Hawthorn	60-80cm	B	40%
	Prunus spinosa	Blackthorn	60-80cm	B	20%
	Rosa canina	Dog Rose	60-80cm	B	5%
	Salix caprea	Goat Willow	60-80cm	B	5%
	Viburnum opulus	Guelder Rose	60-80cm	B	5%
	Planted at 7.00p/m in three staggered rows, native specimen trees (as above) planted a 10 m intervals				100%
C. Woodland and Shrubs					
i. Structural Woodland and Shrub Mix					
	Acer campestre	Field Maple	80-100cm	B	20%
	Corylus avellana	Hazel, Cobnut	80-100cm	B	10%
	Crataegus monogyna	Hawthorn	80-100cm	B	10%
	Fagus sylvatica	Common Beech	80-100cm	B	10%
	Malus sylvestris	Crab Apple	80-100cm	B	20%
	Ilex aquifolium	Holly	80-100cm	C	5%
	Quercus robur	English Oak	80-100cm	C	20%
	Pinus syvelstris	Scots Pine	80-100cm	C	5%
	Planted at 1.5m centres, in single species clusters of 3 - 10No.				100%
ii. Woodland Edge Shrub Mix					
	Cornus sanguinea	Dogwood	60-80cm	B	10%
	Corylus avellana	Hazel	60-80cm	B	20%
	Crataegus monogyna	Hawthorn	60-80cm	B	30%
	Prunus spinosa	Blackthorn	60-80cm	B	20%
	Ilex aquifolium	Holly	3L	C	10%
	Rosa canina	Dog Rose	60-80cm	B	5%
	Viburnum opulus	Guelder Rose	60-80cm	B	5%
	Planted at 1m centres, in single species clusters of 3 - 7No.				100%
iv. Specimen Native Shrubs					
	Crataegus monogyna	Hawthorn	5L	C	
	Corylus avellana	Hazel	5L	C	
	Ilex aquifolium	Holly	5L	C	

Abbr	Botanical name	Common name	Girth / size	Stock	Density / %

D. Grass and Meadow areas

i. Amenity Grass

Mown Amenity Grass	Mix A22 by BSH (or similar and approved)	S

ii. Meadow

Grazing Grassland	EG26/27 Old Fashioned Grazing Mixture by Emorsgate (or similar and approved)	S
Field Margin Meadow	EH1 Hedgerow Mixture by Emorsgate (or similar and approved)	S
Tussock Grassland	EM10 Tussock Mixture by Emorsgate (or similar and approved)	S
Woodland Meadow	EG9 Grass Mixture for Hedgerows and Woodland by Emorsgate (or similar and approved)	S
Wildflower Meadow	EM2 Standard General Purpose Meadow Mixtureby Emorsgate (or similar and approved)	S
Wetland Meadow	EM8 Meadow Mixture for Wetlands by Emorsgate (or similar and approved)	S
Wildbird seed crop	KEAUT1 Enhanced Autumn Sown Wild Bird Seed Mix by Kings Crops (or similar and approved)	S

Stock Abbreviations:
C = Container grown
SR = Spring ringed
RB = Root balled
B = Bagged
S = Seeded
T = Turfed
Cl = Cell grown
Bl = Bulb

BIOSECURITY STATEMENT

RPS GROUP ARE COMMITTED TO THE PROTECTION OF THE UK ENVIRONMENT AND RECOGNISE THE IMPORTANCE OF RISKS POSED BY IMPORTED PESTS AND DISEASES

- All trees and shrubs are to be sourced responsibly, in the first instance, from UK Nurseries / suppliers, where they have been propagated and/or grown on for a minimum of 5 years in the UK (2 years for shrubs);

- In light of this, all suppliers shall be approved, shall share our values and must have a sound Biosecurity Policy / Management Systems in place to demonstrate the traceability of their stock, and an awareness of the prevalence of all current biosecurity threats, both domestically and abroad;

- The contractor is responsible for ensuring that they operate in strict accordance with the latest guidelines set out by DEFRA, including regularly checking for updates in relation to the latest plant health controls / diseases; i.e. (https://planthealthportal.defra.gov.uk/)

- Inspections will be carried out at selected nurseries and plant health certification / passports will be sought to identify traceability of tree and shrub stock as required.

Appendix C Maintenance Schedule Year 1

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

	MAINTENANCE ITEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Remove litter, leaf litter, rubbish and debris from all planted areas (including grassed areas). Dispose of arisings from all specified operations off site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Watering of all planted areas sufficient to maintain healthy growth, irrespective of season or weather conditions*, until restrained from doing so by statutory legislation. Specimen trees to be irrigated by means of dedicated irrigation tubes where provided. (*Do not water when ground is frozen / likely to freeze).			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Treat diseased plants with an appropriate insecticide / fungicide as necessary to maintain healthy growth.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Maintain a weed free environment. Remove unwanted weed growth within planted areas manually or by treatment with glyphosate-based herbicide to maintain weed free environment as required. Remove all weed growth from site. 14 Visits total. Fork over beds as necessary to keep soil loose, taking care not to reduce depth or effect of mulch. Herbicide to be of a type approved by the Environment Agency where impact is likely upon any nearby watercourse and in any case in accordance with current legislation. Spray out grass / weeds in a 300mm diameter area around any tree set into grassed areas. Adjacent paths and surfaces to be swept clean as the work proceeds, and the site left tidy.			✓ (1)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (1)		
Planting: General	Re-firm all plants affected by frost heave / wind rock / vandalism by treading around the base. Re-stake trees if necessary. Collars at the base of tree stems created by tree movement to be broken up by fork, avoiding damage to roots, backfilled with topsoil as necessary, and re-firmed.			✓						✓			
Planting: General	Check all existing trees and hedging with regard to public safety. Report any trees that appear to pose a risk to public safety and conduct remedial work as necessary in accordance with good arboricultural practice.			✓							✓		
Planting: General	Prune trees / shrubs only to remove vandalised, dead / dangerous branches or to promote healthy growth / natural shape. Remove all cuttings from site. Except where specified otherwise, prune trees and shrubs as recommended by BS:7370 Part 4 clause 3.6.3 to 3.6.5. Confirm which trees are covered by Tree Preservation Orders and seek appropriate permission prior to conducting any arboricultural work. All trees to be checked for safety by a suitably trained arboricultural specialist. Pruning shall be conducted by skilled labour only. Do not apply growth retardants, fungicide or sealant unless instructed otherwise. Herbaceous plants to be trimmed according to their growth habit.			✓						✓			

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

	MAINTENANCE ITEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Check / replace / adjust tree stakes, ties and rabbit / strimmer guards as required. Remove redundant tapes, tags, ties, labels and other encumbrances.	✓		✓		✓		✓		✓		✓	
Planting: General	Ensure 50mm of 50-75mm grade bark mulch is maintained to all planted areas and to base of individual trees set into grass.												✓
Planting: General	Apply Enmag CRF granular fertilizer, or equal approved, at ~140g per individual tree pits and 70g / sqm to planted areas (quantities to be confirmed by manufacturer).			✓									
Planting: General	Replace any diseased, damaged or dead plants with plant stock of the same size / species (unless otherwise directed by the Landscape Architect or LPA). A schedule of all dead plant material removed is to be kept by the Maintenance Operator.										✓		
Planting: General	Generally, make good all ridges, ruts, depressions and dead areas.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Treat pernicious weeds (e.g. Japanese Knotweed), with an appropriate herbicide immediately after identification on site, and continue treating as necessary to achieve complete eradication.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Existing Wildlife Corridors	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides, pesticides and fertilisers to be avoided.										✓		

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Existing Hedgerow	To ensure that the hedgerows retain dense growth and value to wildlife, clipping should be minimised where possible. No more than one side of the hedgerow should be trimmed in any one year, with the remainder left un-trimmed to allow continuity of cover and opportunities for wildlife. Trimming should take place during late winter to maximise food and cover availability for wildlife and also to avoid detrimental effects on breeding birds. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides or pesticides to be avoided. Hedge should be managed to a minimum height of 3m.	✓											
Native Hedgerow	New hedgerows to be trimmed / faced up to promote healthy growth. Where infill planting within an existing hedgerow, new planting to be maintained at a height to match existing hedgerow. Check that there are no nesting birds present prior to any hedgerow works. It is an offence under the Wildlife & Countryside Act 1981 to damage or destroy the nest of any wild bird while it is in use or being built. Invasive species (e.g. bramble) should be controlled to allow new planting to establish, taking care not to damage new hedgerow plants.				✓			✓			✓		
Structural Woodland and Shrub Mix	Monitor initial establishment of planting to ensure trees and shrubs remain upright, stable and in good condition. Where necessary, cut back or spot treat excessive bramble or other invasive / ruderal weeds to allow planted species to establish, taking care not to damage new planting. Use of herbicides or other pesticides to be avoided where possible.				✓					✓			
Woodland Edge Mix	Monitor initial establishment of planting to ensure trees and shrubs remain upright, stable and in good condition. Where necessary, cut back or spot treat excessive bramble or other invasive / ruderal weeds to allow planted species to establish, taking care not to damage new planting. The use of herbicides or other pesticides to be avoided where possible.				✓					✓			
Grassland: General	Mowing: Remove litter, rubbish and debris from grassed areas before mowing. Do not allow mowing machinery closer than 500mm to any plant stems. Avoid damage to stems by nylon filament rotary cutters or other mechanical tools. Complete operations close to stems, corners and edges using handheld strimmer with special care taken not to cause whipping / damage to the base of tree trunks.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	All grassed areas to be watered so as to maintain healthy growth / establishment.			✓	✓	✓	✓	✓	✓	✓	✓		

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grassland: General	Re-seed any gaps / hollows in lawns / meadows with a seed mix selected to match existing grass in quality and appearance.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Weed material within sward to be eradicated manually or spot treated with suitable herbicide.				✓					✓			
Amenity Grass and mown Paths: A22	Areas to be cut to 25mm height on 2 weekly basis during growing season and cuttings removed from site. Use edging equipment to maintain neat / tidy edge as necessary. 16 No. cuts total.			✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)		
Amenity Grass and mown Paths: A22	Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									
Grazing Grassland Old Fashioned Grazing Mixture: EG26/27	Area to be mown mid-summer after first flush weeds have flowered. Remove cuttings from site. Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									
Field Margin Meadow - Hedgerow Mixture: EH1	In the first-year annual weed growth is to be cut back to encourage development of perennial ground cover.			✓			✓			✓			
Tussock Grassland Tussock mix: EM10	Low intensity cutting regime (as required – review annually)									✓			
Woodland Meadow - Grass Mixture for Hedgerows and Woodland: EG9	Area to be mown mid-summer after first flush weeds have flowered. Remove cuttings from site. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks). Mow regularly in the first year until sown grasses are established.								✓	✓	✓	✓	

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wildflower Meadow - Standard General Purpose Meadow Mixture: EM2	Area to be mown late summer after annual weeds have flowered and late autumn (2 No. cuts total). Remove cuttings from site. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).								✓ (1)		✓ (1)		
Wetland Meadow - Meadow Mixture for Wetlands: EM8	Area to be mown late summer after annual weeds have flowered and late autumn (2 No. cuts total). Remove cuttings from site. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).								✓ (1)		✓ (1)		
Wild bird Seed Crop - Enhanced Autumn Sown Wild Bird Seed Mix KEAUT1	See Section 9.4 Winter Cover Crop for information												
Bulbs + Corms	Maintain area in a weed free condition. Cease mowing and weed control prior to emergence of leaves. Do not cut grass until foliage die back has begun. No chemical weed control until foliage dies back completely.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bulbs + Corms	Lift and divide as appropriate just after mowing.			✓	✓	✓							
Ponds / Attenuation Basins (Year 1)	Seasonally wet margins will be sown with a wet grassland seed mix (EM8) in spring or late summer. Margins of permanent standing water will be sown with a water's edge seed mix (EP1) in spring or late summer when water levels have receded and once established will be managed on a rotational basis with other marginal planting. In addition to the marginal seed mix, pockets of native aquatic and marginal plants will be planted within and around the margins of standing water in the attenuation basins. Checks for presence of non-native invasive plant species to be conducted at least once annually.				✓					✓			
Hard Surfacing	Clear soil, mulch, litter or other debris from hard surfaced areas and remove from site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

APPENDIX C – MAINTENANCE SCHEDULE YEAR 1

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hard Surfacing	Hard surfaces in communal areas to be treated with glyphosate-based non-residual herbicide (Roundup or equal approved), in full accordance with manufacturer's recommendations & COSHH regulations.			✓				✓					
Fencing	Report any damage (including rabbit fencing); provide temporary barriers to secure fence line where damage poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interpretation Boards	Visually inspect for vandalism / damage, make safe and report any damage to the relevant party.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
General	Collect fallen leaf litter and remove from site (do not blow away). Allow for 2 weekly visits.	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)
General	Report any remaining element that through failure, fatigue or vandalism poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix D Maintenance Schedule Year 2

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

	MAINTENANCE ITEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Remove litter, leaf litter, rubbish and debris from all planted areas (including grassed areas). Dispose of arisings from all specified operations off site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Watering of all planted areas sufficient to maintain healthy growth, irrespective of season or weather conditions*, until restrained from doing so by statutory legislation. Specimen trees to be irrigated by means of dedicated irrigation tubes where provided. (*Do not water when ground is frozen / likely to freeze).			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Treat diseased plants with an appropriate insecticide / fungicide as necessary to maintain healthy growth.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Maintain a weed free environment. Remove unwanted weed growth within planted areas manually or by treatment with glyphosate-based herbicide to maintain weed free environment as required. Remove all weed growth from site. 8 Visits total. Fork over beds as necessary to keep soil loose, taking care not to reduce depth or effect of mulch. Herbicide to be of a type approved by the Environment Agency where impact is likely upon any nearby watercourse and in any case in accordance with current legislation. Spray out grass / weeds in a 300mm diameter area around any tree set into grassed areas. Adjacent paths and surfaces to be swept clean as the work proceeds, and the site left tidy.			✓ (2)		✓ (2)		✓ (2)		✓ (2)			
Planting: General	Re-firm all plants affected by frost heave / wind rock / vandalism by treading around the base. Re-stake trees if necessary. Collars at the base of tree stems created by tree movement to be broken up by fork, avoiding damage to roots, backfilled with topsoil as necessary, and re-firmed.			✓						✓			
Planting: General	Check all existing trees and hedging with regard to public safety. Report any trees that appear to pose a risk to public safety and conduct remedial work as necessary in accordance with good arboricultural practice.			✓							✓		
Planting: General	Prune trees / shrubs only to remove vandalised, dead / dangerous branches or to promote healthy growth / natural shape. Remove all cuttings from site. Except where specified otherwise, prune trees and shrubs as recommended by BS:7370 Part 4 clause 3.6.3 to 3.6.5. Confirm which trees are covered by Tree Preservation Orders, and seek appropriate permission, prior to conducting any arboricultural work. All trees to be checked for safety by a suitably trained arboricultural specialist. Pruning shall be conducted by skilled labour only. Do not apply growth retardants, fungicide or sealant unless instructed otherwise. Herbaceous plants to be trimmed according to their growth habit.			✓						✓			

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Check / replace / adjust tree stakes, ties and rabbit / strimmer guards as required. Remove redundant tapes, tags, ties, labels and other encumbrances.	✓		✓		✓		✓		✓		✓	
Planting: General	Ensure 50mm of 50-75mm grade bark mulch is maintained to all planted areas and to base of individual trees set into grass.												✓
Planting: General	Apply Enmag CRF granular fertilizer, or equal approved, at ~140g per individual tree pits and 70g / sqm to planted areas (quantities to be confirmed by manufacturer).			✓									
Planting: General	Replace any diseased, damaged or dead plants with plant stock of the same size / species (unless otherwise directed by the Landscape Architect or LPA). A schedule of all dead plant material removed is to be kept by the Maintenance Operator.										✓		
Planting: General	Treat pernicious weeds (e.g. Japanese Knotweed), with an appropriate herbicide immediately after identification on site, and continue treating as necessary to achieve complete eradication.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Existing Wildlife Corridors	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides, pesticides and fertilisers to be avoided.										✓		
Existing Hedgerow	To ensure that the hedgerows retain dense growth and value to wildlife, clipping should be minimised where possible. No more than one side of the hedgerow should be trimmed in any one year, with the remainder left un-trimmed to allow continuity of cover and opportunities for wildlife. Trimming should take place during late winter to maximise food and cover availability for wildlife and also to avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Hedge should be managed to a minimum height of 3m.	✓											

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Native Hedgerow	New hedgerows to be trimmed / faced up so as to promote healthy growth and effective screening, albeit trimming of native hedges to be kept to a minimum to allow dense, bushy vegetation to develop. Where infill planting within an existing hedgerow, new planting to be maintained at a height to match existing hedgerow. Check that there are no nesting birds present prior to any hedgerow works. It is an offence under the Wildlife & Countryside Act 1981 to damage or destroy the nest of any wild bird while it is in use or being built. Invasive species (e.g. bramble) to be thinned if required to ensure continued establishment of planted species, taking care not to damage new hedgerow plants.				✓			✓			✓		
Structural Woodland Mix	Monitor initial establishment of planting to ensure trees and shrubs remain upright, stable and in good condition. Where necessary, cut back or spot treat excessive bramble or other invasive / ruderal weeds to allow planted species to establish, taking care not to damage planted species. Use of herbicides or other pesticides to be avoided where possible.				✓					✓			
Woodland Edge Mix	Monitor initial establishment of planting to ensure trees and shrubs remain upright, stable and in good condition. Where necessary, cut back or spot treat excessive bramble or other invasive / ruderal weeds to allow planted species to establish, taking care not to damage planted species. The use of herbicides or other pesticides to be avoided where possible.				✓					✓			
Grassland: General	Mowing: Remove litter, rubbish and debris from grassed areas before mowing. Do not allow mowing machinery closer than 500mm to any plant stems. Avoid damage to stems by nylon filament rotary cutters or other mechanical tools. Complete operations close to stems, corners and edges using handheld strimmer with special care taken not to cause whipping / damage to the base of tree trunks.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	All grassed areas to be watered so as to maintain healthy growth / establishment.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Re-seed any gaps / hollows in lawns with a seed mix selected to match existing grass in quality and appearance. Top dress where necessary with fine topsoil to BS 3882.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Weed material within sward to be eradicated manually or spot treated with suitable herbicide.				✓					✓			

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Amenity Grass and mown Paths: A22	Areas to be cut to 25mm height on 2 weekly basis during growing season and cuttings removed from site. Use edging equipment to maintain neat / tidy edge as necessary. 16 No. cuts total.			✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)		
Amenity Grass and mown Paths: A22	Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									
Field Margin Meadow - Hedgerow Mixture: EH1	Keep semi-shade weeds such as nettles and brambles in check. Grass swards to be selectively sprayed to control docks and thistles every 2-3 years on a rotational basis so that no more than half of the area is cut in any one year. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.											✓	
Tussock Grassland - Tussock mix: EM10	Low intensity cutting regime (as required – review annually)									✓			
Woodland Meadow - Grass Mixture for Hedgerows and Woodland: EG9	Annual mid-summer mid cut (no shorter than 30mm) and avoid cutting if prolonged dry spell. Keep weeds of semi-shade such as nettles and brambles in check. Grass swards that do not contain wildflowers can be selectively sprayed to controls docks and thistles. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.								✓				
Wildflower Meadow - Standard General Purpose Meadow Mixture: EM2	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wetland Meadow - Meadow Mixture for Wetlands: EM8	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Localised differences may require a targeted approach. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	
Pond Edge Mixture: EP1F	In second and subsequent years create variety of vegetation structures by cutting back and removing short sections of vegetation every 2-3 years in rotation. Remove wedges (like slices of cake) of vegetation and selectively thin Yellow Iris and any dense stands of single species. Machines and heavy equipment may only be used with care to avoid damage to soil and vegetation.										✓		
Wild bird Seed Crop - Enhanced Autumn Sown Wild Bird Seed Mix KEAUT1	See Section 9.4 Winter Cover Crop for information												
Bulbs + Corms	Maintain area in a weed free condition. Cease mowing and weed control prior to emergence of leaves. Do not cut grass until foliage die back has begun. No chemical weed control until foliage dies back completely.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bulbs + Corms	Lift and divide as appropriate just after mowing.			✓	✓	✓							

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

	MAINTENANCE ITEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Attenuation Basins / Ponds (Year 2+)	Checks for presence of non-native invasive plant species to be conducted at least once annually. Other native aquatic or marginal species may colonise naturally and will be allowed to establish or be managed as appropriate to enhance floral diversity and maintain suitability for a range of wildlife. Aquatic and marginal vegetation will be managed by cutting or hand pulling on an 'as needed' basis to ensure a third of the pond surface remains free from vegetation from September to November within semi-permanent ponds and a variety of edge habitats. Marginal and emergent vegetation to be maintained at a maximum extent of 20%. Any removed aquatic or marginal vegetation will be left at the pond edge for up to 3 days (minimum 1 day) to allow any pond life to re-enter the pond. Some piles may be left to provide refuge opportunities for amphibians, invertebrates and reptiles, but generally all arisings will be removed from the management area. Removal of sediment from the ponds will be as required. No more than 25% of marginal vegetation or silt will be removed from the pond during management in any one year. This work would be conducted during the winter. Management of planted and self-seeded scrub will be conducted during winter months to prevent excessive shading and encroachment into wetland areas. This will be conducted by hand pulling and cutting. No fish will be introduced to the ponds in order to maintain optimal conditions for other native wildlife including invertebrates and amphibians. If non-native invasive plant species are recorded during survey, they will be subject to control using a methodology appropriate to the species present (and the presence of a waterbody).			✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)			✓ (2)
Hard Surfacing	Clear soil, mulch, litter or other debris from hard surfaced areas and remove from site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hard Surfacing	Hard surfaces in communal areas to be treated with glyphosate-based non-residual herbicide (Roundup or equal approved), in full accordance with manufacturer's recommendations & COSHH regulations.			✓				✓					
Fencing	Report any damage (including rabbit fencing); provide temporary barriers to secure fence line where damage poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interpretation Boards	Visually inspect for vandalism / damage, make safe and report any damage to the relevant party.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
General	Collect fallen leaf litter and remove from site (do not blow away). Allow for 2 weekly visits.	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)

APPENDIX D – MAINTENANCE SCHEDULE YEAR 2

	MAINTENANCE ITEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General	Report any remaining element that through failure, fatigue or vandalism poses a risk to public safety.	√	√	√	√	√	√	√	√	√	√	√	√

Appendix E Maintenance Schedule Year 3

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Remove litter, leaf litter, rubbish and debris from all planted areas (including grassed areas). Dispose of arisings from all specified operations off site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Watering of all planted areas sufficient to maintain healthy growth, irrespective of season or weather conditions*, until restrained from doing so by statutory legislation. Specimen trees to be irrigated by means of dedicated irrigation tubes where provided. (*Do not water when ground is frozen / likely to freeze).			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Treat diseased plants with an appropriate insecticide / fungicide as necessary to maintain healthy growth.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Maintain a weed free environment. Remove unwanted weed growth within planted areas manually or by treatment with glyphosate-based herbicide to maintain weed free environment as required. Remove all weed growth from site. 4 Visits total. Fork over beds as necessary to keep soil loose, taking care not to reduce depth or effect of mulch. Herbicide to be of a type approved by the Environment Agency where impact is likely upon any nearby watercourse and in any case in accordance with current legislation. Spray out grass / weeds in a 300mm diameter area around any tree set into grassed areas. Adjacent paths and surfaces to be swept clean as the work proceeds, and the site left tidy.			✓		✓		✓		✓			
Planting: General	Check all existing trees and hedging with regard to public safety. Report any trees that appear to pose a risk to public safety and carry out remedial work as necessary in accordance with good arboricultural practice.			✓							✓		
Planting: General	Prune trees / shrubs only to remove vandalised, dead / dangerous branches or to promote healthy growth / natural shape. Remove all cuttings from site. Except where specified otherwise, prune trees and shrubs as recommended by BS:7370 Part 4 clause 3.6.3 to 3.6.5. Confirm which trees are covered by Tree Preservation Orders, and seek appropriate permission, prior to conducting any arboricultural work. All trees to be checked for safety by a suitably trained arboricultural specialist. Pruning shall be conducted by skilled labour only. Do not apply growth retardants, fungicide or sealant unless instructed otherwise. Herbaceous plants to be trimmed according to their growth habit.			✓						✓			
Planting: General	Check / replace / adjust tree stakes, ties and rabbit / strimmer guards as required. Remove redundant tapes, tags, ties, labels and other encumbrances.	✓		✓		✓		✓		✓		✓	

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Replace any diseased, damaged or dead plants with plant stock of the same size / species (unless otherwise directed by the Landscape Architect or LPA). A schedule of all dead plant material removed is to be kept by the Maintenance Operator.										✓		
Planting: General	Treat pernicious weeds (e.g. Japanese Knotweed), with an appropriate herbicide immediately after identification on site, and continue treating as necessary to achieve complete eradication.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Existing Wildlife Corridors	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides, pesticides and fertilisers to be avoided.										✓		
Existing Hedgerow	To ensure that the hedgerows retain dense growth and value to wildlife, clipping should be minimised where possible. No more than one side of the hedgerow should be trimmed in any one year, with the remainder left un-trimmed to allow continuity of cover and opportunities for wildlife. Trimming should take place during late winter to maximise food and cover availability for wildlife and also to avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Hedge should be managed to a minimum height of 3m.	✓											
Native Hedgerows	Native hedgerows to be cut on a biennial basis, such that no more than 50% of the hedgerows to be cut during any one year to allow continuity of habitats for wildlife. Vegetation should be maintained to a height of *at least* 3m above ground level, or to match pre-existing established hedgerow. Trimming should take place ideally during late winter to maximise food and cover availability for wildlife and also avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Check that there are no nesting birds present prior to any hedgerow works. It is an offence under the Wildlife & Countryside Act 1981 to damage or destroy the nest of any wild bird while it is in use or being built.	✓											

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Structural Woodland and Shrub Mix	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Woodland Edge Mix	Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Grassland: General	Mowing: Remove litter, rubbish and debris from grassed areas before mowing. Do not allow mowing machinery closer than 500mm to any plant stems. Avoid damage to stems by nylon filament rotary cutters or other mechanical tools. Complete operations close to stems, corners and edges using handheld strimmer with special care taken not to cause whipping / damage to the base of tree trunks.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	All grassed areas to be watered so as to maintain healthy growth / establishment.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Re-seed any gaps / hollows in lawns with a seed mix selected to match existing grass in quality and appearance. Top dress where necessary with fine topsoil to BS 3882.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Weed material within sward to be eradicated manually or spot treated with suitable herbicide.				✓					✓			
Amenity Grass and mown Paths: A22	Areas to be cut to 25mm height on 2 weekly basis during growing season and cuttings removed from site. Use edging equipment to maintain neat / tidy edge as necessary. 16 No. cuts total.			✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)		
Amenity Grass and mown Paths: A22	Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Margin Meadow - Hedgerow Mixture: EH1	Keep semi-shade weeds such as nettles and brambles in check. Grass swards to be selectively sprayed to control docks and thistles every 2-3 years on a rotational basis so that no more than half of the area is cut in any one year. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.											✓	
Tussock Grassland Tussock mix: EM10	Low intensity cutting regime (as required – review annually)									✓			
Woodland Meadow - Grass Mixture for Hedgerows and Woodland: EG9	Annual mid-summer mid cut (no shorter than 30mm) and avoid cutting if prolonged dry spell. Keep weeds of semi-shade such as nettles and brambles in check. Grass swards that do not contain wildflowers can be selectively sprayed to controls docks and thistles. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.								✓				
Wildflower Meadow: EM2	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	
Wetland Mixture: EM8	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Localised differences may require a targeted approach. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pond Edge Mixture: EP1F	In second and subsequent years create variety of vegetation structures by cutting back and removing short sections of vegetation every 2-3 years in rotation. Remove wedges (like slices of cake) of vegetation and selectively thin Yellow Iris and any dense stands of single species. Machines and heavy equipment may only be used with care to avoid damage to soil and vegetation.										✓		
Wild bird Seed Crop - Enhanced Autumn Sown Wild Bird Seed Mix: KEAUT1	See Section 9.4 Winter Cover Crop for information												
Bulbs + Corms	Maintain area in a weed free condition. Cease mowing and weed control prior to emergence of leaves. Do not cut grass until foliage die back has begun. No chemical weed control until foliage dies back completely.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bulbs + Corms	Lift and divide as appropriate just after mowing.			✓	✓	✓							

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Attenuation Basins / Ponds (Year 3+)	Checks for presence of non-native invasive plant species to be conducted at least once annually. Other native aquatic or marginal species may colonise naturally and will be allowed to establish or be managed as appropriate to enhance floral diversity and maintain suitability for a range of wildlife. Aquatic and marginal vegetation will be managed by cutting or hand pulling on an 'as needed' basis to ensure a third of the pond surface remains free from vegetation from September to November within semi-permanent ponds and a variety of edge habitats. Marginal and emergent vegetation to be maintained at a maximum extent of 20%. Any removed aquatic or marginal vegetation will be left at the pond edge for up to 3 days (minimum 1 day) to allow any pond life to re-enter the pond. Some piles may be left to provide refuge opportunities for amphibians, invertebrates and reptiles, but generally all arisings will be removed from the management area. Removal of sediment from the ponds will be as required. No more than 25% of marginal vegetation or silt will be removed from the pond during management in any one year. This work would be conducted during the winter. Management of planted and self-seeded scrub will be conducted during winter months to prevent excessive shading and encroachment into wetland areas. This will be conducted by hand pulling and cutting. No fish will be introduced to the ponds in order to maintain optimal conditions for other native wildlife including invertebrates and amphibians. If non-native invasive plant species are recorded during survey, they will be subject to control using a methodology appropriate to the species present (and the presence of a waterbody).			✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)			✓ (2)
Hard Surfacing	Clear soil, mulch, litter or other debris from hard surfaced areas and remove from site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hard Surfacing	Hard surfaces in communal areas to be treated with glyphosate-based non-residual herbicide (Roundup or equal approved), in full accordance with manufacturer's recommendations & COSHH regulations.			✓				✓					
Fencing	Report any damage (including rabbit fencing); provide temporary barriers to secure fence line where damage poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interpretation Boards	Visually inspect all areas and play equipment for vandalism / damage, make safe and report any damage to the relevant party.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
General	Collect fallen leaf litter and remove from site (do not blow away). Allow for 2 weekly visits.	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)

APPENDIX E – MAINTENANCE SCHEDULE YEAR 3

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General	Report any remaining element that through failure, fatigue or vandalism poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix F Maintenance Schedule Year 4

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Remove litter, leaf litter, rubbish and debris from all planted areas (including grassed areas). Dispose of arisings from all specified operations off site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Watering of all planted areas sufficient to maintain healthy growth, irrespective of season or weather conditions*, until restrained from doing so by statutory legislation. Specimen trees to be irrigated by means of dedicated irrigation tubes where provided. (*Do not water when ground is frozen / likely to freeze).				✓	✓	✓	✓	✓	✓			
Planting: General	Treat diseased plants with an appropriate insecticide / fungicide as necessary to maintain healthy growth.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Maintain a weed free environment. Remove unwanted weed growth within planted areas manually or by treatment with glyphosate-based herbicide to maintain weed free environment as required. Remove all weed growth from site. 4 Visits total. Fork over beds as necessary to keep soil loose, taking care not to reduce depth or effect of mulch. Herbicide to be of a type approved by the Environment Agency where impact is likely upon any nearby watercourse and in any case in accordance with current legislation. Spray out grass / weeds in a 300mm diameter area around any tree set into grassed areas. Adjacent paths and surfaces to be swept clean as the work proceeds, and the site left tidy.			✓		✓		✓		✓			
Planting: General	Check all existing trees and hedging with regard to public safety. Report any trees that appear to pose a risk to public safety and conduct remedial work as necessary in accordance with good arboricultural practice.			✓							✓		
Planting: General	Prune trees / shrubs only to remove vandalised, dead / dangerous branches or to promote healthy growth / natural shape. Remove all cuttings from site. Except where specified otherwise, prune trees and shrubs as recommended by BS:7370 Part 4 clause 3.6.3 to 3.6.5. Confirm which trees are covered by Tree Preservation Orders, and seek appropriate permission, prior to conducting any arboricultural work. All trees to be checked for safety by a suitably trained arboricultural specialist. Pruning shall be conducted by skilled labour only. Do not apply growth retardants, fungicide or sealant unless instructed otherwise. Herbaceous plants to be trimmed according to their growth habit.			✓						✓			
Planting: General	Check / replace / adjust tree stakes, ties and rabbit / strimmer guards as required. Remove redundant tapes, tags, ties, labels and other encumbrances.	✓		✓		✓		✓		✓		✓	

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Replace any diseased, damaged or dead plants with plant stock of the same size / species (unless otherwise directed by the Landscape Architect or LPA). A schedule of all dead plant material removed is to be kept by the Maintenance Operator.										✓		
Planting: General	Treat pernicious weeds (e.g. Japanese Knotweed), with an appropriate herbicide immediately after identification on site, and continue treating as necessary to achieve complete eradication.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Existing Wildlife Corridors	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides, pesticides and fertilisers to be avoided.										✓		
Existing Hedgerow	To ensure that the hedgerows retain dense growth and value to wildlife, clipping should be minimised where possible. No more than one side of the hedgerow should be trimmed in any one year, with the remainder left un-trimmed to allow continuity of cover and opportunities for wildlife. Trimming should take place during late winter to maximise food and cover availability for wildlife and also to avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Hedge should be managed to a minimum height of 3m.	✓											
Native Hedgerows	Native hedgerows to be cut on a biennial basis, such that no more than 50% of the hedgerows to be cut during any one year to allow continuity of habitats for wildlife. Vegetation should be maintained to a height of *at least* 3m above ground level, or to match pre-existing established hedgerow. Trimming should take place ideally during late winter to maximise food and cover availability for wildlife and also avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Check that there are no nesting birds present prior to any hedgerow works. It is an offence under the Wildlife & Countryside Act 1981 to damage or destroy the nest of any wild bird while it is in use or being built.	✓											

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Structural Woodland and Shrub Mix	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Woodland Edge Mix	Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Grassland: General	Mowing: Remove litter, rubbish and debris from grassed areas before mowing. Do not allow mowing machinery closer than 500mm to any plant stems. Avoid damage to stems by nylon filament rotary cutters or other mechanical tools. Complete operations close to stems, corners and edges using handheld strimmer with special care taken not to cause whipping / damage to the base of tree trunks.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	All grassed areas to be watered so as to maintain healthy growth / establishment.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Re-seed any gaps / hollows in lawns with a seed mix selected to match existing grass in quality and appearance. Top dress where necessary with fine topsoil to BS 3882.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Weed material within sward to be eradicated manually or spot treated with suitable herbicide.				✓					✓			
Amenity Grass and mown Paths: A22	Areas to be cut to 25mm height on 2 weekly basis during growing season and cuttings removed from site. Use edging equipment to maintain neat / tidy edge as necessary. 16 No. cuts total.			✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)		
Amenity Grass and mown Paths: A22	Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field Margin Meadow - Mixture: EH1	Keep semi-shade weeds such as nettles and brambles in check. Grass swards to be selectively sprayed to control docks and thistles every 2-3 years on a rotational basis so that no more than half of the area is cut in any one year. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.											✓	
Tussock Grassland Tussock mix: EM10	Low intensity cutting regime (as required – review annually)									✓			
Woodland Meadow - Grass Mixture for Hedgerows and Woodland: EG9	Annual mid-summer mid cut (no shorter than 30mm) and avoid cutting if prolonged dry spell. Keep weeds of semi-shade such as nettles and brambles in check. Grass swards that do not contain wildflowers can be selectively sprayed to controls docks and thistles. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.								✓				
Wildflower Meadow - Standard General Purpose Meadow Mixture: EM2	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	
Wetland Meadow - Meadow Mixture for Wetlands: EM8	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Localised differences may require a targeted approach. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pond Edge Mixture: EP1F	In second and subsequent years create variety of vegetation structures by cutting back and removing short sections of vegetation every 2-3 years in rotation. Remove wedges (like slices of cake) of vegetation and selectively thin Yellow Iris and any dense stands of single species. Machines and heavy equipment may only be used with care to avoid damage to soil and vegetation.										✓		
Wild bird Seed Crop - Enhanced Autumn Sown Wild Bird Seed Mix: KEAUT1	See Section 9.4 Winter Cover Crop for information												
Bulbs + Corms	Maintain area in a weed free condition. Cease mowing and weed control prior to emergence of leaves. Do not cut grass until foliage die back has begun. No chemical weed control until foliage dies back completely.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bulbs + Corms	Lift and divide as appropriate just after mowing.			✓	✓	✓							

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Attenuation Basins / Ponds (Year 4+)	Checks for presence of non-native invasive plant species to be conducted at least once annually. Other native aquatic or marginal species may colonise naturally and will be allowed to establish or be managed as appropriate to enhance floral diversity and maintain suitability for a range of wildlife. Aquatic and marginal vegetation will be managed by cutting or hand pulling on an 'as needed' basis to ensure a third of the pond surface remains free from vegetation from September to November within semi-permanent ponds and a variety of edge habitats. Marginal and emergent vegetation to be maintained at a maximum extent of 20%. Any removed aquatic or marginal vegetation will be left at the pond edge for up to 3 days (minimum 1 day) to allow any pond life to re-enter the pond. Some piles may be left to provide refuge opportunities for amphibians, invertebrates and reptiles, but generally all arisings will be removed from the management area. Removal of sediment from the ponds will be as required. No more than 25% of marginal vegetation or silt will be removed from the pond during management in any one year. This work would be conducted during the winter. Management of planted and self-seeded scrub will be conducted during winter months to prevent excessive shading and encroachment into wetland areas. This will be conducted by hand pulling and cutting. No fish will be introduced to the ponds in order to maintain optimal conditions for other native wildlife including invertebrates and amphibians. If non-native invasive plant species are recorded during survey, they will be subject to control using a methodology appropriate to the species present (and the presence of a waterbody).			✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)			✓ (2)
Hard Surfacing	Clear soil, mulch, litter or other debris from hard surfaced areas and remove from site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hard Surfacing	Hard surfaces in communal areas to be treated with glyphosate-based non-residual herbicide (Roundup or equal approved), in full accordance with manufacturer's recommendations & COSHH regulations.			✓				✓					
Fencing	Report any damage (including rabbit fencing); provide temporary barriers to secure fence line where damage poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interpretation Boards	Visually inspect all areas and play equipment for vandalism / damage, make safe and report any damage to the relevant party.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
General	Collect fallen leaf litter and remove from site (do not blow away). Allow for 2 weekly visits.	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)

APPENDIX F – MAINTENANCE SCHEDULE YEAR 4

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General	Report any remaining element that through failure, fatigue or vandalism poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix G Maintenance Schedule Year 5

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Remove litter, leaf litter, rubbish and debris from all planted areas (including grassed areas). Dispose of arisings from all specified operations off site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Watering of all planted areas sufficient to maintain healthy growth, irrespective of season or weather conditions*, until restrained from doing so by statutory legislation. Specimen trees be irrigated by means of dedicated irrigation tubes where provided. (*Do not water when ground is frozen / likely to freeze).				✓	✓	✓	✓	✓	✓			
Planting: General	Treat diseased plants with an appropriate insecticide / fungicide as necessary to maintain healthy growth.			✓	✓	✓	✓	✓	✓	✓	✓		
Planting: General	Maintain a weed free environment. Remove unwanted weed growth within planted areas manually or by treatment with glyphosate-based herbicide to maintain weed free environment as required. Remove all weed growth from site. 4 Visits total. Fork over beds as necessary to keep soil loose, taking care not to reduce depth or effect of mulch. Herbicide to be of a type approved by the Environment Agency where impact is likely upon any nearby watercourse and in any case in accordance with current legislation. Spray out grass / weeds in a 300mm diameter area around any tree set into grassed areas. Adjacent paths and surfaces to be swept clean as the work proceeds, and the site left tidy.			✓		✓		✓		✓			
Planting: General	Check all existing trees and hedging with regard to public safety. Report any trees that appear to pose a risk to public safety and conduct remedial work as necessary in accordance with good arboricultural practice.			✓							✓		
Planting: General	Prune trees / shrubs only to remove vandalised, dead / dangerous branches or to promote healthy growth / natural shape. Remove all cuttings from site. Except where specified otherwise, prune trees and shrubs as recommended by BS:7370 Part 4 clause 3.6.3 to 3.6.5. Confirm which trees are covered by Tree Preservation Orders, and seek appropriate permission, prior to conducting any arboricultural work. All trees to be checked for safety by a suitably trained arboricultural specialist. Pruning shall be conducted by skilled labour only. Do not apply growth retardants, fungicide or sealant unless instructed otherwise. Herbaceous plants to be trimmed according to their growth habit.			✓						✓			

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planting: General	Check / replace / adjust tree stakes, ties and rabbit / strimmer guards as required. Remove redundant tapes, tags, ties, labels and other encumbrances. Where trees have successfully established, untie and remove stakes / ties from site. (Acceptable tree establishment to be ascertained by the presence of a full, balanced canopy of healthy foliage and evidence of strong, annual growth. This should be supported by a healthy trunk and root plate, firmly anchored into the ground).	✓		✓		✓		✓		✓		✓	
Planting: General	Replace any diseased, damaged or dead plants with plant stock of the same size / species (unless otherwise directed by the Landscape Architect or LPA). A schedule of all dead plant material removed is to be kept by the Maintenance Operator.										✓		
Planting: General	Treat pernicious weeds (e.g. Japanese Knotweed), with an appropriate herbicide immediately after identification on site, and continue treating as necessary to achieve complete eradication.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planting: General	Carefully, (with a clean cut), crown-lift standard specimen trees to one-quarter of their overall height, up to a maximum of 2.5m height for small trees and 4.0m height for larger forest scale / avenue trees. The leader shoot(s) must not be cut. Feathered trees and multi-stems should not be crown lifted.												✓
Existing Wildlife Corridors	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Where gaps are present, supplementary planting of native species to match those already present should be undertaken and managed accordingly. Use of herbicides, pesticides and fertilisers to be avoided.										✓		

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Native Hedgerows	Native hedgerows to be cut on a biennial basis, such that no more than 50% of the hedgerows to be cut during any one year to allow continuity of habitats for wildlife. Vegetation should be maintained to a height of *at least* 3m above ground level, or to match pre-existing established hedgerow. Trimming should take place ideally during late winter to maximise food and cover availability for wildlife and also avoid detrimental effects on breeding birds. Use of herbicides or pesticides to be avoided. Check that there are no nesting birds present prior to any hedgerow works. It is an offence under the Wildlife & Countryside Act 1981 to damage or destroy the nest of any wild bird while it is in use or being built.	✓											
Structural Woodland and Shrub Mix	Where possible and where it is safe to do so, standing dead wood to be retained to provide opportunities for wildlife. Where dead wood must be thinned, this should be retained within habitat areas and stacked into piles to provide wildlife habitats. Additional wood resulting from pruning or other tree works to be similarly retained within discrete piles where possible. Surplus / additional pruning's / clippings to be removed. Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Woodland Edge Mix	Selective thinning of trees and shrubs to be undertaken as required (outside of spring / summer to avoid detrimental effects on nesting birds), to ensure successful development of an open canopy and understorey vegetation. Use of herbicides and fertilisers to be avoided.										✓		
Grassland: General	Mowing: Remove litter, rubbish and debris from grassed areas before mowing. Do not allow mowing machinery closer than 500mm to any plant stems. Avoid damage to stems by nylon filament rotary cutters or other mechanical tools. Complete operations close to stems, corners and edges using handheld strimmer with special care taken not to cause whipping / damage to the base of tree trunks.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	All grassed areas to be watered so as to maintain healthy growth / establishment.			✓	✓	✓	✓	✓	✓	✓	✓		
Grassland: General	Re-seed any gaps / hollows in lawns with a seed mix selected to match existing grass in quality and appearance. Top dress where necessary with fine topsoil to BS 3882.			✓	✓	✓	✓	✓	✓	✓	✓		

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grassland: General	Weed material within sward to be eradicated manually or spot treated with suitable herbicide.				✓					✓			
Amenity Grass and mown Paths: A22	Areas to be cut to 25mm height on 2 weekly basis during growing season and cuttings removed from site. Use edging equipment to maintain neat / tidy edge, as necessary. 16 No. cuts total.			✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)		
Amenity Grass and mown Paths: A22	Apply ICI Summer & Spring Feed (14:4:4) or equal approved at 30g / sqm to all lawn areas.			✓									
Field Margin Meadow - Hedgerow Mixture: EH1	Keep semi-shade weeds such as nettles and brambles in check. Grass swards to be selectively sprayed to control docks and thistles every 2-3 years on a rotational basis so that no more than half of the area is cut in any one year. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.											✓	
Tussock Grassland Tussock mix: EM10	Low intensity cutting regime (as required – review annually)									✓			
Woodland Meadow - Grass Mixture for Hedgerows and Woodland: EG9	Annual mid-summer mid cut (no shorter than 30mm) and avoid cutting if prolonged dry spell. Keep weeds of semi-shade such as nettles and brambles in check. Grass swards that do not contain wildflowers can be selectively sprayed to controls docks and thistles. Less intensive management over time will develop an open tussocky nature as a refuge for wildlife.								✓				
Wildflower Meadow - Standard General Purpose Meadow Mixture: EM2	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wetland Meadow - Meadow Mixture for Wetlands: EM8	Areas to be mown in spring after early annual weeds have flowered (remove cuttings from site). Areas to be cut late summer after annuals have flowered and set seed with a scythe or petrol strimmer to ~50mm. Cuttings are to be left to dry and shed seed for 5-7 days and then removed from site. Areas to be mown early winter to ~50mm (remove cuttings from site). 3 No. cuts total. Localised differences may require a targeted approach. Use of herbicides or other pesticides to be avoided where possible except for spot treatment of any colonising ruderal species (e.g. nettles, thistles and docks).			✓ (1)					✓ (1)			✓ (1)	
Pond Edge Mixture: EP1F	In second and subsequent years create variety of vegetation structures by cutting back and removing short sections of vegetation every 2-3 years in rotation. Remove wedges (like slices of cake) of vegetation and selectively thin Yellow Iris and any dense stands of single species. Machines and heavy equipment may only be used with care to avoid damage to soil and vegetation.										✓		
Wild bird Seed Crop - Enhanced Autumn Sown Wild Bird Seed Mix: KEAUT1	See Section 9.4 Winter Cover Crop for information												
Bulbs + Corms	Maintain area in a weed free condition. Cease mowing and weed control prior to emergence of leaves. Do not cut grass until foliage die back has begun. No chemical weed control until foliage dies back completely.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bulbs + Corms	Lift and divide as appropriate just after mowing.			✓	✓	✓							

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Attenuation Basins / Ponds (Year 5+)	Checks for presence of non-native invasive plant species to be conducted at least once annually. Other native aquatic or marginal species may colonise naturally and will be allowed to establish or be managed as appropriate to enhance floral diversity and maintain suitability for a range of wildlife. Aquatic and marginal vegetation will be managed by cutting or hand pulling on an 'as needed' basis to ensure a third of the pond surface remains free from vegetation from September to November within semi-permanent ponds and a variety of edge habitats. Marginal and emergent vegetation to be maintained at a maximum extent of 20%. Any removed aquatic or marginal vegetation will be left at the pond edge for up to 3 days (minimum 1 day) to allow any pond life to re-enter the pond. Some piles may be left to provide refuge opportunities for amphibians, invertebrates and reptiles, but generally all arisings will be removed from the management area. Removal of sediment from the ponds will be as required. No more than 25% of marginal vegetation or silt will be removed from the pond during management in any one year. This work would be conducted during the winter. Management of planted and self-seeded scrub will be conducted during winter months to prevent excessive shading and encroachment into wetland areas. This will be conducted by hand pulling and cutting. No fish will be introduced to the ponds in order to maintain optimal conditions for other native wildlife including invertebrates and amphibians. If non-native invasive plant species are recorded during survey, they will be subject to control using a methodology appropriate to the species present (and the presence of a waterbody).			✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)	✓ (1)			✓ (2)
Hard Surfacing	Clear soil, mulch, litter or other debris from hard surfaced areas and remove from site.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hard Surfacing	Hard surfaces in communal areas to be treated with glyphosate-based non-residual herbicide (Roundup or equal approved), in full accordance with manufacturer's recommendations & COSHH regulations.			✓				✓					
Fencing	Report any damage (including rabbit fencing); provide temporary barriers to secure fence line where damage poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interpretation Boards	Visually inspect all areas and play equipment for vandalism / damage, make safe and report any damage to the relevant party.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
General	Collect fallen leaf litter and remove from site (do not blow away). Allow for 2 weekly visits.	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)

APPENDIX G – MAINTENANCE SCHEDULE YEAR 5+

MAINTENANCE ITEM		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General	Report any remaining element that through failure, fatigue or vandalism poses a risk to public safety.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix H General Management Standards and Considerations

GENERAL MANAGEMENT STANDARDS AND CONSIDERATIONS

A. Standards of Workmanship

All maintenance and management works shall only be carried out by competent and suitably qualified individuals on behalf of Lightsource bp with experience of managing a site such as the Plas Power Solar and Energy Storage Project.

Where materials and workmanship are not clearly specified, work is to be carried out in accordance with:

a. Suitability for the purpose of the stated objectives;

b. In accordance with good horticultural practice and current British Standards with particular reference to:

- BS 3998: Recommendations for Tree Works;
- BS 4428: Code of Practice for General Landscape Operations;
- BS 8545: Trees: from nursery to independence in the landscape – Recommendations
- BS 7370: Grounds Maintenance;
  - Part 1: Recommendations for establishing and managing grounds maintenance organisations and for design considerations related to maintenance;
  - Part 2: Maintenance of Hard Areas;
  - Part 3: Maintenance of amenity and functional turf (other than sports turf);
  - Part 4: Maintenance of soft landscape (other than amenity turf);
- Control of Substances Hazardous to Health (COSHH) Regulations; and,
- Control of Pesticide (COPR) Regulations.

c. Recognised woodland and arboricultural management practices, including:

- Forestry and arboricultural training and safety council safety guidelines (AFAG);
- Ancient and other Veteran Trees: Further Guidance on Management (Woodland Trust / David Lonsdale);
- BS 3998:2010 Tree Works Recommendation. Note: all tree works carried out by an Arboricultural Association (AA) approved qualified tree surgeon in accordance with the AA Standard Conditions of Contract and Specification for Tree Works and Arboricultural Association Guidance Note 8.

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

B. Examination of the Site

The landscape management contractor and his operatives should be satisfied as to the nature of the planting, including all new tree, shrub, hedge, grassland and meadow planting, and any other matters that could affect the execution of the landscape maintenance.

C. Climatic Conditions

Work shall be conducted during the appropriate season. Ground and weather conditions should be suitable for the relevant operations.

D. Machines and Tools

Use only machinery and tools suitable for the site conditions and the work to be carried out. Use hand tools around trees and shrubs or where use if machinery is essential, use with appropriate precautions in place to protect trees and shrubs.

E. Services

The landscape management contractor and his operatives shall locate, identify and familiarise themselves with all existing services on site which may affect the works and shall satisfy themselves of the extent and nature of the services.

The landscape management contractor and his operatives shall raise notification when it is considered that the works may affect existing services. In such cases the managing authority (Lightsource bp) may instruct, or amend the setting out of the works as necessary.

F. Dust and Mud Nuisance

The landscape management contractor and their operatives shall take all necessary steps to eliminate dust and mud nuisance (including woody waste, grass and herbage clippings) during the carrying out of the works. The existing public highways used by vehicles of the landscape management contractor and their operatives or any of his sub-contractors or suppliers of materials or plant, shall be kept clean and clear of dust, grass debris and mud dropped by the said vehicles or their tyres. The landscape management contractor shall immediately clear all dust and mud from the work spreading onto these highways or any public right of way.

G. Waste and Control of Pollution

The landscape management contractor and their operatives must be conversant with the requirements of the Environmental Protection Act 1990, Pollution, Prevention and Control Regulations 2000, Hazardous Waste Regulations 2005 and the Control of Pollution (Amendment) Act 1989 for the Carriage of Controlled or Special Wastes, and must be registered with a relevant Regulation Authority (Environment Agency) and be in possession of a valid Certificate of Registration or Certificate of Registration as a Broker of Controlled Waste under the Act.

H. Removal of Rubbish and Fires

The landscape management contractor and their operatives shall remove all rubbish, pruning arisings and superfluous materials from the site of the works to the entire satisfaction of the managing authority (Lightsource bp) and shall make his own arrangements for the collection and tipping of rubbish and pruning arisings arising from the contract. All rubbish is to be carted to an approved tip; any expenses incurred will be the responsibility of the landscape management contractor.

Where possible, on site recycling and/or composting shall be considered. If well composted mulch were produced on site, this could provide a value resource for mulching beds and woodland copse areas within the estate during the maintenance operations.

The landscape management contractor and their operatives shall take all reasonable precautions to minimise fire risks. The burning of arisings, litter and pruning arisings is prohibited within the site. Naked lights necessarily in use for the execution of the Works shall be carefully controlled.

No naked light appliance shall be left on the site unattended.

I. Use of Chemicals

The landscape management contractor and their operatives must comply with 'The Control of Pesticides Regulations 1986', 'The Control of Substances Hazardous to Health Regulations 1988' and any other current legislation and subsequent revisions.

All chemicals must be products on the current list of Agricultural Chemicals Approval Scheme and used strictly in accordance with the conditions of approval. The landscape management contractor and their operatives must comply with all relevant Codes of Practice issued by MAFF. In particular where working near water, drainage ditches or land drains, comply with the 'Code of Practice for Use of Herbicides on Weeds in Water Courses and Lakes'. Obtain written approval from the Environment Agency if working within these areas.

All pesticides/herbicides transported or stored in the landscape contractor's vehicles or on site (regardless of quantity) shall be locked in a separate storage compartment or within lockable containers which is secured to the floor of the vehicle. All storage lockers must be sealed and clearly marked as containing pesticides and bear a standard black and yellow hazard sign.

Apply pesticides/herbicides strictly in accordance with the manufacturer's instructions in calm, dry weather conditions. Do not apply in wet, frosty or windy conditions.

The landscape management contractor and their operatives must hold a PA1 and PA6, or work DIRECTLY under the supervision of a certified holder.

Notify the managing authority (Lightsource bp) at least 24 hours in advance of the location, type of pesticide/herbicide, active ingredient and timing of application prior to commencing work. The landscape management contractor and their operatives shall erect warning signs at all entrances to the areas to be treated. When restricted to planting beds, warning signs shall be placed within close proximity in clearly visible locations. Details of application and contact person to be shown.

In accordance with COSHH Regulations the landscape management contractor and their operatives shall protect employees and other persons, including the general public and adjacent land owners who may be exposed to substances hazardous to health.

Dispose of waste chemicals and containers in accordance with the 'Control of Pesticides Regulations 1986', 'Control of Pollution Act 1974' and the 'Water Act 2014' and any subsequent revisions.

The landscape management contractor and their operatives shall be responsible for making good and or compensation for any damage how so ever caused resulting from negligence in application, handling and/or storage of pesticides and herbicides. He shall also be responsible for keeping up to date with all legislation and regulations governing there use and inform the managing authority of any changes that may affect the contract in any way.

The landscape management contractor and their operatives shall ensure that all property and utilities are protected against accidental or negligent damage that may occur. Any damage incurred by the contractor in carrying out their duties is to be made safe immediately and repaired to the satisfaction of the client or Utilities Company at the earliest convenient time, or as agreed, at the cost of the landscape management contractor.

It shall be the landscape management contractor and their operative’s responsibility and liability for any damage to person or property, however caused. All operatives shall be trained according to the task to be undertaken.

J. Timing of Works and Ecological Considerations

It is an offence to disturb nesting wild birds under the Wildlife and Countryside Act 1981. In all cases check in advance with an ecologist that there are no birds nesting in the area of operation, and that no European protected species would be disturbed by the works.

Prior to works to trees, hedges and shrubs taking place consideration will be given to the potential for nesting birds with advice being sought from a suitably qualified ecologist and/or works will take place outside the bird nesting season to avoid any destruction or damage to birds' nests.

Routine monitoring shall be carried out to ensure that operations are undertaken as programmed and to take appropriate action to deal with damage and debris arising from periods of heavy rainfall, high winds and heavy snowfall.

Vegetation clearance, pruning and trimming operations shall generally take place outside the bird nesting season (generally March to August inclusive). Any works which could affect bat roosts, or dormouse resting places will be subject to prior approval by an ecologist.

K. Management of Works

The landscape management contractor and their operatives shall ensure that instructions for works are received and acted upon and that inspections of the works are carried out by the client (Lightsource bp) at regular intervals.

The client (Lightsource bp) shall satisfy himself that the Health and Safety requirements of the site operations are maintained at all times.

Works shall be carried out at regular intervals during the growing season and as necessary to fulfil the requirements of this oLEMP as well as the operational requirements of the site The landscape management contractor is responsible for the acts of its employees and ensure that smoke, dust, chippings, un-reasonable noise, vehicular movements and any other nuisances are minimised at all times.

L. Equipment and Machinery

All equipment shall be used for its designated purpose and all operatives fully trained, qualified and authorised to use the equipment.

No equipment shall be left unattended. If fuel is to be stored on site, this is required to be located on an area of hardstanding, in a double skinned tank.

M. General Litter

Any areas where general debris collects shall be removed as required and disposed of to a licensed tip. Where viable compostable material will be managed on site, as a sustainable, reusable resource material.

Litter picking, including any blown litter, shall be carried out as detailed in the schedule in Appendices C to G, and disposed of to a licensed tip.

N. Disposal

All debris, litter and rubbish from the works shall be cleared and disposed of from site to a licensed compound where required, as the works proceeds.

Composting on site maybe viable subject to confirmation and agreement with the client (Lightsource bp). Chipped arisings could be reused as informal mulch within wooded areas, spread to a depth no greater than 100mm in any given area.

All areas are to be clear of machinery and arisings when the management practice leaves the site and at the completion of each working day.

O. Damages

Do not damage grass / plants and trees during the maintenance operations. All damaged plants should be replaced by the landscape management contractor and their operatives at their own expense. In particular the landscape management contractor and their operatives shall ensure that trees are not subjected to damage by strimming / mowing operations and shall implement all necessary protective measures. Protect existing grass by laying boards or tarpaulins. Do not place excavated material directly onto grass.

During the execution of the works, the landscape management contractor and their operatives will be held responsible for any damage to highways, roads, kerbs, footpaths and services caused by their employees, and they shall make good any damage at their own expense.

Reinstate to original condition and within a reasonable period of time (according to season), any damage or disturbance occurring during the work to soil structure, planting, grass, fencing, hard landscaping structures or buildings.

P. Damage to Existing Trees / Shrubs

Any damage incurred to existing trees / shrubs by the landscape management contractor or their operatives during the works will be the liability of the landscape management contractor and they shall replace such trees / shrubs at their own expense with material of a size and species to be agreed with the Local Authority.

Q. Thinning by Removal of Surplus Plants

It should be noted that the objective of thinning is to aid the establishment and overall development of plant material. The main aim of thinning is to provide adequate space for improved growth. Overcrowded trees will become tall and thin with relatively limited root systems. It is important that thinning is conducted before trees become spindly, as some varieties are not able to respond well if they are given additional space in later years.

Selectively thin shrubs using the methods in BS 7370: Part 4, Clause 3.5.17.1. At the discretion of the landscape management contractor and where necessary following the advice of a suitably qualified and experienced person during the first 5 years of this oLEMP , begin to thin soon after the foliage of adjacent plants has begun to touch.

R. Health and Safety

The landscape management contractor and his operatives is to take all safety precautions to prevent injury to any persons by effectively covering excavations, and removing topsoil and rubbish from footpaths / roads etc. Pavements are to be swept and washed down before nightfall and the landscape management contractor and their operatives is to comply with the requirements of the Health and Safety at Work Act 1974 and current Construction, Design and Management Regulations.

The landscape management contractor and their operatives will ensure that all equipment or apparatus brought onto or used on site is safe and without risk to health and has been maintained

at a standard that will not constitute an offence under the Health and Safety at Work Act 1974, or any other relevant statutory provision relating to Health and Safety.

The landscape management contractor and their operatives should be adequately informed, trained and supervised and be sufficiently competent to perform their work without risk to the Health and Safety of themselves, or any other person. All work will be done in accordance with all relevant codes of safety practice currently in force.

All of the landscape management contractor's operatives on site shall use PPE (Personal Protective Equipment), or anything else necessary in the interest of the Health and Safety or welfare of themselves or any other persons who may be affected by their work.

S. General Watering

Water as necessary to ensure the continued thriving of all planting until restrained from doing so by statutory legislation.

Obtain approval before using a water supply other than portable mains water. Use a fine hose or low-pressure hose where appropriate to avoid damage or loosening plants.

Ensure the full depth of topsoil is thoroughly wetted. Where necessary loosen soil or form depressions around the stem base of plants to ensure that water reaches the root zone instead of dispersing on the surface.

T. Notice

Provide 2 days' notice of the following operations:

- Use of any equipment during maintenance that may pose a risk to public health and safety;
- Application of herbicide;
- Application of fertiliser;
- Watering;
- Each site maintenance visit.

U. Periodic Tree Inspections

Trees are living, dynamic organisms whose health and condition can change rapidly. It is therefore recommended that tree inspections be undertaken periodically by a suitably qualified and experienced person in order to assess the full health and safety of the trees. The inspections shall prioritize areas based on levels of access and presence of target (i.e. exposure of people to hazard) and accord with arboricultural advice, taking account of relevant factors (where known) that affect safety such as extreme weather events, the age class, condition, size and species of the trees. Where exposure increases the inspection regime shall respond to the changed demands. The project's formal arboricultural documents will provide the baseline information to inform the inspections.

The results of the inspection may trigger a more detailed assessment and the requirement for arboricultural works as necessary.

V. Monitoring

The 'Landscape Management and Maintenance Schedule' (Appendix C – G) will be reviewed every 10 years and the Local Planning Authority (LPA) consulted as necessary as part of the review. **This document will not be changed without the written prior approval of the LPA.**

During the first 2 years of the period of this oLEMP, the works will be inspected 3 times per annum by a suitably qualified person. Thereafter, there will be an annual review of the site looking at the following:

- Tree, hedgerow, scrub and meadow establishment;
- Publicly accessible routes and desire lines (as required);
- Litter;
- Establishment of biodiversity areas and informal recreation areas; and
- Success of the surface water attenuation basins.

It is anticipated that following the review, any problems or changes that are impacting on the landscape will be accommodated within reason by the landscape management contractor on behalf of Lightsource bp.

Appendix 6.9
Biodiversity Net Gain Report

PLAS POWER SOLAR AND ENERGY STORAGE PROJECT

Biodiversity Net Gain Report

BNG Report
1
February 2024

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
1		Georgia Kelly	Tim Oliver	Tim Oliver	09/02/24

Approval for issue

9 February 2024

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Contents

Figures

1 INTRODUCTION

1.1 Purpose and Scope of This Report

1.1.1 RPS Planning and Development were commissioned by Lightsource bp to undertake a Biodiversity Net Gain (BNG) Assessment of the Proposed Development at the Plas Power Estate at Wrexham, North Wales. Lightsource bp proposes the installation of a Solar and Energy Storage Project at the site. The site is located to the West of Wrexham, centred at grid reference SJ 301 501.

1.1.2 While a Biodiversity Net Gain Assessment is not required for developments in Wales, the assessment has been undertaken on behalf of Lightsource bp to provide additional information on the biodiversity status of the baseline site and the Proposed Development.

1.1.3 The Biodiversity Net Gain Assessment provides a comparison of the values (as defined by the BNG habitat scores) of the site prior to development and following development, habitat creation and enhancement. The assessment was carried out using the Biodiversity Metric V4.0 published on the Natural England website which takes into consideration where habitat will be gained, lost or enhanced as a result of the Proposed Development. The BNG baseline assessment was completed in 2023 prior to the publishment of the Statutory Metric to provide information on the baseline habitat value and inform the design and Illustrative Landscape and Ecology Management Plan of the site.

1.1.4 The Biodiversity Metric provides Biodiversity Units calculated based on the habitat type, area or length, distinctiveness, condition, ecological connectivity and strategic significance. For enhanced or created habitats the time required and difficulty of establishing the habitat are also taken into consideration.

1.1.5 Each of the existing habitat areas and their condition are defined in the BNG metric with reference to the rationale for the selected condition in the assessor notes. The BNG metric should be viewed with reference to the Habitat Plan (Figure 1) which shows the baseline habitats, the Landscape Strategy (Figure 2) and the BNG Metric calculations (RPS, 2024).

2 BASELINE HABITATS

2.1.1 The baseline site comprises sheep grazed improved grassland and arable fields bounded by hedgerows. A field drain adjoins part of the site boundary and field ditches are present within a few fields. The extent of the habitats are shown on the Habitat Plan (Figure 1) and further information on habitats is provided in the Preliminary Ecological Appraisal (RPS, 2023).

2.2 Habitat Descriptions

Modified Grassland

2.2.1 The eastern and southern areas of the site comprise 11 improved grassland pasture fields. The fields are dominated by perennial rye-grass *Lolium perenne*. Rarely present within the grassland were other grass species such as creeping bent *Agrostis stolonifera*, annual meadow-grass *Poa annua*, and Yorkshire fog *Holcus lanatus* and forbs such as spear thistle *Cirsium vulgare*, white clover *Trifolium repens* and creeping buttercup *Ranunculus repens*.

2.2.2 The grassland is grazed by sheep. It lacks tussocks or variation in the sward height. The majority under 10 cm in height. The grassland is free of scrub, invasive species and extensive areas of damage or bare ground.

2.2.3 The pasture fields classify as in Moderate condition under the BNG condition criteria.

2.2.4 Two small areas of semi-improved grassland are present at the north of the site. Both fields have a low species diversity, characterised by Yorkshire fog, creeping bent, cock's-foot *Dactylis glomerata* and hogweed *Heracleum sphondylium*. Species present which are indicative of sub-optimal condition include nettle *Urtica dioica*, spear thistle and creeping buttercup.

2.2.5 The grassland has a tussocky structure and scrub, bracken and invasive species are absent, but there are some areas of bare ground and damage from vehicle movements.

2.2.6 The semi-improved grassland classifies as in Poor condition under the BNG condition criteria.

Arable

2.2.7 The northern and western areas of the site consist of nine arable fields used as grass ley and crop production. The field margins are less than 1m in width on average.

2.2.8 The habitat is classified as 'Non cereal crops' and 'Temporary grass and clover ley'. Habitat conditions are not applied to arable habitats under the BNG condition criteria.

Unsealed Tracks

2.2.9 Bare ground farm tracks are present throughout the site. The tracks are categorised as 'Artificial unvegetated, unsealed surface'. Habitat conditions are not applied to this habitat under the BNG condition criteria.

Hedgerows

Native Hedgerows

2.2.10 There are 27 hedgerows within the site which fall into the following categories in the BNG Assessment according to the level of species richness, association with ditches and the presence and density of larger trees:

- species-rich native hedgerow;

- species-rich native hedgerow with trees;
- species-rich native hedgerow with trees - associated with bank or ditch;
- native hedgerow;
- native hedgerow - associated with bank or ditch;
- native hedgerow with trees - associated with bank or ditch;
- native hedgerow with trees.

2.2.11 The majority hedgerows classify as one of the categories of native hedgerows with less than 5 woody species, 22 hedgerows in total.

2.2.12 Most are classified as Moderate condition under the BNG condition criteria but the five hedgerows with wider field margins classify as Good condition.

2.2.13 The majority of the native hedgerows adjoining the section of the site south of the A525 are typically dominated by hawthorn *Crateagus monogyna*. Other hedgerow species include holly *Ilex aquifolium*, hazel *Corylus avellana*, damson *Prunus domestica*, bramble *Rubus fruticosus* and gorse *Ulex* sp. Several of the hedgerows have gaps along their length.

2.2.14 Seven hedgerows within the survey area are species-rich with 5 or more woody plant species represented in the hedgerow. The majority of these are located within the northern section.

2.2.15 Species frequently present within the species-rich hedgerows include: hazel, sycamore *Acer pseudoplatanus*, ash *Fraxinus excelsior*, holly, English oak *Quercus robur*, blackthorn *Prunus spinosa*, field rose *Rosa campestre* and elder *Sambucus nigra*. Less frequent species include: willow *Salix* species., bramble, cherry *Prunus* sp., alder *Alnus glutinosa*, plum *Prunus* sp., field maple *Acer campestre*, apple, beech *Fagus sylvatica* and elm *Ulmus* sp.

2.2.16 The majority of hedgerows within the northern section include mature and semi-mature trees, typically sycamore, oak and ash. Fewer large trees were present in the central area.

2.2.17 The majority of the hedgerows adjoin short-grazed pasture or arable and the hedge-base flora is typically species-poor characterised by common nettle, broadleaved dock and cleavers *Galium aparine*.

2.2.18 Two hedgerows adjoin a small stream and several adjoin field ditches.

Mixed Scrub

2.2.19 A small linear section of dense scrub is present between two arable fields within the site. The scrub is up to 15m in width and comprises hawthorn, blackthorn and bramble. The areas of scrub have a dense structure, but lack structural diversity and have a limited ground flora.

2.2.20 The mixed scrub habitat classifies as being in Poor condition.

Individual Trees

2.2.21 Several scattered broadleaved trees are present within the site. This includes five oak and willow classified as being Medium sized and Good condition.

2.2.22 Six young silver birch *Betula pendula*, alder and fruit trees are also present at the south of the site and are classified as being Small sized and Moderate condition.

2.2.23 The trees are all in good health and the medium sized trees have features such as deadwood, loose bark and ivy with value for invertebrates.

Field Drain

2.2.24 A field drain runs between the southern boundary of an arable field within the site and the A525. To the west the drain is unshaded with shallow banks supporting tall ruderal vegetation. The eastern section is shaded by an overhanging hedgerow and has steep grassy banks. The drain had a water depth of 5cm during the survey walkover and the water quality appeared good.

2.2.25 The drain lacks signs of physical damage. Algae is absent though the emergent and marginal plants are limited. A stand of Japanese knotweed *Reynoutria japonica* is present on the bankside.

2.2.26 The drain is classified as Poor condition under the BNG condition criteria.

2.3 Baseline Biodiversity Unit Scores

2.3.1 The baseline site achieves the following scores:

- Score of **273.59** Habitat Units.
- Score of **49.02** Hedgerow Units.
- Score of **2.25** River Units.

3 HABITATS WITHIN THE PROPOSED DEVELOPMENT

3.1.1 The Proposed Development will largely comprise grazed improved grassland bounded by perimeter fencing. There will be a mown grassland buffer between the perimeter fencing and field boundaries.

3.1.2 Biodiversity Areas will also be created where a range of habitats will be created with the aim of providing resources with value for wildlife. The extent of the habitats are shown on the Illustrative Landscape and Ecology Masterplan (Figure 2).

3.2 Habitat Descriptions

Modified Grassland

3.2.1 The Proposed Development will largely comprise grazed grassland.

3.2.2 The retained grassland should at least maintain its Poor condition.

3.2.3 Where solar panels are installed in existing arable fields, these will be sown with a grazing mixture which will include a range of grasses and forbs. The grassland will be sheep grazed or mown and is expected to achieve at least Moderate condition.

3.2.4 The two small areas of semi-improved grassland at the north of the site will be retained. Both areas will be subject to sheep grazing, with several solar panel arrays installed in the smaller of the two areas. Areas of bare ground would be left to be naturally recolonised by grasses and herbs. The condition of the areas is expected to increase to Moderate.

3.2.5 The above conditions have been assessed based on a precautionary approach and it is possible that the grasslands will achieve a higher condition. For example where there is low intensity grazing there may be an increase in the species diversity or structural variation which could result in Moderate or higher condition being achieved. Given the large extent of the grassland, there would be potential for a significant increase in Habitat Units across the site where a higher condition is achieved.

Other Neutral Grassland

3.2.6 Two fields within the Proposed Development will be subject to enhancement to achieve Fairly Good condition Other Neutral Grassland classification. Measures will be undertaken to reduce the nutrient status of the soil and it will be harrowed and reseeded with a suitable grassland mixture containing a range of grasses and forbs. The fields will be sensitively managed through low intensity sheep grazing or a sensitive cutting regime (such as an early spring and late summer / early autumn cut). The management will aim to create a tussocky structure with greater species diversity compared to the existing short, grazed pasture.

3.2.7 Grassland between the perimeter fence of the Proposed Development and site boundary will be cut on an infrequent basis to encourage a tussocky structure and greater species diversity to develop. The condition of the grassland is anticipated to increase to achieve at least Fairly Good condition.

3.2.8 The margins of the arable fields and several larger sections within the existing grazed fields will be sown with a meadow mixture. These will be subject to low intensity management to encourage the development of a taller and more varied sward with greater species diversity and are expected to achieve Fairly Good condition.

3.2.9 Sections of woodland wildflower mixture will be sown between the perimeter fencing and woodland edges to increase the species diversity of the grassland within the site. The grassland will be sensitively managed and is expected to achieve Fairly Good condition.

3.2.10 Areas of wildflower rich grassland and tussocky grassland will be sown in the Biodiversity Areas. These will be subject to low intensity grazing or a sensitive cutting regime with the aim of creating

higher value grassland with a good species diversity and varied structure. These areas are expected to achieve at least Fairly Good condition.

Winter Cover Crop

3.2.11 Several areas of former grassland and arable will be sown with a winter cover crop to provide foraging resources for birds over winter. Habitat conditions are not applied to this habitat.

Hedgerows

3.2.12 Hedgerows will be retained and protected within the Proposed Development.

3.2.13 New native species hedgerows will be planted within the operational site including in the Biodiversity Areas. A mixture of native woody species will be planted.

3.2.14 Retained hedgerows at the north of the site include mature and semi-mature trees which will be retained. The sensitive management of mature trees will minimise tree surgery operations.

3.2.15 All hedgerows will be sensitively managed to promote the development of dense structure with fruiting and flowering shrubs which would achieve at least Moderate condition.

3.2.16 Hedgerows which currently achieve Good condition will be maintained at this condition.

3.2.17 The management of grassland adjoining many of the hedgerows to create a tussocky structure is expected to result in an increase in their condition to at least Fairly Good.

Individual Trees

3.2.18 Existing scattered broadleaved trees will be retained and sensitively managed to maintain their existing condition.

3.2.19 Approximately 50 new native trees will be planted throughout the site. These will be maintained at Moderate condition.

Mixed Scrub

3.2.20 Native shrubs will be planted within the Biodiversity Areas and at the edges of fields with solar arrays. These will be managed to promote the development of sections of dense scrub. The scrub is expected to achieve Moderate condition.

Ponds

3.2.21 Three new ponds will be created with Biodiversity Area 1, creating a new habitat type within the site. The pond margins will be planted with a range of marginal native species. The ponds will be managed to achieve at least Moderate condition.

Field Drain

3.2.22 The field drain will be retained and unaffected by the development, with its existing condition retained.

Unsealed tracks

3.2.23 There will be a small increase in the extent of unsealed tracks within the Proposed Development. Tracks will be created through the fields to provide vehicle access to the solar arrays and infrastructure during the operational phase. Habitat conditions are not applied to this habitat.

Hardstanding and Buildings

3.2.24 Areas of hardstanding and buildings will be created to facilitate the Proposed Development. Habitat conditions are not applied to this habitat.

3.3 Post-development Biodiversity Unit Scores

3.3.1 The Proposed Development will achieve the following scores:

- Score of **449.62** Habitat Units.
- Score of **84.20** Hedgerow Units.
- Score of **2.25** River Units.

3.4 Potential for Further Biodiversity Net Gain

3.4.1 The retention and creation of grassland across the site provides opportunity for a significant further increase in biodiversity value.

3.4.2 There is potential for areas of grassland beneath solar panels to achieve a greater condition than has been predicted under a precautionary basis in this assessment.

3.4.3 Should all areas of grassland across the site achieve Moderate condition or higher, there would be potential for a total of up to **827.33** Habitat Units to be achieved.

3.5 Management and Monitoring Plan

3.5.1 The biodiversity objectives and management prescriptions for habitats within the Proposed Development are detailed within the Landscape and Ecology Management Plan along with a programme of monitoring.

3.5.2 Monitoring targets will be aligned to BNG target condition and will relate to measurable attributes which will be reported to the LPA.

3.5.3 The biodiversity monitoring and reviews of management outcomes will document the status of the habitats, inform modifications to specific management plan actions, where appropriate, and identify the need for remedial measures. This objective and target led approach with periodic checks on the management approaches will be integral to initially achieving and then maintaining the target conditions over the long term.

4 CONCLUSIONS

4.1.1 The baseline site largely comprises sheep grazed improved grassland, categorised as Modified Grassland in Poor condition along with arable (grass leys and crop fields). Small sections of semi-improved grassland in Poor condition are also present.

4.1.2 The fields are bounded by hedgerows, most of which are in Moderate condition with some classified as Good condition.

4.1.3 Solar arrays and associated infrastructure will be installed within the fields. The grass leys and crop fields will be sown with a grazing mixture. Grassland beneath the solar panels will be sheep grazed or mown and is expected to achieve Moderate condition.

4.1.4 Two of the existing improved fields will be enhanced through reseeding and sensitive management to increase their biodiversity value. The fields will be enhanced to Moderate condition Other Neutral Grassland.

4.1.5 The semi-improved grassland will be sensitively managed and its condition is expected to increase to Moderate.

4.1.6 A small amount of arable and improved grassland will be converted to tracks and built infrastructure.

4.1.7 Biodiversity Areas will be created, which will include sections sown with a mixture of wildflower grassland and a tussocky grassland mixture. These will be managed to achieve Fairly Good condition.

4.1.8 Additional areas of higher value grassland will be created throughout the wider site, including areas sown with tussocky grassland, woodland edge grassland and meadow grassland seed mixtures. These will be managed to achieve Fairly Good condition.

4.1.9 Three new ponds will be created within Biodiversity Area 1 and managed to achieve Moderate condition.

4.1.10 The field ditches and drain will be retained and protected.

4.1.11 Existing hedgerows will be retained and protected. Where the adjoining grassland will be managed to develop a higher species diversity the hedgerow condition is expected to increase to Good.

4.1.12 New native species hedgerows will be created throughout the site and managed to achieve Moderate condition. New tree and shrub planting will be undertaken throughout the site.

4.1.13 The Proposed Development will result in the following Biodiversity Net Gain:

- The habitat unit score will increase from **273.59** to **449.62** Habitat Units, providing an overall total on site net change of **64.34%**.
- The hedgerow unit score will increase from **49.02** to **84.20** Hedgerow Units, providing an overall total on site net change of **71.76%**.
- The river unit score will remain unchanged at **2.25** River Units.

4.1.14 Where grassland within the site achieves a higher condition than predicted under a precautionary approach in this assessment, there is potential for a gain of up to **827.33** Habitat Units. This would provide an overall net change of **202.40%.**

4.1.15 A Landscape and Ecology Management Plan has been prepared for the development which includes a programme of monitoring to the LPA.

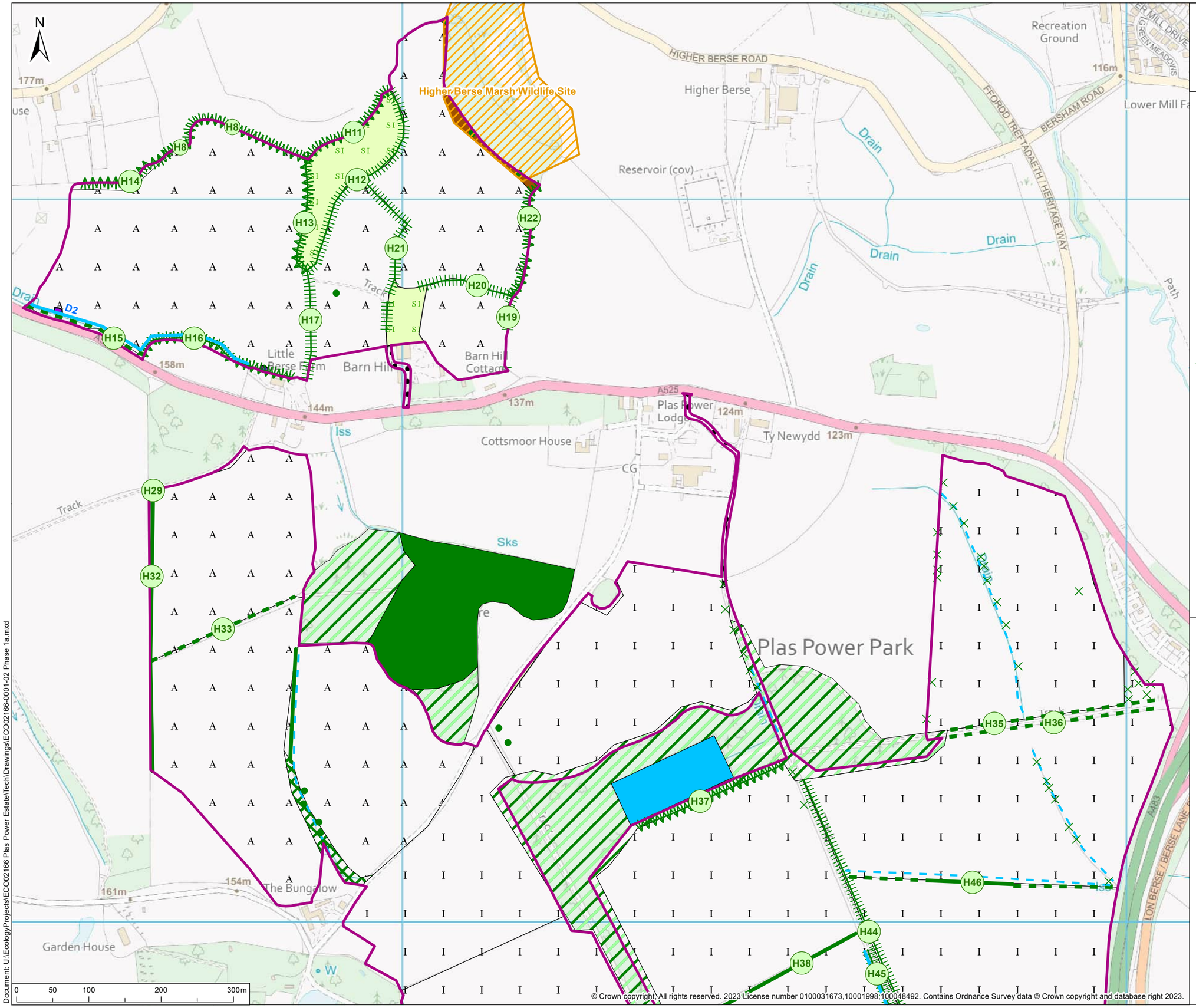
4.1.16 The habitat monitoring will follow an objective and target led approach integral to initially achieving and then maintaining the target conditions over the long term.

REFERENCES

RPS (2023). Preliminary Ecological Appraisal: Plas Power Estate.

RPS (2024). Plas Power BNG Metric.

FIGURES



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- Survey Boundary
- Wildlife sites
- A — Arable
- Bare ground
- Bracken - continuous
- Broadleaved woodland - semi-natural
- I — Improved grassland
- Mixed woodland - plantation
- Japanese Knotweed
- SI — Poor semi-improved grassland
- Scrub - dense/continuous
- Standing water
- Defunct hedge - species-poor
- Dry ditch
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Intact hedge - species-poor
- Standng water
- Scattered scrub
- Scattered tree - broadleaved
- H1 — Hedgerow number
- F1 — Field number
- W1 — Watercourse number
- D1 — Ditch number

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Project: Plas Power Solar Park

Title: Phase 1 habitat map

Status	Drawn By	PM/Checked By
Draft	MP	GK
Project Number	**Scale @ A3**	**Date Created**
ECO02166	1:5,000	21/06/23
Figure Number		**Rev**
1a		**04**

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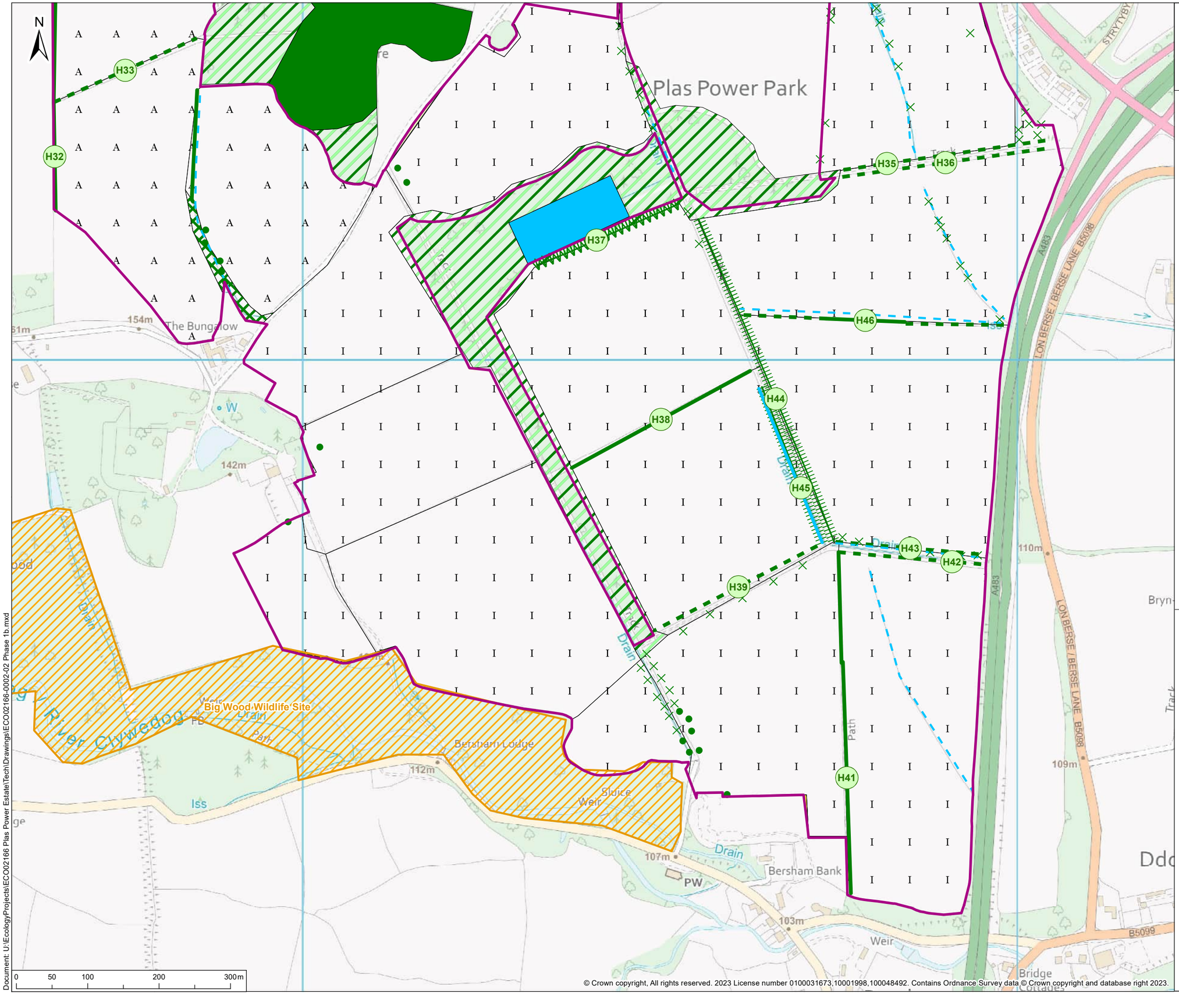

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ECO02166	1:5,000	21/06/23
Figure Number		**Rev**
1b		04

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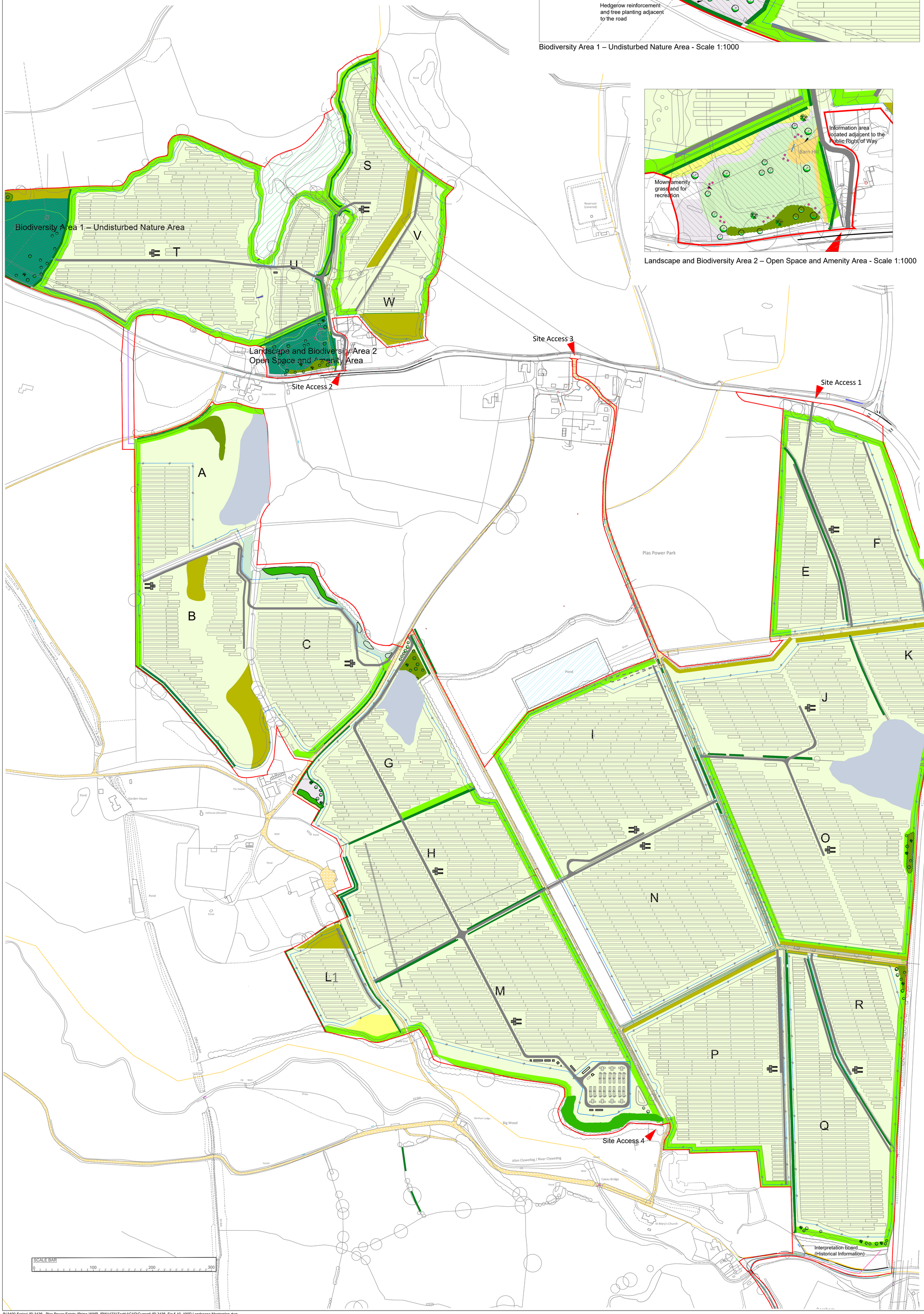
Biodiversity Area 1 – Undisturbed Nature Area - Scale 1:1000

Landscape and Biodiversity Area 2 – Open Space and Amenity Area - Scale 1:1000



Key

Proposed elements

- APPLICATION SITE BOUNDARY
- SITE ACCESS
- MODULE PANELS (See Layout for further details)
- SECURITY FENCE TBC
- PROPOSED ACCESS TRACK
- STRUCTURES (See Layout for further details)
- A — FIELD REFERENCE For LVIA and G&G

SOFT LANDSCAPE

Proposed elements

- DECIDUOUS TREE Varied native species and stock sizes
- CONIFEROUS TREE Varied native species
- SPECIMEN SHRUB In shrub border or gravel area
- NATIVE HEDGEROW (WITH SPACED STANDARD TREES) Complementing existing hedge lines and providing new field boundaries
- NATIVE CLIPPED HEDGEROW Complementing existing hedge lines and providing new field boundaries
- STRUCTURAL WOODLAND AND SHRUB Varied structure native woodland planting
- WOODLAND EDGE SHRUB Varied structure native shrub planting
- GRAZING GRASSLAND
- FIELD MARGIN MEADOW
- TUSSOCKY GRASSLAND
- WOODLAND MEADOW
- WILDFLOWER MEADOW
- WETLAND MEADOW
- MOWN AMENITY GRASS
- SPRING FLOWERING BULB PLANTING

HARD LANDSCAPE

Proposed elements

- INTERPRETATION BOARD Varied information, refer to notes for details
- FOOTPATH Compacted gravel

BIODIVERSITY ENHANCEMENTS

- WILD BIRD SEED CROP 6m wide on southern side of hedgerows
- ECOLOGICAL ENHANCEMENTS As per ecological reports
- ECOLOGICAL ENHANCEMENT AREA See inserts for details

Existing features

- TREES To be retained and protected. New tree planting would complement existing species and provide ongoing variation and structure.
- WOODLAND To be retained, protected and managed appropriately for longevity
- HEDGEROW / SCRUB To be retained, protected and gapped up where appropriate and managed on rotational basis to a height of 2.5-3m
- PUBLIC RIGHTS OF WAY Maintained and opportunities to further connect (As traced from OS Explorer 1:25,000)
- ANCIENT WOODLAND CLASSIFICATION Ref to Arb reports for further detail
- WATERBODY To be retained, protected and enhanced as possible and recommended within ecological reports
- GRAVEL TRACK Existing gravel track to be retained

Note

The illustrated landscape treatment would not alter if the proposed development included PVs instead of the BESS

Field D has been removed from the development

N

Rev	Description	By	CB	Date
D	REVISED LAYOUT	PL	GL	01.24
C	REVISED LAYOUT	CL	KH	11.23
B	OPEN SPACE AMENITY AREA	CL	KH	10.23
A	REVISED LAYOUT 2023	CL	KH	09.23

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Project: Plas Power Solar and Energy Storage Project

Title: Illustrative Landscape and Ecology Masterplan

Status	Drawn By	PM/Checked by
Planning	KH	GL

Job Ref	Scale @ A0	Date Created
JSL3436	See Scale Bar	Feb 2024

RPS Drawing / Figure Number: Figure 5.10

Rev: D

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Plas Power Solar and Energy Storage Project

Headline Results

Return to results menu

Scroll down for final results ⚠

On-site baseline	*Habitat units*	273.59		
	Hedgerow units	49.02		
	Watercourse units	2.25		
On-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	449.62		
	Hedgerow units	84.20		
	Watercourse units	2.25		
On-site net change (units & percentage)	*Habitat units*	176.03	64.34%	
	Hedgerow units	35.18	71.76%	
	Watercourse units	0.00	0.00%	On-site net gain is less than target set ⚠

Off-site baseline	*Habitat units*	0.00		
	Hedgerow units	0.00		
	Watercourse units	0.00		
Off-site post-intervention (Including habitat retention, creation & enhancement)	*Habitat units*	0.00		
	Hedgerow units	0.00		
	Watercourse units	0.00		
Off-site net change (units & percentage)	*Habitat units*	0.00	0.00%	
	Hedgerow units	0.00	0.00%	
	Watercourse units	0.00	0.00%	

Combined net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	176.03
	Hedgerow units	35.18
	Watercourse units	0.00
Spatial risk multiplier (SRM) deductions	*Habitat units*	0.00
	Hedgerow units	0.00
	Watercourse units	0.00

FINAL RESULTS

Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	176.03	
	Hedgerow units	35.18	
	Watercourse units	0.00	
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	*Habitat units*	64.34%	
	Hedgerow units	71.76%	
	Watercourse units	0.00%	Total net gain achieved is less than target set ⚠
Trading rules satisfied?	Yes ✓		

Unit Type	Target	Baseline Units	Units Required	Unit Deficit	
Habitat units	10.00%	273.59	300.95	0.00	Unit requirement met or surpassed ✓
Hedgerow units	10.00%	49.02	53.92	0.00	Unit requirement met or surpassed ✓
Watercourse units	10.00%	2.25	2.48	0.23	

Project Name: Flas Power Solar and Energy Storage Project Map Reference:

A-1 On-Site Habitat Baseline

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Area habitat summary	
Total Net Unit Change	170.03
Total Net % Change	64.34%
Trading Rules Satisfied	Yes ✓

	Existing area habitats			Distinctiveness		Condition		Strategic significance			Required Action to Meet Trading Rules	Ecological baseline	Retention category biodiversity value						Bespoke compensation agreed for unacceptable losses	Comments		
Ref	Broad Habitat	Habitat Type	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic Significance multiplier		Total habitat units	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area habitat lost	Units lost		User comments	Consenting body comments	GIS reference number
1	Grassland	Modified grassland	80.51	Low	2	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required 2	161.02	72.4	4	144.80	8.00	4.11	8.22		Improved, sheep grazed grassland. Passes condition criteria C, D, E, F, G.		
2	Grassland	Modified grassland	15.8	Low	2	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required 2	31.60	0	15.8	0.00	31.60	0.00	0.00		Small sections of S1. Passes condition criteria C, F, G		
3	Grassland	Modified grassland	1.73	Low	2	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required 2	3.46	0	1.73	0.00	3.46	0.00	0.00		Arable crop (fields north of A road)		
4	Cropland	Non-cereal crops	19.77	Low	2	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required 2	39.54	0	0	0.00	0.00	19.77	39.54		Grass ley (fields south of A road)		
5	Cropland	Temporary grass and clover leys	16.39	Low	2	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same distinctiveness or better habitat required 2	32.78	0	0	0.00	0.00	16.39	32.78		Section of scrub bEtween grass ley fields. Passes condition criteria A, C.		
6	Heathland and shrub	Mixed scrub	0.26	Medium	4	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (or)	1.04	0.26	0	1.04	0.00	0.00	0.00				
7	Individual trees	Rural tree	0.1832	Medium	4	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (or)	2.20	0.1832	0	2.20	0.00	0.00	0.00				
8	Individual trees	Rural tree	0.244	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Same broad habitat or a higher distinctiveness habitat required (or)	1.95	0.244	0	1.95	0.00	0.00	0.00		Tracks throughout site		
9	Urban	Artificial unvegetated, unsealed surface	1.08	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	Compensation Not Required	0.00	1.08	0	0.00	0.00	0.00	0.00				
10																						

ct Name: Plas Power Solar and Energy Storage Project   Map Refer

A-3 On-Site Habitat Enhancement

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Area habitat summary	
Total Net Unit Change	176.03
Total Net % Change	84.34%
Trading Rules Satisfied	Yes ✓

A 'Fairly' Category has been used - check evidence to ensure this is appropriate ⚠

	Baseline habitats									
Baseline ref	Baseline habitat	Total habitat area (hectares)	Baseline distinctiveness band	Baseline distinctiveness score	Baseline condition category	Baseline condition score	Baseline strategic significance category	Baseline strategic significance score	Baseline habitat units	Required Action to Meet Trading Rules
1	Grassland - Modified grassland	80.51	Low	2	Poor	1	Low Strategic Significance	1	161.02	Same distinctiveness or better habitat required ≥
2	Grassland - Modified grassland	15.8	Low	2	Poor	1	Low Strategic Significance	1	31.60	Same distinctiveness or better habitat required ≥
3	Grassland - Modified grassland	1.73	Low	2	Poor	1	Low Strategic Significance	1	3.46	Same distinctiveness or better habitat required ≥

Post development/ post intervention habitats

Baseline ref	Proposed Habitat (Pre-populated but can be overridden)		Change in distinctiveness and condition							Strategic significance		
	Proposed Broad Habitat	Proposed habitat	Distinctiveness change	Condition change	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier
1	Grassland	Other neutral grassland	Low - Medium	Lower Distinctiveness Habitat - Fairly Good	4	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
2	Grassland	Other neutral grassland	Low - Medium	Lower Distinctiveness Habitat - Moderate	15.8	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
3	Grassland	Modified grassland	Low - Low	Poor - Moderate	1.73	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1

Baseline ref	Temporal risk multiplier						Difficulty risk multipliers				Habitat units delivered	Comments		GIS reference number
	Standard time to target condition (years)	Habitat enhanced in advance (years)	Delay in starting habitat enhancement (years)	Standard or adjusted time to target condition	Final time to target condition (years)	Final time to target multiplier	Standard difficulty of enhancement	Applied difficulty multiplier	Final difficulty of enhancement	Difficulty multiplier applied		User comments	Consenting body comments	
1	12	0	0	Standard time to target condition applied	12	0.652	Low	Standard difficulty applied	Low	1	28.87	Field margins (see field margin meadow on landscape plan)		
2	10	0	0	Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	97.99	Two improved fields to be enhanced through reseeding and sensitive management		
3	10	0	0	Standard time to target condition applied	10	0.700	Low	Standard difficulty applied	Low	1	5.88	SI to be sensitively managed		

Project Name: Pias Power Solar and Energy Storage Project Map Reference:
A-2 On-Site Habitat Creation

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Area habitat summary	
Total Net Unit Change	178.08
Total Net % Change	94.94%
Trading Rules Satisfied	Yes ✓
Area Check (excluding individual trees and green walls)	Area Acceptable ✓

A 'Fairly' Category has been used - check evidence to ensure this is appropriate ⚠

Post development/ post intervention habitats																					
			Distinctiveness		Condition		Strategic significance			Temporal multiplier					Difficulty multipliers				Habitat units delivered	Comments		
Broad Habitat	Proposed habitat	Area (hectares)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard time to target condition (years)	Habitat created in advance (years)	Delay in starting habitat creation (years)	Standard or adjusted time to target condition	Final time to target condition (years)	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied		User comments	Consenting body comments	GIS reference number
Grassland	Modified grassland	26.5	Low	2	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	4	0	0	Standard time to target condition applied	4	0.867	Low	Standard difficulty applied	Low	1	91.92	Grassland on former arable - acres with grazing mixture and sheep grazed, panels to be installed in fields		
Grassland	Other neutral grassland	3.94	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	7	0	0	Standard time to target condition applied	7	0.779	Low	Standard difficulty applied	Low	1	30.70	Meadow grassland margins on former arable		
Grassland	Other neutral grassland	0.45	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	7	0	0	Standard time to target condition applied	7	0.779	Low	Standard difficulty applied	Low	1	3.51	Woodland grassland margins on former arable		
Grassland	Other neutral grassland	1.71	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	7	0	0	Standard time to target condition applied	7	0.779	Low	Standard difficulty applied	Low	1	13.33	Hedgerow grassland on former arable		
Grassland	Other neutral grassland	0.77	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	7	0	0	Standard time to target condition applied	7	0.779	Low	Standard difficulty applied	Low	1	6.00	Larger areas of tussocky grassland		
Grassland	Other neutral grassland	0.51	Medium	4	Fairly Good	2.5	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	7	0	0	Standard time to target condition applied	7	0.779	Low	Standard difficulty applied	Low	1	3.97	Mown amenity in Biodiversity Area 2		
Cropland	Arable field margins game bird mix	2.23	Medium	4	Condition Assessment N/A	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	1	0	0	Standard time to target condition applied	1	0.965	Low	Standard difficulty applied	Low	1	8.61	Winter cover crop		
Urban	Artificial unvegetated, unsealed surface	2	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0	0	0	Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Low	1	0.00	New tracks		
Urban	Developed land; sealed surface	1	V.Low	0	N/A - Other	0	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	0	0	0	Standard time to target condition applied	0	1.000	Low	Standard difficulty applied	Medium	0.67	0.00	Built infrastructure elements		
Heathland and shrub	Mixed scrub	1.05	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5	0	0	Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	7.03	New sections of dense scrub throughout		
Lakes	Ponds (non-priority habitat)	0.12	Medium	4	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	5	0	0	Standard time to target condition applied	5	0.837	Low	Standard difficulty applied	Low	1	1.21	New pond creation in Biodiversity Area		
Individual trees	Rural tree	0.2036	Medium	4	Moderate	2	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	22	0	0	Standard time to target condition applied	22	0.362	Low	Standard difficulty applied	Low	1	0.62	New tree planting throughout		

Project Name: Plas Power Solar and Energy Storage Project Map Reference

B-1 On-Site Hedge Baseline

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Hedgerow summary	
Total Net Unit Change	35.18
Total Net % Change	71.76%
Trading Rules Satisfied	Yes ✓

	Existing hedgerow habitats			Distinctiveness	Condition	Strategic significance	Required Action to Meet Trading Rules	Ecological baseline	Retention category biodiversity value						Comments		
Baseline ref	Hedge number	Hedgerow type	Length (km)	Distinctiveness	Condition	Strategic significance		Total hedgerow units	Length retained	Length enhanced	Units retained	Units enhanced	Length lost	Units lost	User comments	Consenting body comments	GIS reference number
1	H11, H12, H13, H37	Species-rich native hedgerow with trees	0.43	High	Good	Area/compensation not in local strategy/ no local strategy	Like for like or better	7.74	0.43		7.74	0.00	0.00	0.00	Passes condition criteria A1, A2, B1, B2, C1, D1, D2, E1 (some), E2		
2	H8, H14, H22	Species-rich native hedgerow with trees	0.56	High	Moderate	Area/compensation not in local strategy/ no local strategy	Like for like or better	6.72		0.56	0.00	6.72	0.00	0.00	Passes condition criteria A1, A2, B1, B2, D1, D2, E1, E2		
3	H16	Species-rich native hedgerow with trees - associated with bank or ditch	0.23	V.High	Moderate	Area/compensation not in local strategy/ no local strategy	Like for like	3.68		0.23	0.00	3.68	0.00	0.00	Passes condition criteria A1, A2, B1, B2, D1, D2, E1, E2		
4	H12	Native hedgerow with trees	0.32	Medium	Good	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	3.84	0.32		3.84	0.00	0.00	0.00	Passes condition criteria A1, A2, B1, B2, C1, D1, D2, E1, E2		
5	H17, H19, H20, H21, H44	Native hedgerow with trees	0.83	Medium	Moderate	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	6.64	0.15	0.68	1.20	5.44	0.00	0.00	Passes condition criteria A1, A2, B1, B2, D1, D2, E1 (some), E2 H17, H19, H21 and H44 enhanced		
6	H45	Native hedgerow with trees - associated with bank or ditch	0.27	High	Moderate	Area/compensation not in local strategy/ no local strategy	Like for like or better	3.24	0.27		3.24	0.00	0.00	0.00	Passes condition criteria A1, A2, B1, B2, D1, D2, E1, E2		
7	H15	Native hedgerow - associated with bank or ditch	0.28	Medium	Good	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	3.36	0.28		3.36	0.00	0.00	0.00	Passes condition criteria A1, A2, B1, C1, D1, E1		
8	H43	Native hedgerow - associated with bank or ditch	0.22	Medium	Moderate	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	1.76		0.22	0.00	1.76	0.00	0.00	Passes condition criteria A1, A2, B1, D1, D2		
9	H29, H32, H38, H41, H34	Native hedgerow	1.34	Low	Moderate	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	5.36	0.95	0.39	3.80	1.56	0.00	0.00	Passes condition criteria A1, A2, B1, B2, D1, D2 H29 and H32 enhanced		
10	H33, H35, H36, H39, H42, H46	Native hedgerow	1.67	Low	Moderate	Area/compensation not in local strategy/ no local strategy	Same distinctiveness band or better	6.68	1.46	0.21	5.84	0.84	0.00	0.00	Passes condition criteria A1, A2, B1, D1, D2 H33 enhanced		
11																	

roject Name: Pias Power Solar and Energy Storage Project Map Reference

B-2 On-Site Hedge Creation

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Hedgerow summary	
Total Net Unit Change	38.18
Total Net % Change	71.70%
Trading Rules Satisfied	Yes ✓

		Proposed habitats		Distinctiveness		Condition		Strategic significance			Temporal multiplier						Difficulty risk multipliers				Hedge units delivered	Comments		
Baseline ref	New hedge number	Habitat type	Length (km)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic position multiplier	Standard Time to target condition (years)	Habitat created in advance (years)	Delay in starting habitat creation (years)	Standard or adjusted time to target condition	Final time to target condition (years)	Final time to target multiplier	Standard difficulty of creation	Applied difficulty multiplier	Final difficulty of creation	Difficulty multiplier applied		User comments	Consenting body comments	GIS reference number
1		Species-rich native hedgerow	3.37	Medium	4	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	12	0	0	Standard time to target condition applied	12	0.652	Low	Standard difficulty applied	Low	1	26.37	New native hedge planting throughout		
2																								

me: Plas Power Solar and Energy Storage Project   Map R

B-3 On-Site Hedge Enhancement

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Hedgerow summary

Hedgerow summary	
Total Net Unit Change	35.18
Total Net % Change	71.76%
Trading Rules Satisfied	Yes ✓

Baseline Habitats

Baseline ref	Baseline habitat	Length (km)	Baseline distinctiveness band	Baseline distinctiveness score	Baseline condition category	Baseline condition score	Baseline strategic significance category	Baseline strategic significance score	Baseline habitat units	Required Action to Meet Trading Rules
2	Species-rich native hedgerow with trees	0.56	High	6	Moderate	2	Low Strategic Significance	1	6.72	Like for like or better
3	Species-rich native hedgerow with trees - associated with bank or ditch	0.23	V.High	8	Moderate	2	Low Strategic Significance	1	3.68	Like for like
5	Native hedgerow with trees	0.83	Medium	4	Moderate	2	Low Strategic Significance	1	6.64	Same distinctiveness band or better
8	Native hedgerow - associated with bank or ditch	0.22	Medium	4	Moderate	2	Low Strategic Significance	1	1.76	Same distinctiveness band or better
9	Native hedgerow	1.34	Low	2	Moderate	2	Low Strategic Significance	1	5.36	Same distinctiveness band or better
10	Native hedgerow	1.67	Low	2	Moderate	2	Low Strategic Significance	1	6.68	Same distinctiveness band or better

Post development/ post intervention habitats

Baseline ref	Proposed (Pre-populated but can be overridden)	Change in distinctiveness and condition: Distinctiveness movement	Change in distinctiveness and condition: Condition movement	Length (km)	Distinctiveness: Distinctiveness	Distinctiveness: Score	Condition: Condition	Condition: Score	Strategic significance: Strategic significance	Strategic significance: Strategic significance	Strategic significance: Strategic position multiplier
2	Species-rich native hedgerow with trees	High - High	Moderate - Good	0.56	High	6	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
3	Species-rich native hedgerow with trees - associated with bank or ditch	V.High - V.High	Moderate - Good	0.23	V.High	8	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
5	Native hedgerow with trees	Medium - Medium	Moderate - Good	0.68	Medium	4	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
8	Native hedgerow - associated with bank or ditch	Medium - Medium	Moderate - Good	0.22	Medium	4	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
9	Native hedgerow	Low - Low	Moderate - Good	0.39	Low	2	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
10	Native hedgerow	Low - Low	Moderate - Good	0.21	Low	2	Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1
							Good	3	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1

Baseline ref	Temporal multiplier: Standard Time to target condition (years)	Temporal multiplier: Habitat enhanced in advance (years)	Temporal multiplier: Delay in starting habitat enhancement (years)	Temporal multiplier: Standard or adjusted time to target condition	Temporal multiplier: Final time to target condition (years)	Temporal multiplier: Final Time to target multiplier	Difficulty risk multipliers: Standard difficulty of enhancement	Difficulty risk multipliers: Applied difficulty multiplier	Difficulty risk multipliers: Final difficulty of enhancement	Difficulty risk multipliers: Difficulty multiplier applied	Hedge units delivered	Comments: User comments	Comments: Consenting body comments	GIS reference number
2	4	0	0	Standard time to target condition applied	4	0.867	Low	Standard difficulty applied	Low	1	9.63	Hedgerows where adjoining grassland will develop higher value		
3	4	0	0	Standard time to target condition applied	4	0.867	Low	Standard difficulty applied	Low	1	5.28	Hedgerows where adjoining grassland will develop higher value		
5	4	0	0	Standard time to target condition applied	4	0.867	Low	Standard difficulty applied	Low	1	7.80	Hedgerows where adjoining grassland will develop higher value		
8	2	0	0	Standard time to target condition applied	2	0.931	Low	Standard difficulty applied	Low	1	2.58	Hedgerows where adjoining grassland will develop higher value		
9	2	0	0	Standard time to target condition applied	2	0.931	Low	Standard difficulty applied	Low	1	2.29	Hedgerows where adjoining grassland will develop higher value		
10	2	0	0	Standard time to target condition applied	2	0.931	Low	Standard difficulty applied	Low	1	1.23	Hedgerows where adjoining grassland will develop higher value		
		0	0											

Project Name: Flas Power Solar and Energy Storage Project

C-1 On-Site WaterC' Baseline

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Watercourse summary	
Total Net Unit Change	0.00
Total Net % Change	0.00%
Trading Rules Satisfied	Yes ✓

Existing watercourse type			Distinctiveness		Condition		Strategic significance			Watercourse encroachment		Riparian encroachment		Required Action to Meet Trading Rules	Ecological baseline	Retention category biodiversity value						Bespoke compensation agreed for unacceptable losses	Comments		
Baseline ref	Watercourse type	Length (km)	Distinctiveness	Score	Condition	Score	Strategic significance	Strategic significance	Strategic significance multiplier	Extent of encroachment	Multiplier	Extent of encroachment for both banks	Multiplier		Total watercourse units	Length retained	Length enhanced	Units retained	Units enhanced	Length Lost	Units Lost		User Comments	Consenting body comments	GIS reference number
1	Other rivers and streams	0.5	High	6	Poor	1	Area/compensation not in local strategy/ no local strategy	Low Strategic Significance	1	No Encroachment	1	Major/Major	0.75	Same habitat remained =	2.25	0.5	0	2.25	0.00	0.00	0.00				
2																									

Appendix 6.10
Great Crested Newt Mitigation Strategy

GREAT CRESTED NEWT MITIGATION STRATEGY

Plas Power Solar and Energy Storage Project

ECO02166
1
February 2024

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
1	Issue	Georgia Kelly	Paul Turner	Tim Oliver	27/10/23

Approval for issue

Tim Oliver	31 October 2023

Prepared for:

Lightsource bp

Contents

Drawings

Appendices

1 INTRODUCTION

1.1.1 RPS was commissioned by Lightsource bp to prepare a great crested newt (GCN) Mitigation Strategy for the installation of a solar farm and battery energy storage system (BESS) at the Plas Power site. The site lies within the Plas Power Estate at Wrexham, North Wales.

1.1.2 This document provides details on the following:

- protection measures that will be implemented in advance of and during construction;
- habitat enhancement and creation; and
- management and monitoring measures.

1.1.3 The Mitigation Strategy has been prepared alongside the development proposal and landscape scheme which has informed the extent of the areas of disturbance and loss, and the requirement for ecological mitigation.

1.2 Great Crested Newt Populations at the Site

1.2.1 GCN surveys were undertaken of ponds within 600m of the Proposed Development (RPS,2021 and 2023). The locations of the ponds are shown on Drawing 1.

1.2.2 The surveys concluded the following:

- Pond P3 located 60m west of the Proposed Development supports a small GCN population.
- Ponds P8 and P9 located 710m west of the Proposed Development support a medium-sized population of GCN.
- Pond 5 located 100m north of the site and which was dry during both 2021 and 2023 has the potential to periodically support a small population of GCN when water levels are higher.
- Ponds P6 and P7 located 430m and 550m east of the site which were not accessed may have potential to support GCN populations.
- GCN are likely absent from ponds P1, P2, P4, P10 and WB1.

1.2.3 Johnstown Newt Sites Specially Area of Conservation (SAC) is designated for its population of GCN, which is one of the largest known in Great Britain and has been the focus of much conservation management. The SAC covers multiple sites in the wider area with the closest being 1.69km south of the site.

1.3 Site Description

1.3.1 The Proposed Development is approximately 140 ha in size and is located to the west of Wrexham, North Wales, centred at grid reference SJ 301 501.

1.3.2 The site comprises two sections of land located to the north and south of the A525. The majority of the survey area lies to the south of the A525 and covers an area of farmland, most of which is pasture. A further section of the survey area lies to the north of the A525 and largely comprises arable farmland (grass ley fields). Small sections of amenity grassland and tall ruderal are present.

1.3.3 The fields are bounded by hedgerows, mature and semi-mature trees and woodland.

1.3.4 Big Wood Wildlife Site (WS) adjoins the survey area to the south with the River Clywedog flowing through this block of woodland. Higher Berse Marsh WS adjoins the survey area at the north, and Afon Gwenfro WS lies beyond the B5430 (Higher Berse Road) to the north of the survey area.

1.3.5 The A483 dual carriageway is located to the east of the survey area, adjoining the site boundary to the east.

1.3.6 The wider landscape comprises farmland. The city of Wrexham to the east and smaller villages to the north and east.

1.4 Legislation and policy

1.4.1 Great created newts *Triturus cristatus* are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (and as amended), which affords the species protection under Section 9. The species is also listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended). In combination, this makes it an offence to:

- intentionally kill, injure or take (capture etc.) a great crested newt;
- possess a great crested newt; or,
- intentionally or recklessly damage, destroy, obstruct access to any structure or place used by Great Crested Newt for shelter or protection, or disturb any animal occupying such a structure or place; and sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative) or advertise for buying or selling such things.

1.4.2 Great crested newts are also listed as Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016. This legislation requires the conservation of great crested newt and their habitats to be given consideration in planning decisions. The Section 7 Species list is based on the UK Biodiversity Action Plan (UKBAP) priority species list which it replaces.

2 SITE DESIGN

2.1 Proposals

2.1.1 The Proposed Development will comprise:

- solar panels and frames;
- inverters;
- transformers;
- cabling;
- substations;
- perimeter fencing;
- Battery Energy Storage System (BESS);
- access roads and tracks.

2.1.2 During construction and decommissioning temporary site compounds will be required to host staff facilities, take deliveries of components and store plant and equipment securely while not in use.

2.1.3 The Illustrative Site Layout Plan (Drawing 2) details the extent of solar arrays and locations of the infrastructure. The Illustrative Landscape and Ecology Masterplan (Drawing 3) illustrates the proposed habitats in the site following installation.

2.1.4 The static solar panels are arranged in series of rows up to a height of 3m at the highest point and tilted broadly southwards at an angle of 10-25 degrees. The support frame uprights will be pile driven into the ground, with 'string' inverters mounted onto the support frames. Localised excavation will be required for the foundations of transformers.

2.1.5 Most of the cabling associated with the development will be laid underground via surface dug trenches approximately 1m deep and 50cm wide and backfilled. These will utilise existing access tracks and road options wherever possible.

2.1.6 Existing access points will be used for access for the construction, maintenance and decommissioning of the Proposed Development. If necessary, some minor modifications to enable access to the site by all vehicles anticipated to visit it will be undertaken. Existing farm tracks will be used for internal access within the site with all sections of new access track to be formed using a layer permeable crushed stone.

2.1.7 Construction and installation of the Proposed Development is anticipated to take approximately 12 to 18 months. Construction of the BESS will take approximately 6-9 months (independent of the overall construction programme). The BESS element of the Proposed Development will be constructed at a later date and is currently expected to be constructed during 2032 and will be completed by 2033 at the latest. Decommissioning will take up to 12 months. The development will be minimally intrusive with the majority of the site remaining as or being converted to grassland. Areas of hardstanding will be small in size.

2.1.8 For decommissioning the remediation works following the removal of the solar panels and associated infrastructure will be relatively minor returning the site to its previous greenfield character. All the internal tracks will be constructed from crushed stone with a geotextile between the road surface and underlying soil. The roads will be built up above the existing ground level in the root protection areas of trees and hedgerows.

2.1.9 The Proposed Development will be designed to accommodate sheep grazing beneath and between the rows of panels.

2.1.10 The Proposed Development will be enclosed by 2m tall post and wire 'deer-proof' fencing with security cameras on 3m tall steel posts in selected locations.

2.2 Habitat Protection

2.2.1 The development footprint is largely within the existing arable and pasture fields.

2.2.2 Direct loss of habitat will be largely limited to arable land (which will be converted to sheep grazed pasture) beneath the panels, with small areas of arable and short-grazed pasture lost to create unsealed access tracks and other infrastructure.

2.2.3 Across the site, the existing hedgerows, ditches and off-site woodland provide wildlife corridors, foraging habitat, refuges and hibernacula for GCN. These habitats will be retained and protected within the development, maintaining the existing higher value habitat for GCN. Some short portions of hedgerow be required to be removed to facilitate access between fields, however this will be limited.

2.2.4 A 25m buffer will be implemented around Big Wood Ancient Woodland. There will be a minimum 10m buffer around other woodland areas, field boundaries and ponds. The closest pond supporting GCN is located over 60m from the development (pond P3).

2.2.5 Most of the new and existing pasture fields will be continue to be accessible for sheep grazing throughout the operation of the Proposed Development.

2.3 Habitat Creation/Enhancement

2.3.1 The existing short-grazed grassland is suboptimal habitat for GCN while the grass leys and crop fields have very low/negligible value. The arable land will be converted to grazed pasture.

2.3.2 In addition, new habitats will be created across the site. A Biodiversity Area is proposed to the north-west of the site and has been designed to provide new habitats with value for wildlife including GCN.

2.3.3 Three ponds will be created within the Biodiversity Area surrounded by grassland subject to low intensity sheep grazing. Groups of native trees and shrubs will also be planted in this area but set back from the new ponds to avoid shading in the future.

2.3.4 The location of the Biodiversity Area is shown on the Landscape Masterplan (Drawing 3) illustrates the proposed habitats in this location. The Biodiversity Area will create new areas of habitat suitable for GCN at the north of the site where habitat there is currently limited, increasing connectivity across the site.

2.3.5 The new ponds will be a minimum 150m2 in extent with a minimum open water depth of 1m with shallow sloping edges on at least 25% of the margin.

2.3.6 Pond management will be implemented during the operational life to maintain their potential to support a breeding population of GCN. Management actions will target maintaining deeper open water and mixed species marginal vegetation on the perimeter. Remedial actions include the removal of invasive plant species (should any colonise) and that ensuring fish populations do not become established in the small ponds.

2.3.7 The intensity of sheep grazing in the Biodiversity Area will be controlled to promote the development of a taller and more diverse sward which would be expected to support a range of invertebrate prey species.

2.3.8 Although there may be very localised loss of field boundary habitat (including hedgerows and scrub) from the construction of access routes the retention and enhancements of habitats provide an overall gain in the extent of suitable habitat for GCN.

3 IMPACT ASSESSMENT

3.1 Construction Phase

3.1.1 There is a low risk of GCN being present within the habitats subject to disturbance. Each of the ponds supporting GCN populations are surrounded by broadleaved woodland and the majority of GCN will be expected to remain largely within the pond and woodland habitat. The 'core habitat' associated with a breeding population lies within 50m of the open water (Cresswell and Whitworth, 2004). There is no core habitat within the site, with the closest breeding pond being P3 located over 60m from the working area.

3.1.2 Arable land will be sown with a pasture seed mix to establish grassland as part of the enabling works with the fields. The disturbance would be equivalent to, or less than, activities associated with arable landscape management.

3.1.3 There is a low likelihood of individual GCN being present in the arable and short-grazed pasture within the working area away from the field margins. There are unlikely to be below ground hibernation features in the arable and short-grazed pasture so potential impacts would be limited to GCN moving through the working area being harmed or killed.

3.1.4 Between mid-November and the end of January GCN will be hibernating and there is negligible potential for impacts from work undertaken during these months. Outside of this period when the weather conditions are suitable there is potential for GCN to be active, moving above ground and foraging in terrestrial habitats and precautionary working measures would be implemented.

3.1.5 Wherever practical, existing established field margin grassland will be left undisturbed. The need for localised cutting back or removal of small sections of hedgerows, scrub or arable field margins is to be defined.

3.1.6 Disturbance to the waterbodies during construction and operation will be avoided with a minimum stand-off of 10m between all ponds adjoining the site and the boundary fence.

3.1.7 The stand-off is larger (60m) from the closest pond supporting GCN (pond P3). All other ponds where the absence of GCN has not been confirmed or where GCN are known to be present (ponds P8 and P9) are a minimum of 100m from the Proposed Development.

3.1.8 Precautionary working methods will be followed as described in Section 4 to reduce the potential for harm to GCN during enabling works and construction / installation.

3.2 Operational Phase

3.2.1 The newly created Biodiversity Area within the north-west of the site will include areas of wildflower and tussocky grassland, new ponds and native tree and scrub planting. The area will be managed to provide biodiversity value including value as GCN habitat.

3.2.2 Within the site, wider field margins will be created with taller grassland increasing the extent of terrestrial habitat suitable for GCN and improving connectivity across the site.

3.2.3 Although the conversion of arable to short-grazed pasture would not be expected to significantly increase the value of these fields as terrestrial habitat for GCN, the widened field margins created alongside retained hedgerows will increase the value of the site for GCN compared to the existing arable farmland.

3.2.4 Over the lifetime of the Proposed Development the retained and created habitats should at least maintain the current status of the breeding population of GCN within the site. There should be no adverse impacts on offsite populations.

3.2.5 The enhancements and management will directly contribute to the favourable conservation status of this species in the operational Proposed Development over its 40-year lifetime.

Decommissioning

3.2.6 Prior to decommissioning, a site walkover should be undertaken by an ecologist to assess potential ecological constraints.

3.2.7 Precautionary working measures should be followed as described in Section 4 to reduce the potential for harm to GCN.

3.3 Johnstown Newt Sites SAC

3.3.1 Johnstown Newt Sites SAC is located at the extreme distance which GCN would be expected to disperse, with GCN typically staying within 50m of their breeding pond. There are no direct wildlife corridors along which GCN would be expected to travel between the site and the SAC. Three roads (B5605, B5097 and an unnamed road) are located between the site and the SAC and would also deter movement of GCN between the site and the SAC.

3.3.2 Given the above, movement of GCN between the site and SAC is likely to be minimal. The measures which will be undertaken to protect GCN within the site will prevent any significant adverse effects on the wider metapopulation of GCN including the population within Johnstown Newt Sites SAC.

4 SPECIES PROTECTION

4.1 NRW GCN Mitigation Licensing

4.1.1 Where there is potential for GCN to be impacted by the construction activities a GCN Mitigation Licence will be obtained from Natural Resources Wales (NRW) prior to any disturbance of habitats.

4.1.2 Installation of the Proposed Development and short grazed pasture are considered activities with a very low likelihood of encountering GCN. The localised areas of denser cover associated with hedgerows, scrub and longer grassland in field boundaries have a greater risk of encountering GCN where they are located within 250m of a breeding pond.

4.1.3 The licence method statement would define the specific protection measures that will be directly managed by the Ecological Clerk of Works (ECoW) the named ecologist on the NRW mitigation licence or accredited agent who holds a NRW GCN survey licence.

4.2 Tool Box Talk / Site Induction

4.2.1 An ECoW will be present for the commencement of works to provide a toolbox talk to site personnel. The toolbox talk will inform workers of the potential presence of GCN in the working area. The talk will include details of the differences between GCN and other newt species.

4.2.2 All site personnel not present for the initial toolbox talk must be given a toolbox talk by the site manager prior to starting work on the site. A copy of the toolbox talk provided by the ECoW and will be retained in the site office for future reference.

4.2.3 Activity specific working method statement would be prepared for tasks reflecting their location and the nature of the habitat. These documents would form part of the site induction for staff working on site.

4.2.4 All staff will be required to sign a record sheet (as provided in Appendix B) to state they have had a toolbox talk and they understand the implications of the Working Method Statement. If site workers have any questions, the ECoW should be consulted.

4.2.5 The ECoW will mark out or inform the site staff of any sensitive areas which are to be avoided during the works without direct ecological supervision. These will include all:

- field margins where grassland is longer
- areas of grassland with a sward height higher than 2cm
- field ditches and banks
- ground within 2m of the base of a hedgerow
- piles of logs, rubble or cut vegetation
- Banks, buried man-made materials, mammal burrows

4.2.6 The toolbox will explicitly set out that if a newt of any species is encountered during the works, all works in that location must immediately stop and advice be sought from the project ecologist. Identification sheets for GCN and smooth newts are provided in Appendix A of this document to aid site workers.

4.3 Material Storage and Site Hygiene

4.3.1 Materials will be stored in such a way as to prevent the creation of GCN hibernacula. Storage of materials is suggested as follows:

- Gravels, sand and other aggregates will be stored in builder's bags to prevent animals crawling or burrowing into the material. Where possible these bags will be raised on pallets.
- Pipes / cables will be stacked on pallets or otherwise raised off the ground to prevent animals entering, and where possible they will be capped, or otherwise checked before use for the presence of animals.
- Upon completion of the works and during the clearance of remaining materials, the ECoW will check beneath these for the presence of GCN.
- Any chemicals or machinery are to be stored in a secure compound.

4.3.2 Any open piping, whether stored in the lay-down area or installed, will be capped overnight to prevent animals entering.

4.3.3 Any open excavations will have a means of escape for animals to prevent them from becoming trapped. The excavations will either be covered, or a ramp provided at a maximum angle of 45º overnight. Excavations will be checked for any trapped animals at the start of each working day by site workers. In the event that an animal is found, the ECoW should be contacted immediately.

4.3.4 Root protection areas of retained trees which will be marked out must be observed at all times.

4.4 Biosecurity

4.4.1 There will no access for contractors or construction staff to ponds within or adjoining the site. Heras fencing will be used to create access barriers for the duration of the construction to maintain this separation and prevent the possibility of accidentally spreading amphibian disease.

4.4.2 In the event that amphibians need to be handled under the NRW mitigation licence the licensed ecologist or accredited agent will wear powder-free disposable vinyl glove. Any containers used to hold amphibians after the site visit using approved disinfection procedures (ARG UK,2017).

4.5 Habitat Clearance Works

Arable Fields / Pasture

4.5.1 It is intended that general species protection measures for working in arable fields and short grazed grassland where the areas of active works are localised and activities limited to areas with a very low likelihood of encountering GCN.

4.5.2 Prior to any works the ECoW will undertake a site walkover and confirm where works can proceed without risk to GCN.

Removal of Hedgerows and Scrub

4.5.3 There is a possible requirement to remove short sections of hedgerow or scrub habitat. These would be undertaken under the direct supervision of the ECoW.

4.5.4 Removal of features which have potential to be used as GCN hibernacula will be undertaken only between mid March and October and when daytime temperatures are above 12°C. This will include the removal of stumps, roots and logs.

4.5.5 Potential hibernacula features or refuges will be clearly marked by the ECoW using barrier tape or line marker paint prior to supervised excavation.

4.5.6 The ECoW will direct the careful excavation of potential hibernation features, undertaking fingertip searches where necessary to confirm the removal of any reptiles if present.

4.5.7 A small, toothed bucket should be used for any work undertaken with an excavator and any such work will be directly supervised by the ECoW.

4.5.8 The ECoW will confirm that all potential below ground refuges having been removed prior to bulk movements of soil/substrate.

4.5.9 Should the cutting of trees and scrub be undertaken within the nesting season for birds (generally considered to be between March and August inclusive) it will first be subject to a nesting bird check by an ECoW to confirm that no active nests are present. Following the nesting bird check, vegetation will be cut to ground level (avoiding any bird nest exclusion zones established by the ECoW). Scrub will be cut and removed using hand tools.

Supervised Habitat Degradation - Arable Field Margins

4.5.10 Taller grassland and tall ruderal vegetation will require phased cutting to ground level before any further work or excavation in these habitats.

4.5.11 With the majority of the site comprising short-grazed grassland and arable, supervised habitat degradation would be limited to works in the field margins or the few smaller fields of semi-improved grassland.

4.5.12 The first cut will be to no less than 150mm height above ground under ECoW supervision.

4.5.13 Immediately after the first cut, the ECoW will search the cleared areas for below ground features (i.e. buried rubble, mammal burrows, complex tree / shrub root systems etc) that could be used by GCN for shelter. This may require raking off and removal of arisings to allow the good visibility of the area. If any potential shelter features are found, they will be carefully excavated using the same method described above for hedgerow and scrub vegetation removal.

4.5.14 If no potential shelter or hibernation features are found, clearance to ground level can proceed without further ecological supervision.

Species relocation

4.5.15 An NRW licence will be obtained prior to the movement of any GCN.

4.5.16 Any GCN found during the species protection procedures will be caught by hand by the ECoW following good practice biosecurity procedures (ARG, 2017) and relocated to dense vegetation cover close to a purpose-built refuge in the vicinity of pond P3 on the western side of the site. where there is good landscape connectivity.

4.5.17 All GCN or other amphibians will be moved in a suitable clean container and release them within 30 minutes of capture.

REFERENCES

Amphibian and Reptile Group (2017) *Amphibian and Reptile Conservation Advice Note 4: Amphibian Disease Precautions: A Guide for UK Fieldworkers Version 2* ARG UK / ZSL Institute of Zoology

Cresswell, W. & Whitworth, R.(2004). *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt Triturus cristatus.* English Nature Report no 576.

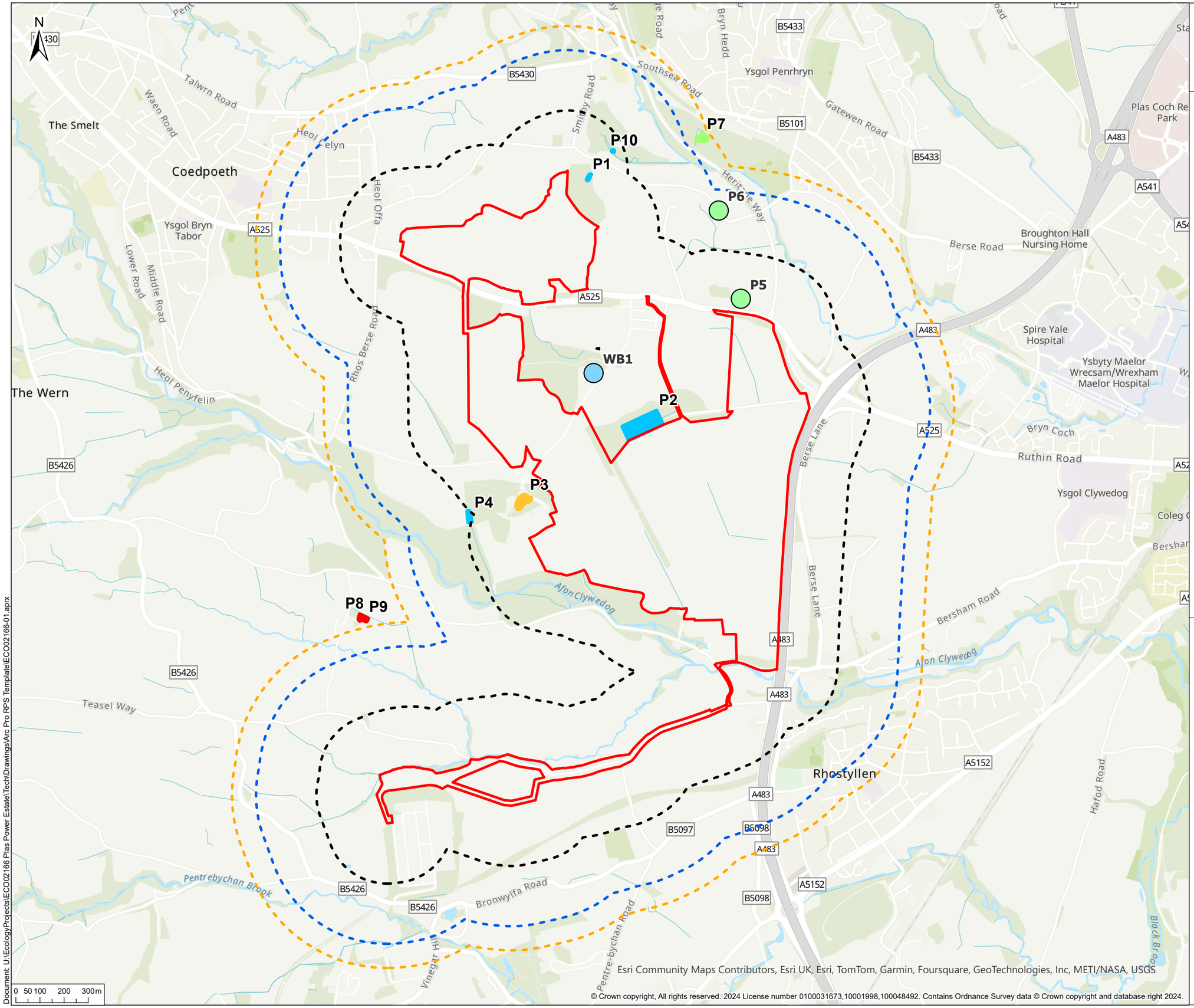
England Nature (2001) Great Crested Newt Mitigation Guidelines

RPS (2023). Great Crested Newt Report: Plas Power Estate.

RPS (2021). Great Crested Newt Survey: Plas Power Estate.

DRAWINGS

Drawing 1	Great Crested Newt Results Plan
Drawing 2	Site Layout Plan
Drawing 3	Illustrative Landscape and Ecology Masterplan



Notes
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Legend

- Site boundary
- 250 buffer
- 500m buffer
- 600m buffer

Waterbodies:

Great crested newt population

- Medium
- Small
- Assumed present
- Absent

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Client	RPS Cardiff
Project	Plas Power Solar Park
Title	Waterbodies: GCN population

Status	Drawn By	PM/Checked By
Draft	OW/MP/LP	GK
Project Number	**Scale @ A3**	**Date Created**
ECO02166	1:15,000	13/02/24
Figure Number		**Rev**
1		04

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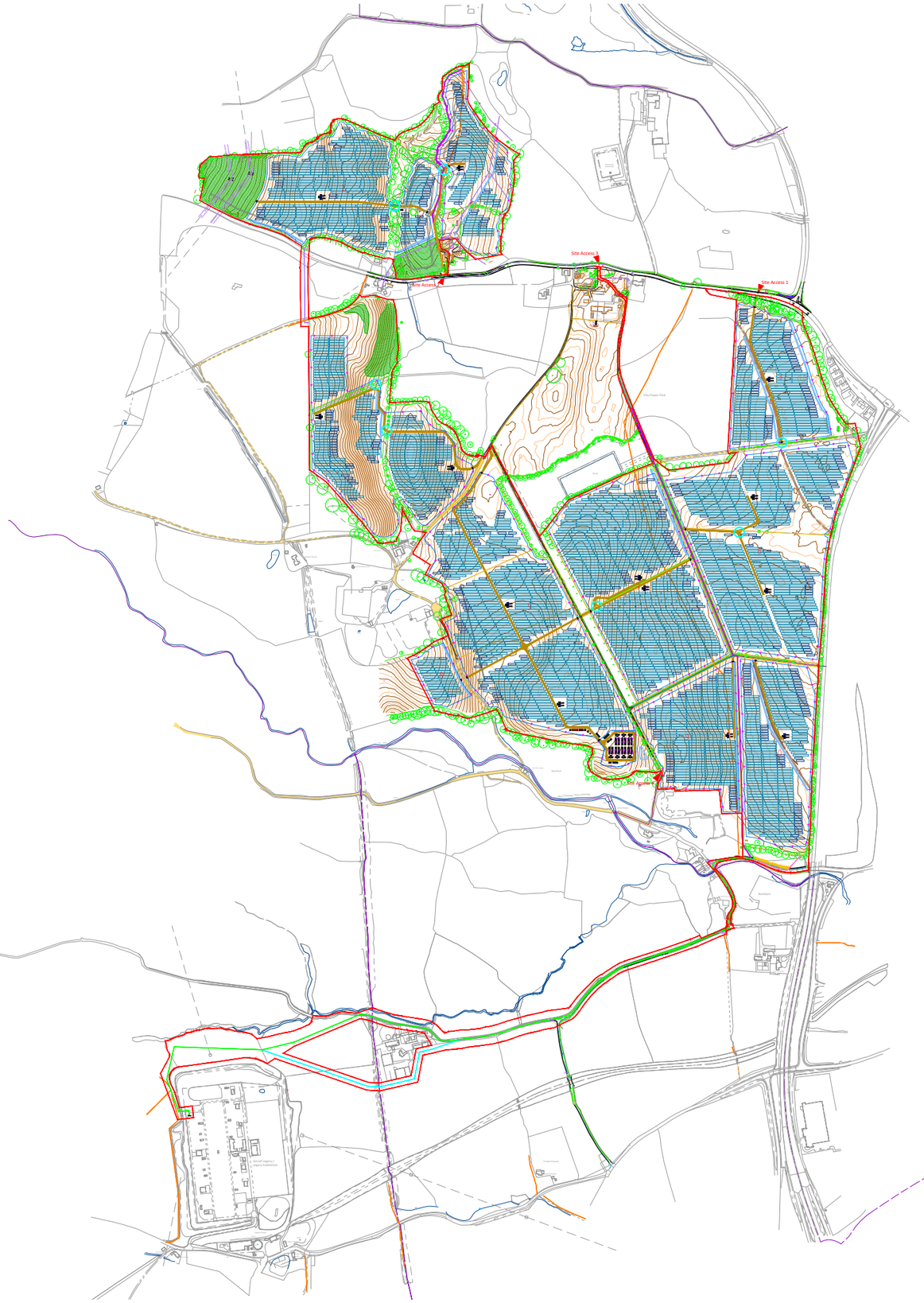
Document: U:\EcologyProjects\ECO02166 Plas Power Estate\Tech\Drawings\Arc Pro RPS Template\ECO02166-01.aprx

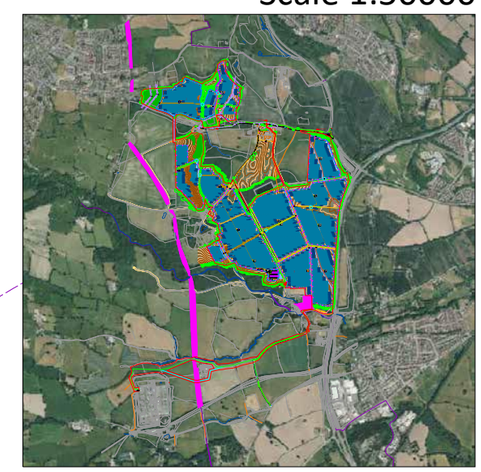
GBR_Plas Power Solar & Battery Project_LP2 - Indicative Site layout_13

Area 1,355,959 m2 (335.06 acres)



- Site Boundary
- Site Access
- Security Fence
- Module Table 30 x 2
- Module Table 15 x 2
- Transformer
- Inverter
- Switchgear Substation
- PV Intake Substation
- GRP
- Customer Substation
- Monitoring House
- Auxiliary Transformer
- Spares Container
- Access Road
- Access Gates
- CCTV
- Toilet
- BESS Enclosure x 4
- BIC
- Twin MV Skid
- Backup Generator
- BESS Intake Substation
- Spares Container
- BESS Security Fence
- Landscape / Biodiversity
- Preferred Cable Route Option
- Cable Route Option 1
- Cable Route Option 2
- Cable Route Option 3
- Cable Route
- Existing PRoW
- Proposed PRoW diversion
- Possible hedge removal
- Indicative Swales
- Attenuation Pond
- Existing Access Road
- Existing Tree
- Existing Hedgerow/Vegetation
- Existing Ditch
- Cable Sealing End

Scale 1:50000



DRAWN	CHECKED	APPROVED	DATE
DA			13.02.2024

PROJECT NAME & ADDRESS:
Location: Plas Power Estate, Rhosrobin
Postcode: Caego, Wrexham, Wales

NOTES:
-
-
-
-

Paper Size:	Scale:	Sheet:
A3	1:12500	1

CAPACITY:

DRAWING TITLE:
GBR_Plas Power Solar & Battery Project_LP2 - Indicative Site Layout_13

DRAWING NUMBER:	STATUS:
LP2-PDL	Pre-application Consultation

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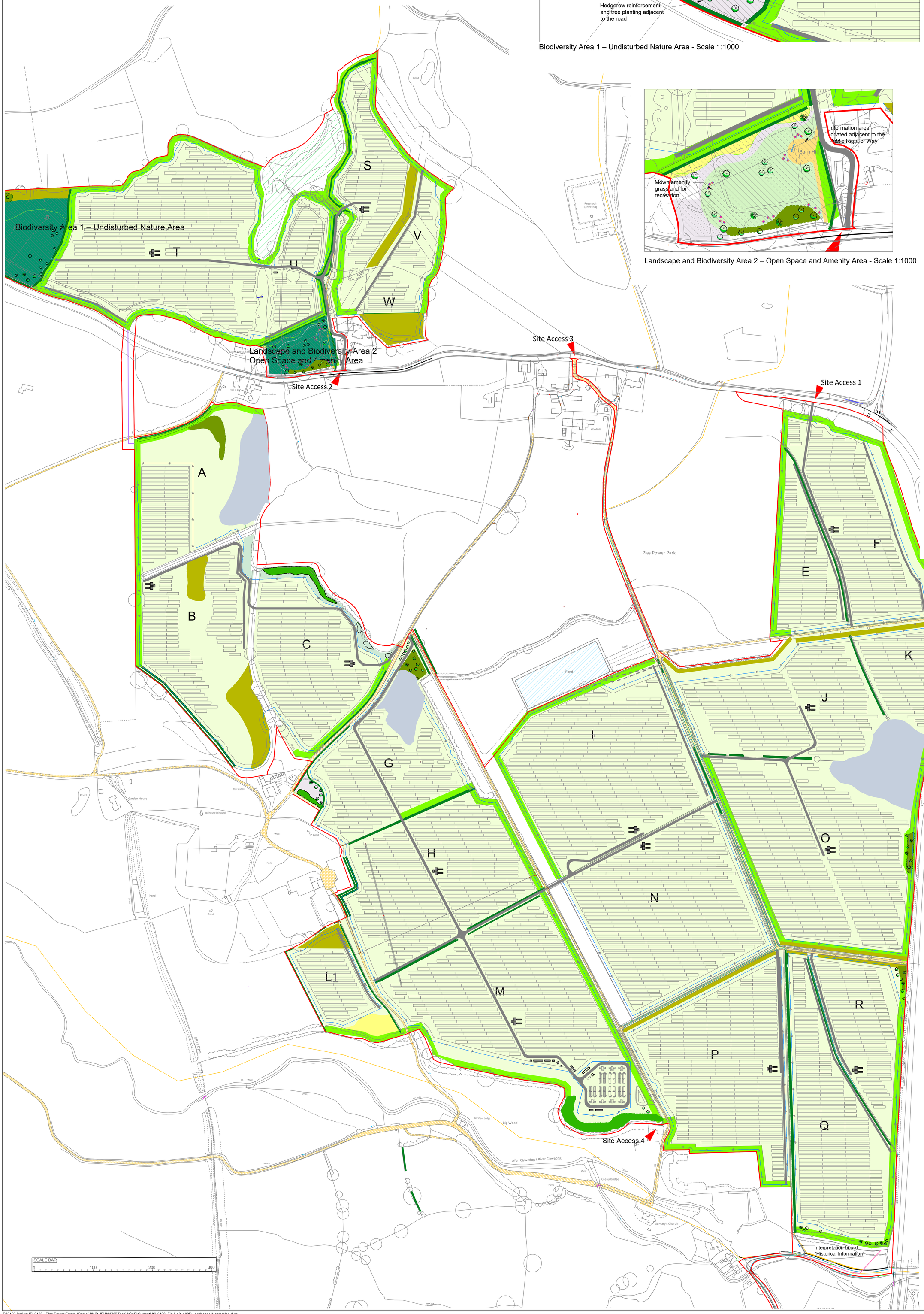
Biodiversity Area 1 – Undisturbed Nature Area - Scale 1:1000

Landscape and Biodiversity Area 2 – Open Space and Amenity Area - Scale 1:1000



Key

Proposed elements

- APPLICATION SITE BOUNDARY
- SITE ACCESS
- MODULE PANELS (See Layout for further details)
- SECURITY FENCE TBC
- PROPOSED ACCESS TRACK
- STRUCTURES (See Layout for further details)
- FIELD REFERENCE For LVIA and G&G

SOFT LANDSCAPE

Proposed elements

- DECIDUOUS TREE Varied native species and stock sizes
- CONIFEROUS TREE Varied native species
- SPECIMEN SHRUB In shrub border or gravel area
- NATIVE HEDGEROW (WITH SPACED STANDARD TREES) Complementing existing hedge lines and providing new field boundaries
- NATIVE CLIPPED HEDGEROW Complementing existing hedge lines and providing new field boundaries
- STRUCTURAL WOODLAND AND SHRUB Varied structure native woodland planting
- WOODLAND EDGE SHRUB Varied structure native shrub planting
- GRAZING GRASSLAND
- FIELD MARGIN MEADOW
- TUSSOCKY GRASSLAND
- WOODLAND MEADOW
- WILDFLOWER MEADOW
- WETLAND MEADOW
- MOWN AMENITY GRASS
- SPRING FLOWERING BULB PLANTING

HARD LANDSCAPE

Proposed elements

- INTERPRETATION BOARD Varied information, refer to notes for details
- FOOTPATH Compacted gravel

BIODIVERSITY ENHANCEMENTS

- WILD BIRD SEED CROP 6m wide on southern side of hedgerows
- ECOLOGICAL ENHANCEMENTS As per ecological reports
- ECOLOGICAL ENHANCEMENT AREA See inserts for details

Existing features

- TREES To be retained and protected. New tree planting would complement existing species and provide ongoing variation and structure.
- WOODLAND To be retained, protected and managed appropriately for longevity
- HEDGEROW / SCRUB To be retained, protected and gapped up where appropriate and managed on rotational basis to a height of 2.5-3m
- PUBLIC RIGHTS OF WAY Maintained and opportunities to further connect (As traced from OS Explorer 1:25,000)
- ANCIENT WOODLAND CLASSIFICATION Ref to Arb reports for further detail
- WATERBODY To be retained, protected and enhanced as possible and recommended within ecological reports
- GRAVEL TRACK Existing gravel track to be retained

Note

The illustrated landscape treatment would not alter if the proposed development included PVs instead of the BESS

Field D has been removed from the development

N

Rev	Description	By	CB	Date
D	REVISED LAYOUT	PL	GL	01.24
C	REVISED LAYOUT	CL	KH	11.23
B	OPEN SPACE AMENITY AREA	CL	KH	10.23
A	REVISED LAYOUT 2023	CL	KH	09.23

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Client: Lightsource bp

Project: Plas Power Solar and Energy Storage Project

Title: Illustrative Landscape and Ecology Masterplan

Status	Drawn By	PM/Checked by
Planning	KH	GL

Job Ref	Scale @ A0	Date Created
JSL3436	See Scale Bar	Feb 2024

RPS Drawing / Figure Number: Figure 5.10

Rev: D

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P:\3400 Series\JSL3436 - Plas Power Estate (Prime WWP-JPW1473)\Tech\ACAD\Current\JSL3436_Fig 5.10_100D Landscape Masterplan.dwg

APPENDICES

Appendix A

Newt Identification Sheet

Great Crested Newt

- Much larger than smooth and palmate newts, up to 17 cm in length.
- Rough, black / dark brown colour skin with darker spots (warty looking), sometimes with finer white spots on the lower flanks.
- Bright orange / yellow and black blotchy belly.
- During the breeding season, males develop a jagged crest along the back and along top of tail, with gap between back and tail. This is often only visible when they are in water as the crest will flop over when on land.
- Males have a white / silver / grey strip down centre of tail. Females have an orange / yellow strip along bottom edge of tail.

Smooth and Palmate Newts

- Much smaller than GCN; up to 10 cm in length.
- Skin without rough texture, and lighter in colour.
- Males will have a wavy crest along back and top of tail during the breeding season, unlike GCN there is no gap in the crest between the body and tail.
- May have orange/yellow belly but with fewer black blotches than GCN.
- Male palmate newts will develop a filament at the tip of their tail and black webbing on their back feet during the breeding season.

Size Comparison of GCN and Smooth Newts

Appendix B

Record of Toolbox Talk Attendance

Name of Site Worker	Toolbox Talk Delivered	Site Worker Knows Where a Copy of the Working Method Statement is Stored on Site	Date	Signature

Appendix 7.1
Archaeological Desk Based Assessment

PLAS POWER SOLAR AND ENERGY STORAGE PROJECT, WREXHAM.

ARCHAEOLOGICAL DESK-BASED ASSESSMENT

Plas Power Solar and Energy Storage Project
Archaeological Desk-Based Assessment
February 2024

rpsgroup.com

Quality Management

Version	Status	Authored by	Reviewed by	Approved by	Review date
1.0	Draft	Philip Bethell	Richard Smalley	Richard Smalley	September 2023
2.0	Update for revised scheme	Philip Bethell	Emily Avery	Richard Smalley	October 2023
2.1	Minor revisions following geophysical survey	Richard Conolly	Emily Avery	Richard Smalley	January 2024

Prepared by:

RPS

Prepared for:

Lightsource bp

EXECUTIVE SUMMARY

The study site has been assessed for its below ground archaeological potential, and potential impacts on the settings of designated archaeological heritage assets. The study site is proposed for development as Plas Power Solar and Energy Storage Project.

There will be no direct impacts on any designated archaeological heritage assets. The proposed grid connection cable route options all pass through the line of Offa's Dyke, but any direct impact will be avoided through mitigation, e.g. through directional drilling.

The potential development impacts on non-designated buried archaeological remains are considered to be low. Much of the study site has been subject to opencast coal extraction, and therefore any archaeological remains within those areas has been destroyed. Geophysical survey has identified some potential archaeology in localised areas of the study site, but none of this is considered likely to be of more than low significance.

Archaeological potential by period and the likely significance of any archaeological remains which may be present is summarised in table form below:

Period:	Identified Archaeological Potential and Significance:	
Prehistoric	Low	Low (Local)
Roman	Low	Low (Local)
Early Medieval	Low	Low (Local)
Medieval	Low	Low (Local)
Post Medieval	Low	Low (Local)
Modern	Low	Low (Local)

There is a potential for impacts on the settings of designated archaeological heritage assets, and this potential is summarised in the table below:

Monument	Ref numbers	Level of impact on setting	Level of effect on significance
Section of Offa's Dyke in Plas Power Park	DE180, NPRN 275785	Low to Medium	Low
Section of Offa's Dyke in Plas Power Woods	DE139, NPRN 275766	None	None
Section of Offa's Dyke: Cadwgan Hall section	DE132, NPRN 275760	None	None
Sections of Offa's Dyke to the south of DE132 –	DE194/NPRN 275791, DE137/NPRN 275782	None	None

Sections of Offa's Dyke north of DE180: North section at Coedpoeth; South of River Gwenfro; Vron Section	 DE181, NPRN 275786 DE182, DE183, NPRN 303287 DE 113, NPRN 275787	None	None
Cadwgan Hall Mound	DE131, NPRN 275759	None	None
Croes-Foel Barrow	DE048, NPRN 307140	None	None
Llyntro Moat Rhostyllen	DE 193, NPRN 27460	None	None
Bersham Ironworks	DE189, NPRN 34051	None	None

There is the potential for impact on the settings of a section of Offa's Dike designated archaeological asset, however, the primary significance of the monument will not be affected. Although the setting will be altered, this will not be to the extent that the monument cannot still be experienced in its current form. In addition, any visual impact from the Proposed Development is completely reversible and can be removed following the operational period (usually 40 years). As a consequence of these factors, it is considered that the level of effect on the significance of any designated archaeological heritage asset will be no more than Minor.

It is not considered that any identified impact on the setting of any designated archaeological heritage asset from the Proposed Development would breach the unacceptable criterion as noted in Future Wales Policy 18.

Although some of the extant field boundaries may be important under the Hedgerow Regulations 1997, there is no intention to remove any hedgerows within the development proposals, and therefore no impact is anticipated on these assets.

Despite the low potential for any hitherto unknown significant buried archaeological remains to be present in the study site, the archaeological advisors at the Clwyd-Powys Archaeological Trust have expressed an opinion that evaluation of the site prior to development would be required. This has partly been addressed through geophysical survey, but further evaluation through trial trenching is likely to be required, followed by mitigation if necessary.

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1 INTRODUCTION AND SCOPE OF STUDY

1.1 This archaeological desk-based assessment has been prepared by Philip Bethell of RPS Consulting on behalf of Lightsource bp.

1.2 The subject of this assessment, also known as the study site, is the site of Plas Power Estate, Wrexham. The site is centred approximately on National Grid Reference SJ 30160 50380. The assessment considers the full extent of the site as shown in Figure 1a. The study site is very irregular in shape and has a total area of approximately 145ha. The study site occupies several areas of land that are not contiguous. For ease of reference throughout this assessment, the study site has been divided into four zones (A-D) which reflect both the topographic variation across the study site and the physical separation of different parts of the study site. These zones are shown in Figure 1b.

1.3 The Proposed Development is for the construction of a solar photovoltaic electricity generating station and Battery Energy Storage System (BESS) (Plas Power Solar and Energy Storage Project).

1.4 This desk-based assessment is designed to provide the baseline information to enable informed decisions about managing any impacts that may potentially arise on any significant archaeological assets in the site. This report discusses both the potential for encountering below-ground archaeology during the course of the development, and the potential for impacts to arise on the settings of designated archaeological heritage assets (Scheduled Monuments) within the study site and within a radius of 1km.

1.5 In accordance with government policy (Planning Policy Wales and associated guidance), this assessment draws together the available archaeological, historic, topographic and land-use information in order to clarify the heritage significance and archaeological potential of the study site.

1.6 Additionally, in accordance with the *Standard and guidance for historic environment desk-based assessment* (Chartered Institute for Archaeologists 2020), the assessment includes the results of a site inspection, an examination of published and unpublished records and charts historic land-use through a map regression exercise.

1.7 As a result, the assessment enables relevant planning decision makers to make a suitably informed decision, in relation to archaeology, on an application for the study site's development. Specifically, this would include assessment of the significance of archaeological heritage assets on and close to the study site and assesses the potential for hitherto undiscovered archaeological heritage assets, thus enabling potential impacts on such assets to be identified along with the need for design, civil engineering or archaeological impact mitigation solutions.

2 PLANNING BACKGROUND AND DEVELOPMENT PLAN FRAMEWORK

Legislation

2.1 National (UK-wide) legislation regarding archaeology, including scheduled monuments, is contained in the Ancient Monuments and Archaeological Areas Act 1979, amended by the National Heritage Act 1983 and 2002, and updated in April 2014.

2.2 The Well-being of Future Generation (Wales) Act 2015 places duties on public bodies requiring them to act in accordance with the 'sustainable development principle'. The Act also establishes well-being goals which include achieving 'a Wales of vibrant culture and Welsh language', described as 'a society that promotes and protects culture, heritage and the Welsh language'. The Act lays down the principle that a properly protected, conserved and enhanced historic environment can improve the quality of life and well-being for everyone.

2.3 The Historic Environment (Wales) Act 2016 was given Royal Assent in March 2016. This Act provides the legislative framework for managing the historic environment in Wales. Accompanying the Act was new policy and guidance in the form of a Technical Advice Note (TAN) specific to the Historic Environment (TAN24, see below), and changes to Planning Policy Wales (PPW). This legislation and guidance supersedes the previous Welsh Office Circulars which formed the basis of historic environment policy in Wales.

2.4 A new Historic Environment (Wales) Act has been given Royal Assent on June 14th 2023. The purpose of this Act is to consolidate existing Welsh and UK-wide legislation in one place. The 2023 Act consolidates enactments in or made under the following:

- the Historic Buildings and Ancient Monuments Act 1953;
- Parts 1 and 3 of the Ancient Monuments and Archaeological Areas Act 1979;
- Parts 14 and 15 of the Town and Country Planning Act 1990;
- the Planning (Listed Buildings and Conservation Areas) Act 1990;
- Part 5 of the Planning and Compulsory Purchase Act 2004;
- the Historic Environment (Wales) Act 2016

2.5 The Welsh Government has published Planning Policy Wales (PPW), currently updated to Version 12 from February 2024 (PPW12). This sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs). Procedural advice is given in circulars and policy clarification letters.

2.6 PPW is additionally supported by guidance published by Cadw. This includes Heritage Impact Assessment in Wales (2017), and Setting of Historic Assets in Wales (2017).

National Planning Policy

Future Wales –the National Plan 2040 (February 2021)

2.7 Future Wales is the national development framework, setting the direction for development in Wales to 2040. It addresses key national priorities, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities.

2.8 Policy 18 of Future Wales – 'Renewable and Low Carbon Energy Developments of National Significance' – makes reference to the historic environment, with clause 6 stating that renewable developments will be permitted as long as 'there are no unacceptable adverse impacts on statutorily protected built heritage assets'.

Planning Policy Wales (PPW)

2.9 Chapter 6 of PPW12, entitled 'Distinctive and Natural Places', has a section entitled 'The Historic Environment' (section 6.1 - pp. 125-131) which provides policy for planning authorities, property owners, developers and others on the conservation and investigation of heritage assets. Overall, the objectives of Section 6.1 in relation to the historic environment can be summarised as seeking to:

- protect the Outstanding Universal Value of the World Heritage Sites;
- conserve archaeological remains, both for their own sake and for their role in education, leisure and the economy;
- safeguard the character of historic buildings and manage change so that their special architectural and historic interest is preserved;
- preserve or enhance the character or appearance of conservation areas, whilst the same time helping them remain vibrant and prosperous;
- preserve the special interest of sites on the register of historic parks and gardens; and
- protect areas on the register of historic landscapes in Wales.

2.10 Section 6.1 of PPW12 describes the historic environment as comprising all the surviving physical elements of previous human activity and illustrates how past generations have shaped the world around us. The historic environment is made up of individual historic features, archaeological sites, historic buildings and historic parks, gardens, townscapes and landscapes, collectively known as historic assets.

2.11 Welsh planning legislation and policy guidance outlines that the conservation of archaeological remains and their settings is a material consideration in the determination of a planning application, whether those remains are scheduled or not (PPW12 Para. 6.1.23). In order to take account of archaeological considerations and deal with them from the beginning of the development control process, Local Planning Authorities in Wales need to be fully informed about the nature and importance of archaeological remains, and their setting, and the likely impact of any Proposed Development upon them.

2.12 Paragraphs 6.1.26 of PPW12 states that where archaeological remains are known to exist or there is a potential for them to survive, an application should be accompanied by sufficient information, through desk-based assessment and/or field evaluation, to allow a full understanding of the impact

of the proposal on the significance of the remains. The needs of archaeology and development may be reconciled, and potential conflict very much reduced, through early discussion and assessment.

2.13 Paragraph 6.1.27 of PPW12 states that if the planning authority is minded to approve an application and where archaeological remains are affected by proposals that alter or destroy them, the planning authority must be satisfied that the developer has secured appropriate and satisfactory provision for their recording and investigation, followed by the analysis and publication of the results and the deposition of the resulting archive in an approved repository. On occasions, unforeseen archaeological remains may still be discovered during the course of a development. A written scheme of investigation should consider how to react to such circumstances or it can be covered through an appropriate condition for a watching brief.

2.14 In considering any planning application for development, the planning authority will be mindful of the framework set by government policy, in this instance PPW12, by current Development Plan Policy and by other material considerations.

Hedgerow Regulations

2.15 Under the Hedgerow Regulations 1997, hedgerows are deemed to be historically Important if they are more than 20m long and over 30 years old and if they meet at least one of these criteria:

- they mark all or part of a parish boundary that existed before 1850;
- they mark an archaeological feature of a site that is a scheduled monument or noted on the Historic Environment Record;
- they mark the boundary of an estate or manor or looks to be related to any building or other feature that's part of the estate or manor that existed before 1600;
- they are part of a field system or looks to be related to any building or other feature associated with the field system that existed before the Inclosure Acts (that is before 1845);

2.16 In practice (and following case law) hedgerows are deemed Important under the above regulations if they can be demonstrated to exist on the appropriate pre-1845 parish tithe or enclosure map.

Local Planning Policy

2.17 The site is located within the Wrexham County Borough Council area, which has adopted the Wrexham Local Development Plan (LDP) 2013 – 2028. The relevant policy of the LDP is:

Policy SP15 Historic and Cultural Environment *– Development will only be supported where it conserves, protects, preserves or enhances the following cultural and historic assets of the County Borough and their setting:*

i. Listed Buildings;

ii. Conservation Areas;

iii. Pontcysyllte Aqueduct and Canal World Heritage Site;

iv. Registered Historic Parks, Gardens and Landscapes; and

v. Scheduled Monuments and Archaeological Remains.

2.18 In line with relevant planning policy and guidance, this desk-based assessment seeks to clarify the site's archaeological potential and the likely significance of that potential and the need or otherwise for additional mitigation measures.

Definitions and Guidance

2.19 The *'Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment in Wales'* published by Cadw in March 2011 provides the basic principles under which all subsequent guidance has evolved. The six principles expressed are:

- Historic assets will be managed to sustain their values.
- Understanding the significance of historic assets is vital.
- The historic environment is a shared resource.
- Everyone will be able to participate in sustaining the historic environment.
- Decisions about change must be reasonable, transparent and consistent.
- Documenting and learning from decisions is essential.

Definition of the historic environment

2.20 The historic environment is defined in TAN 24 (at para. 1.7) as:

- *"All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and deliberately planted or managed*."

Definition of Heritage Assets

2.21 Heritage assets are defined by Cadw (March 2011) and TAN 24 (2017) as:

- "*An identifiable component of the historic environment. It may consist or be a combination of an archaeological site, an historic building or area, historic park and garden or a parcel of historic landscape. Nationally important historic assets will normally be designated*."

2.22 A Designated Heritage Asset is considered to be a: World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area. In Wales areas of landscape have been designated and included in the non-statutory Register of Landscapes of Historic Interest in Wales.

Significance

2.23 Significance in relation to heritage policy considerations is defined as:

- The sum of the cultural heritage values (Cadw 2011).

Setting

2.24 Guidance on the assessments of impact on the settings of heritage assets is provided by Cadw in *'Setting of Historic Assets in Wales'* (May 2017). This provides a 4-stage process for determining if

any impact on the settings of historic assets would arise from a Proposed Development, and how it could be mitigated if impacts are identified.

3 GEOLOGY AND TOPOGRAPHY

Geology

3.1 The solid geology underlying the study site is composed of Carboniferous sandstone, mudstone and siltstone of both the Pennine Lower and Middle Coal Measures Formations. There are superficial deposits of sand and gravel from Devensian Glaciofluvial Sheet Deposits, along the eastern boundary of the study site and part of the southern boundary in the south-west corner.

3.2 Quaternary sand and gravel River Terrace Deposits are present along the course of the River Clywedog which runs along the southern boundary of the study site, but these deposits are not present within the Proposed Development area.

3.3 The base mapping on the British Geological Survey (BGS) on-line viewer shows a large part of the site shaded but with no descriptive data; in the BGS Geoindex Onshore, a large extent of the site is shown as 'Artificial Ground' (see Figure 4a). A BGS Technical Report (Hains 1991) contains a number of maps in which the area shown in Figure 4a is described as 'Worked out opencast coal area or worked clay or sand and gravel pit, wholly or partially backfilled' (e.g. Hains 1991, Figure 8). The extent of this disturbance can be seen in Figures 4a-4c.

Topography

3.4 The general topography of the study site and the area surrounding it is of a reduction in height from west to east. Height Above Ordnance Datum (AOD) at the western boundary of the site in Zone B is 180m, in Zone A 170m. The lowest parts of the site are along the eastern boundary of Zone D, where height AOD is approximately 105-110m.

3.5 The valley of the River Clywedog which runs along the southern boundary of Zone C and D provides a locally lower height.

3.6 Within the study site there are minor variations in this broad topography, e.g. where watercourses/drainage ditches are present, and these are best seen in the LiDAR plot, Figure 3.

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND WITH ASSESSMENT OF SIGNIFICANCE

Timescales used in this report

Prehistoric

Palaeolithic	c. 800,000 -	10,000 BC
Mesolithic	c. 10,000 -	4,400 BC
Neolithic	c. 4,400 -	2,300 BC
Bronze Age	c. 2,300 -	700 BC
Iron Age	c. 700 -	AD 43

Historic

Roman	AD 43 -	410
Post-Roman/Early Medieval	AD 410 -	1066
Medieval	AD 1066 -	1536
Post Medieval	AD 1536 -	1750
Industrial	AD 1750 -	1899
Modern	AD 1900 -	Present

Introduction

4.1 This chapter reviews the available archaeological evidence for the study site and the archaeological/historical background of the general area, and, in accordance with national and local policy, considers both the potential for any as yet to be discovered archaeological evidence on the study site, and the potential for impacts on the settings of designated archaeological assets (Scheduled Monuments).

4.2 What follows comprises a review of known archaeological assets within a 1km radius of the study site (Figs. 2a to 2d), also referred to as the study area. This assessment is based on a consideration of evidence in the Historic Environment Record (HER) curated by the Clwyd-Powys Archaeological Trust (CPAT) for the study site and for a 1km radius around the study site centre (the study area). Data held by The National Monuments Record (NMR), part of the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) was also consulted. Historic maps and documents in the Wrexham Archives were examined, as well as historic Ordnance Survey maps from open/commercial sources. This information has enabled a historic map regression exercise charting the development of the study area from the 19th century onwards until the present day.

4.3 Aerial Photographs from the Central Register of Aerial Photographs in Wales were also reviewed. No hitherto unidentified archaeological heritage assets were noted from the aerial photographs studied, but the extent of disturbance from opencast mining within the site was clearly seen. It is clear that at least 1/3 of the site area has been dug up (see Figs 4a to 4c), effectively most of Zones C and D, and consequently anywhere within the area of opencast mining has zero archaeological potential.

4.4 Chapter 5 subsequently considers the site conditions and whether the Proposed Development will impact the theoretical archaeological potential identified below.

Archaeological Work

4.5 A geophysical survey was carried out over the majority of the site in 2021 (SUMO 2021). The survey area was based on a previous version of the scheme, which excluded Zone A, and included an additional area to the south of the Clywedog valley. The survey did not include those areas identified as subject to open-cast mining, contained within study site Zones C and D.

4.6 Areas 1, 2, and 3 of the geophysical survey correspond to study site Zone B. Results from areas 1 and 2 along the western part of Zone B showed no anomalies with archaeological potential, but were potentially masked by Green Waste and area 3 in the eastern part of Zone B contained a group of discrete linear responses and curvilinear trends. The responses are magnetically weak; however, they do appear to form rectangular and sub-circular enclosures. While they could be archaeological in nature, they lack the defined morphology of anomalies that would normally be categorised as being of interest.

4.7 In study site Zone C (survey areas 4-8) linear anomalies were identified as former field boundaries.

4.8 One survey area (9) is located in study site Zone D. This contains a discrete broad linear ditch identified as possible archaeology. A discrete curvilinear response, linear trends and pit-like anomalies have also been recorded in Area 9. The curvilinear response could possibly be a ring-ditch. While archaeological origins for the anomalies is possible, it is worth noting Area 9 is heavily disturbed and they could be due to other modern processes.

4.9 The other survey areas (10-15) lie outside the site. Probable archaeology identified in these areas includes a possible barrow, enclosures which may be related to a Medieval monastic grange, and possible bell pits potentially indicative of early coal extraction.

4.10 Zone A was the subject of a geophysical survey in 2023 (SUMO 2023). This recorded magnetic disturbance, probably the result of the spreading of green waste, which is likely to have obscured any archaeological anomalies that may have otherwise been recorded. Despite this some anomalies corresponding with historic field boundaries were recorded.

4.11 Event data from the CPAT HER is plotted in Figure 2c. None of the recorded events provided evidence relevant to understanding the archaeological potential of the study site.

Prehistoric

4.12 There are no firmly identified Prehistoric finds or features recorded within the study site.

4.13 There is a single fieldname record, ‘Twmpath’ (HER 101522, 102637) 50m south-west of Zone A, which may indicate the former presence of a mound, which may refer to a Prehistoric barrow. No visible evidence exists for this now. Any such mound could also date from other periods.

4.14 Within the wider 1km study area, there is limited evidence of Prehistoric activity. A Neolithic hand-axe was found as an isolated find 1km north-west of Zone A (HER 87290).

4.15 A cluster of Bronze Age features is present 1.2km south of the study site. The cluster includes possible barrows visible as cropmarks (HER 101824, 105077), close to an extant mound (HER 101236), which is a Scheduled Monument (DE048). A Bronze Age cremation cemetery (HER 100044) was dug up in the 19th century immediately west of Offa’s Dyke, 300m west of Zone A.

4.16 The Scheduled Monument Cadwgan Hall Mound (HER 101151, DE131), 500m south-west Zone C, and adjacent to the proposed cable route, has been interpreted as a possible Bronze Age barrow, but remains undated.

4.17 Another 'Twmpath' fieldname is noted 400m north-west of the northern end of Zone A (HER 101523, 102691), and this may indicate the presence of an earlier mound, as in 4.8 above.

4.18 There is very little evidence of Iron Age activity within the study area. One enclosure (HER 120891) identified in a LiDAR survey (see Figure 3), 150m south of Zone C in the Clywedog valley, has been identified as an Iron Age defended enclosure on typological grounds alone. One undated enclosure identified from cropmarks (HER 1000084, 650m west of Zone A) is also considered to be possibly Prehistoric, but no other finds or features are recorded within the 1km study area.

4.19 Some of the anomalies identified in the geophysical survey may be of Prehistoric origin.

4.20 There is a very sparse spread of known Prehistoric features across the study site and study area recorded in the HER and NMR. As a result, it is considered that there is a low potential for hitherto unknown significant archaeological remains from the Prehistoric periods to be present within the undisturbed areas of the study site (Zones A-C).

Roman

4.21 There are no Roman finds or features firmly recorded within the study site, although finds from a group recorded as being within a 1km map grid square which partly overlaps the eastern part of the study site, may possibly lie within the study site. This group includes two Roman coins (HER 44826, 102980), but their precise locations are uncertain. Lead and other minerals were mined in the Esclusham and Minera Mountains to the west of the study area in the Roman period, but there is no evidence of such activities recorded within the study site.

4.22 A Roman coin was found 1km east of Zone D (HER 103005).

4.23 As a result of this very limited evidence, it is considered that there is a low potential for hitherto unknown significant archaeological remains from the Roman period to be present within the undisturbed areas of the study site (Zones A-C).

Early Medieval

4.24 There are no identified Early Medieval archaeological heritage assets within the study site.

4.25 Parts of the linear boundary earthwork known as Offa's Dyke run roughly from south to north through the study area to the west of the study site. It was originally planned, and construction commenced, in the late 8th century, when Offa was king of Mercia, the Saxon kingdom occupying most of the midlands of England.

4.26 One part of this earthwork runs from south-east to north-west approximately 150m west of Zone B at its closest. This is a Scheduled Monument (SM) (DE180). There are other sections of Offa's Dyke which run through the study area, aligned north-south (see Figure 2d).

4.27 Four sections (all SMs, DE181, DE182, DE183, DE113) are at the northern end of the study area, between 250m and 900m north-west of the western boundary of Zone A.

4.28 A further section (DE139) runs 250m west of the western boundary of Zone C, and to the south of this section, a further length (DE132) runs approximately 1km south of the southern boundary of

Zone C. Sections DE194 and DE137 continue the line of the Dyke southwards to the limit of the study area. The proposed cable routes cross some of these sections of Offa's Dyke.

4.29 The HER records a considerable number of entries along the length of the Dyke, but these are not listed here.

4.30 There are no other Post-Roman/Early Medieval assets recorded in the HER within the study site or study area.

4.31 Further evidence of Anglo-Saxon influence is provided by local place names incorporating 'Ham', an English word meaning settlement or manor, and 'Esclus', probably an English corruption of the Welsh 'Ystlys' that refers to the side or flank of a hillside.

4.32 Beyond the known Early Medieval asset of Offa's Dyke, it is considered that there is a low potential for hitherto unknown significant archaeological remains from the Early Medieval period to be present within the undisturbed areas of the study site (Zones A-C).

Medieval

4.33 There is one area of ridge and furrow cultivation recorded within the study site, HER 128255 in the central area of Zone B. Another area of ridge and furrow (HER 128244) lies 250m north of Zone A. These features may have their origin in the Medieval period, and indicate the agricultural use of the study site during this period.

4.34 There is a single fieldname record, 'Twmpath' (HER 101522, 102637) 50m south west of Zone A, which may indicate the former presence of a mound, which may refer to a Medieval motte. No visible evidence exists for this now. Any such mound could also date from other periods.

4.35 Within the wider study area, there is a number of Medieval assets recorded. There is a another 'Twmpath' fieldname record, (HER 101523, 102961) 400m north-west of Zone A, which may indicate the former presence of a mound, which may also refer to a Medieval motte. No visible evidence exists for this now. Any such mound could also date from other periods.

4.36 The Scheduled Monument Cadwgan Hall Mound (HER 101151, DE131), 1km south-west of the study site, has been interpreted as a possible Medieval motte, but remains undated.

4.37 There are moated sites recorded 200m east of the eastern boundary of Zone D (HER 100393) and 1km south of the study site (HER 101237, SM DE193).

4.38 A placename, 'Croes Foel', recorded 1km south of the study site, is interpreted as recording the presence of a standing cross (HER 102645) during the Medieval period. This location is within the group of Bronze Age features discussed above in 4.10.

4.39 A Medieval seal (HER 102636) is recorded 300m south-east of the south-east corner of Zone D.

4.40 The HER records the presence of a Medieval grange (HER 120659) somewhere in the eastern part of the study site. This is derived from documentary evidence which indicated that an outlying grange belonging to Valle Crucis Abbey was present in the area. This possible asset is not located in any detail.

4.41 Wrexham was established as a settlement in the Medieval period, and there was settlement in the surrounding countryside including within the study site area. The settlement at Bersham was formed during the Medieval period from two adjacent groups of cottages known as Pentre Dybenni and Dol Cuhelyn, and was part of the manor of Esclusham. This was later separated into Esclusham above

the dyke and Esclusham below the dyke, and Bersham then became a separate township within the parish of Wrexham. Plas Power Estate had its origins in the Medieval period (WCBC 2009).

4.42 There is no available evidence which suggests any Medieval settlement was present within the study site. The only evidence from within the study site consists of now destroyed ridge and furrow cultivation features which indicate the agricultural use of the study site during the Medieval period. The evidence for the potential presence of a monastic grange is weak, and any such asset is unlikely to be located within the study site.

4.43 Magnetic anomalies revealed in the geophysical survey may represent features of Medieval origin, but these are most likely to be evidence of agricultural activity.

4.44 Based on current knowledge, it is therefore considered that there is a low potential for hitherto unknown significant archaeological remains from the Medieval period to be present within the undisturbed areas of the study site (Zones A-C).

Post Medieval & Modern (including map regression exercise)

4.45 The archaeological interest of the study area during these periods is dominated by the development of local industry, associated with coal and mineral extraction, and iron production. The topography of the riverbank at Bersham made it ideal for iron production: the natural cliff formation allowed furnaces to be charged from the top and for the molten metal to run off below at road level; the surrounding woodlands supplied them with plentiful fuel; and the fast flow of the River Clywedog provided a power supply to drive the water wheels. Evidence suggests that there were already several iron furnaces and foundries along the Clywedog Valley by the seventeenth century.

4.46 In the late 18th century Isaac Wilkinson diverted the course of the River Clywedog and built a number of weirs along its length in order to better supply power to his mills. Whilst now dry, these leats remain visible in Plas Power woods and the meadow leading to Papermill Cottage. The Bersham Ironworks, 50m south of the study site, (SM DE189, HER 36683, 77982, 36682, 126369) was developed from the 1770s until its closure in 1812. Following the ironworks' decline, paper and corn mills came to re-use redundant ironwork buildings. Two paper mills were located in Bersham during the nineteenth-century and the blast furnace on the west side of the village was converted to a corn mill in 1829 and worked until 1933.

4.47 Through both the nineteenth and twentieth centuries, mining was another important local industry, with 38 collieries operating in the Wrexham area at peak. During the twentieth century, a large area of land to the north of Bersham, which encompassed much of Zones C and D of the Site, was used for opencast mining (see Figures 4a-4c).

4.48 Plas Power Estate had its main house replaced in the mid-19th century, and the associated parkland was enclosed with a high stone wall, much of which survives today. The group of buildings which lies in woodland between Zones B and C (outside the study site) represents the surviving ruins of this 19th century house and associated outbuildings (HER126370).

Map Regression

4.49 The earliest available detailed mapping of the Site is nineteenth-century tithe maps of the 1840s (not illustrated), with Zones A-D of the study site lying within the parish of Bersham Township, Wrexham. These tithe maps and their associated apportionments show that in the early 1840s Zones C and D comprised parkland associated with Plas Power, with Plas Power shown to be enclosed to the north, south and west by plantations. Zones A and B and comprise smaller field

parcels which are recorded as being agricultural land (predominantly arable and pasture) variously associated with Rhos Berse, Upper Berse, and Ty'n Ddol.

4.50 Ordnance Survey (OS) mapping from 1879 (Figure 5) and an estate map of 1899 (Figure 6) provide evidence of the 'improvements' made to the Plas Power Estate by owner William Lloyd. In this mapping, Zone B no longer comprises smaller agricultural field parcels but instead forms part of the parkland. This parkland stretches from Rhos Berse Road to the west, to what is now the A525 to the north, and the old Berse Road to the east. The re-building of Plas Power itself is also shown, with the new mansion in a similar position to the old but now enclosed to a greater extent, on all sides, by more substantial plantations. Zone A and the land to the south of the study site remained divided into smaller irregular-shaped fields. It is clear that no development was present within the study site, and the whole of the study site was either agricultural land or woodland.

4.51 The 1938 OS mapping (Figure 7) shows the extent of Plas Power Park shaded in grey. Land use was essentially the same as in the late-nineteenth century and the study site seems otherwise broadly unchanged. Within the surrounding area, however, some expansion of Coedpoeth is evident. Similarly, to the north-east, Broughton is shown to have expanded after the arrival of a second railway line.

4.52 In the Post-War period, however, both the Site and its surrounds underwent considerable change. In 1946-7 Plas Power was demolished; although, as illustrated in the 1963-4 OS mapping (Figure 8), a number of adjacent estate buildings and the plantation in which it was enclosed remained. Zone A which had previously been farmed independently was largely unchanged in this mapping, and the field divisions remained as in 1879. Zone B also appears to be largely unchanged. However, the former parkland to the east of Plas Power, including most of Zones C and D was being used for opencast mining by this time. The reservoir between Zones B and D was also built by this time. Within the surrounding area, both Coedpoeth and Broughton display further expansion.

4.53 The extent of the opencast mining on the former Plas Power parkland is illustrated on an aerial photograph from 1966 (Figure 4b), which shows these opencast workings extending right up to the plantation in which Plas Power had formerly stood. Figure 4c shows the extent of opencast mining as understood form the available evidence, overlaid onto a modern aerial photograph.

4.54 On OS mapping from the 1970s (Figure 9), however, this opencast mining is shown to have ceased, with made ground in the area of the former workings, displaying the field boundaries, linear tree belt, overflow pond and tracks we see today. It can be seen that the whole extent of the opencast workings has been restored to either woodland or agricultural land. Neither the mapping nor the aerial photographs show any buildings or other structures within the study site that might be related to this extraction phase. Zone A appears largely unchanged. Along the eastern boundary of the Site, the A435 is shown to have been constructed, dividing Bersham in two.

4.55 OS mapping from 2000 (Figure 10) shows few changes to the study site, with only a small number of field boundary changes evident, mainly in Zone A. No substantial changes to the surrounding area are apparent either. Although, to the north-east of the study site, the railway lines to the south of Broughton are shown to be disused and part has been built over with residential development at 'New Broughton'.

4.56 The evidence of historic mapping indicates that the study site was agricultural land throughout the Post-Medieval and early Modern periods, and that the developing extractive and iron-working industries which sprang up across the Wrexham area were not active in the study site.

4.57 There was, however, major intervention into the study site during the 1960s, when a large portion of Zones C and D were subject to opencast coal extraction across their extents. In the rest of the study site, Zones A and B, it is considered that there is a low potential for any significant archaeological

remains from the Post-Medieval and Modern periods to be present within these undisturbed areas of the study site.

Assessment of Significance (Designated Assets)

4.58 Existing national policy guidance for archaeology enshrines the concept of the 'significance' of heritage assets. Significance as defined in Cadw's *Conservation Principles* (2011) is 'the sum of the cultural heritage values' of a heritage assets.

4.59 There are no designated archaeological heritage assets within the study site.

4.60 Within the 1km study area, there are 12 Scheduled Monuments (see Figure 2d). These are as follows:

- Bersham Ironworks, (DE189), adjacent to southern boundary of Zone E;
- Section of Offa's Dyke (DE113), 900m north-west of Zone A;
- Section of Offa's Dyke (DE183), 850m north-west of Zone A;
- Section of Offa's Dyke (DE182), 700m west of Zone A;
- Section of Offa's Dyke (DE181), 450m west of Zone A;
- Section of Offa's Dyke (DE180), 200m west of Zone B at closest;
- Section of Offa's Dyke (DE139), 200m west of Zone C;
- Section of Offa's Dyke (DE132), 350m south-west of Zone C;
- Section of Offa's Dyke (DE194), 850m south-west of Zone C;
- Section of Offa's Dyke (DE137), 1km south-west of Zone C;
- Cadwgan Hall Mound (DE131), 600m south-west of Zone C;
- Moated site (DE193), 950m south of Zone F;
- Bronze Age barrow (DE048), 1km south of Zone F.

4.61 All of the above assets are designated Scheduled Monuments of national (UK) significance.

4.62 Potential impacts from the Proposed Development on designated built heritage assets are the subject of a separate report.

Assessment of Significance (Non-Designated Assets)

4.63 As identified by desk based work, archaeological potential by period and the likely significance of any archaeological remains which may be present is summarised in table form below:

Period:	Identified Archaeological Potential	Identified Archaeological Significance
Prehistoric	Low	Low (Local)
Roman	Low	Low (Local)
Early Medieval	Low	Low (Local)
Medieval	Low	Low (Local)
Post Medieval and Modern	Low	Low (Local)

4.64 The identified potential applies only to Zones A and B, and part of C, of the study site. Zones C and D have been disturbed by opencast mining to the extent that any archaeological features in those disturbed areas has been destroyed, and consequently there is no archaeological potential left.

4.65 Some of the hedgerows within the study site may be considered important under the 1997 Hedgerow Regulations.

5 SITE CONDITIONS, THE PROPOSED DEVELOPMENT & REVIEW OF POTENTIAL DEVELOPMENT IMPACTS ON ARCHAEOLOGICAL ASSETS

Site Conditions

5.1 The study site consists of a series of agricultural fields divided into a number of separate zones divided by areas of woodland, on topographical variation, and other landscape features. These zones are mapped in Figure 1b, and described here. A series of plates is included to illustrate the general nature of the study site (Plates 1-46).

Zone A

5.2 Zone A, located in the north-western part of the study site, is the highest part of the study site, with a series of smaller fields rising to the west. There are wider views eastwards and south-eastwards from the western boundary, but the downwards slope and intervening field boundaries reduce these views in the eastern part of the zone. The western boundary has been drawn along a set of field boundaries that are below the ridge line to the west, and so the zone is enclosed to the west; to the south and north there are belts of woodland that reduce any visual interaction in these directions (Plates 1-7).

Zone B

5.3 Zone B is the north-western part of the study site, rising gently up to the west and bounded on the west by a hedgerow field boundary. It is made up of three large fields. The Zone is largely enclosed by woodland to the north, with frequent tree belts to the east breaking up and restricting longer views in this direction. Views to the west are dominated by a distinctive narrow dense tree belt running south-east to north-west, which is a section of Offa's Dyke. Beyond this is a high stone-built estate wall which runs along Berse Road. There are dense tree-filled hedgerows to the south. Zone C therefore has its most open aspect to the east (Plates 10-16).

Zone C

5.4 Zone C is an irregular-shaped area that is wrapped around the eastern and southern sides of the Plas Power manor and buildings, which are in turn enclosed in woodland. There is an extension of Zone C to the north-east. There are dense woodland boundaries along the east, south and west sides of Zone C, which is relatively flat. These woods serve to enclose Zone C and inhibit any views in or out across the wider landscape (Plates 17-20).

Zone D

5.5 Zone D is the largest zone of the study site, occupying the eastern side of the study site. It is largely composed of large, flat agricultural fields, with a central band of woodland. There are some longer-distance views westwards from a small area in the north-east of the zone. On the east side, the A483 trunk road forms a strong boundary, and the tree belts along the road serve to enclose the zone in that direction. The whole of Zone D is essentially flat, rising only slightly from south to north, and in general is very enclosed by woodland and the tree belts lining the A483. The woodland along the Clywedog valley to the south serves to enclose the zone strongly in that direction (21-31).

5.6 No hitherto unrecorded earthworks or vestigial structures were noted during the site visit that would indicate the presence of hitherto unrecorded archaeological features.

Proposed Development

5.7 The development proposal is for the installation of solar photo-voltaic (PV) panels across the study site and Battery Energy Storage System with associated infrastructure of access roads, transformers, cable trenches, lighting and security fencing.

Review of Potential Development Impacts on Designated Archaeological Assets

5.8 The Proposed Development has no potential for a direct physical impact on any designated archaeological asset within the main development area.

5.9 There is a potential for some impact where cable route Option B crosses Offa's Dyke. As this is a protected national monument, any development directly on or adjacent to this monument will be avoided or mitigated. As a result, it is considered there will be no direct physical impact on any designated archaeological heritage asset from the cable run(s).

5.10 The Proposed Development has the potential for impacts on the settings of designated archaeological heritage assets, as identified in 4.52 above. The preliminary assessment below has used the process outlined in Cadw's settings guidance (Cadw 2017). In all of the following assessments it has been borne in mind that the Proposed Development is fully reversible in terms of any visual impacts, and of a temporary nature.

5.11 Impacts on designated built heritage assets are the subject of a separate report (RPS 2023b).

5.12 The following is a review of potential impacts on designated archaeological assets within 1km of the study site. There are further designated archaeological assets within 3km of the study site (Figure 2d), but it is considered at this stage of the assessment, that all significant impacts arising from the Proposed Development would take place within 1km of the study site. The great majority of designated assets between 1km and 3km distant from the study site are shielded by the topography, intervening vegetation, or urban development, and as such it is highly unlikely that a significant effect would arise on the significance of any asset further than 1km from the study site.

Offa's Dyke - general

5.13 The Dyke is a large linear earthwork that roughly follows the current border between England and Wales. The structure is named after the 8th century king of the Saxon kingdom of Mercia, and although its precise purpose is unknown, it is assumed it was intended to mark a territorial boundary from inception. The overall length of the Dyke is approximately 240km, and sections of it have been constructed at different times. It is up to 20m wide, and consists of a raised linear earthwork and a flanking ditch. The earthwork is up to 2.4m high.

5.14 The significance of the monument is vested in its survival as a feature in the landscape for over 1,000 years. It has evidential value for survival of original material and features, and a strong historical value as a marker of the border between Wales and England.

Section of Offa's Dyke in Plas Power Park (DE180, NPRN 275785)

5.15 This section of the Dyke is 640m long, and runs on a south-east to north-west alignment (Plates 10-14) to the west of Zone B of the study site. The line of the Dyke is very easy to follow, as the bank

is heavily overgrown with trees and shrubs, and so is experienced as a dense hedgerow between two arable fields. There is no pedestrian route alongside or parallel to the Dyke, and it is not clear that there is a bank until climbing over the monument when using the footpath that crosses it at right angles towards its north-western end.

5.16 The setting consists essentially of the two adjoining fields immediately to the west of Zone B. The monument is not generally visible from the west, where the estate wall blocks any view, but can be seen from the road to the west where it reaches that road. It can be seen from the footpath which crosses the Dyke. Towards the east, the ground slopes downwards and views are obscured by woodland and to some extent enclosed by the hedgerow which forms the western boundary of Zone B.

5.17 The significance of the monument is vested in its survival as a feature in the landscape for over 1,000 years. It has evidential value for survival of original material and features, and a strong historical value as a marker of the border between Wales and England.

5.18 The immediate setting of this particular section of the Dyke is relatively open (compared to neighbouring sections), but nonetheless constrained by the enclosing effect of the estate wall to the west, and the woodland further east. This setting does contribute to the understanding of the monument as a linear earthwork, and therefore contributes to its significance.

5.19 As the western part of Zone B lies in the wider setting of the monument, Proposed Development within the study site can be considered to have a potential impact on that setting. While the visual nature of the setting will be altered, there will be no alteration to how the monument is experienced, nor any diminution in how it is understood. The solar panels will present a uniform appearance across the field to the east, and will introduce a more static, industrial feel to the setting, but nonetheless the monument will retain its form and function as a field boundary, and so retain the bulk of its significance. There will be a suitable buffer between the monument and the nearest solar panels, and the footpath and the panels, so the monument will still be visible from the current vantage points along the footpath which crosses it.

5.20 Overall, it is clear that the Proposed Development will impact on the significance of the monument to some extent, but it is considered that this will not reach an unacceptable level. The primary significance of the monument will not be affected, and the setting will be altered but not to the extent that the monument cannot be experienced in its current form. In addition, any visual impact from the Proposed Development is completely reversible, and can be removed following the operational period (usually 40 years). As a consequence of these factors, it is considered that the level of effect on the significance of this section of Offa's Dyke can be regarded as no more than Minor, and temporary.

5.21 Within this section of the development, there is scope for mitigation of effects. This would take the form primarily of maintaining a suitable buffer zone between the monument and the edge of the solar panel array in Zone B, and between the footpath and the edge of the solar panel array in Zone B. This buffer lies between the monument an the western boundary hedgerow of Zone B. This buffer zone would leave the monument open to view from the footpath as it is now, and preserve how it is experienced. Strengthening of the western boundary hedgerow of Zone B will also help to diminish or remove views eastwards across the solar panels in Zone B.

Section of Offa's Dyke in Plas Power Woods (DE139, NPRN 275766)

5.22 This section of the Dyke runs for c. 550m southwards from the southern end of DE180, through Plas Power Woods to the river Clywedog. The monument lies largely in dense woodland, and is not currently easily accessible – it is difficult to experience due to this (Plate 44).

5.23 The significance of the monument is as described in the sections above for Offa's Dyke as a whole, but it does not have the open aspect and accessibility of DE180.

5.24 The setting is contained entirely within Plas Power Wood.

5.25 The western boundary of Zone C lies within 150m to 200m of the monument, but it is considered that that the development will not be intervisible with the Dyke at this point due to the density of the woodland screening it from view.

5.26 As a result, it is considered that no impact will arise on the monument from the Proposed Development.

Section of Offa's Dyke: Cadwgan Hall section (DE132, NPRN 275760)

5.27 This section runs north-south from the Clywedog river to an east-west stream, and beyond to a disused railway for approximately 1km. DE 132 is experienced as an overgrown field boundary. Its setting is confined to the agricultural fields to east and west, with a more open aspect to the west (Plates 36, 42, 43).

5.28 The dense woodland in the Clywedog valley effectively prevents any intervisibility with the monument, and it cannot be seen from the study site.

5.29 As a result of these factors, it is considered that the Proposed Development would have no impact on the setting of the monument, on account of the lack of intervisibility, and therefore no impact on its significance.

Sections of Offa's Dyke to the south of DE132 – DE194/NPRN 275791, DE137/NPRN 275782,

5.30 These sections of Offa's Dyke are not intervisible with the study site, and therefore it is considered that no impact would arise on their settings or significance as a result of the Proposed Development.

Sections of Offa's Dyke north of DE180: North section at Coedpoeth (DE181, NPRN 275786); south of River Gwenfro (DE182, DE183, NPRN 303287); Vron Section (DE 113, NPRN 275787).

5.31 These sections of Offa's Dyke run northwards away from Plas Power Park, and at an increasing distance (300m to 900m) from Zone A of the study site. The western boundary of Zone A has been drawn because it is enclosed by higher ground immediately to the west, beyond which the land slopes down to the Gwenfro valley. As a result, there is no intervisibility between these sections of Offa's Dyke and the study site. It is considered therefore that no impact would arise on their settings or significance as a result of the Proposed Development.

Cadwgan Hall Mound (DE131, NPRN 275759)

5.32 This monument is an earthwork built on a natural hillock, approximately 2.4m high and 42m in diameter. It is adjacent to Offa's Dyke (DE 132 section) and has been variously interpreted as a Prehistoric barrow, a Medieval motte, and an entirely natural feature (HER 01151, 142403). There is a World War 2 air-raid shelter cut into the side of the mound. Current thinking favours its identification as a Medieval motte (Hankinson 2016), but it remains formally undated (Plates 45, 46).

5.33 The significance of the mound is vested in its provision of an example of a Medieval defensive structure, and its association with the later Medieval house of Cadwgan Hall, and the earlier boundary earthwork of Offa's Dyke.

5.34 The setting of the mound is tightly constrained to the south and east by the farm buildings and other structures of Cadwgan Hall. It is more open to the west and north, and includes partial views over Zone F of the study site to the north-east. The setting makes some contribution to the significance of the monument, but as the interpretation of the mound remains unproved, the scale of this contribution is difficult to assess.

5.35 The study site to the north-east (approximately 1km at nearest) forms no part of the setting of the monument. There is no intervisibility between the monument and the study site. It is considered therefore that no impact would arise on its settings or significance as a result of the Proposed Development.

Croes-Foel Barrow (DE048, NPRN 307140)

5.36 This monument is a circular mound, approximately 28m in diameter and 1.3m high. It lies in an agricultural field just under 1km south of the study site, and is assumed to be of Bronze Age date. Such barrows are significant for the information they contain about beliefs and burial rituals in the Bronze Age, and can contain environmental and other archaeological evidence preserved in the original deposits, and in the buried soil horizon in which the barrow is built.

5.37 The setting is enclosed within the field, with relatively limited views outwards, due to intervening vegetation in the form of hedgerows with frequent mature trees. The dense tree growth along the disused railway to the north is the main inhibitor to views northwards towards the study site. It effectively masks any such views.

5.38 As a result of this lack of intervisibility, and lack of any associative relationship with the study site, it is considered that no impact would arise on the setting of the barrow form the Proposed Development, and consequently no effect on its significance would arise.

Llyntro Moat Rhostyllen (DE 193, NPRN 27460)

5.39 This Medieval moated site is described by the Ordnance Survey as a subrectangular platform, c. 28m north-south and 24m east-west. Remains of buildings were reported here, and depicted on the OS map of 1979. The monument is overgrown with trees, and there is a high-voltage overhead electricity pylon adjacent to it. The monument lies just under 1km south of the study site.

5.40 The setting is within the field in which it sits, with relatively limited views outwards, due to intervening vegetation in the form of hedgerows with frequent mature trees. The dense tree growth along the disused railway to the north is the main inhibitor to views northwards towards the study site. It effectively masks any such views.

5.41 As a result of this lack of intervisibility, and lack of any associative relationship with the study site, it is considered that no impact would arise on the setting of the barrow form the Proposed Development, and consequently no effect on its significance would arise.

Bersham Ironworks (DE189, NPRN 34051).

5.42 The remains of the Bersham Ironworks lie in the Clywedog valley immediately south of Zone D, and 200m east of Zone F.

5.43 The ironworks was established in about 1715, although there are a couple of documentary references to an earlier furnace, possibly in Bersham, from the 1670s (Cadw Coflein information). The works started to produce cast iron goods from the early 1730's. Isaac Wilkinson took over the works in 1753 and for the first time began producing iron cannon. A large steam engine was installed

for pumping water around the furnace water wheel, and a number of waggonways to the works were constructed.

5.44 John Wilkinson took over ownership of the ironworks in 1763. A new method of gun manufacture was developed, whereby the guns were cast solid and bored out later, and steam engine cylinders were produced in the same way. Producing these items, Bersham dramatically increased in size and profitability reaching its peak in about 1795. Decline set in soon afterward with the establishment by John of Brymbo ironworks nearby and with John's death in 1808. The works were finally sold in 1812.

5.45 Surviving buildings include the octagonal cannon foundry (NPRN 40427) and adjacent probable fettling shop, a boring mill (NPRN 24854) later converted into a corn mill (NPRN 24853) as well as substantial remains, including lengths of wooden railway and a furnace (NPRN 34053), uncovered through excavations since 1987. Associated are two weirs (NPRNs 34404 and 33629) and the former accounts house (NPRN 26752). Its significance is vested in the survival of these original features and structures, and in the historical importance of the processes developed at Bersham.

5.46 The setting of the monument is largely enclosed in the wooded valley of the Clywedog river. It is more open to the south, where the road runs and other village buildings are clustered around the works. On the north side, the valley rises in a shallow cliff, with trees above, which serve to prevent any intervisibility with the study site Zone E. Woodland and intervening buildings prevent any intervisibility with Zone F.

5.47 Although there is a historical association between the works and the southern end of Zone D, the remains of any related activity would have been removed by the opencast mining activity, which extracted coal to within a few metres of the top of the cliff (see Figures 4a to 4c).

5.48 As a result of the lack of intervisibility, and the erasure of any potential archaeological remains of the ironworks in Zone E, it is considered that the Proposed Development would have no impact on the monument or its setting. It will, therefore, have no effect on the significance of the Bersham ironworks.

Summary of potential impacts on settings

5.49 The potential impacts are summarised in the following table:

Monument	Ref numbers	Level of impact on setting	Level of effect on significance	Potential Mitigation
Section of Offa's Dyke in Plas Power Park	(DE180, NPRN 275785)	Minor	Minor to Negligible	Maintaining buffer zones; increasing planting density along western boundary of study site.
Section of Offa's Dyke in Plas Power Woods	DE139, NPRN 275766	None	None	None
Section of Offa's Dyke: Cadwgan Hall section	DE132, NPRN 275760	None	None	None
Sections of Offa's Dyke to the south of DE132 –	DE194/NPRN 275791, DE137/NPRN 275782	None	None	None

Sections of Offa's Dyke north of DE180: North section at Coedpoeth; south of River Gwenfro; Vron Section	DE181, NPRN 275786 DE182, DE183, NPRN 303287 DE 113, NPRN 275787	None	None	None
Cadwgan Hall Mound	DE131, NPRN 275759	None	None	None
Croes-Foel Barrow	DE048, NPRN 307140	None	None	None
Llyntro Moat Rhostyllen	DE 193, NPRN 27460	None	None	None
Bersham Ironworks	DE189, NPRN 34051	None	None	None

Future Wales Policy 18 threshold

5.51 It is not considered that any identified impact on the setting of any designated archaeological heritage asset from the Proposed Development would be unacceptably adverse.

Review of Potential Development Impacts on Non-Designated Assets

5.52 The proposed new build could potentially have a below-ground impact on any buried archaeological remains if any are present. Any such impact could be destructive of any buried remains.

5.53 The geophysical survey has identified some potential archaeology in the undisturbed areas of the study site, but the potential for hitherto unknown archaeological remains from any period to be present is considered to be low, and it is further considered that any archaeological remains present in the study site are unlikely to be of more than local significance. The Proposed Development is therefore not considered likely to have any significant effect on the buried archaeological element of the historic environment.

5.54 Although some of the extant field boundaries may be important under the Hedgerow Regulations 1997, there is no intention to remove any hedgerows within the development proposals, and therefore no impact is anticipated on these assets.

Heritage Impact Sensitivity of Study Site Zones

5.55 The different zones of the study site had a varying sensitivity in terms of their potential for adverse impacts on the archaeological record in the original scheme plan. This variation was a result of variation in their topography, boundary treatments, and previous land use. The revised scheme has reduced the overall sensitivity to low, as a result of re-design.

5.56 This sensitivity is summarised in the table below:

	Buried archaeology	Designated assets	Overall sensitivity
Zone A	Low potential	Low potential for impact	Low

Zone B	Low potential, some possible archaeology in geophysical survey	Section of Offa's Dyke to west, Minor potential for impact	Low/Medium
Zone C	Low potential, some possible archaeology in geophysical survey, partly area of opencast mining	Low potential for impact	Low
Zone D	No potential, area of opencast mining	Low potential for impact	Low

6 SUMMARY AND CONCLUSIONS

6.1 The study site has been assessed for its below ground archaeological potential, and potential impacts on the settings of designated archaeological heritage assets.

6.2 There will be no direct impacts on any designated archaeological heritage assets. The proposed grid connection cable run options all pass through the line of Offa's Dyke, but any impact will be avoided through mitigation, e.g. through directional drilling.

6.3 The potential development impacts on non-designated buried archaeological remains are considered to be low. Much of the study site has been subject to opencast coal extraction, and therefore any archaeological remains within those areas has been destroyed. Geophysical survey has identified some potential archaeology in localised areas of the study site, but none of this is considered likely to be of more than low significance.

6.4 Archaeological potential by period and the likely significance of any archaeological remains which may be present is summarised in table form below:

Period:	Identified Archaeological Potential and Significance:	
Prehistoric	Low	Low (Local)
Roman	Low	Low (Local)
Early Medieval	Low	Low (Local)
Medieval	Low	Low (Local)
Post Medieval	Low	Low (Local)
Modern	Low	Low (Local)

6.5 There is a greater potential for impacts on the settings of designated archaeological heritage assets, and this potential is summarised in the table below, using a simple traffic light system (Low, Medium, High):

Monument	Ref numbers	Level of impact on setting	Level of effect on significance
Section of Offa's Dyke in Plas Power Park	DE180, NPRN 275785	Low to Medium	Low
Section of Offa's Dyke in Plas Power Woods	DE139, NPRN 275766	None	None
Section of Offa's Dyke: Cadwgan Hall section	DE132, NPRN 275760	None	None
Sections of Offa's Dyke to the south of DE132 –	DE194/NPRN 275791, DE137/NPRN 275782	None	None

Sections of Offa's Dyke north of DE180: North section at Coedpoeth; South of River Gwenfro; Vron Section	 DE181, NPRN 275786 DE182, DE183, NPRN 303287 DE 113, NPRN 275787	None	None
Cadwgan Hall Mound	DE131, NPRN 275759	None	None
Croes-Foel Barrow	DE048, NPRN 307140	None	None
Llyntro Moat Rhostyllen	DE 193, NPRN 27460	None	None
Bersham Ironworks	DE189, NPRN 34051	None	None

6.7 There is the potential for impacts on the settings of designated archaeological assets. In each case, the primary significance of the monument will not be affected. Although the settings will be altered, this will not be to the extent that the monuments cannot still be experienced in their current form. In addition, any visual impact from the Proposed Development is completely reversible, and can be removed following the operational period (usually 40 years). As a consequence of these factors, it is considered that the level of effect on the significance of any designated archaeological heritage asset will be no more than Minor.

6.8 It is not considered that any identified impact on the setting of any designated archaeological heritage asset from the Proposed Development would breach the unacceptable criterion as noted in Future Wales Policy 18.

6.9 Although some of the extant field boundaries may be important under the Hedgerow Regulations 1997, there is no intention to remove any hedgerows within the development proposals, and therefore no impact is anticipated on these assets.

6.10 Despite the low potential for any hitherto unknown significant buried archaeological remains to be present in the study site, the archaeological advisors at the Clwyd-Powys Archaeological Trust have expressed an opinion that evaluation of the site prior to development would be required. This has partly been addressed through geophysical survey, but further evaluation through trial trenching is likely to be required, followed by mitigation if necessary.

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The Central Register for Aerial Photographs in Wales

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Cartographic

1841 Tithe map for the parish of Bersham Township

1844 Tithe map for the parish of Esclusham Below, Wrexham

1899 Estate map

Ordnance Survey 1:2,500: 1872-87, 1899, 1912, 1939, 1963-64, 1968-76, 1983-87, 1984, 1992-93

Ordnance Survey 1:10,560/10,000: 1879, 1900, 1914-15, 1938, 1954, 1963-64, 1974-79, 1981, 1987, 1988, 1990-93, 2000, 2006, 2019

APPENDICES

Appendix A

Gazetteer of CPAT HER data

CPAT Core Data

prn	site name	period
104374	Aberoer Colliery	POST MEDIEVAL
104500	Adwy'r Clawdd Milestone	POST MEDIEVAL
16691	Berse Drelincourt Church (St Paul), yard	POST MEDIEVAL
141554	Bersham Conservation Area	MODERN
44826	Bersham finds	ROMAN
120659	Bersham Grange (Valle Crucis)	MEDIEVAL
101243	Bersham Ironworks	POST MEDIEVAL
101248	Bersham Ironworks, East Ironworks	POST MEDIEVAL
77977	Bersham Lodge Leat	POST MEDIEVAL
77984	Bersham Lodge Wall	POST MEDIEVAL
102980	Bersham Roman Coins	ROMAN
144650	Bersham, Bersham Statue, war memorial	MODERN
36682	Bersham, Caeau Bridge	POST MEDIEVAL
36683	Bersham, Caeau Weir	POST MEDIEVAL
144704	Bersham, Capt G Fitzhugh And Men Of Plas Power Estate, war memorial	MODERN
36680	Bersham, East Weir on River Clywedog	POST MEDIEVAL
36687	Bersham, Nant Bridge	POST MEDIEVAL
36686	Bersham, Western Weir on the River Clywedog	POST MEDIEVAL
104453	Broughton Colliery	POST MEDIEVAL
104452	Broughton Hall Kiln	POST MEDIEVAL
124076	Broughton, Broughton Colliery, shaft	POST MEDIEVAL
124077	Broughton, Broughton Colliery, shaft	POST MEDIEVAL
124075	Broughton, gasometer	POST MEDIEVAL
124074	Broughton, weighing machine	POST MEDIEVAL
119853	Brymbo Tunnel Junction to Broughton Forge branch railway	POST MEDIEVAL
16553	Brynteg	MULTIPERIOD
88799	Cadwgan Hall coin	POST MEDIEVAL
104360	Cadwgan Hall limekiln	POST MEDIEVAL
142403	Cadwgan Hall mound, air raid shelter	MODERN
128267	Cadwgan Hall ridge and furrow	MEDIEVAL
97000	Cadwgan Hall spindlewhorl	ROMAN;MEDIEVAL
101512	Cae Nesar Stryt Fieldname	MEDIEVAL
101522	Cae Twmpath Fieldname	MEDIEVAL;BRONZE AGE
101523	Cae Twmpath Fieldname	MEDIEVAL;BRONZE AGE
102637	Cae Twmpath Fieldname	BRONZE AGE
102961	Cae Twmpath Fieldname	MEDIEVAL
68163	Caeau Bridge trackway	POST MEDIEVAL
126369	Caeau Farmstead, garden	POST MEDIEVAL
77982	Caeau Leat	POST MEDIEVAL
101513	Caer Groes Fieldname	MEDIEVAL
85166	Coedpoeth, Deep Day Level and Exit	POST MEDIEVAL
102645	Croes Foel placename	MEDIEVAL
101824	Croes Foel ring ditch	BRONZE AGE
105077	Croes Foel ring ditch	BRONZE AGE
101236	Croes Foel round barrow	BRONZE AGE
17016	Escluslham Mill	POST MEDIEVAL
142401	GWR Rhos Branch near Cadwgan Hall	MODERN
68993	Hafod Farm, shaft	POST MEDIEVAL
87290	Hafod Farm, stone axe	NEOLITHIC
68991	Hafod Farm, well	POST MEDIEVAL
55039	Hafod, ford	POST MEDIEVAL
55042	Hafod, well	POST MEDIEVAL
26236	Hafod-y-Bwch Hall, house and gate piers	POST MEDIEVAL
104370	Legacy Station Coal Shaft	POST MEDIEVAL
102636	Little Fawnog Seal	MEDIEVAL
1000084	Lliiart Fanny 'enclosure'	POST MEDIEVAL;PREHISTORIC
101237	Llyntro moated site	MEDIEVAL
104439	Lodge Colliery	POST MEDIEVAL
100393	Lower Berse Farm, moat	MEDIEVAL
18124	Minera, Nant	POST MEDIEVAL
120981	Nant Bridge, defended enclosure	IRON AGE
121565	Nant Farm coal shaft I	POST MEDIEVAL
121566	Nant Farm coal shaft II	POST MEDIEVAL
77981	Nant Mill Millers House	POST MEDIEVAL
77985	Nant Mill Wood Boundary	POST MEDIEVAL
77983	Nant Mill Wood Coal Pit	POST MEDIEVAL
106030	New Broughton East Earthworks	UNKNOWN
110361	New Broughton, Bersham Road/Windsor Road, Soar Church	POST MEDIEVAL
110362	New Broughton, Windsor Road/Dale Road, Church	POST MEDIEVAL
104800	Offa's Dyke	EARLY MEDIEVAL
106749	Offa's Dyke - Bersham	EARLY MEDIEVAL
106747	Offa's Dyke - Brymbo	EARLY MEDIEVAL
106748	Offa's Dyke - Brymbo De113	EARLY MEDIEVAL
106751	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106753	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106752	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106755	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106756	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106758	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106759	Offa's Dyke - Coed Poeth	EARLY MEDIEVAL
106760	Offa's Dyke - Coed Poeth De139	EARLY MEDIEVAL
106757	Offa's Dyke - Coed Poeth De180	EARLY MEDIEVAL
106754	Offa's Dyke - Coed Poeth De181	EARLY MEDIEVAL
106750	Offa's Dyke - Coed Poeth De183	EARLY MEDIEVAL
28194	Offa's Dyke - DC entry	EARLY MEDIEVAL
28195	Offa's Dyke - DC entry	EARLY MEDIEVAL
28196	Offa's Dyke - DC entry	EARLY MEDIEVAL
28197	Offa's Dyke - DC entry	EARLY MEDIEVAL
28198	Offa's Dyke - DC entry	EARLY MEDIEVAL
28199	Offa's Dyke - DC entry	EARLY MEDIEVAL
28200	Offa's Dyke - DC entry	EARLY MEDIEVAL
28201	Offa's Dyke - DC entry	EARLY MEDIEVAL
28202	Offa's Dyke - DC entry	EARLY MEDIEVAL
28203	Offa's Dyke - DC entry	EARLY MEDIEVAL
28204	Offa's Dyke - DC entry	EARLY MEDIEVAL
28205	Offa's Dyke - DC entry	EARLY MEDIEVAL
28206	Offa's Dyke - DC entry	EARLY MEDIEVAL
28207	Offa's Dyke - DC entry	EARLY MEDIEVAL
28208	Offa's Dyke - DC entry	EARLY MEDIEVAL
28209	Offa's Dyke - DC entry	EARLY MEDIEVAL
28210	Offa's Dyke - DC entry	EARLY MEDIEVAL
28211	Offa's Dyke - DC entry	EARLY MEDIEVAL
28212	Offa's Dyke - DC entry	EARLY MEDIEVAL
28213	Offa's Dyke - DC entry	EARLY MEDIEVAL
28214	Offa's Dyke - DC entry	EARLY MEDIEVAL
28215	Offa's Dyke - DC entry	EARLY MEDIEVAL
28216	Offa's Dyke - DC entry	EARLY MEDIEVAL
28217	Offa's Dyke - DC entry	EARLY MEDIEVAL
28218	Offa's Dyke - DC entry	EARLY MEDIEVAL
28219	Offa's Dyke - DC entry	EARLY MEDIEVAL
28220	Offa's Dyke - DC entry	EARLY MEDIEVAL
28221	Offa's Dyke - DC entry	EARLY MEDIEVAL
28222	Offa's Dyke - DC entry	EARLY MEDIEVAL
28223	Offa's Dyke - DC entry	EARLY MEDIEVAL
28224	Offa's Dyke - DC entry	EARLY MEDIEVAL
28225	Offa's Dyke - DC entry	EARLY MEDIEVAL
28226	Offa's Dyke - DC entry	EARLY MEDIEVAL
28227	Offa's Dyke - DC entry	EARLY MEDIEVAL
28228	Offa's Dyke - DC entry	EARLY MEDIEVAL
28229	Offa's Dyke - DC entry	EARLY MEDIEVAL
28230	Offa's Dyke - DC entry	EARLY MEDIEVAL
28231	Offa's Dyke - DC entry	EARLY MEDIEVAL
28232	Offa's Dyke - DC entry	EARLY MEDIEVAL
28233	Offa's Dyke - DC entry	EARLY MEDIEVAL
28234	Offa's Dyke - DC entry	EARLY MEDIEVAL
28235	Offa's Dyke - DC entry	EARLY MEDIEVAL
28236	Offa's Dyke - DC entry	EARLY MEDIEVAL
28237	Offa's Dyke - DC entry	EARLY MEDIEVAL
28238	Offa's Dyke - DC entry	EARLY MEDIEVAL

28239	Offa's Dyke - DC entry	EARLY MEDIEVAL
28240	Offa's Dyke - DC entry	EARLY MEDIEVAL
28241	Offa's Dyke - DC entry	EARLY MEDIEVAL
106762	Offa's Dyke - Esclusham	EARLY MEDIEVAL
106761	Offa's Dyke - Esclusham De132, De137, De194	EARLY MEDIEVAL
101153	Pentre Bychan Coins	EARLY MEDIEVAL
126378	Pentre-bychan, fish pond	POST MEDIEVAL
126379	Pentre-bychan, hydraulic pump I	POST MEDIEVAL
126380	Pentre-bychan, hydraulic pump II	POST MEDIEVAL
101151	Plas Cadwgan mound	MEDIEVAL;EARLY MEDIEVAL
72310	Plas Power and Nant Mill Wood	POST MEDIEVAL
104494	Plas Power Colliery	POST MEDIEVAL
77979	Plas Power Croft I	POST MEDIEVAL
77980	Plas Power Croft II	POST MEDIEVAL
126370	Plas Power Estate, garden	POST MEDIEVAL
36663	Plas Power Estate, wall	POST MEDIEVAL
36664	Plas Power Estate, wall	POST MEDIEVAL
126736	Plas Power Park, fish pond	POST MEDIEVAL
128255	Plas Power Park, ridge and furrow	MEDIEVAL
142076	Plas Power Prisoner of War camp	MODERN
77978	Plas Power Track	POST MEDIEVAL
68162	Plas-Buckley Cottage, well I	POST MEDIEVAL
68164	Plas-Buckley Cottage, well II	POST MEDIEVAL
68165	Plas-Buckley, footbridge	POST MEDIEVAL
17253	Rhostyllen Church	MULTIPERIOD
17255	Rhostyllen Church (Holy Trinity), yard	MODERN
132621	Rhostyllen, Plas Grono Road, Bersham Bank Colliery Tip	POST MEDIEVAL
145067	Rhostyllen, Rhostyllen Memorial Gardens, war memorial	MODERN
104495	Smithy Road Boundary Stone	POST MEDIEVAL
17072	Southsea Brickworks	POST MEDIEVAL
1000103	Southsea, Church Road, site of former church (All Saints)(2)	MODERN
128244	Southsea, Smithy Road, ridge and furrow	MEDIEVAL
145122	Southsea, Southsea And Gwenfro WW1 Memorial Cross, war memorial	MODERN
104490	Talwrn Colliery I	POST MEDIEVAL
145196	Tan-y-fron, Vron School - Boer War And WW1, war memorial	MODERN
145197	Tan-y-fron, Vron Ward, war memorial	MODERN
15699	Tanyfron	MULTIPERIOD
17466	Tanyfron Church	MODERN
17446	Tanyfron Church (St Alban), yard	MODERN
126782	The Nant, fields	POST MEDIEVAL
142404	Ty'n-y-twll well	POST MEDIEVAL
100044	Tyn y Coed Cremation Cemetery	BRONZE AGE
104423	Vron Colliery	POST MEDIEVAL
86819	Vron Colliery, horizontal engine	POST MEDIEVAL
86813	Vron Colliery, shaft I	POST MEDIEVAL
86814	Vron Colliery, shaft II	POST MEDIEVAL
86815	Vron Colliery, shaft III	POST MEDIEVAL
86820	Vron Colliery, winding engine	POST MEDIEVAL
27390	Wat's Dyke - DC entry	EARLY MEDIEVAL
103005	Wrexham Roman Coin	ROMAN
119860	Wrexham, Mold and Connah's Quay Railway, Brymbo branch	POST MEDIEVAL
119866	Wrexham, Mold and Connah's Quay Railway, Vron branch	POST MEDIEVAL

CPAT Events Data

prn	site name	type
106595	Offa's Dyke - Legacy, watching brief 2002	WATCHING BRIEF
110517	Wrexham, Ruthin Road, assessment project 2005	ASSESSMENT PROJECT
113119	Offa's Dyke - Coedpoeth, watching brief 2008	WATCHING BRIEF
113546	Offa's Dyke - Coedpoeth, Heol Offa, 14, evaluation 2009	EVALUATION
123124	Medieval and Post-Medieval Industry, assessment project 2011-12	ASSESSMENT PROJECT
124527	Bersham Ironworks (DE189), Scheduled monument consent 2012	SCHEDULED MONUMENT CONSENT
124769	Bersham Ironworks, Scheduled monument consent 2015	SCHEDULED MONUMENT CONSENT
124914	Bersham Ironworks, Scheduled monument consent 2016	SCHEDULED MONUMENT CONSENT
124921	Wrexham, Tanyfron, St Albans Road (no. 14), Cana Chapel, photographic survey 2016	PHOTOGRAPHIC SURVEY
125014	Offa's Dyke: Cadwgan Hall Section and Pentre-Bychan Hall Section	SCHEDULED MONUMENT CONSENT
129139	New Broughton, Higher Berse Road, Higher Berse Farm, The Farm	PHOTOGRAPHIC SURVEY
129367	Rhostyllen, Plas Grono Road, Bersham Bank Colliery Tip	PHOTOGRAPHIC SURVEY
129371	Caego, Berse Road, St Paul's Church	PHOTOGRAPHIC SURVEY
129535	Coedpoeth, Middle Road (No 47)	PHOTOGRAPHIC SURVEY
129723	Mills and Milling Scheduling Enhancement Programme 2011-12	ASSESSMENT PROJECT
129724	Mills and Milling Scheduling Enhancement Programme, desk-based assessment 2011-12	DESK BASED ASSESSMENT
129725	Mills and Milling Scheduling Enhancement Programme, field survey 2012-13	FIELD SURVEY
132753	Southsea, Southsea Road, Former Chapel	PHOTOGRAPHIC SURVEY
132797	Coedpoeth, Tanllan Lane, Tyn Y Coed	PHOTOGRAPHIC SURVEY
132798	Coedpoeth, Smithy Road, Bethlehem Congregational Chapel	PHOTOGRAPHIC SURVEY
141996	Medieval and Post-Medieval Industry, desk based assessment 2011-12	DESK BASED ASSESSMENT
142322	The Monastic Granges of East Wales. The Scheduling Enhancement Programme, 2014-15	PROJECT
142323	The Monastic Granges of East Wales. The Scheduling Enhancement Programme, desk-based assessment 2014-15	DESK BASED ASSESSMENT
38211	Bersham Ironworks, research project 1987-91ff	RESEARCH PROJECT
38231	Churn Mill, excavation 1981	EXCAVATION
38543	Wrexham Water Company Conjunctive Use Scheme, assessment 1992	ASSESSMENT PROJECT
58813	Bersham Ironworks, excavation 1987-91	EXCAVATION
58814	Bersham Ironworks, building recording 1987-91	BUILDING SURVEY
59007	New Broughton, Berse Road, Chapel, photographic survey 1998	PHOTOGRAPHIC SURVEY
64017	Offa's Dyke - Coed Poeth, watching brief 2001	WATCHING BRIEF
72045	Bersham Ironworks, excavations 1997	EXCAVATION
72180	Cadwgan Hall, watching brief 1998	WATCHING BRIEF
72309	Plas Power and Nant Mill Woods, assessment 1998	ASSESSMENT PROJECT
85749	Offa's Dyke - Vron Farm, watching brief 2003	WATCHING BRIEF
86821	Tanyfron Tip, watching brief 1999	WATCHING BRIEF
86822	Tanyfron Tip, evaluation 1999	EVALUATION
86824	Tanyfron Tip, building recording 1999	BUILDING SURVEY
87506	Bersham, Mill House Farm, Wilkinson Stable, photographic survey 2001	PHOTOGRAPHIC SURVEY
95111	Tanyfron, Vron Farm Barns, photographic survey 2004	PHOTOGRAPHIC SURVEY

Appendix B

Gazetteer of RCAHMW data

HER RCAHMW

nprn	nmrwname
410984	BRITISH SCHOOL;GIRLS BOARD SCHOOL AND TEACHER'S HOUSE, COEDPOETH
410981	YSGOL BABANOD PENYGELLI;PENYGELLI INFANTS SCHOOL;YSGOL BRYN TABOR, COEDPOETH
304333	WALL TO PLAS POWER PARK
27854	RHOSBERSE LODGE, COEDPORTH
7482	HOREB WESLEYAN METHODIST CHAPEL, NANT ROAD, THE NANT
24889	NANT MILL, COEDPOETH
7470	SARON WELSH INDEPENDENT CHAPEL, MIDDLE ROAD, THE NANT
23535	CAE NESA'R STRYT, HAFOD-GWNI, ESCLUSHAM
409228	LLIDIART FANNY FARM DEFENDED ENCLOSURE
97280	FORMER CALVINISTIC METHODIST CHAPEL, NANT ROAD, THE NANT, COEDPOETH
266419	PEN-Y-GELLI HALL, GARDEN, COEDPAOETH
7468	BETHLEHEM ENGLISH CONGREGATIONAL CHAPEL, SMITHY ROAD, PENYGELLI, COEDPOETH;ADWY
7474	ADWY'R CLAWDD CHAPEL (WELSH CALVINISTIC METHODIST), MEOL MAELOR, ADWY'R CLAWDD
7481	BATHAFARN WELSH WESLEYAN METHODIST CHAPEL, TALWRN ROAD,COEDPOETH; BATHAVARN
7478	DISGWYLFA WELSH CALVINISTIC METHODIST CHAPEL, HIGH STREET, COEDPOETH; NANT-YR-ADWY
275787	OFFA'S DYKE: VRON SECTION
27700	PLAS BUCKLEY
97354	PENTREBYCHAN CREMATORIUM CHAPEL, PENTREBYCHAN
266432	PENTRE BYCHAN GARDEN, ESCLUSHAM

275791	OFFA'S DYKE: SECTION EXTENDING 120M FROM RAILWAY TO BRONWYLFA ROAD, LEGACY
275782	OFFA'S DYKE: SECTION S (?N) OF BRYN YR OWEN FARM
27140	ESCLUSHAM HALL
27640	PENTRE BYCHAN HALL, ESCLUSHAM
275766	OFFA'S DYKE: PLAS POWER SECTION
275760	OFFA'S DYKE: CADWGAN HALL SECTION, EXTENDING FROM RIVER CLYWEDOG TO THE RAILWAY
37233	PLAS POWER GAME LARDER, BERSHAM
37232	PLAS POWER DAIRY, BERSHAM
304594	OFFA'S DYKE: CADWGWN HALL SECTION
33304	ICE HOUSE ON PLAS POWER SECTION OFFA'S DYKE
86652	PLAS POWER, GARDEN, WREXHAM
23408	PENTRE BYCHAN CREMATORIUM, ESCLUSHAM
26901	PLAS CADWGAN
402313	LEGACY LIVING HISTORY SITE
401540	PENTRE BYCHAN HALL, DOVECOTE, ESCLUSHAM
27477	LOWER BERSE, BERSHAM
7935	QUEENS PARK METHODIST CHURCH (WESLEYAN), QUEENS PARK ?, WREXHAM
26793	BERSHAM HALL
26896	BUNKERS HILL COTTAGES;FORGE ROW
26897	BUNKER'S HILL COTTAGES;FORGE ROW, BERSHAM
266337	BERSHAM HALL, GARDEN, WREXHAM
266425	PLAS PEN-Y-DDOL, GARDEN, WREXHAM
266424	LAUREL GROVE, GARDEN, WREXHAM
12537	METHODIST CHAPEL (WESLEYAN), DDOL, BERSHAM
91688	BERSHAM COLLIERY: GLAN-YR-AFON OFFICES
91689	BERSHAM COLLIERY: GLAN-YR-AFON PITHEAD BATHS

97283	TABERNACLE CHAPEL (1) (CALVINISTIC METHODIST), MOUNT STREET, RHOSTYLLEN
7603	SALEM INDEPENDENT CHAPEL, SCHOOL STREET, RHOSTYLLEN;CAPEL COFFA WILLIAMS O'R WERN
7604	AINON WELSH BAPTIST CHAPEL, SCHOOL STREET, RHOSTYLLEN;RHOSTYLLEN
7605	TABERNACLE ENGLISH PRESBYTERIAN CHAPEL, HILL STREET, RHOSTYLLEN
7502	CYSSEGR CHAPEL (WELSH CALVINIST METHODIST;CYSEGR, Y), BERSE RD. AND CHAPEL RD., CAEGO
12538	HOLY TRINITY CHURCH, WREXHAM ROAD, RHOSTYLLEN
266427	ESLESS HALL, GARDENS, WREXHAM
27567	NEUADD ESLESS;ESLESS HALL, WREXHAM
24039	CAEAU ROAD BRIDGE, BERSHAM
27770	PLAS POWER ESTATE COTTAGES
26752	BERSHAM IRONWORKS: ACCOUNTS HOUSE
37149	HIGHER BERSE DOVECOT
34404	BERSHAM IRONWORKS: WEST WEIR
406019	MILL HOUSE FARMHOUSE
7496	MORIAH BAPTIST CHAPEL, SOUTHSEA ROAD, NEW BROUGHTON
97232	ROCKWOOD GOSPEL MISSION, ROCKWOOD RD. AND LONG LANE, BRYNTEG
26792	BERSHAM BANK COTTAGES, BERSHAM
40427	BERSHAM IRONWORKS: CASTING HOUSE
24853	BERSHAM CORNMILL, BERSHAM
24854	BERSHAM IRONWORKS: BORING MILL
307140	CROES-FOEL, BARROW
34051	BERSHAM IRONWORKS
34053	BERSHAM IRONWORKS: FURNACE REMAINS
400692	CAE'R GROES, TALWRN
275785	OFFA'S DYKE: SECTION IN PLAS POWER PARK

27460	LLYNTRO MOAT, RHOSTYLLEN
35536	VICARAGE, RHOSTYLLEN
24032	BRIDGE NEAR BUNKERS HILL;BERSHAM BRIDGE, BERSHAM
7509	SOAR WELSH WESLEYAN METHODIST CHAPEL, BERSHAM ROAD, NEW BROUGHTON
12564	ENGLISH METHODIST CHURCH (WESLEYAN), WINDSOR RD AND DALE RD. (CLUBHOUSE RD), NEW BROUGHTON
97239	ALL SAINTS (3) CHURCH, CHURCH ROAD, SOUTHSEA
35546	VICARAGE
12560	ALL SAINTS' CHURCH (1) & (2), SOUTHSEA, WREXHAM
27771	PLAS POWER LODGE, BERSHAM
7479	GLANRAFON ENGLISH PRESBYTERIAN CHAPEL, TALWRN ROAD, SOUTHSEA
7477	SEION WELSH CALVINISTIC METHODIST CHAPEL, TALWRN ROAD, SOUTHSEA;GLANYRAFON
7486	SALEM WESLEYAN METHODIST CHAPEL, HIGH STREET, SOUTHSEA
97240	SEION CHAPEL (2), (WELSH CALVINISTIC METHODIST), HIGH ST. AND COLLIERY RD., SOUTHSEA
97241	SEION CHAPEL (1) (CALVINISTIC METHODIST), CHURCH STREET, SOUTHSEA
302163	CROES FOEL TIMBER-FRAMED FARM BUILDING, RHOSTYLLEN
266433	BRYN-TIRION, GARDEN, RHOSTYLLEN
27082	CROES FOEL FARM, RHOSTYLLEN
33629	BERSHAM IRONWORKS: EAST WEIR
27272	HAFOD-Y-BWLCH, GATE PIERS
31674	BERSE DRELINCOURT BARN
96489	BERSE COTTAGE
23350	BERSE DRELINCOURT CHARITY SCHOOL AND ORPHANAGE
413932	2011 NATIONAL EISTEDDFOD OF WALES, LOWER BERSE FARM, WREXHAM
404691	LAUREL GROVE, NOS. 1 - 3

11617	ST PAUL'S CHURCH, BERSE DRELINCOURT
26790	BERSE DRELINCOURT COTTAGE;SUNDAWN, BROUGHTON, WREXHAM
26791	BERSE DRELINCOURT;VICARAGE
411177	RHOSTYLLEN COUNCIL SCHOOL;RHOSTYLLEN COUNTY SECONDARY SCHOOL
411176	BERSHAM BOARD SCHOOL;RHOSTYLLEN INFANTS COUNTY PRIMARY SCHOOL, RHOSTYLLEN
410693	NATIONAL SCHOOL, BERSHAM
26822	BRIDGE COTTAGE;1, BRIDGE COTTAGES, BERSHAM
23351	BERSHAM SCHOOL (FORMER);INDUSTRIAL HERITAGE CENTRE, BERSHAM
27522	MILLWARD HOUSE;NEW BROUGHTON
11629	ST MARY'S CHURCH, BERSHAM
7492	BEREA WELSH INDEPENDENT CHAPEL, SOUTHSEA ROAD, SOUTHSEA
26837	BROUGHTON HALL
27327	HIGHER BERSE FARMHOUSE, HIGHER BERSE ROAD, COEDPOETH
97284	SALEM (1) WELSH INDEPENDENT CHAPEL, CHAPEL STREET, RHOSTYLLEN
7599	RHOSTYLLEN PRIMITIVE METHODIST CHAPEL, CHAPEL STREET, RHOSTYLLEN
27375	SQUIRE COTTAGE;IVY COTTAGE, BERSHAM
34052	BERSHAM FURNACE
33077	BERSHAM
85038	PLAS POWER COLLIERY: UNIDENTIFIED BUILDING
85036	PLAS POWER COLLIERY: HEAPSTEAD
85032	PLAS POWER COLLIERY: WORKSHOPS
85033	PLAS POWER COLLIERY: LAMP ROOM
85037	PLAS POWER COLLIERY: FAN HOUSE
85034	PLAS POWER COLLIERY: WEST WINDING HOUSE

85035	PLAS POWER COLLIERY: EAST WINDING HOUSE
37188	MILL FARM BARN
27769	PLAS POWER, BERSHAM
97233	MOSS BAPTIST CHAPEL, MOSS VALLEY
85031	PLAS POWER COLLIERY: POWER HOUSE
85027	PLAS POWER COLLIERY, SOUTHSEA, WREXHAM
421238	ST ALBAN'S CHURCH, TANYFRON, WREXHAM
31720	ESCLUSHAM HALL, OUTBUILDINGS
275759	CADWGAN HALL MOUND
7510	CANA WELSH INDEPENDENT CHAPEL, ST ALBAN'S ROAD, TANYFRON;TAN-Y-FRON
7521	MYNYDD SEION WELSH WESLEYAN METHODIST CHAPEL, PARK ROAD, TAN-Y-FRON
97282	METHODIST CHAPEL (WESLEYAN), HEOL OFFA, VRON
37280	TYN-Y-COED OUTBUILDINGS
35483	TYN-Y-COED;TY'N-Y-COED, HEOL OFFA, COEDPORTH
303287	OFFA'S DYKE: SECTION SOUTH OF RIVER GWENFRO
275786	OFFA'S DYKE: (NORTH) SECTION AT COEDPOETH
7483	OFFA ENGLISH WESLEYAN METHODIST CHAPEL, HEOL OFFA, ADWY'R CLAWDD, COEDPOETH;FRON OFFA
27439	LLIDIART FANNY;LLIDIART VANI, COEDPORTH

PAS Point

id	objecttype	broadperiod
98909	POLISHED AXEHEAD	NEOLITHIC
381846	COIN	ROMAN
381845	COIN	ROMAN
175258	SPINDLE WHORL	ROMAN
175238	COIN	POST MEDIEVAL

Appendix C

Geophysical Survey 2021 - Report

GEOPHYSICAL SURVEY REPORT

Land at Plas Power Estate, Wrexham

Client

RPS Consulting Services

For

Lightsource BP

Survey Report

SUMO-04255

Date

October 2021

Survey Report 04255: Land at Plas Power Estate, Wrexham

Survey dates	3 - 12 August 2021 28 September -1 October 2021
Field co-ordinator	Robert Knight BA MA Jay Griffiths BA
Field Team	James Hunt BA Simon Lobel BSc Jordan Morris BA James Lorimer BA Darcy Hooper MSci
Report Date	02 September 2021
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2. SURVEY TECHNIQUE

Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site.

Bartington Grad 601-2	Traverse Interval 1.0m	Sample Interval 0.25m
Bartington Cart System	Traverse Interval 1.0m	Sample Interval 0.125m

3 SUMMARY OF RESULTS

3.1 A magnetometer survey of 63 ha of land at Plas Power Estate, Wrexham has recorded numerous magnetic responses that are of archaeological interest. A small circular and two rectilinear enclosures are visible in the dataset; they are located in the approximate vicinity of a Medieval grange (HER 120659) that is recorded in the HER. In addition, the line of a Post-Medieval, Caeau Bridge trackway (HER 68163) has also tentatively been mapped in the survey. The locations of a number of probable and possible bell pits have also been marked. Numerous responses of uncertain origin have been detected which is to be expected in a survey of this size. Zones of magnetic disturbance and strong ferrous responses are visible throughout the dataset, predominantly in the norther half of the survey which are likely to have been caused by open cast mining.

3 Crynodeb o'r Canlyniadau

3.1

4 INTRODUCTION

4.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **RPS Consulting Services** on behalf of **Lightsource BP**.

4.2 Site details

NGR / Postcode	SJ 30248 49591 / LL14 4LW
Location	The site is located 2.5km west of Wrexham. The survey area is bounded to the north by the A525 and to the south by an unnamed road. River Clywedog flows through the middle of the site.
HER	Clwyd-Powis Archaeological Trust
District	Denbighshire
Parish	Wrexham
Topography	Undulating
Current Land Use	Pasture / arable agriculture
Geology (BGS 2021)	Bedrock: Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (undifferentiated) - mudstone, siltstone and sandstone. Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (undifferentiated) - sandstone Superficial: Glaciofluvial Deposits, Devensian - sand and gravel Till, Devensian - diamicton
Soils (CU 2021)	Soilscape 6: Freely draining slightly acid loamy soils. Soilscape 17: Slowly permeable seasonally wet acid loamy and clayey soils. Soilscape 24: Restored soils mostly from quarry and opencast spoil.
Archaeology (RPS 2019)	RPS Consulting Services have assessed the site for its below ground archaeological potential. Two findspots of Roman Coins (HER 44826, 102980) are recorded within the south of the site, although their precise locations are uncertain. The HER records the presence of a Medieval grange (HER 120659) somewhere in the southern part of the study site. This is derived from documentary evidence which indicated that an outlying grange belonging to Valle Crucis Abbey was present in the area;

	however, this possible asset is not located in any detail. Ridge and furrow cultivation is recorded in the north of the site (HER 128255) which it thought to date to the Medieval period. Caeau Bridge trackway (HER 68163) which dates to the Post-Medieval period is also located in the south the site. Offa's Dyke, a Scheduled Monument (DE180) which dates from the late 8th century is located due west of the site. Much of the wider landscape has been subject to opencast coal extraction, and therefore any archaeological remains within those areas have been destroyed.
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	63 ha

4.3 Aims and Objectives

To locate and characterise any anomalies of possible archaeological interest within the study area.

5 RESULTS

The survey has been divided into fifteen survey areas (Areas 1-15) and specific anomalies have been given numerical labels [1] [2] *which appear in the text below, as well as on the Interpretation Figure(s).*

5.1 *Probable / Possible Archaeology*

5.1.1 A circular discrete response [1] has been detected in survey Areas 12 and 13 which measures 17.5m in diameter. The anomaly could be a small enclosure or a barrow; consequently, the anomaly has been assigned to the category of *Probably Archaeology*.

5.1.2 In area 14 a number of discrete linear responses and weaker trends are visible in the magnetic data and appear to form two partial rectilinear enclosures [2 and 3]. Whilst it is unclear if the anomalies are associated with one another, they do appear to share an alignment. The HER records the presence of a Medieval grange (HER 120659) belonging to Valle Crucis Abbey in the vicinity, but the asset is not located in any detail. It is plausible that the responses could be associated with the Medieval grange.

5.1.3 A Post-Medieval Caeau Bridge trackway (HER 68163) is also located in the south the site. Linear discrete responses, trends and bands of increased responses [4] traverse survey Areas 13, 14 and 16. These anomalies roughly correspond to the location of the bridge trackway and could mark its route. However, some of the bands of increased response have been assigned to the category of *Uncertain*, as they are weaker and amorphous.

5.1.4 A broad arching linear ditch-like responses [5] has been detected in Area 9 and has been assigned to the category of *Possible Archaeology*. A discrete curvilinear response, linear trends and pit-like anomalies have also been recorded in Area 9. The curvilinear response could possibly be a ring-ditch. While archaeological origins for the anomalies is possible, it is worth noting Area 9 is heavily disturbed and they could be due to other modern processes.

5.2 *Bell Pits*

5.2.1 A number of discrete circular responses, some 17m in diameter, have been detected in Areas 13, 14 and 15. Given the underlying geology is Pennine Lower Coal Measures Formation, it is likely that these responses mark the location on *Bell Pits*. While some of these anomalies are more convincing than others, four probable and three possible *Bell Pits* have been mapped.

5.3 *Uncertain*

5.3.1 Groups of linear trends, discrete anomalies and increased magnetic responses [6] have been recorded in the Areas 13, 14, 15 and 16. While they are generally weak and lack the defined morphology of archaeological anomalies, they are in close proximity to responses of probable archaeology (see 5.1). Given the wider context it is possible that these anomalies are also of interest but their function is unknown.

5.3.2 A group of discrete linear responses and curvilinear trends [7] have been recorded in the north of Area 3. The responses are magnetically weak; however, they do appear to form rectangular and sub-circular enclosures. While they could be archaeological in nature, they lack the defined morphology of anomalies that would normally be categorised as being of interest.

5.3.3 Throughout the survey there are numerous discrete anomalies, linear trends and zones of increased responses which have been assigned to the category of *Uncertain*, which is to be expected in a survey of this size. Some of the ostensibly pit-like responses could be due to deeply buried ferrous debris, especially in the northern half of the survey as it is in close proximity to the open cast mining (see 5.9.1). It is likely that a combination of agricultural and underlying natural processes may have also cause some of the responses.

5.4 *Former Field Boundary (Corroborated)*

5.4.1 Discrete linear responses have been detected in Areas 4, 5, 8, 9 and 15 which correspond to the location of former field boundaries that are recorded in historic mapping (see Figure 11).

5.5 *Agricultural – Ploughing / Land Drains*

5.5.1 Numerous closely spaced, parallel and magnetically weak linear anomalies are visible in Areas 3, 10, 12, 13, 14 and 15 which are evidence of past ploughing, probably relatively recent.

5.1.2 Magnetically weak linear dipolar ferrous responses have been recorded in Areas 5, 7, 8 and 9 which are typical of responses emitted by land drains.

5.6 *Natural / Geological / Pedological / Topographical*

5.6.1 Broad linear amorphous and sinuous anomalies have been detected in Areas 4, 5, 12, 13, 14, 15 and 16 which are relatively weak. Consequently, they are likely to be natural, perhaps relating to pedological variations.

5.7 *Green Waste*

5.7.1 Unfortunately, Areas 1 and 2 have been disturbed by the presence of what is assumed to be Green Waste. Green waste can have a marked effect on the results from magnetic surveys and has been recognised as an issue for some time (Gerrard et al 2015). However, not all green waste is the same, so it is impossible to predict in advance any potentially detrimental effects; it depends on the quantity of inorganic contaminants, including batteries, pieces of metal cans and other ferrous items which result in spurious anomalies or 'noise'.

5.8 *Services*

5.8.1 Strong dipolar linear ferrous responses have been recorded in Areas 2, 6, 8 and 16 which mark the routes of Service pipes.

5.9 *Ferrous / Magnetic Disturbance*

5.9.1 Zones of magnetic disturbance and strong ferrous responses are visible throughout the dataset, predominantly in the norther half of the survey. Adjacent to the survey area (north-east), the landscape was subject to opencast coal extraction. The ferrous anomalies and disturbance are likely to be a by-product of the opencast mining, possibly due to spreads of debris. The extent of the open cast mining is visible on 1966 aerial imagery (see Figure 12).

5.9.2 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

6 DATA APPRAISAL & CONFIDENCE ASSESSMENT

6.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. The results from this survey indicate the presence of probable enclosures, a small circular enclosure and bell pits; as a consequence, the survey is deemed to have been effective. However, some of the dataset is magnetically disturbed due to the open cast mining and the spreading of green waste; in these areas it is likely that weaker anomalies of interest would have been masked.

7 CONCLUSION

7.1 The magnetometry survey has recorded numerous magnetic responses that have been interpreted as being of archaeological interest. Linear ditch-like responses forming enclosures, a small circular enclosure and other responses have been assigned to the categories of probable and possible archaeology. Some of the responses could mark the presence of a Medieval grange (HER 120659) belonging to Valle Crucis Abbey and a Post-Medieval Caeau Bridge trackway (HER 68163). The survey has also recorded the location of a number of probable and possible bell pits. Numerous uncertain responses have been detected in the survey, which is to be expected in a survey of this size. Former field boundaries, land drains and relatively modern ploughing are also visible in the dataset. The routes of several service pipes have been marked in the survey. Zones of magnetic disturbance and strong ferrous responses are visible throughout the dataset, predominantly in the northern half of the survey which are likely to have been caused by open cast mining. The magnetic data in Areas 1 and 2 is disturbed by the spreading of green waste.

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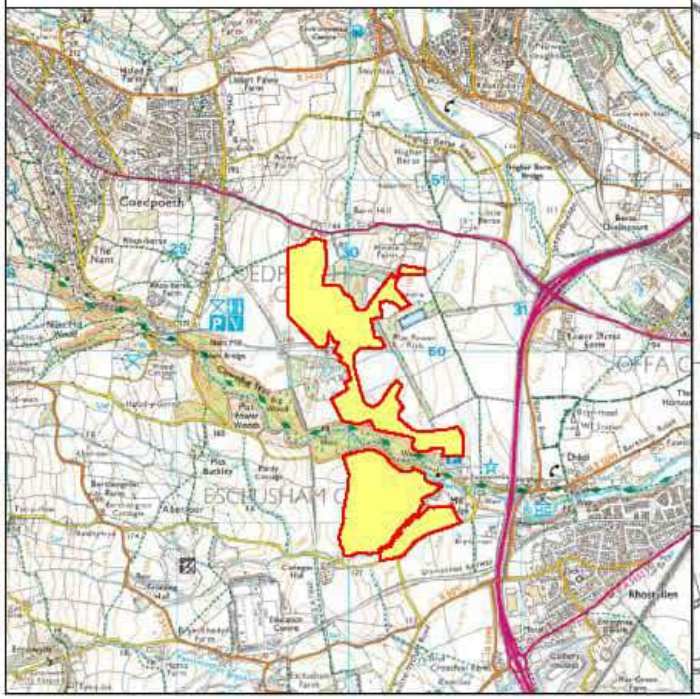

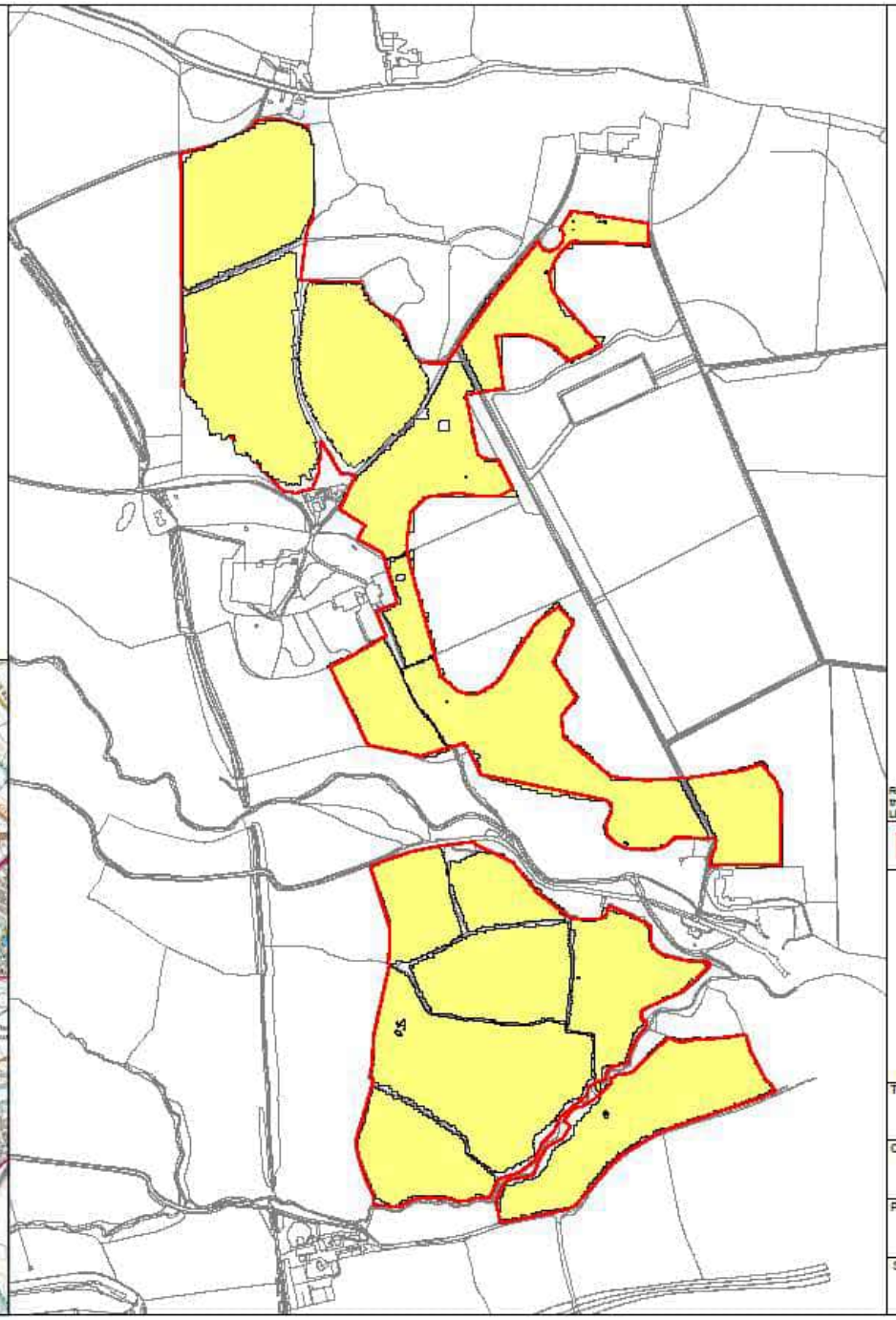

Survey Areas

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sumo Survey
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Client: RPS Consulting Services

Project: SUMO-04255 Land at Plas Power Estate, Wrexham

Scale: NOT TO SCALE

Fig No: 01

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-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

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Client:
RPS Consulting Services

Project:
SUMO-04255 Land at Plas Power Estate, Wrexham

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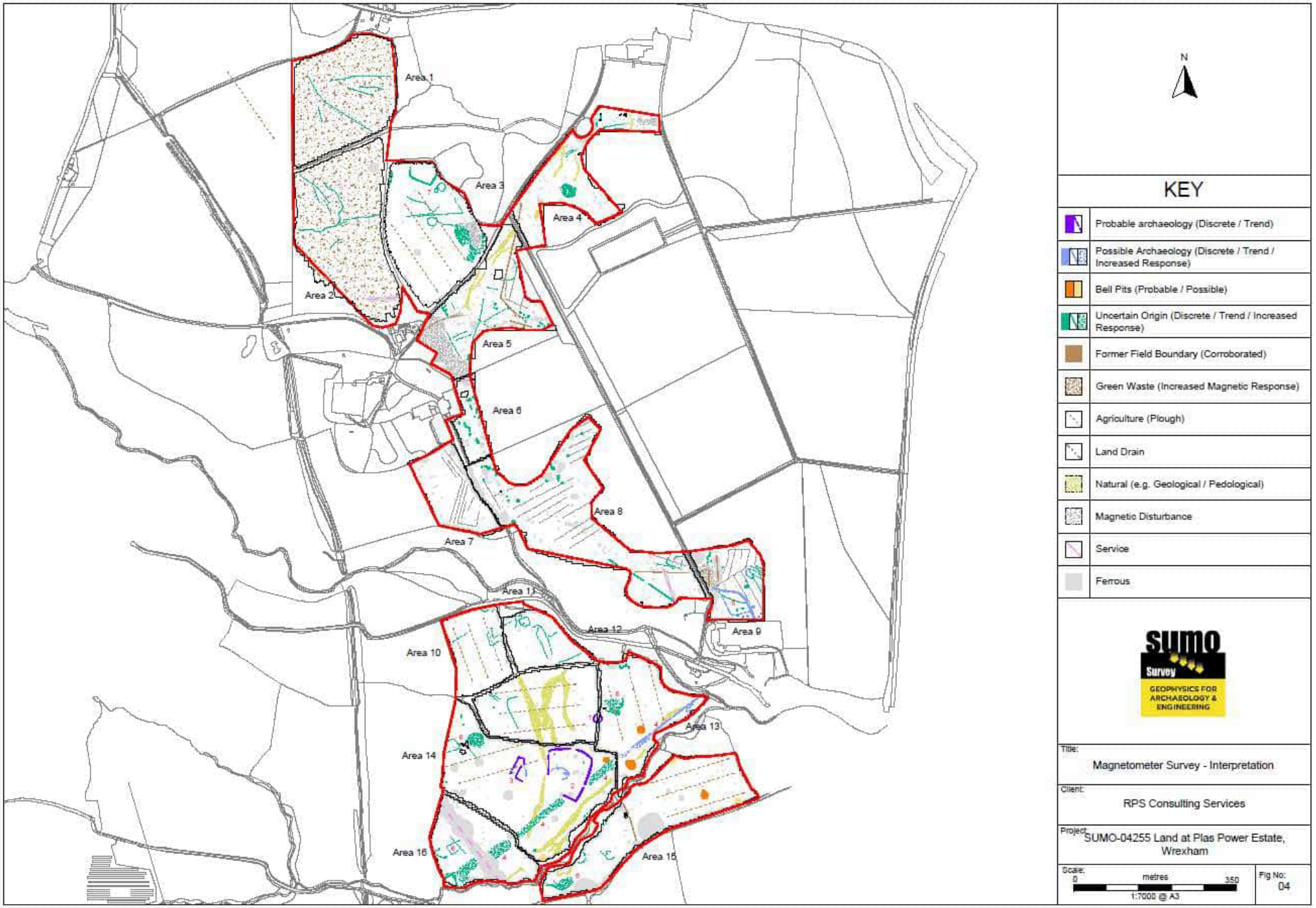
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KEY
Probable archaeology (Discrete / Trend)
Possible Archaeology (Discrete / Trend / Increased Response)
Bell Pits (Probable / Possible)
Uncertain Origin (Discrete / Trend / Increased Response)
Former Field Boundary (Corroborated)
Green Waste (Increased Magnetic Response)
Agriculture (Plough)
Land Drain
Natural (e.g. Geological / Pedological)
Magnetic Disturbance
Service
Ferrous
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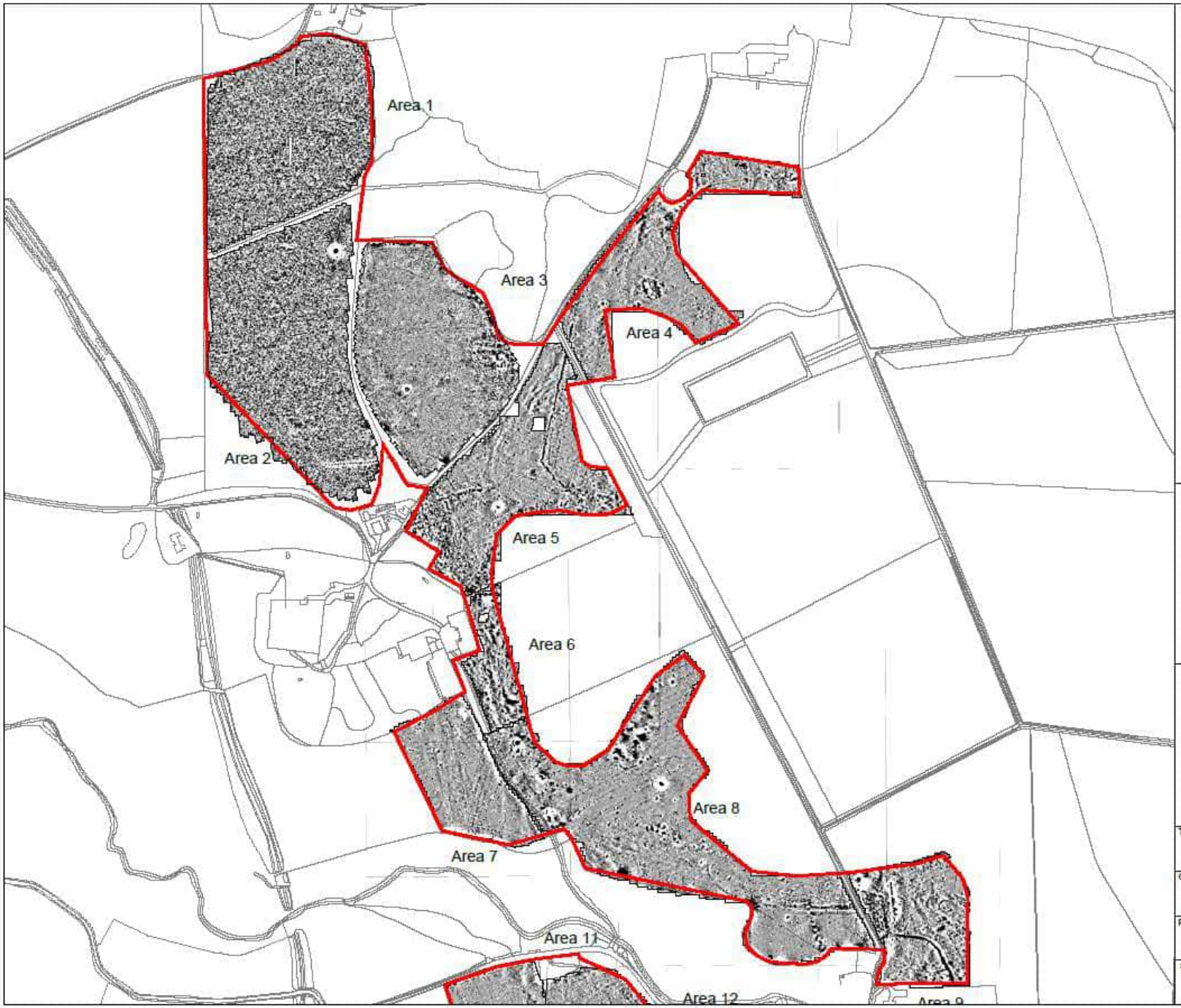

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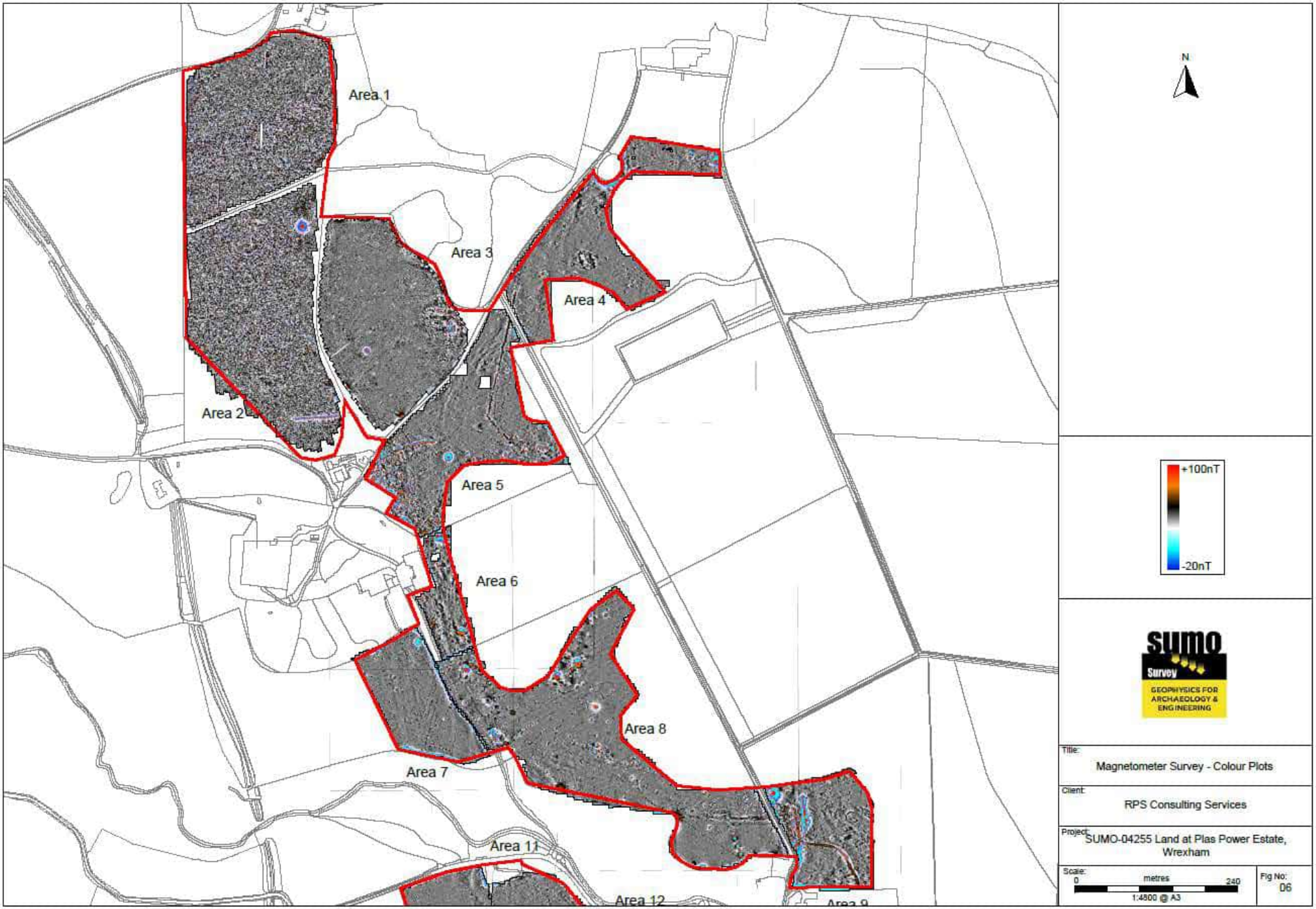
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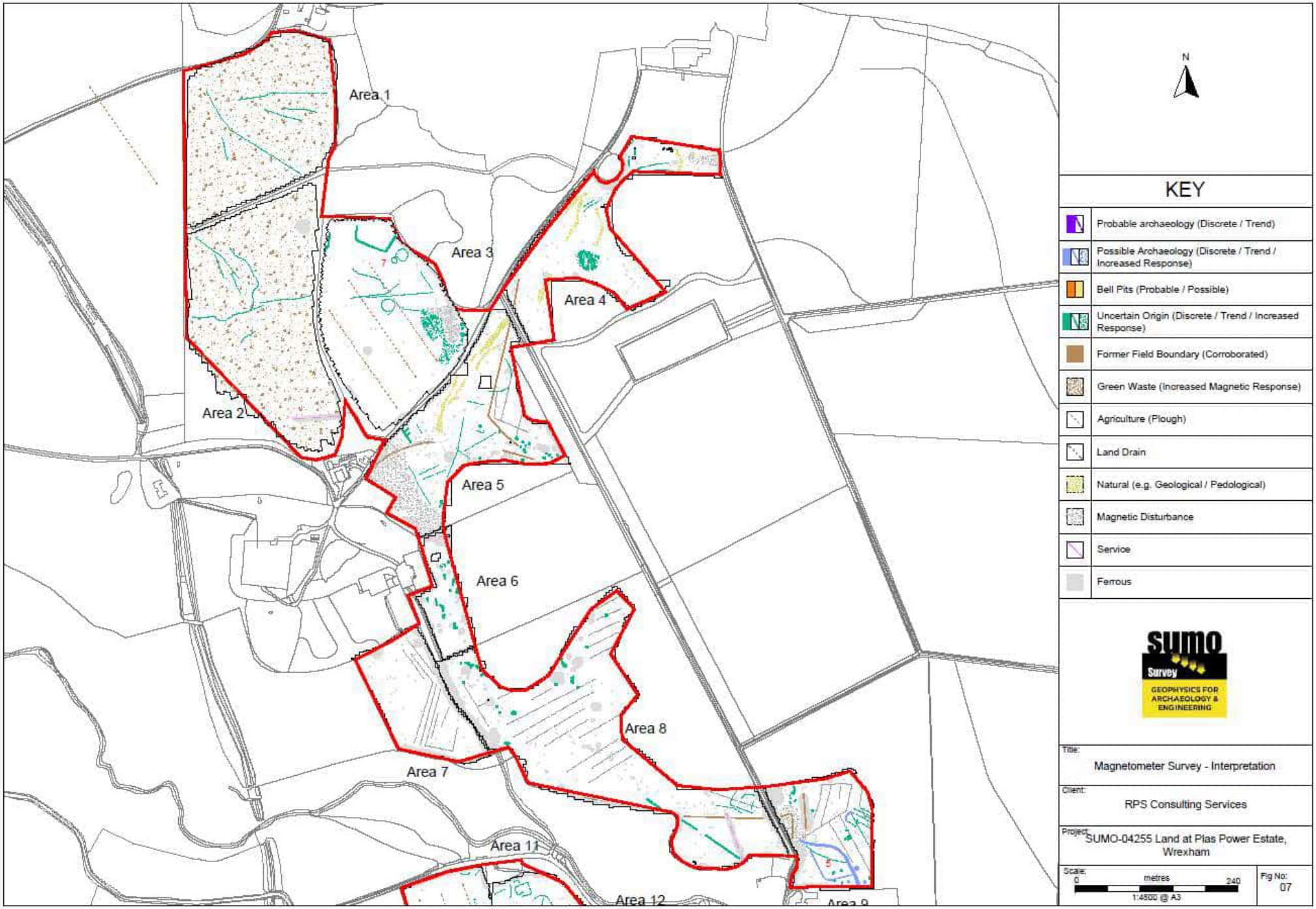
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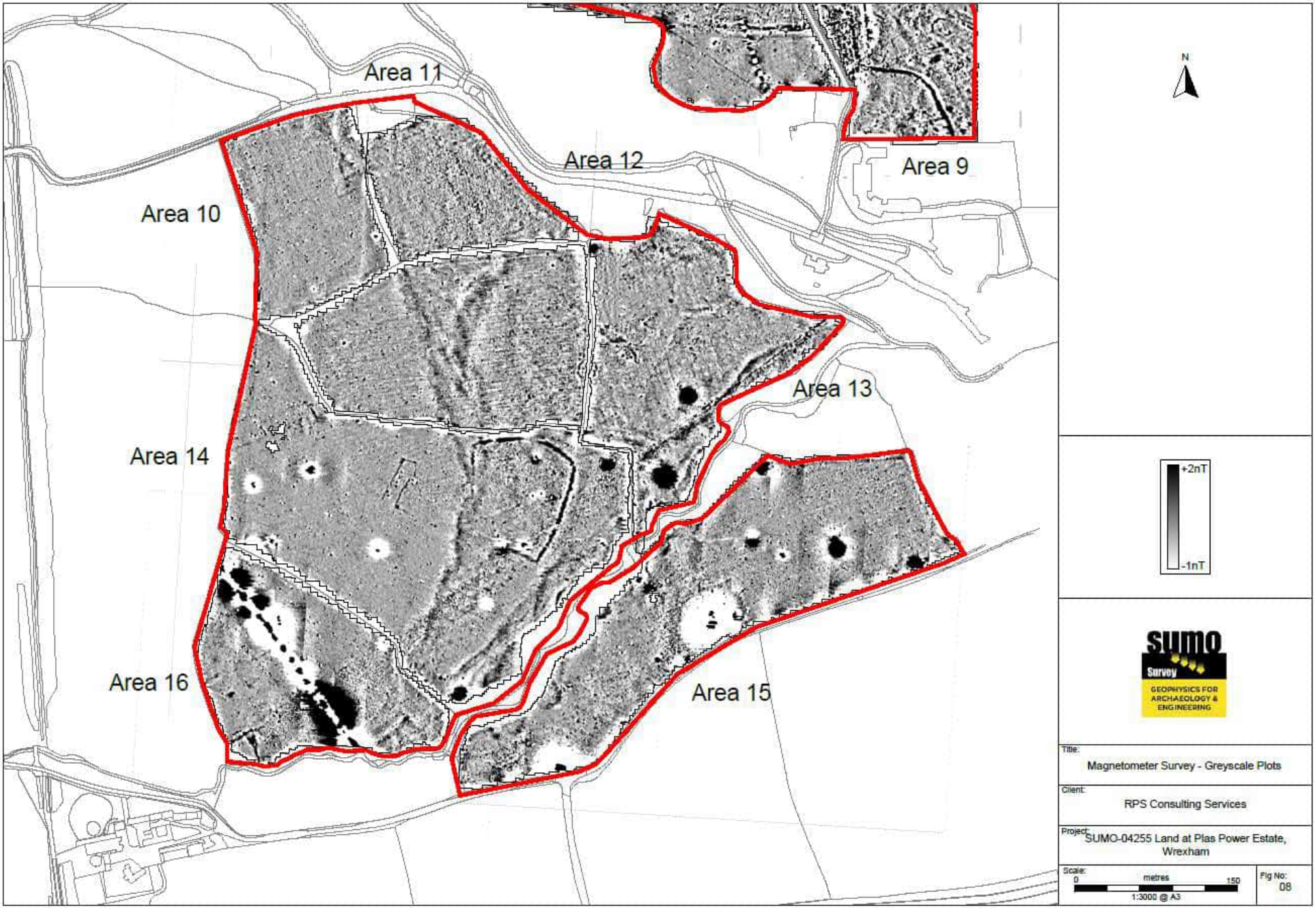
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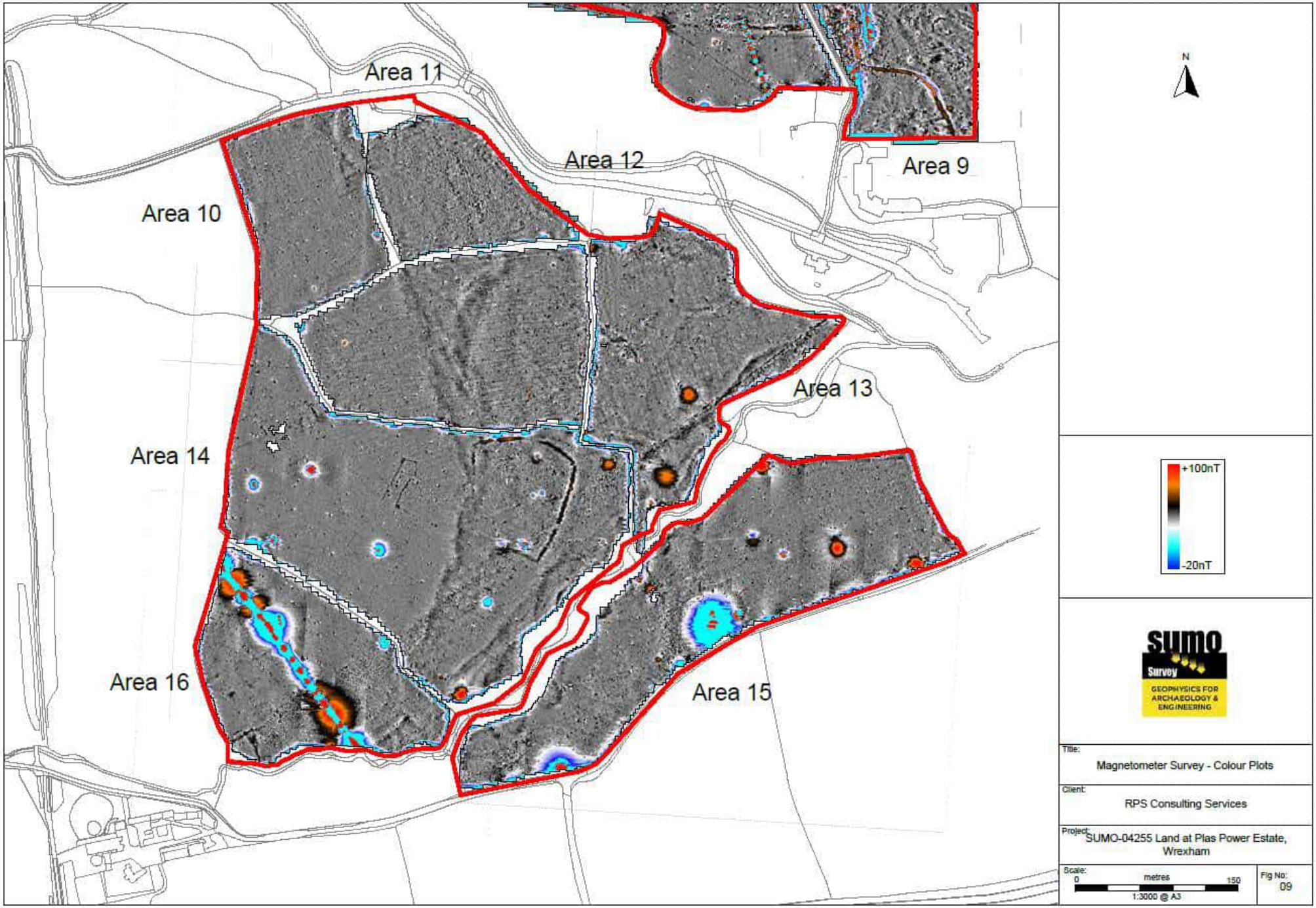
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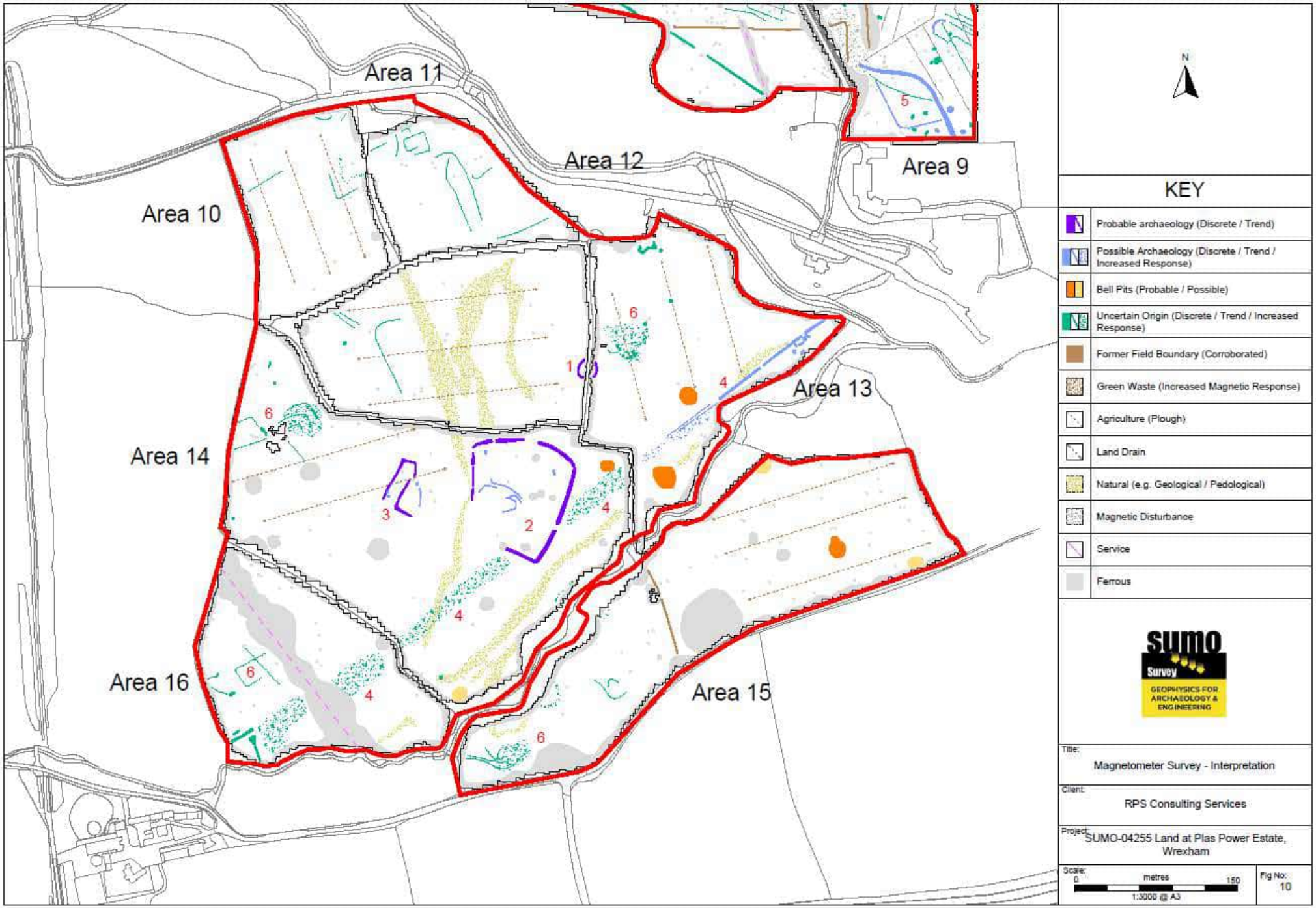
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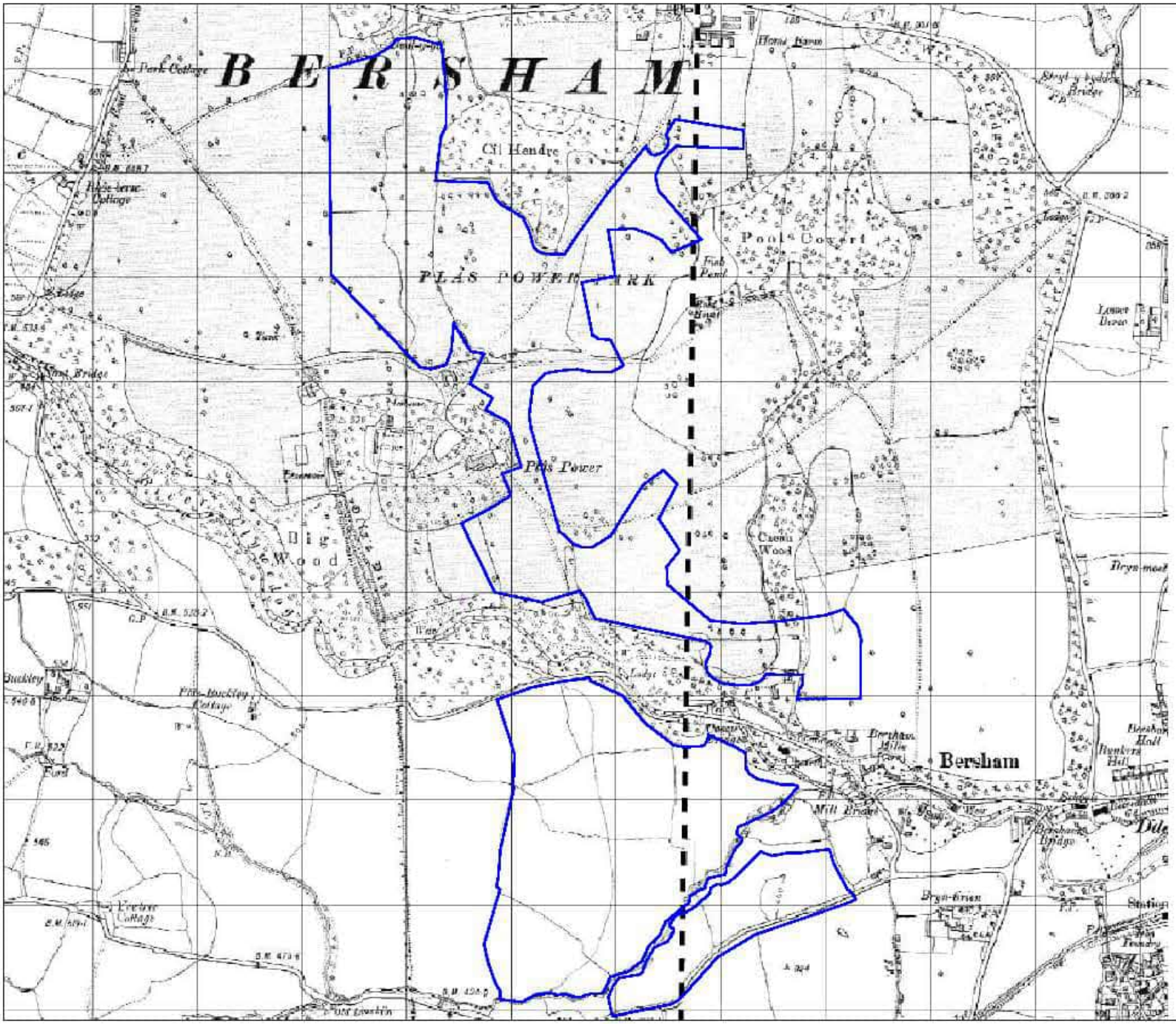

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: 1914 Ordnance Survey Mapping (RPS 2019)

Client: RPS Consulting Services

Project: SUMO-04255 Land at Plas Power Estate, Wrexham

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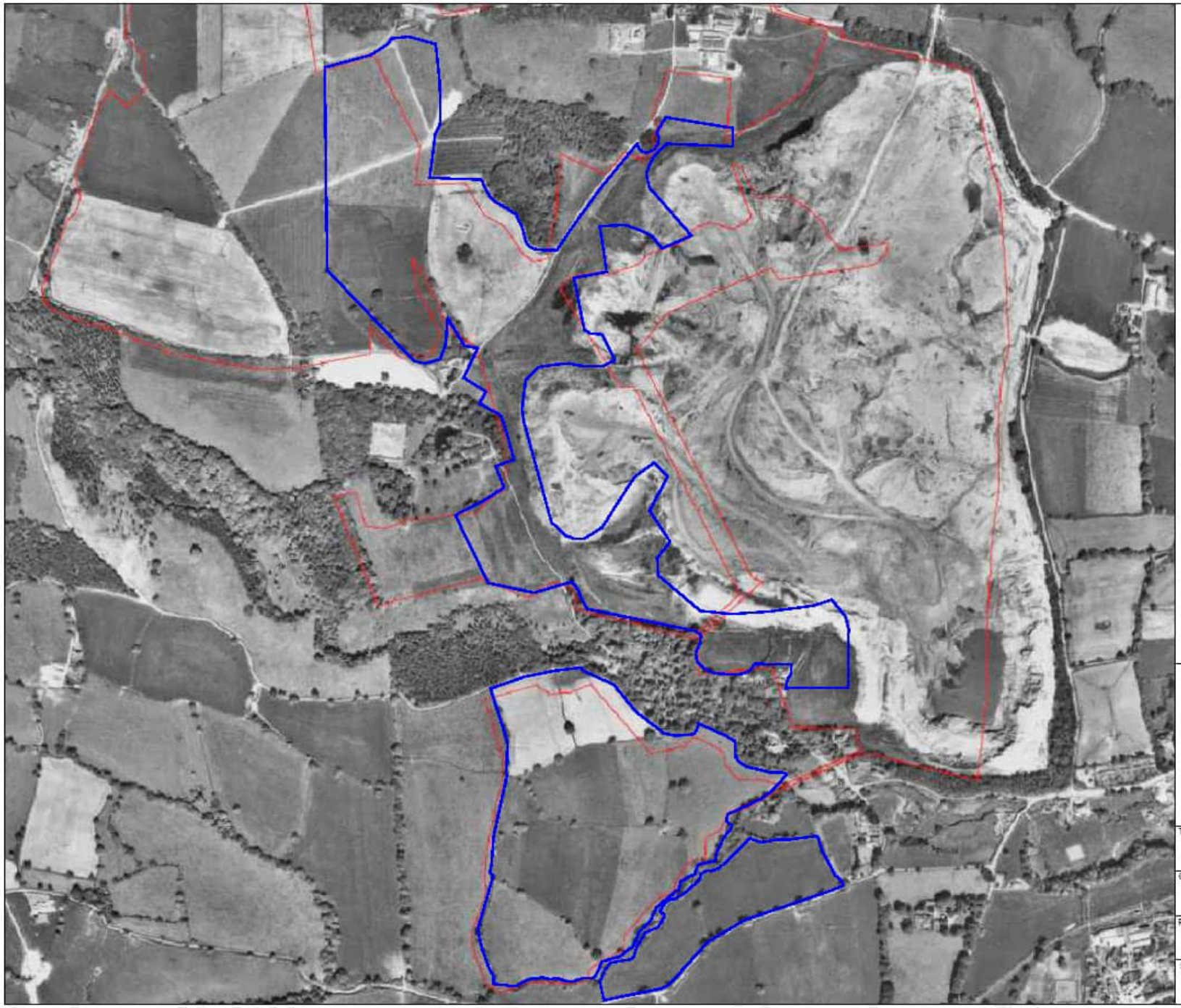

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SUMO Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

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Client: RPS Consulting Services

Project: SUMO-04255 Land at Plas Power Estate, Wrexham

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GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Minimally Processed Data - Greyscale Plots

Client:
RPS Consulting Services

Project:
SUMO-04255 Land at Plas Power Estate, Wrexham

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Appendix A - Technical Information: Magnetometer Survey Method, Processing and Presentation

Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (ClfA 2014) and the European Archaeological Council (EAC 2016).

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad* 601-2

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Presentation of results and interpretation

The presentation of the results includes a ‘minimally processed data’ and a ‘processed data’ greyscale plot. Magnetic anomalies are identified, interpreted and plotted onto the ‘Interpretation’ drawings.

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given specific categories, such as: Abbey Wall or Roman Road. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: Probable, or Possible Archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification Possible.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
Service	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* / *Natural* or (in the case of linear responses) *Possible Archaeology* / *Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

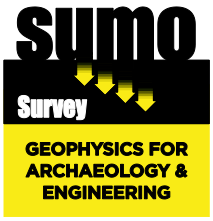
Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL

Appendix D

Geophysical Survey 2023 - Report

GEOPHYSICAL SURVEY REPORT

Plas Power Estate, Wrexham Northern Area

Client

RPS Consulting

For

Lightsource BP

Survey Report

13152

Date

13 December 2023

Survey Report 13152: Plas Power Estate, Wrexham Northern Area

Survey dates	23-27 October 2023
Field co-ordinator	Liam Brice-Bateman BA
Field Team	Darcy Hooper MSc
Report Date	13 December 2023
CAD Illustrations	Thomas Cockcroft MSc MCIfA
Report Author	Thomas Cockcroft MSc MCIfA
Project Manager	Simon Haddrell BEng AMBCS PCIfA
Report approved	Dr John Gater BSc DSc(Hon) MCIfA FSA

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2 LIST OF APPENDICES

3 SURVEY TECHNIQUE

3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).

Bartington Cart System Traverse Interval 1.0m Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge discontinuities over the whole of the data set.

4 SUMMARY OF RESULTS

4.1 A magnetometer survey of 21 hectares of land at Plas Power Estate, Wrexham (Northern Area) has not recorded any magnetic responses that could be interpreted as being of definite archaeological interest. Green waste has resulted in extensive magnetic disturbance across the entire site. Responses of uncertain origin have been detected which are likely to have been caused by agricultural and natural processes. The routes of several former field boundaries have also been marked.

5 Crynodeb o'r Canlyniadau

5.1 Ni welwyd unrhyw nodweddion o ddiddordeb pendant archeolegol yn ystod arolwg magnetomedr ar dir, yn mesur 21 ha, Plas Power Estate, Wrecsam (y parth gogleddol). Gwastraff gwyrdd sydd yn gyfrifol am yr anomaleddau magnetig amlwg ar draws y safle. Mae anomaleddau llai sicr wedi eu cofnodi ar y safle, ac mae'n bosib mae prosesau amaethyddol neu naturiol sy'n gyfrifol. Fe nodwyd sawl ffin cae yn ystod y gwaith.

6 INTRODUCTION

6.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **RPS Consulting** on behalf of **Lightsource BP.**

6.2 Site Details

NGR / Postcode	SJ 29915 50850 / LL11 3BS
Location	The site is located 3km west of Wrexham and 1km east of Coedpoeth. The survey area is bounded to the south by the A525.
HER	Clwyd-Powys Historic Environment Record
District	Wrexham County Borough
Parish	Coedpoeth Community
Topography	Undulating
Land Use	Agricultural / rough pasture
Geology (BGS 2023)	Bedrock: Cefn Rock - Sandstone Superficial: Till, Devensian - Diamicton
Soils (CU 2023)	Soilscape 6: Freely draining slightly acid loamy soils Soilscape 17: Slowly permeable seasonally wet acid loamy and clayey soils
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	21 ha

6.3 ***Archaeological Background***

6.3.1 No designated heritage or non-designated heritage assets are recorded within the survey area. It is thought there is a low potential for archaeological remains of all periods within the survey area. Although there is a section of Offa's Dyke, a Scheduled Monument, within the wider area, it falls outside the development area (RPS 2019).

6.3.2 A UAS landscape survey was carried out in 2023 (SGS) partly over the survey area but extended onto fields south of the current site. The southern survey area predominantly comprised land that had previously been extracted through opencast mining, and later reinstated. As a result, most of the features observed in the UAS data within this area can be attributed to these activities. Some relict ridge and furrow plough scars were evident, although ephemeral in character. A spread of raised ground was observed in the northernmost survey area (area 4). The micro-topographic feature, discerned through terrain flattened processing,

is expressed at surface level as a low rise, measuring no more than 0.10 m in height. The feature is located at the edge of ground that slopes down towards the east and north/north-west.

6.3.3 A previous phase of geophysics survey (SGL 2021) carried out on land south of the site recorded numerous magnetic responses of archaeological interest. A small circular and two rectilinear enclosures were visible in the dataset, located some 1.2km south of the current site. The locations of probable and possible bell pits were also marked along with several former field boundaries.

6.4 *Aims and Objectives*

6.4.1 To locate and characterise any anomalies of possible archaeological interest within the study area.

7 RESULTS

7.1 *The survey has been divided into five survey areas (Areas 1-5). The majority of Area 2 and the west of Area 5 was overgrown which rendered these parts of the site unsurveyable.*

7.2 *Probable / Possible Archaeology*

7.2.1 No magnetic responses have been recorded that could be interpreted as being of definite archaeological interest.

7.3 *Uncertain*

7.3.1 A series of linear and curvilinear trend plus discrete amorphous responses and pit-like anomalies have been detected in the survey which have been assigned to the category of *Uncertain*. They generally lack the defined morphology of anomalies that would ordinarily be interpreted as being of archaeological interest. However, the increased levels of magnetic background ‘noise’ in the survey (see 7.5) has made interpreting the magnetic responses with confidence difficult. While archaeological origins cannot be entirely ruled out for some of the anomalies, the majority are likely to be due to underlying geological variations or agricultural processes.

7.4 *Former Field Boundary – Corroborated*

7.4.1 Numerous linear and curvilinear responses have bee plotted in the survey which correspond with the location of former field boundaries that are recorded on 1888-1913 Ordnance Survey mapping (see Figure 13).

7.5 *Green Waste*

7.5.1 Unfortunately, increased levels of background ‘noise’ resulting from green waste are visible across the entire dataset, and this will have masked any weak anomalies of archaeological interest if present. This waste has a marked effect on the results from magnetic surveys and has been recognised as an issue for some time (Gerrard *et al* 2015). However, not all green waste is the same, so it is impossible to predict in advance any potentially detrimental effects; it depends on the quantity of inorganic contaminants, including batteries, pieces of metal cans and other ferrous items which result in spurious anomalies or ‘noise’.

7.6 *Ferrous / Magnetic Disturbance*

7.6.1 Two strong ferrous responses in the west of the site have been caused by pylons. Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces

of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

8 DATA APPRAISAL & CONFIDENCE ASSESSMENT

8.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. The results from this survey indicate the presence of former field boundaries; however, increased levels of background 'noise' has been recorded throughout the site which will have masked any anomalies of increased response, if present.

9 CONCLUSION

9.1 The magnetometer survey has not recorded any magnetic responses that could be interpreted as being of definite archaeological interest. Numerous anomalies of uncertain origin have been plotted throughout the survey; they are likely to be due to underling geological variations or agricultural processes. Former field boundaries are also visible in the data. Increased levels of background noise have been recorded throughout the site which is likely to have been caused by the spreading of green waste.

10 REFERENCES

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CU 2023 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 08/11/2023] *website: http://mapapps2.bgs.ac.uk/ukso/home.html*

EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology,* European Archaeological Council, Guidelines 2.

EH 2008 *Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)

RPS 2019 *Plas Power Estate, Wrexham Archaeological Desk-Based Assessment. RPS Consulting, Gloucester*

SGL 2021 *Land At Plas Power Estate, Wrexham Geophysical Survey Report.* SUMO Geophysics Limited, Upton-upon-Severn

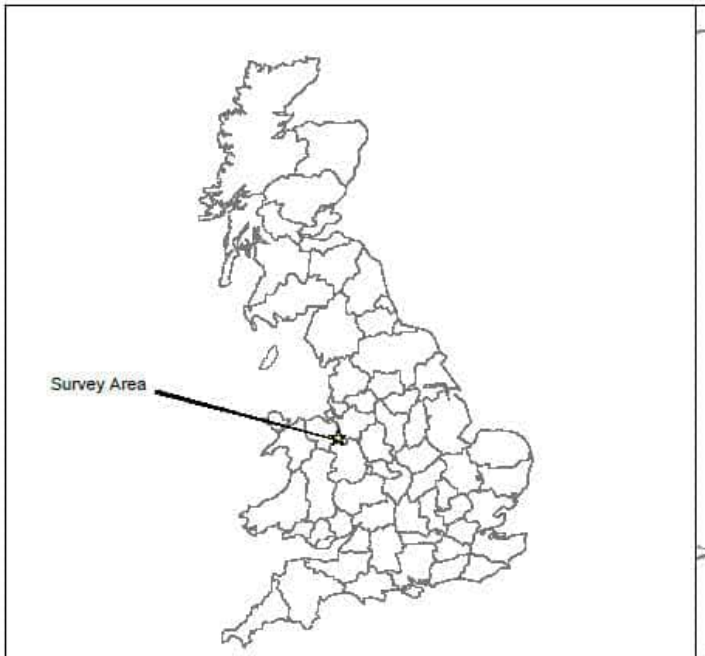
SGS 2023 *Land To The West Of Wrexham UAS Landscape Survey.* SUMO GeoSurveys, Upton-upon-Severn

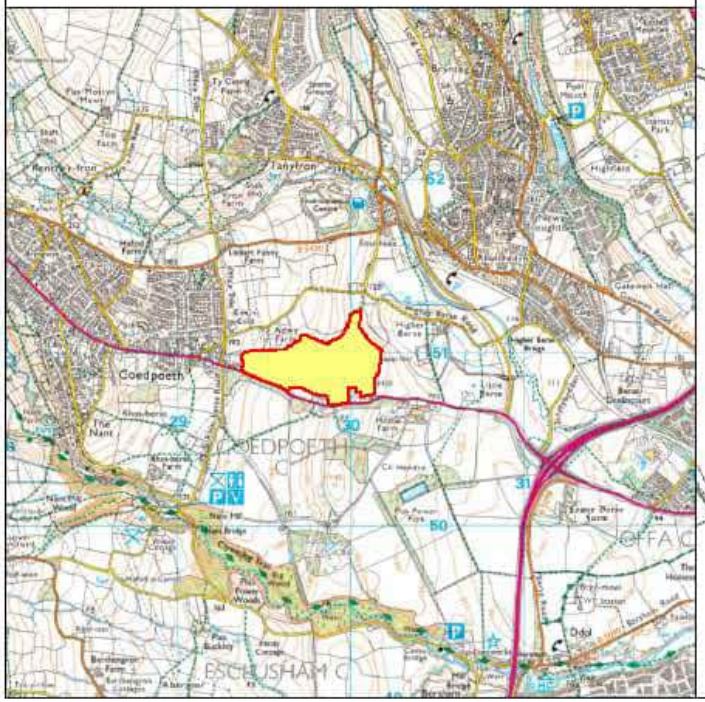
11 ARCHIVE

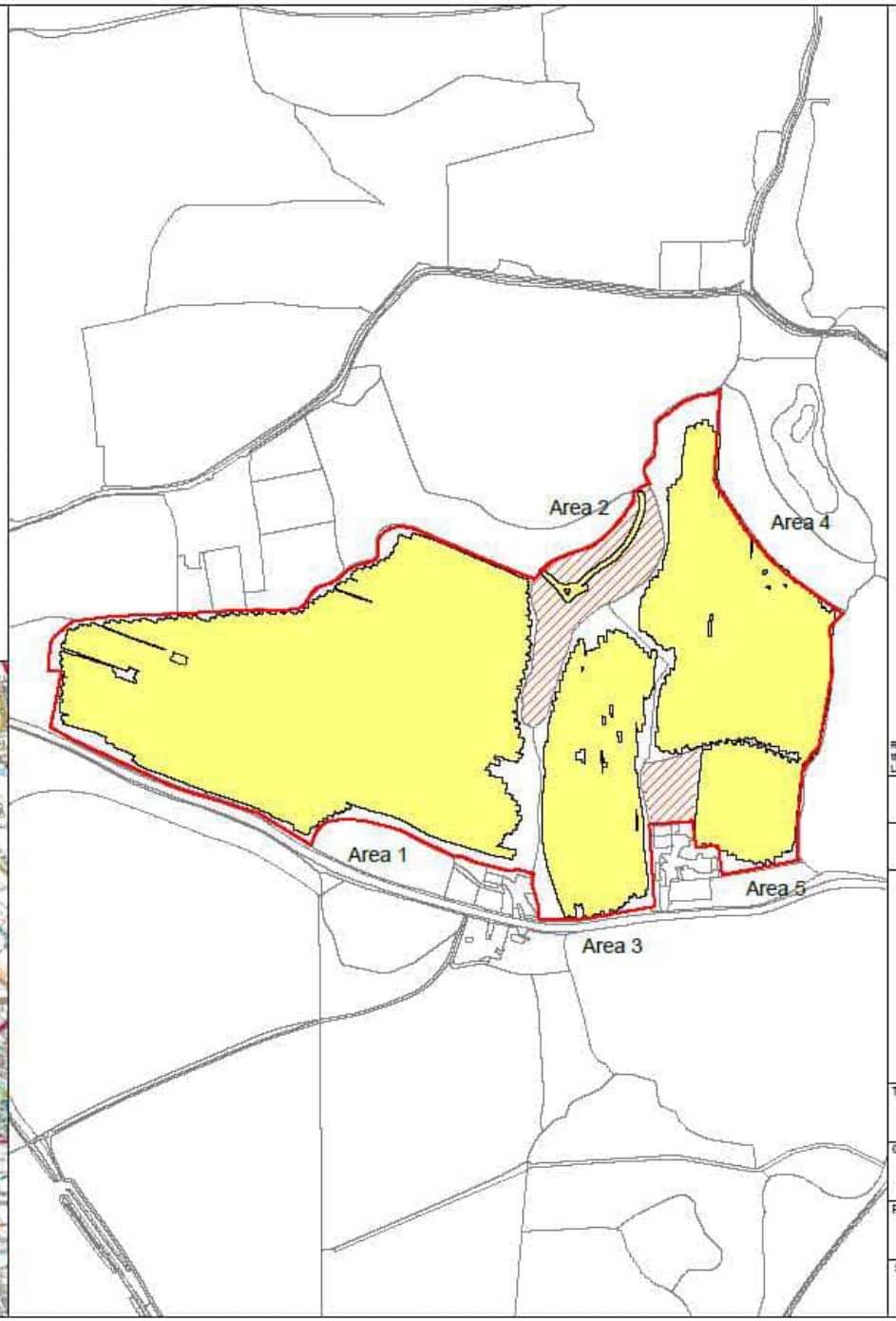
11.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO Geophysics Ltd.'s** digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage**.**

11.1.1 Deposition of a high resolution pdf copy of the final report with the HER via the HEDDOS portal here https://cpat.org.uk/heddos.html and in accordance with the Welsh HER submission guidelines https://cpat.org.uk/curatorial-services/historic-environment-record/#page-content Contact her@cpat.org.uk if any requirements need to be discussed.

11.2 Deposition of the full archive with the National Monuments Record, RCAHMW and/or The Archaeology Data Service in accordance with their submission guidelines.







N

	Survey Areas
	Unsurveyable

sumo Survey
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Project: 13152 - Plas Power Estate, Wrexham Northern Area

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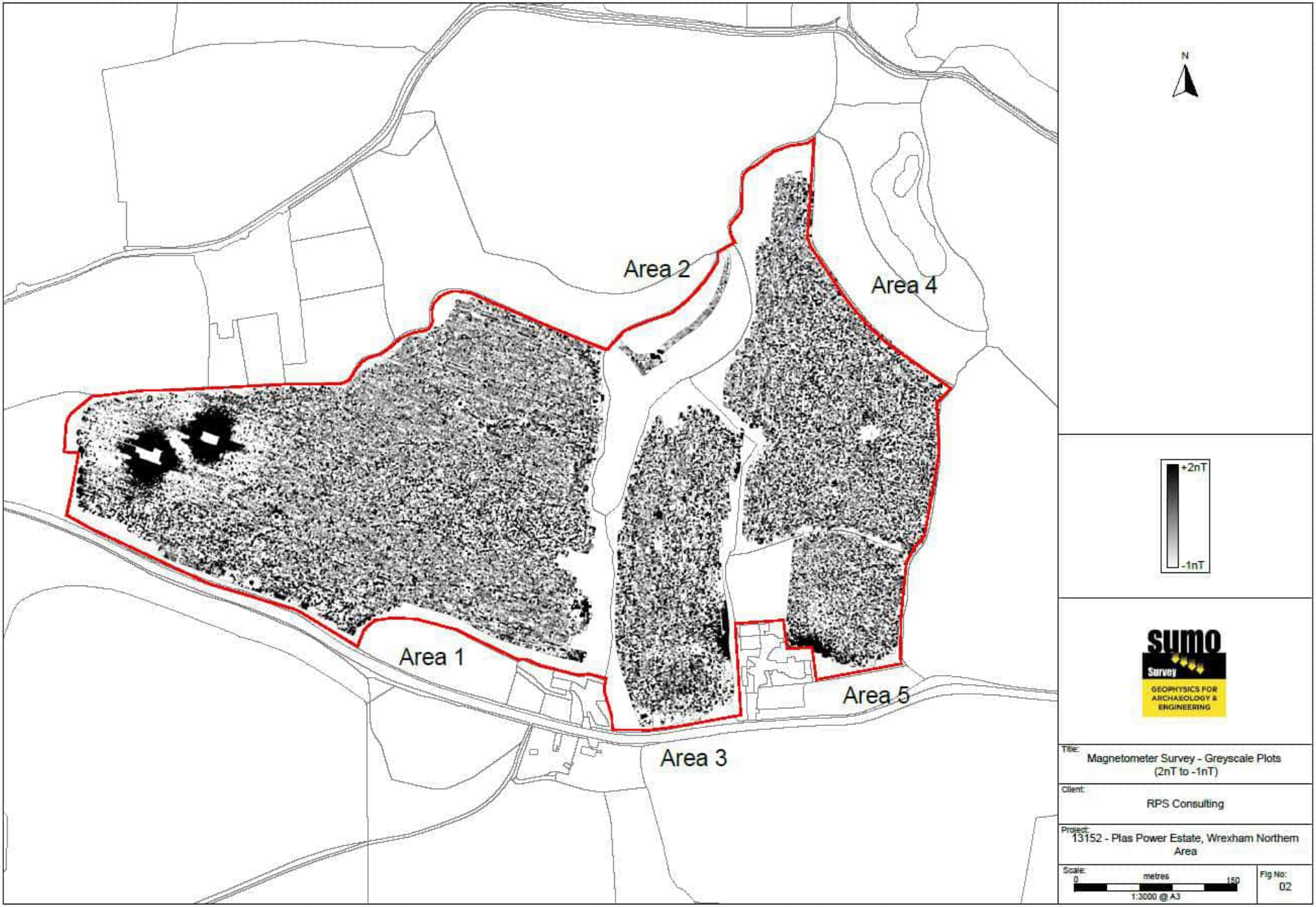
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Area 4
Area 1
Area 5
Area 3
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-1nT
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RPS Consulting
Project:
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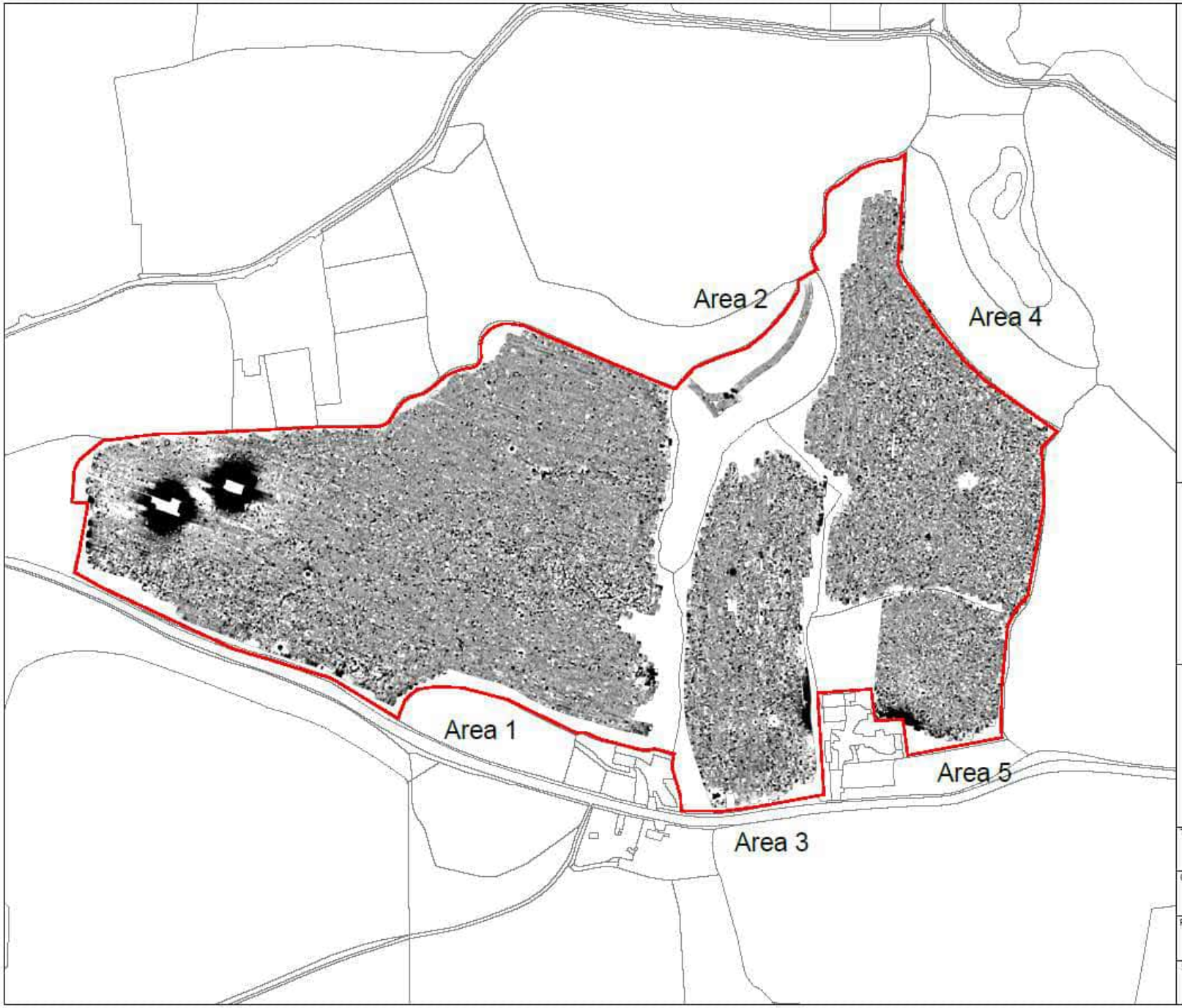

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+5nT

-3nT

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Client:
RPS Consulting

Project:
13152 - Plas Power Estate, Wrexham Northern Area

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Fig No:
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Area 2
Area 4
Area 1
Area 5
Area 3
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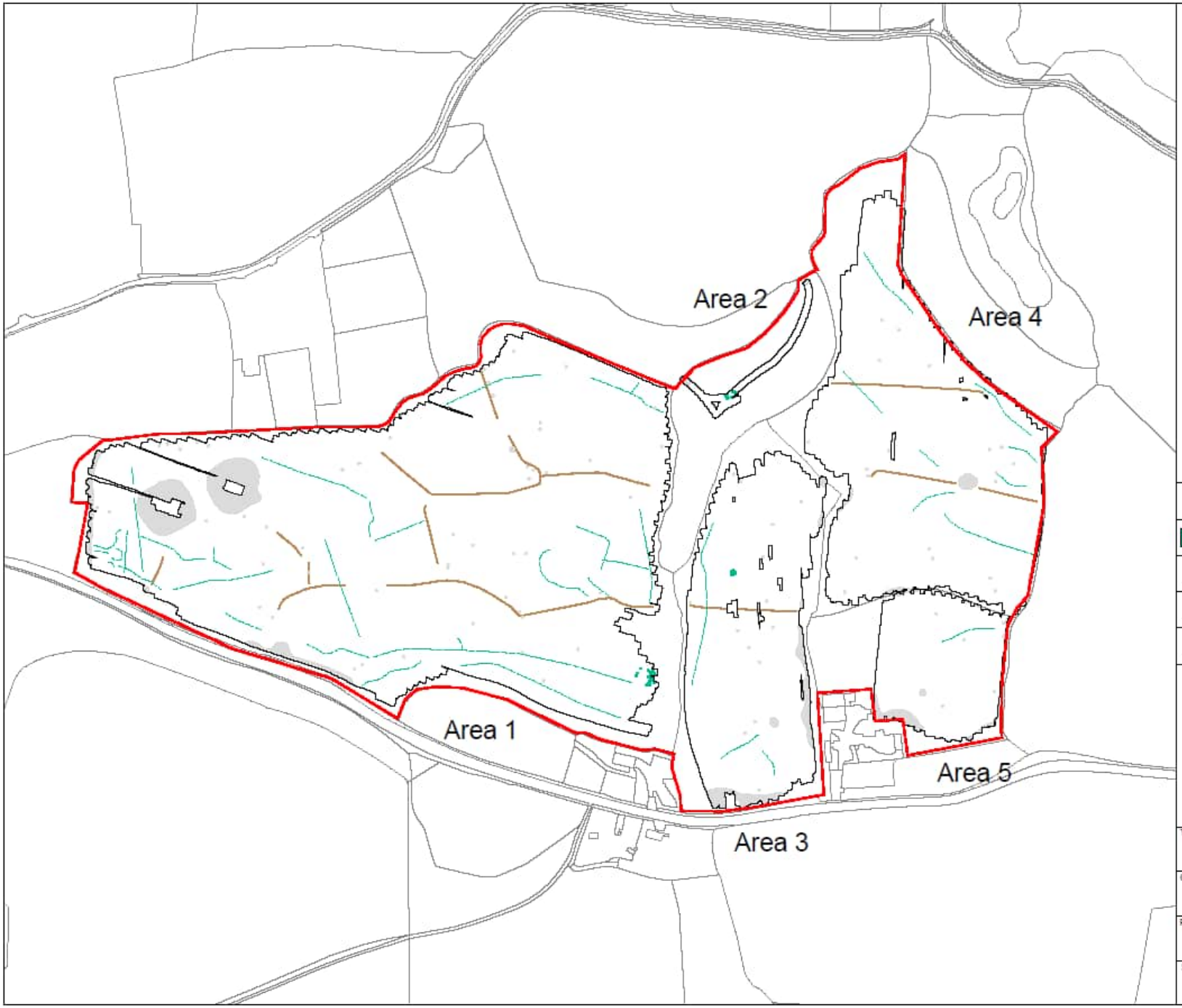

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KEY

	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Magnetic disturbance
	Ferrous

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Title:
Magnetometer Survey - Interpretation

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RPS Consulting

Project:
13152 - Plas Power Estate, Wrexham Northern Area

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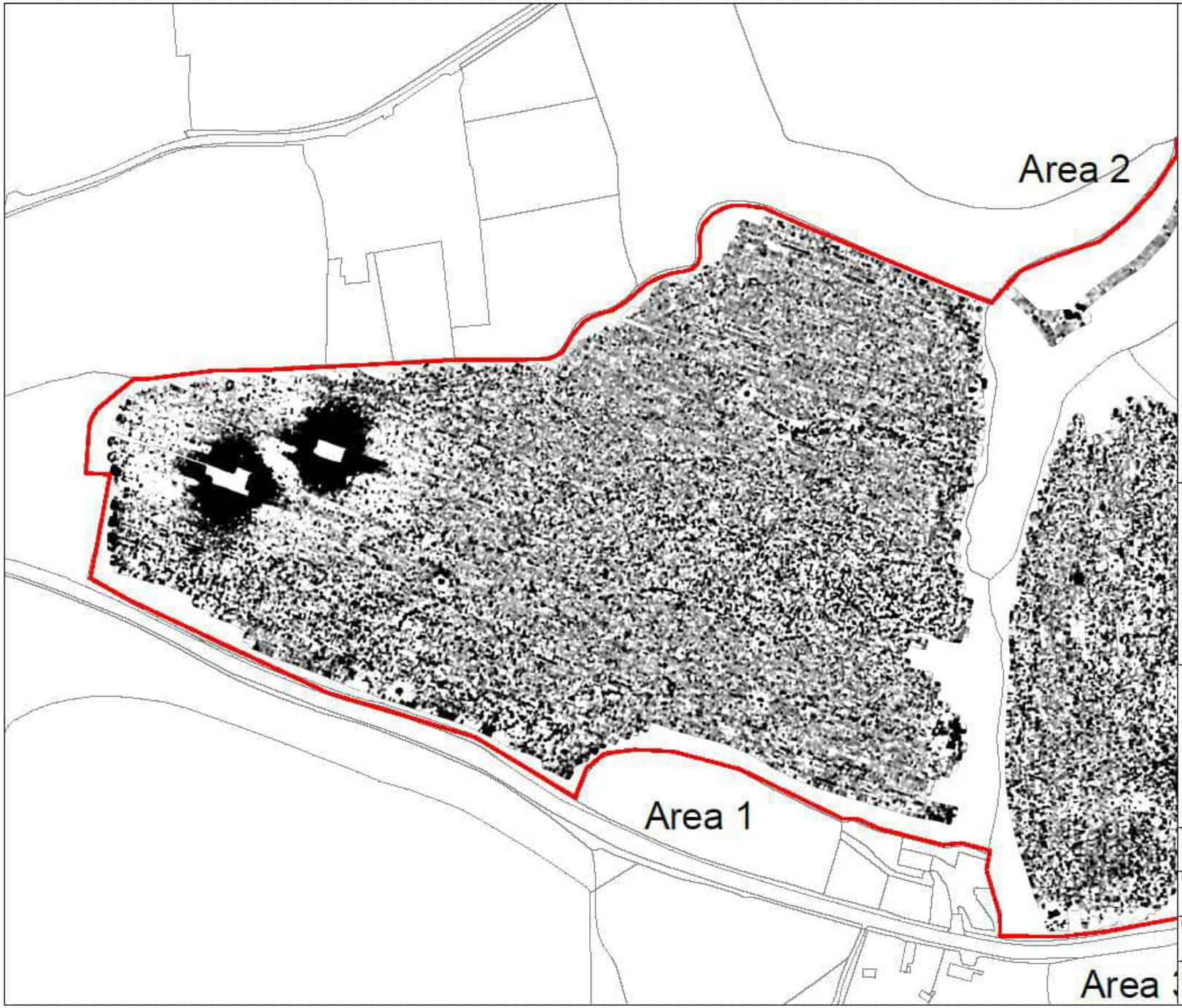

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+2nT

-1nT

sumo Survey

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Project: 13152 - Plas Power Estate, Wrexham Northern Area

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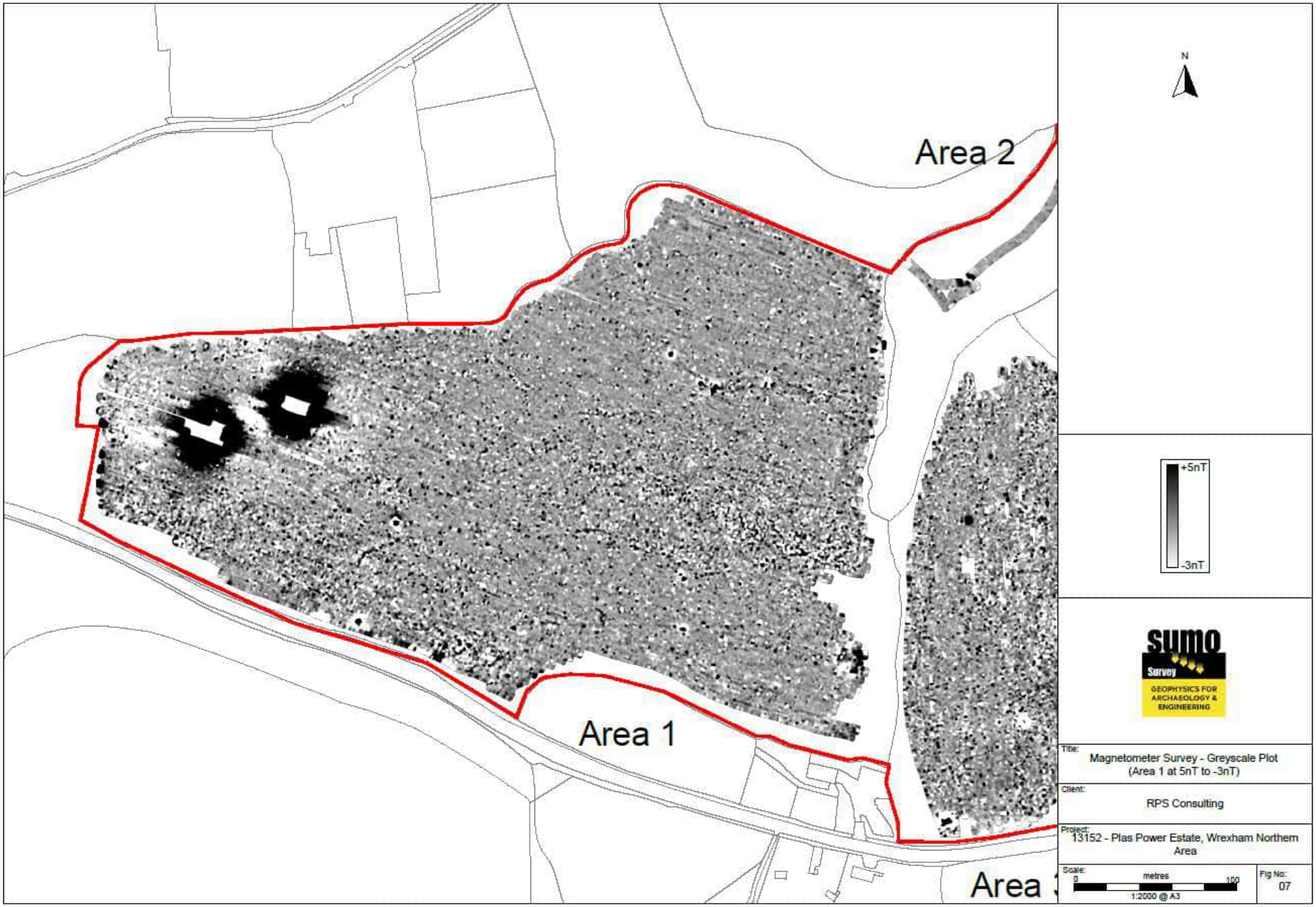
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Area 3
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-3nT
sumo
Survey
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Magnetometer Survey - Greyscale Plot
(Area 1 at 5nT to -3nT)
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RPS Consulting
Project:
13152 - Plas Power Estate, Wrexham Northern Area
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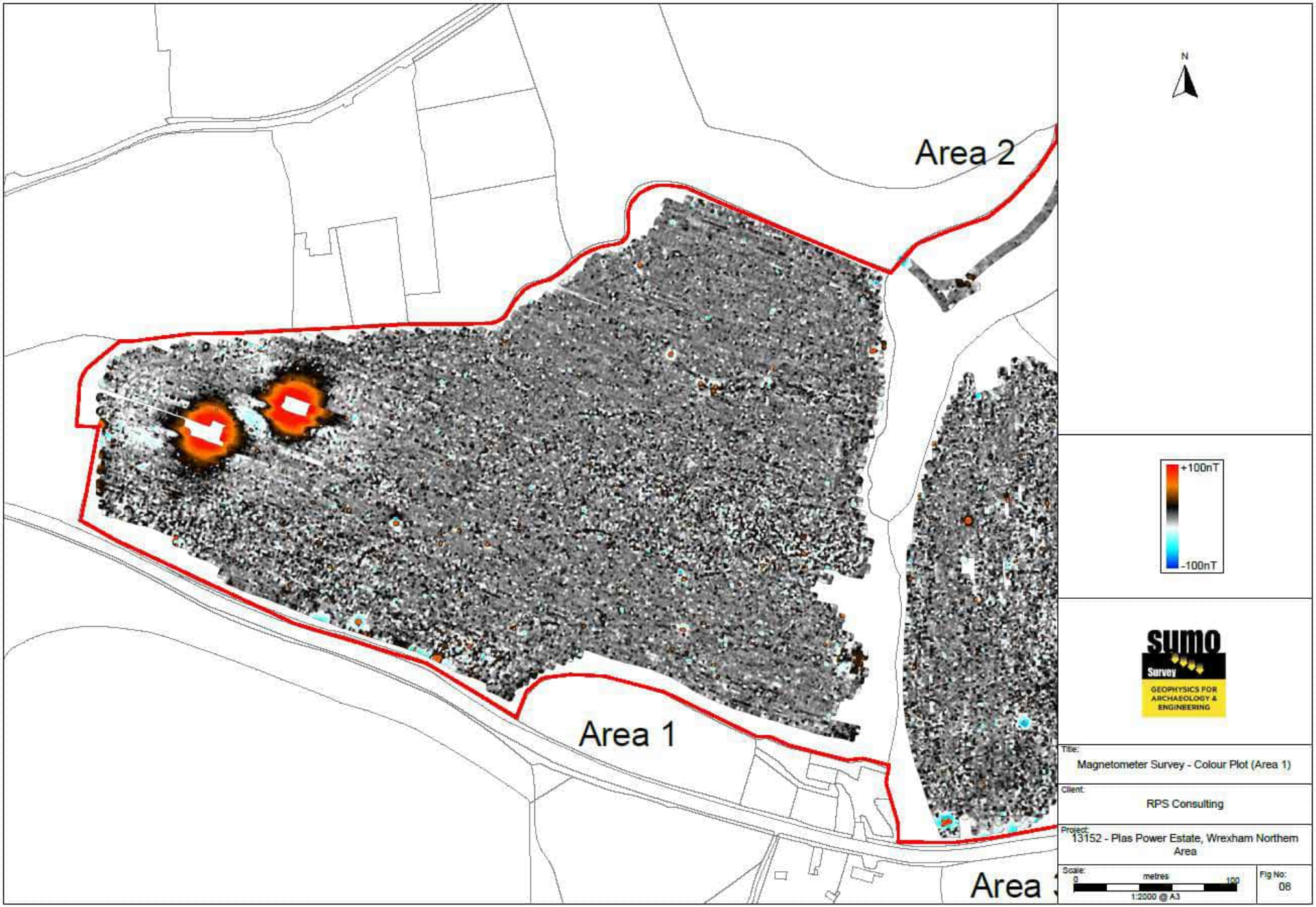
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sumo
Survey
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Magnetometer Survey - Colour Plot (Area 1)
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Project:
13152 - Plas Power Estate, Wrexham Northern Area
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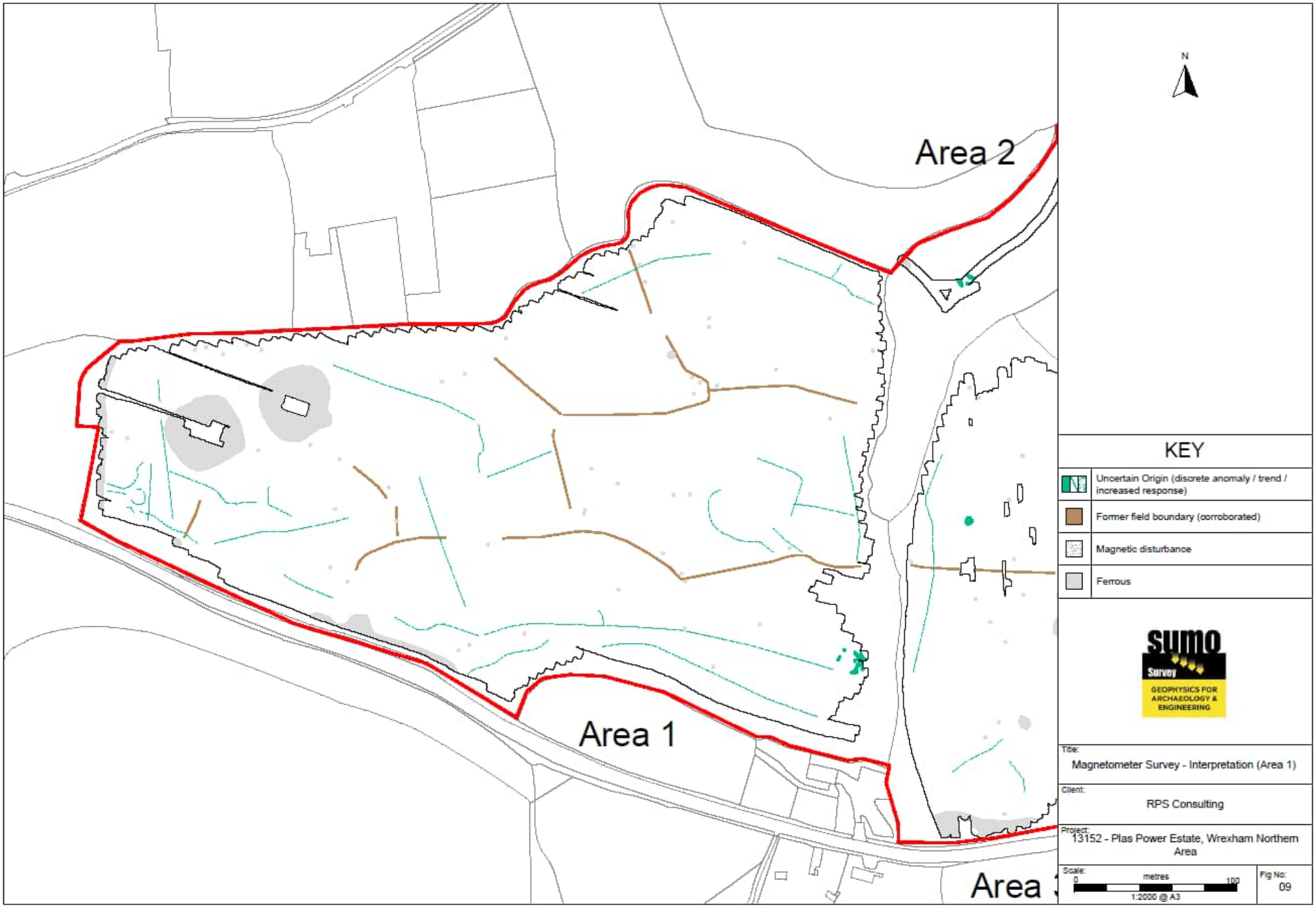
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KEY
Uncertain Origin (discrete anomaly / trend / increased response)
Former field boundary (corroborated)
Magnetic disturbance
Ferrous
sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING
Title:
Magnetometer Survey - Interpretation (Area 1)
Client:
RPS Consulting
Project:
13152 - Plas Power Estate, Wrexham Northern Area
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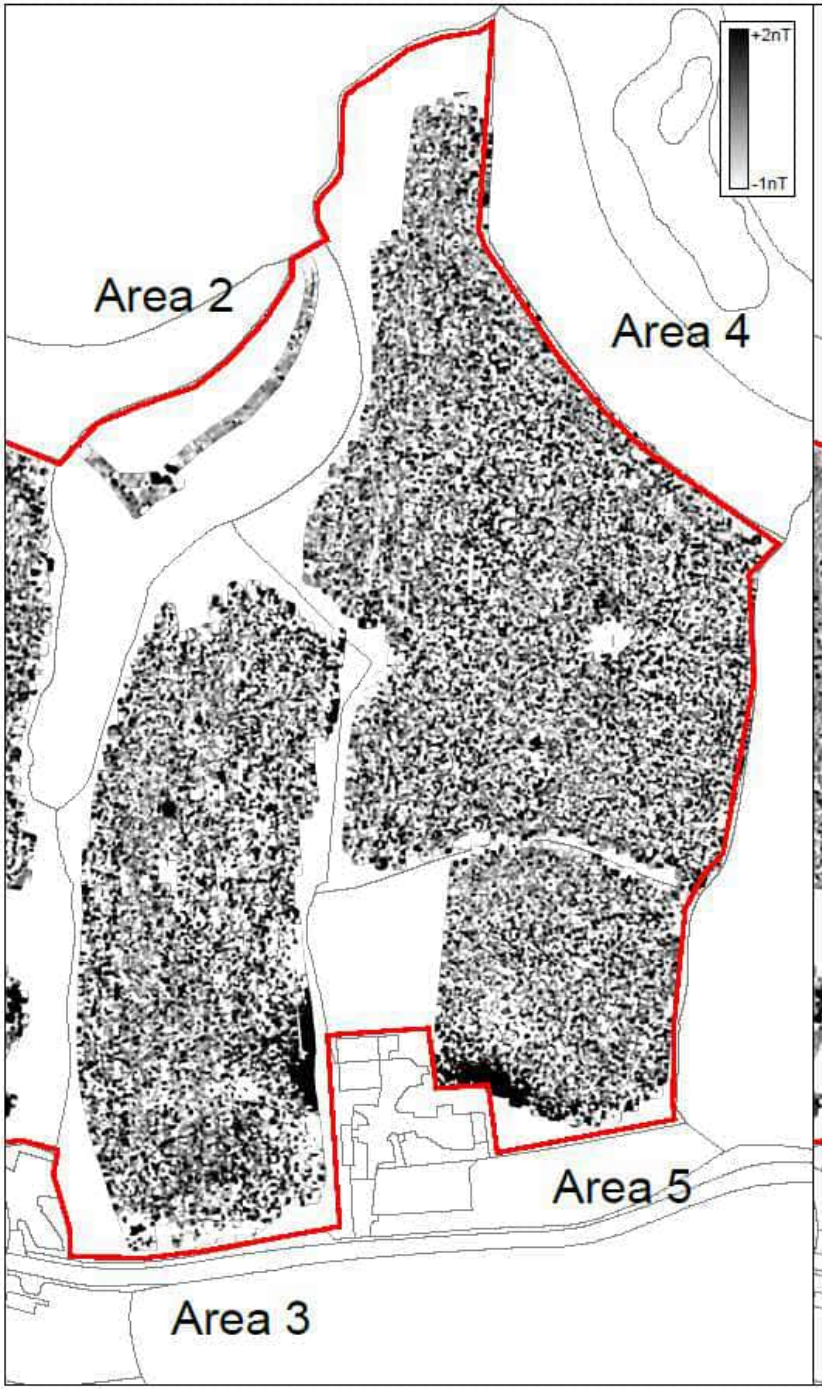

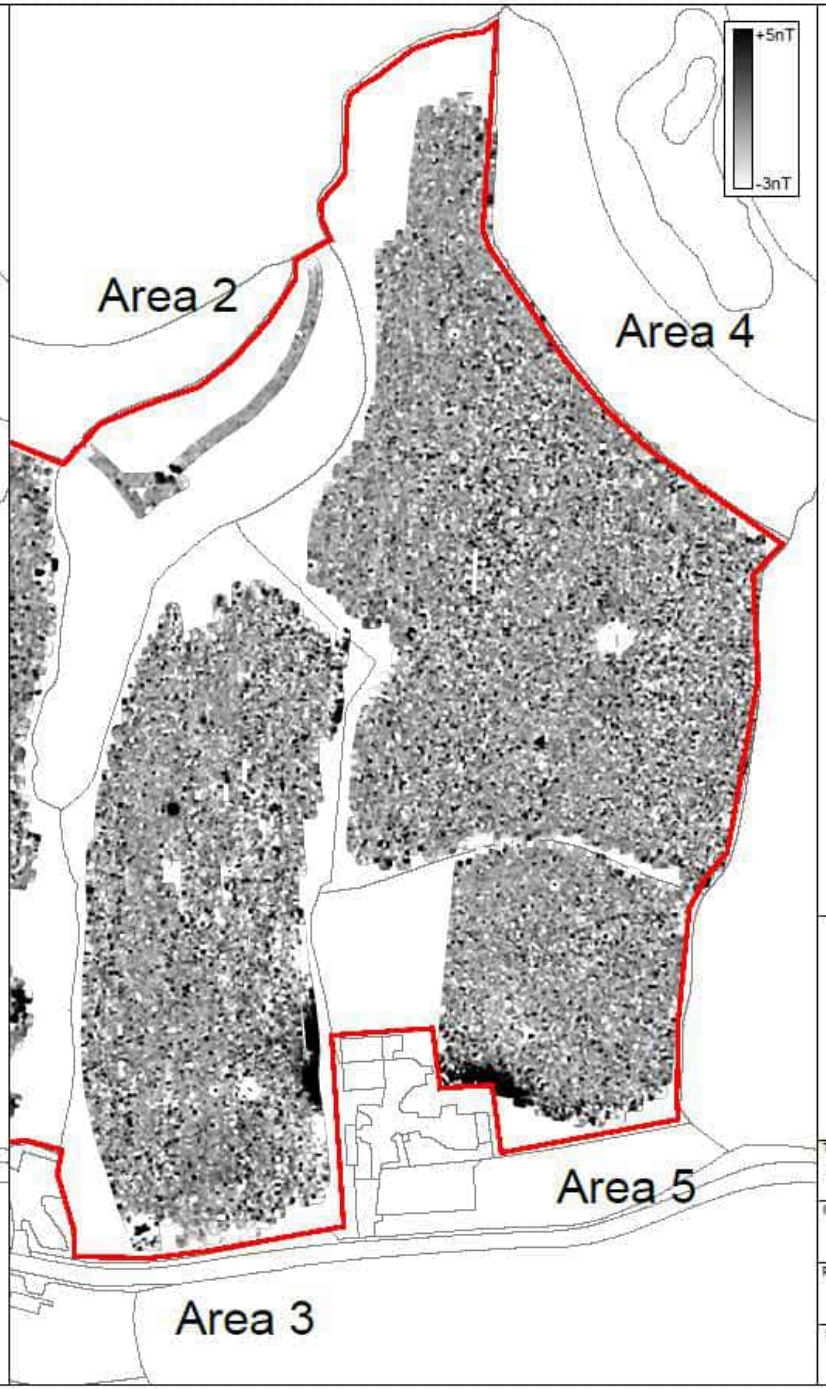

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Client: RPS Consulting

Project: 13152 - Plas Power Estate, Wrexham Northern Area

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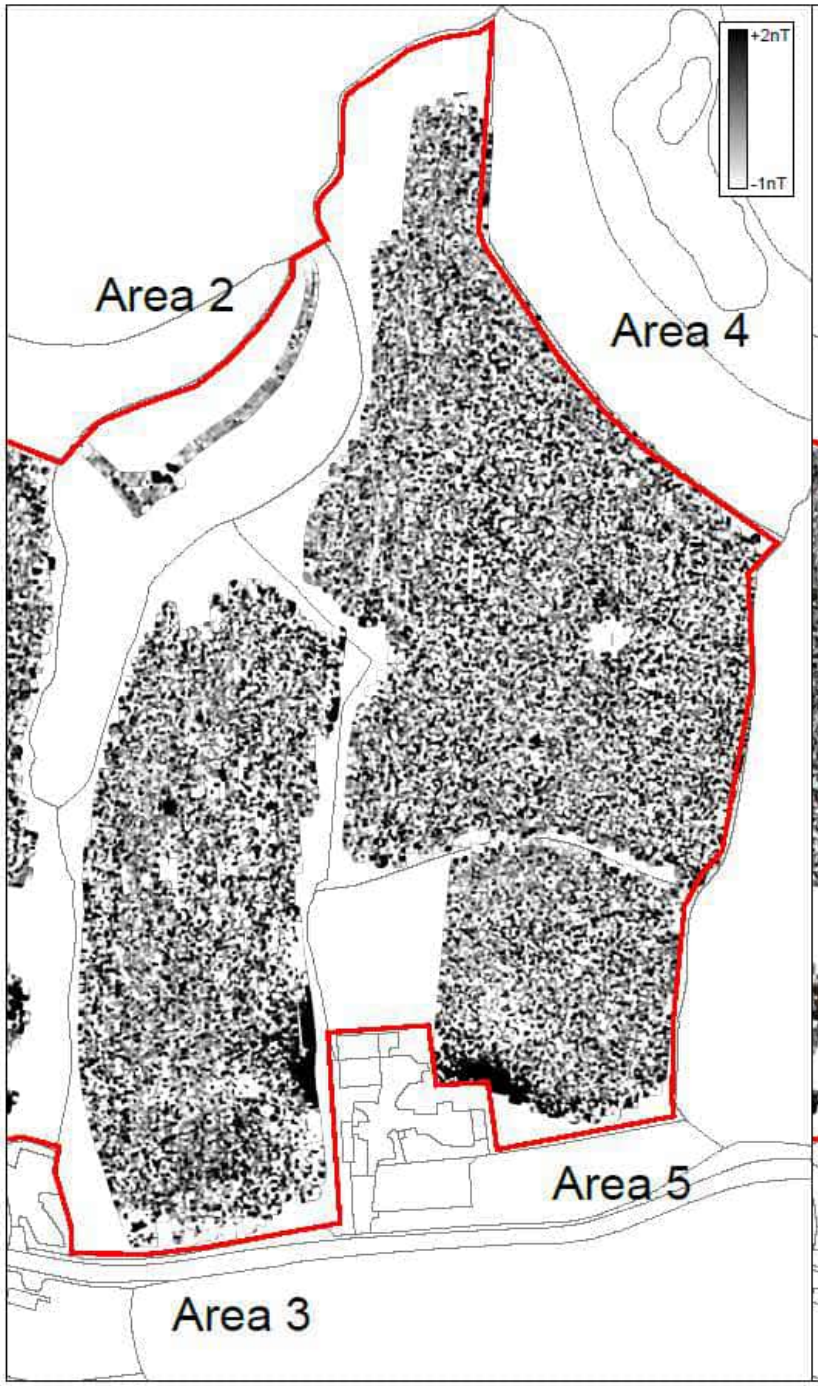

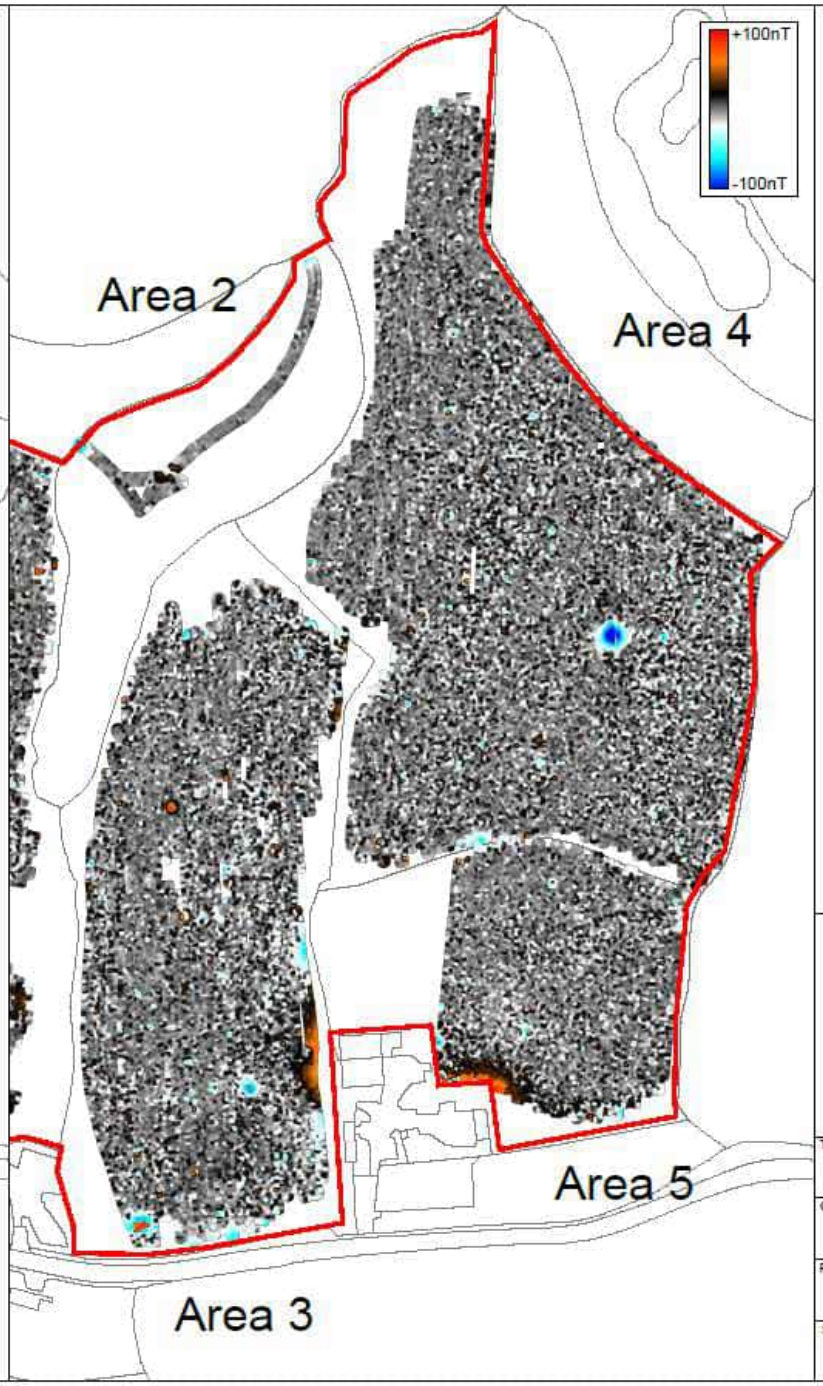

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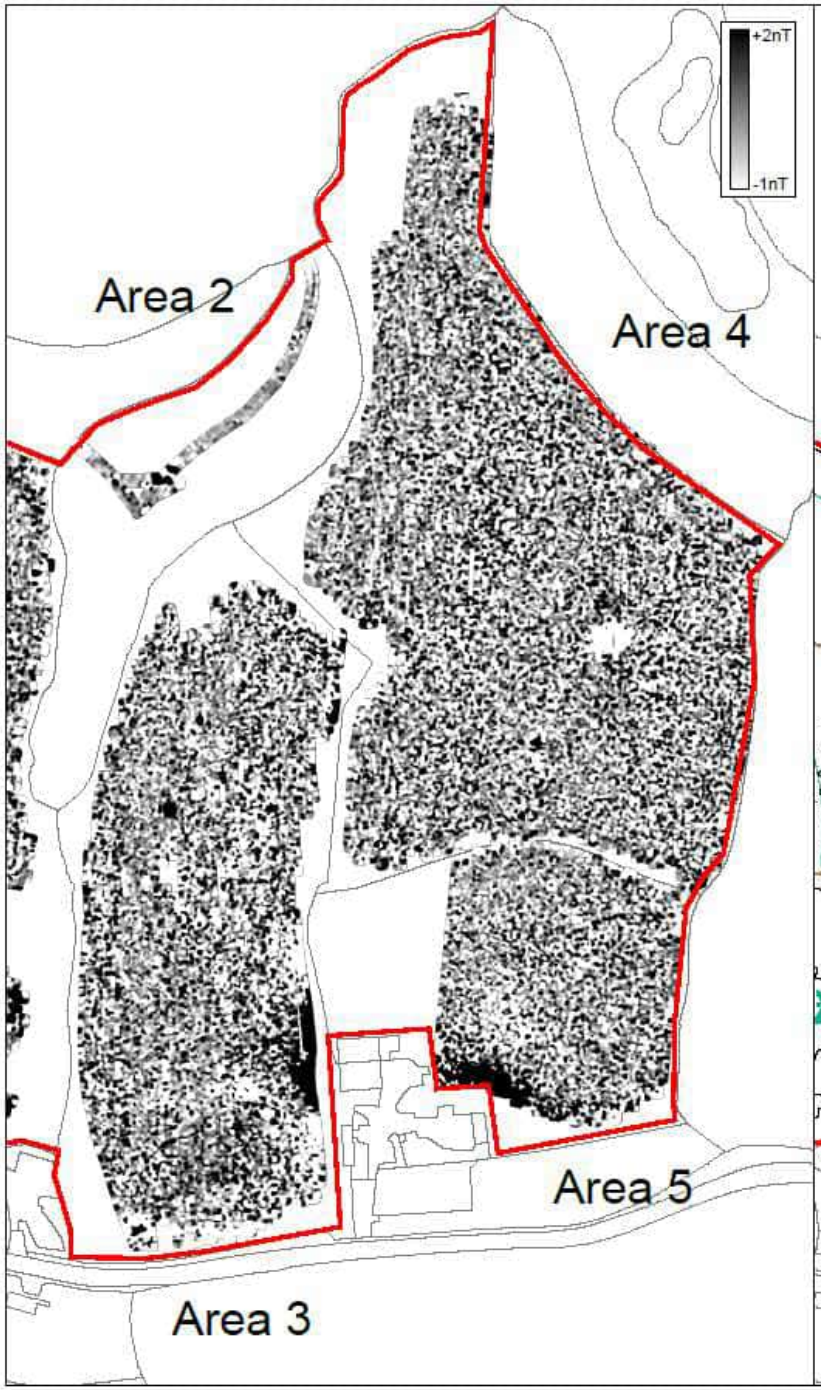

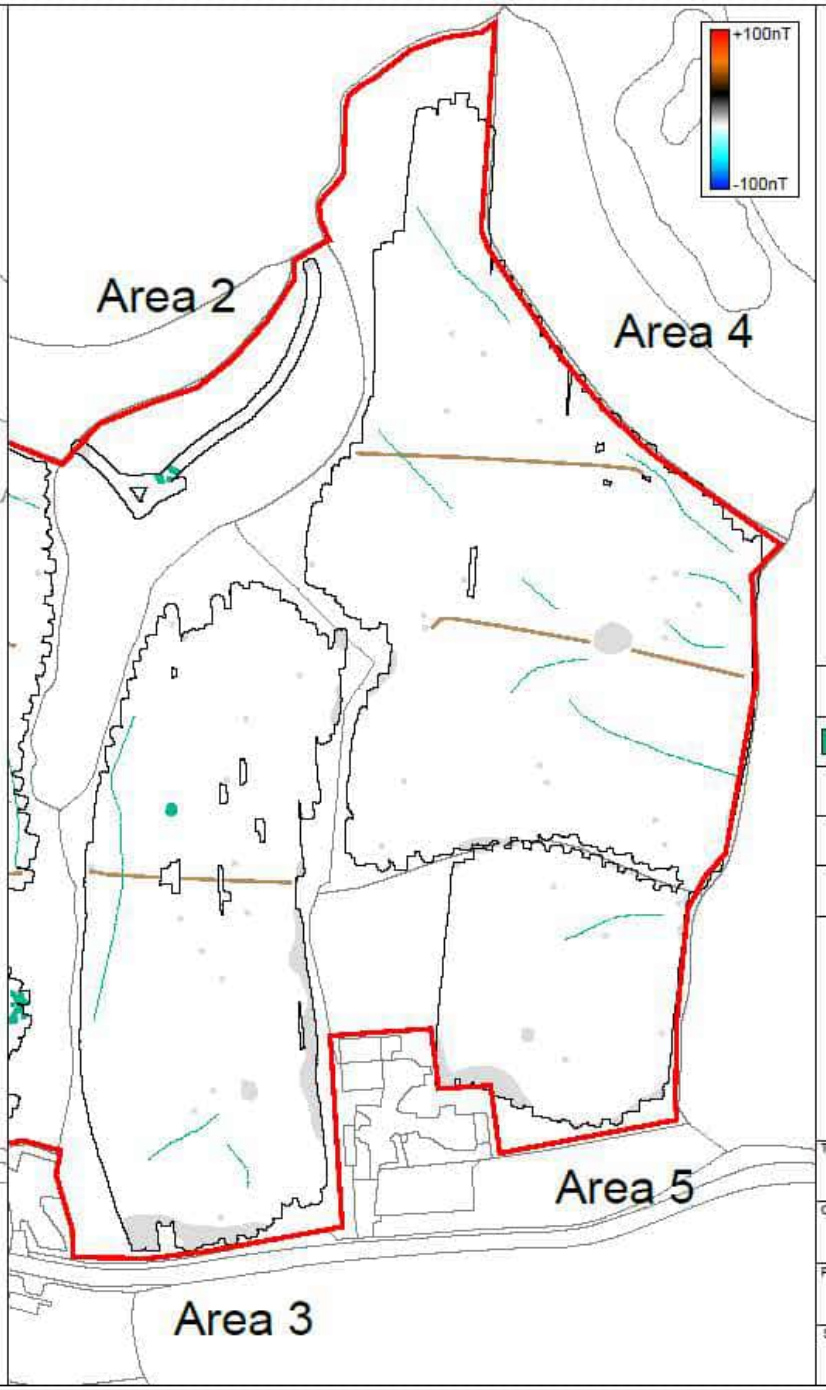

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KEY

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	Magnetic disturbance
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Magnetometer Survey - Greyscale Plots / Interpretation (Area 2, 3, 4 & 5)

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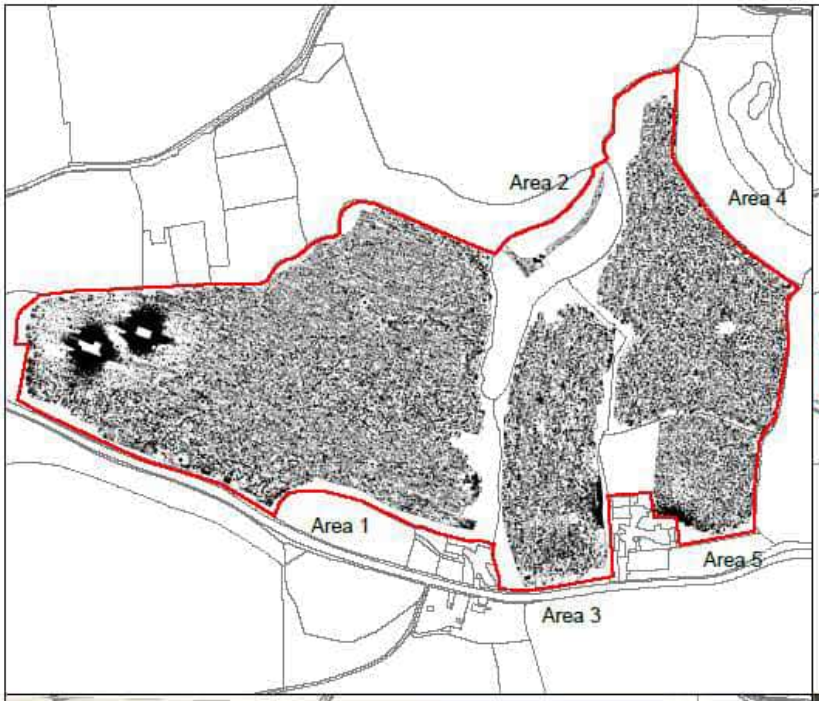
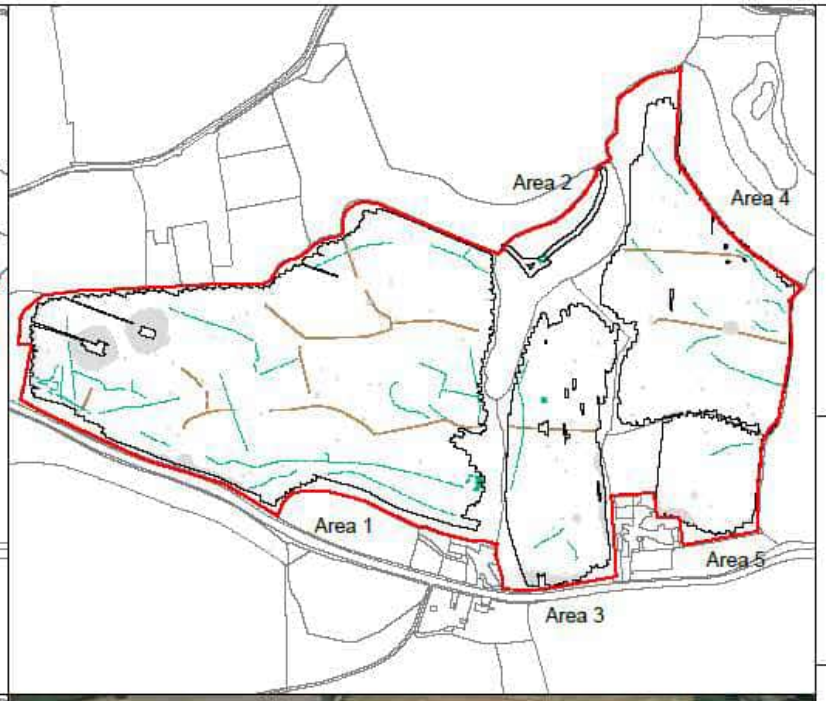
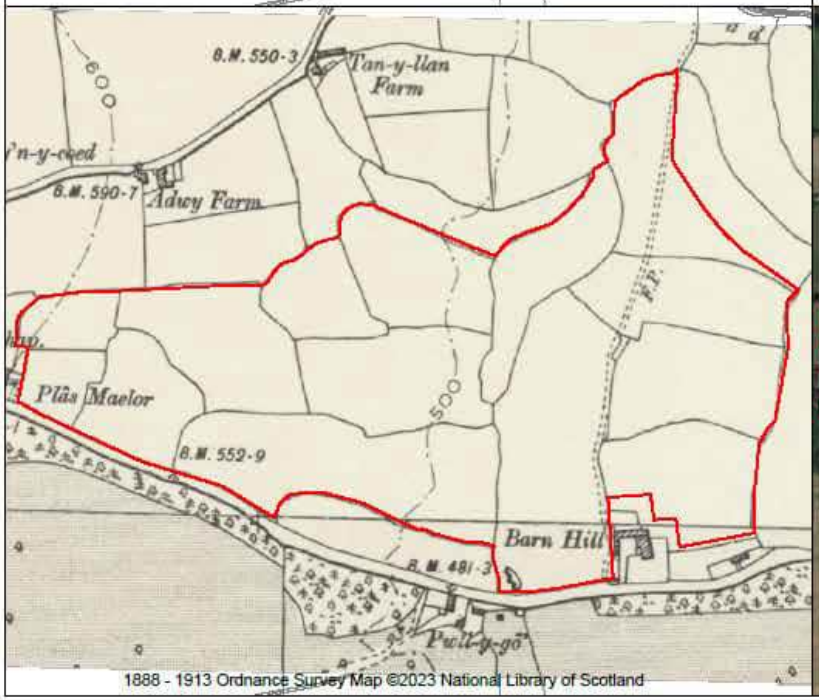
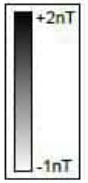






1888 - 1913 Ordnance Survey Map ©2023 National Library of Scotland



KEY

	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Magnetic disturbance
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

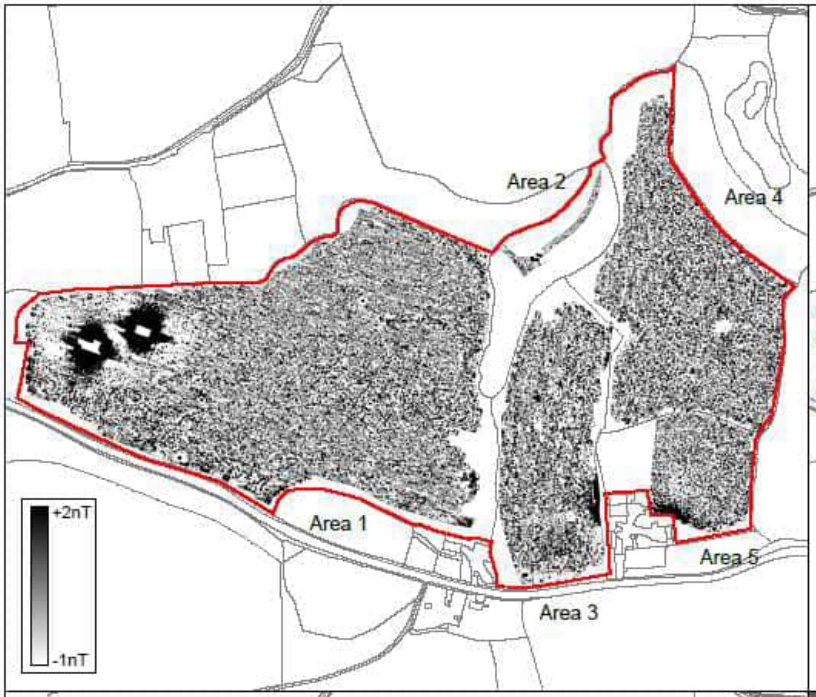
Title: Greyscale Plots / Interpretation / 1888-1913 Ordnance Survey Map / 2018 Aerial Image

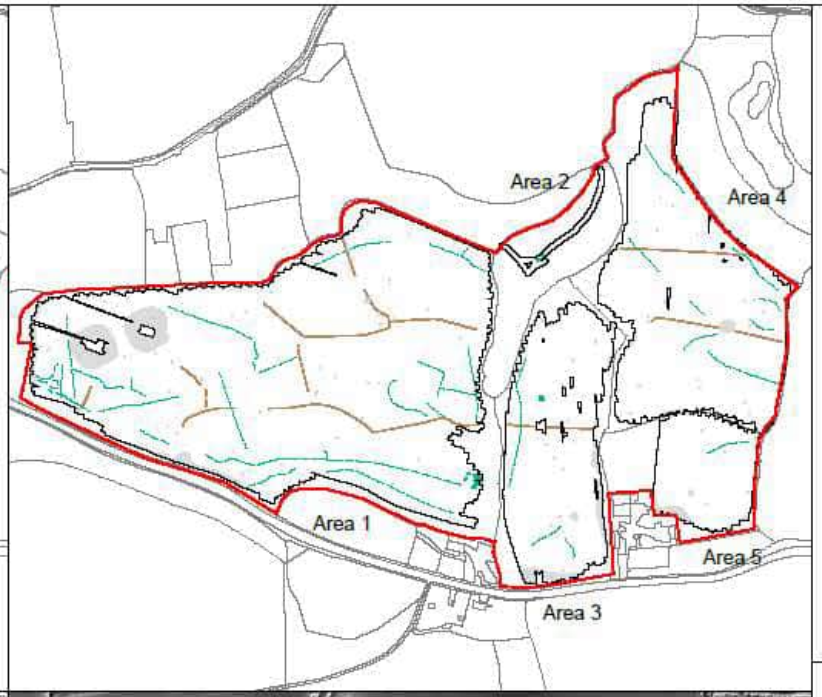
Client: RPS Consulting

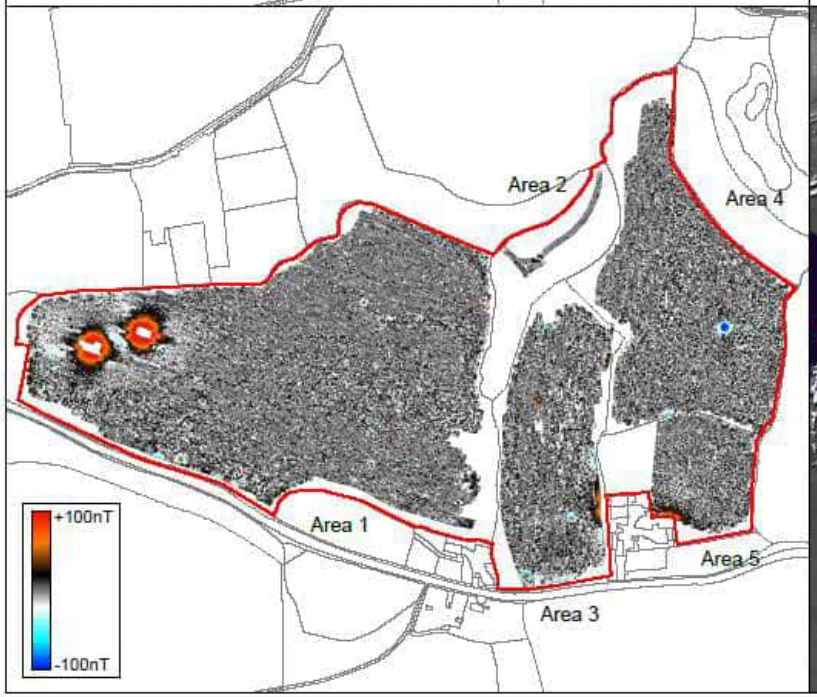
Project: 13152 - Plas Power Estate, Wrexham Northern Area

Scale: NOT TO SCALE

Fig No: 13







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KEY

	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Magnetic disturbance
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

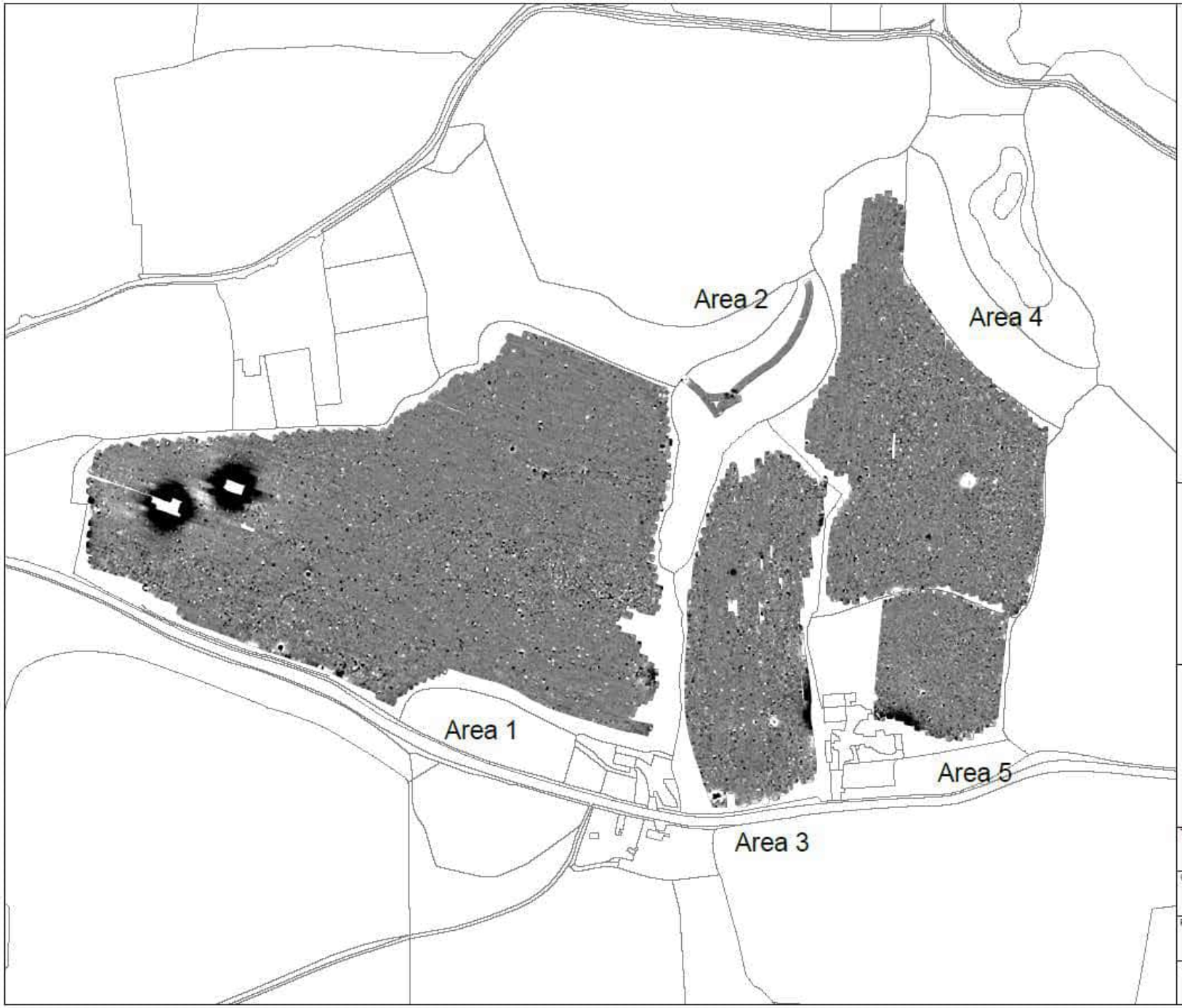
Title:
Greyscale and Colour Plots / Interpretation / LiDAR Data Plot

Client:
RPS Consulting

Project:
13152 - Plas Power Estate, Wrexham Northern Area

Scale:
NOT TO SCALE

Fig No:
14



N

+10nT

-10nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

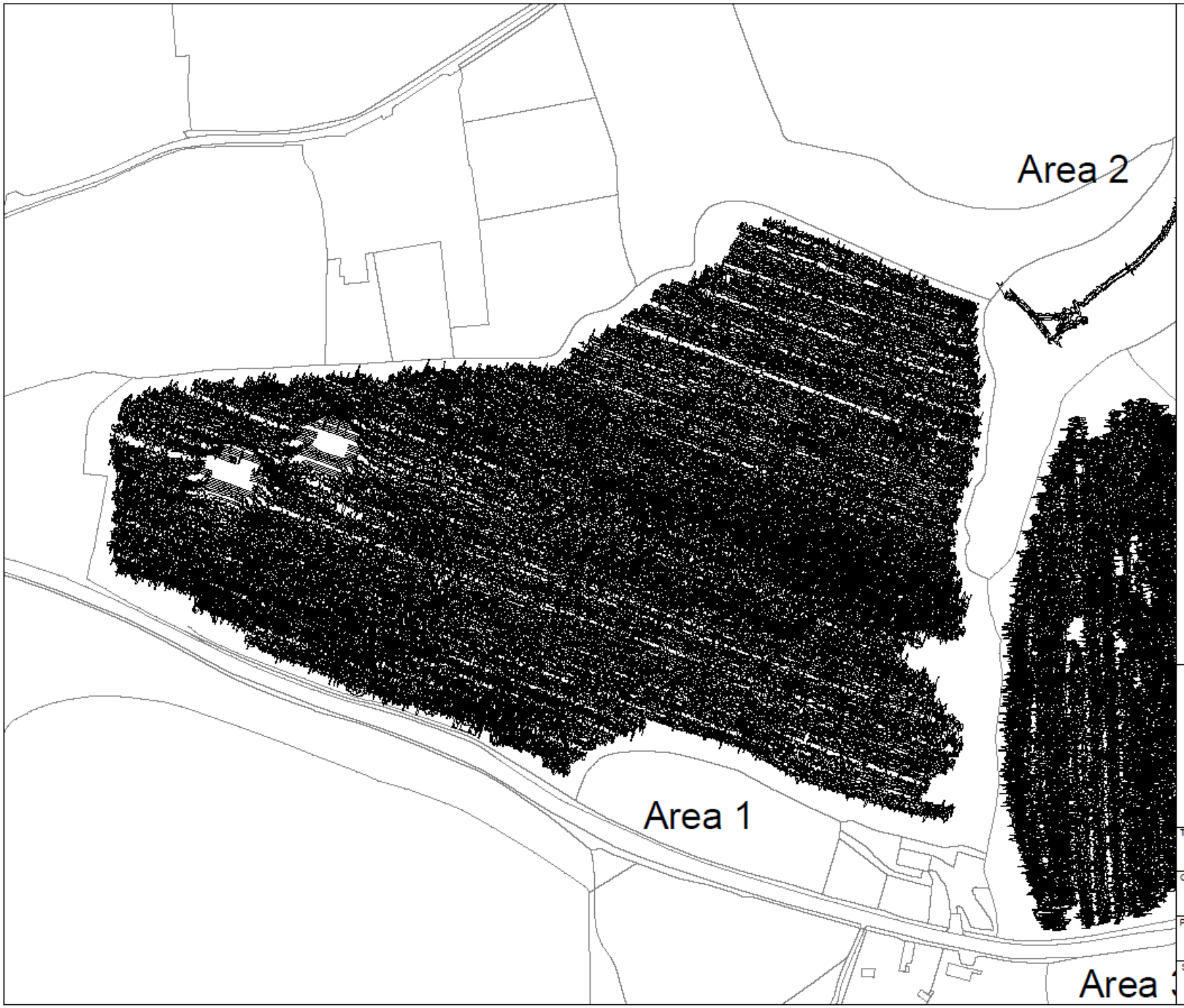
Title:
Minimally Processed Data - Greyscale Plots

Client:
RPS Consulting

Project:
13152 - Plas Power Estate, Wrexham Northern Area

Scale:
0 metres 150
1:3000 @ A3

Fig No:
15



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

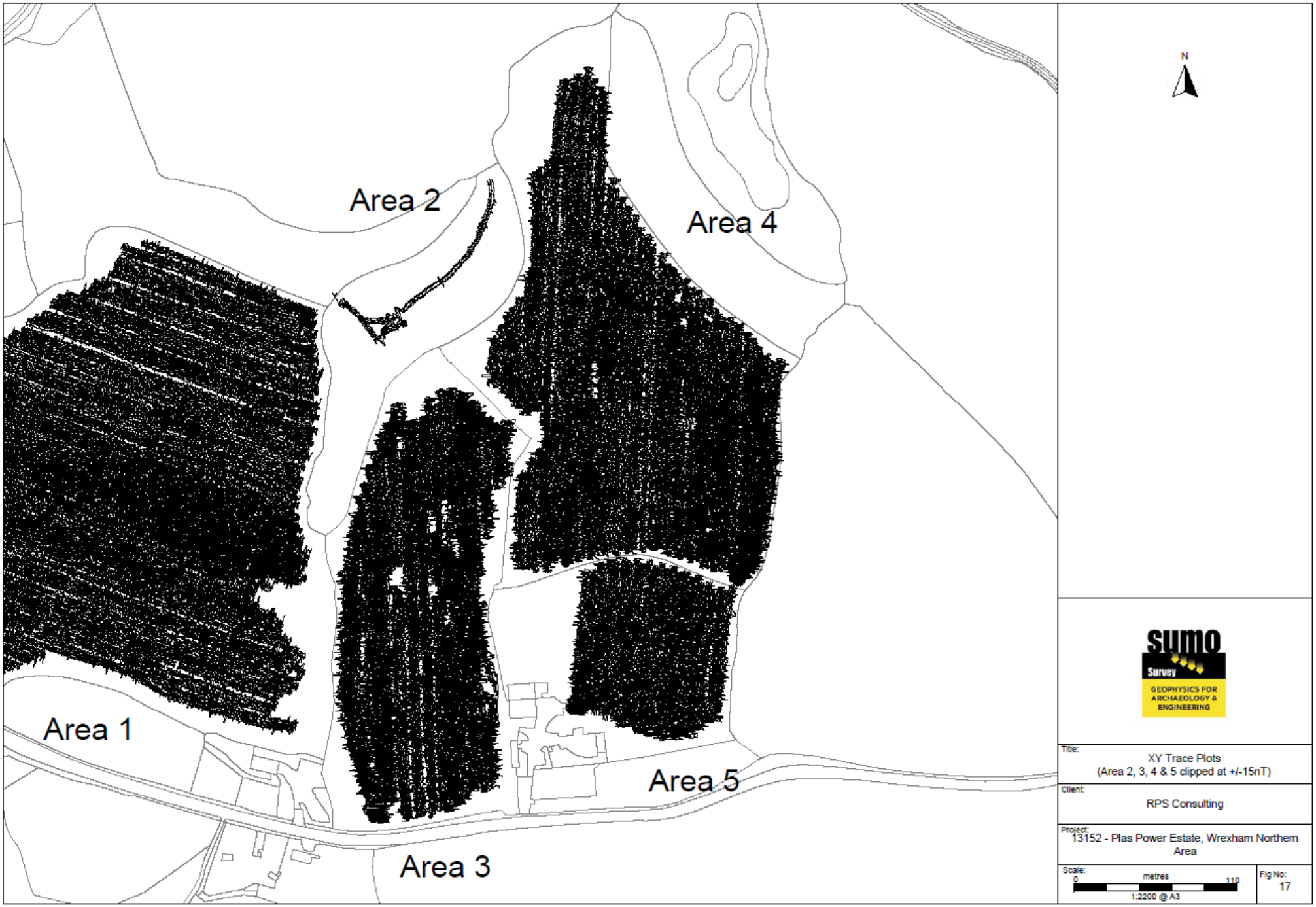
Title: XY Trace Plots (Area 1 clipped at +/-15nT)

Client: RPS Consulting

Project: 13152 - Plas Power Estate, Wrexham Northern Area

Scale: 0 metres 100
1:2000 @ A3

Fig No: 16



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots
(Area 2, 3, 4 & 5 clipped at +/-15nT)

Client:
RPS Consulting

Project:
13152 - Plas Power Estate, Wrexham Northern Area

Scale:
0 metres 110
1:2200 @ A3

Fig No:
17

Appendix A - Technical Information: Magnetometer Survey Method

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1.0m	0.25m
Magnetometer	Bartington Cart System	1.0m	0.125m

Instrumentation:

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted horizontally, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths.

Bartington Grad 601-2

Hand-Held: Data will be collected using a Bartington Grad 601-2. The instrument consists of two paired sensors and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. The collection of data at 0.25m centres provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines

Bartington Cart System

Data will be collected using a cart carrying four paired Bartington magnetic sensors. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
Service	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* / *Natural* or (in the case of linear responses) *Possible Archaeology* / *Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

Appendix C – Data Management Plan & Archive Selection Strategy

Data Management Plan

Project ID

SUMO-13152

Project Name

Plas Power Estate, Wrexham Northern Area

Project Description

Detailed magnetic survey over approx. 21ha

Client

RPS Consulting Ltd for Lightsource BP

Project Manager

Thomas Cockcroft

Field Leader

Liam Brice-Bateman

Date DMP created

12.07.2023

Date DMP last updated

13.12.2023

Version

2

Technique - data

Detailed magnetic survey.

Manual – cart - other

Hand pushed Cart magnetometers.

Documentation and metadata

All documentation and data produced are stored on SUMO servers in a specific job file.

Data storage, access and back-up

- SUMO Secure server during the project life set up in a RAID configuration (a RAID configuration incorporates a level of data redundancy meaning if a single hard drive in fails data can still be restored).

- Snap shots of the data will be made at several intervals during the day to allow data to be restored for up to 30 days if changed / deleted.
- Once the final report has been completed data will be moved onto NAS drive set up in a RAID configuration.
- All data is backed up to an off-site location (Cloud storage).

Archive Selection Strategy

Digital Data

Selection

It is proposed that only the final version of all born digital documents (reports, images and CAD files) will be selected for inclusion in the Preserved Archive. All raw and processed survey data will be included in the preserved archive. Below is what will constitute the selected archive:

- Raw data in XYZ format .csv and .png plus .pgw world file
- Processed data as .png plus .pgw world file
- Final survey report .pdf
- CAD and Vector graphics (interpretations) in .dwg format

De-selected digital data

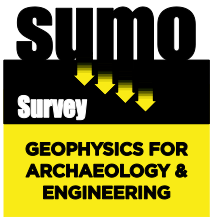
The de-selected material will be retained on the SUMO Secure server and Cloud storage.

Documents

Not applicable – no archive

Materials

Not applicable – no archive



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL

PLATES

Plate 1: Zone A: View north across zone A from the southern boundary, showing the density of the enclosing woodland to the west

Plate 2: Zone A: View south-west across zone A from the eastern boundary, shoign part of zone C and the enclosing woodland to the west

Plate 3: Zone A: View eastwards from western edge of zone A, with long-distance views over Wrexham

Plate 4: Zone A: View south-east across the study site, showing how the intervening hedgerows and woodland blocks break up views between the zones

Plate 5: Zone A: View west from the western boundary of zone A, showing the limited views in this direction

Plate 6: Zone A: View south across the study site, from the northernmost point of zone A

Plate 7: Zone A: View south-west along the western boundary of zone A, showing how the topography and the enclosing woodland prevent any views to the west

Plate 8: Zone B: View south across zone B from the northern boundary, showing the enclosing woodland

Plate 9: Zone B: View north towards zone A, from centre of zone B eastern boundary

Plate 10: Zone C: View north-east along footpath which crosses Offa's Dyke

Plate 11: Zone C: View south-east along the line of Offa's Dyke – south side

Plate 12: Zone C: View eastwards across the study site from east of Offa's Dyke

Plate 13: Zone C: View south-east along line of Offa's Dyke – north side

Plate 14: Zone C: View south across zone C, and line of Offa's Dyke, from centre of zone C northern boundary

Plate 15: Zone C: Enclosing woodland at northern end of zone C

Plate 16: Zone C: View eastwards from northern end of zone C, showing the partial long distance views from zone C, broken up by the intervening woodland and hedgerows

Plate 17: Zone D: View north-west from southern boundary

Plate 18: Zone D: View north from southern boundary

Plate 19: Zone D: View north-east from southern boundary

Plate 20: Zone D: View east from southern boundary

Plate 21: Zone E: View south-east across zone E from northernmost point, showing its flat topography and enclosing woodland

Plate 22: Zone E: View south across zone E from northernmost point, showing its flat topography and enclosing woodland

Plate 23: Zone E: View west over the sheltered, enclosed north-western part of zone E

Plate 24: Zone E: View south over zone E from the woodland fringe towards its northern end

Plate 25: Zone E: View south-west from centre of zone E

Plate 26: Zone E: View north-west from centre of zone E

Plate 27: Zone E: View north-east from centre of zone E

Plate 28: Zone E: View south-east from centre of zone E

Plate 29: Zone E: View of southern boundary of zone E, showing tree belt which completely masks Bersham Ironworks from any intervisibility with the study site

Plate 30: Zone E: Close up of tree belt masking Bersham Ironworks from view

Plate 31: Zone E: View south-east towards Bersham Ironworks from within zone E southern part. The Ironworks buildings cannot be seen from zone E

Plate 32: Bersham Ironworks remains from the south

Plate 33: Bersham Ironworks remains from the south

Plate 34: Zone F: View south-east over zone F from the north-eastern corner

Plate 35: Zone F: View southwards along the western boundary of zone F

Plate 36: Zone F: View west from the western boundary of zone F, towards section of Offa's Dyke to the west

Plate 37: Zone F: View north across zone F from its highest point

Plate 38: Zone F: View north-east across zone F from its highest point

Plate 39: Zone F: View south-east across zone F from its highest point

Plate 40: Zone F: View south across zone F from its highest point

Plate 41: Zone F: View east from the centre of zone F, towards Bersham Ironworks

Plate 42: View south along section of Offa's Dyke to west of zone F, showing land rising up to zone F on left of photo, preventing any intervisible between solar panels in zone F and this section of the Dyke

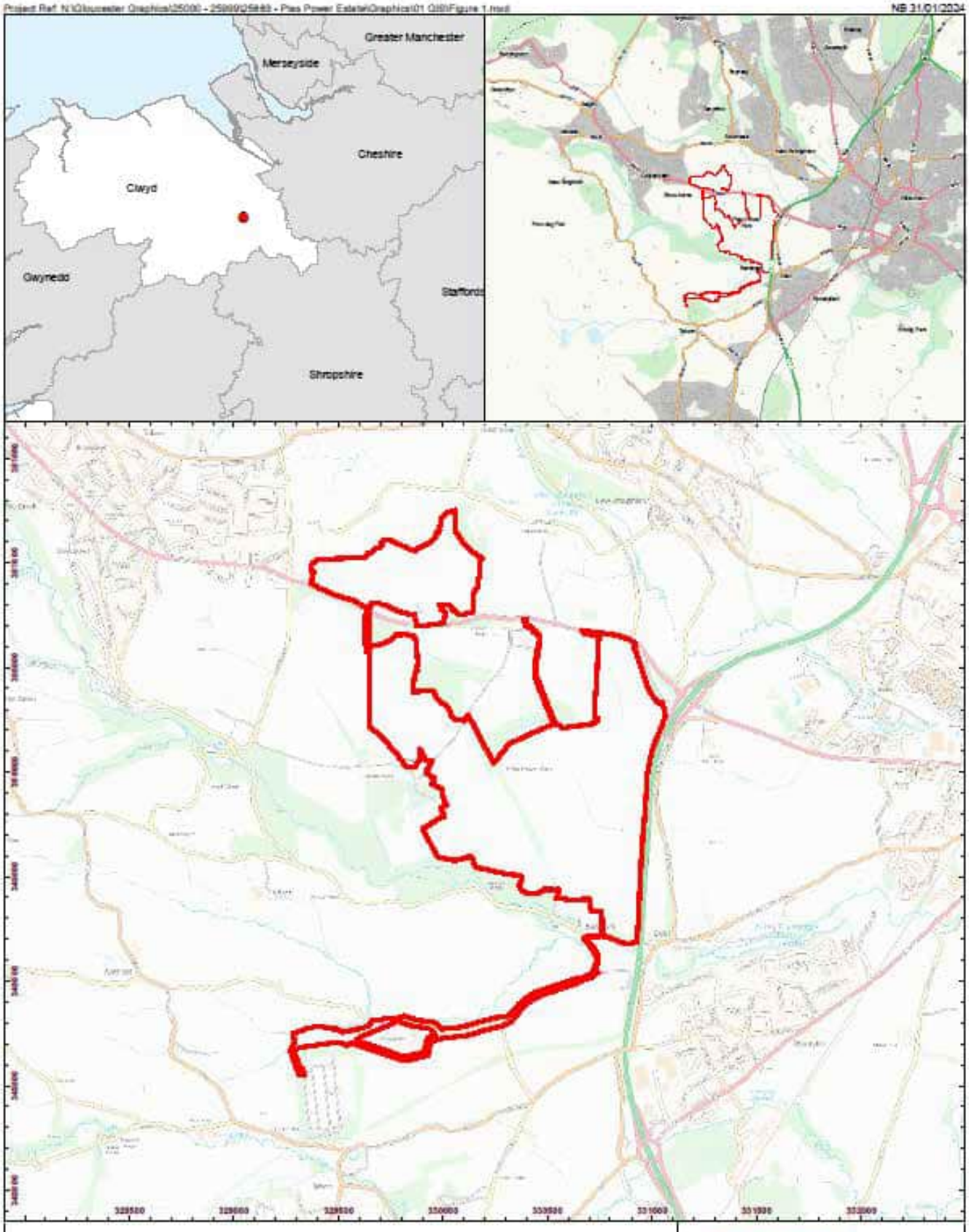
Plate 43: View north along section of Offa's Dyke to west of zone F

Plate 44: View north along the section of Offa's Dyke running through Plas Power woods, to the west of zone D – the line of the Dyke is marked by the dense trees on the right of the picture

Plate 45: Cadwgan Hall Mound, from the north-west, with the buildings of Plas Cadwgan beyond

Plate 46: View from the south-west over Cadwgan Hall Mound towards zone F

FIGURES



Site Boundary

N

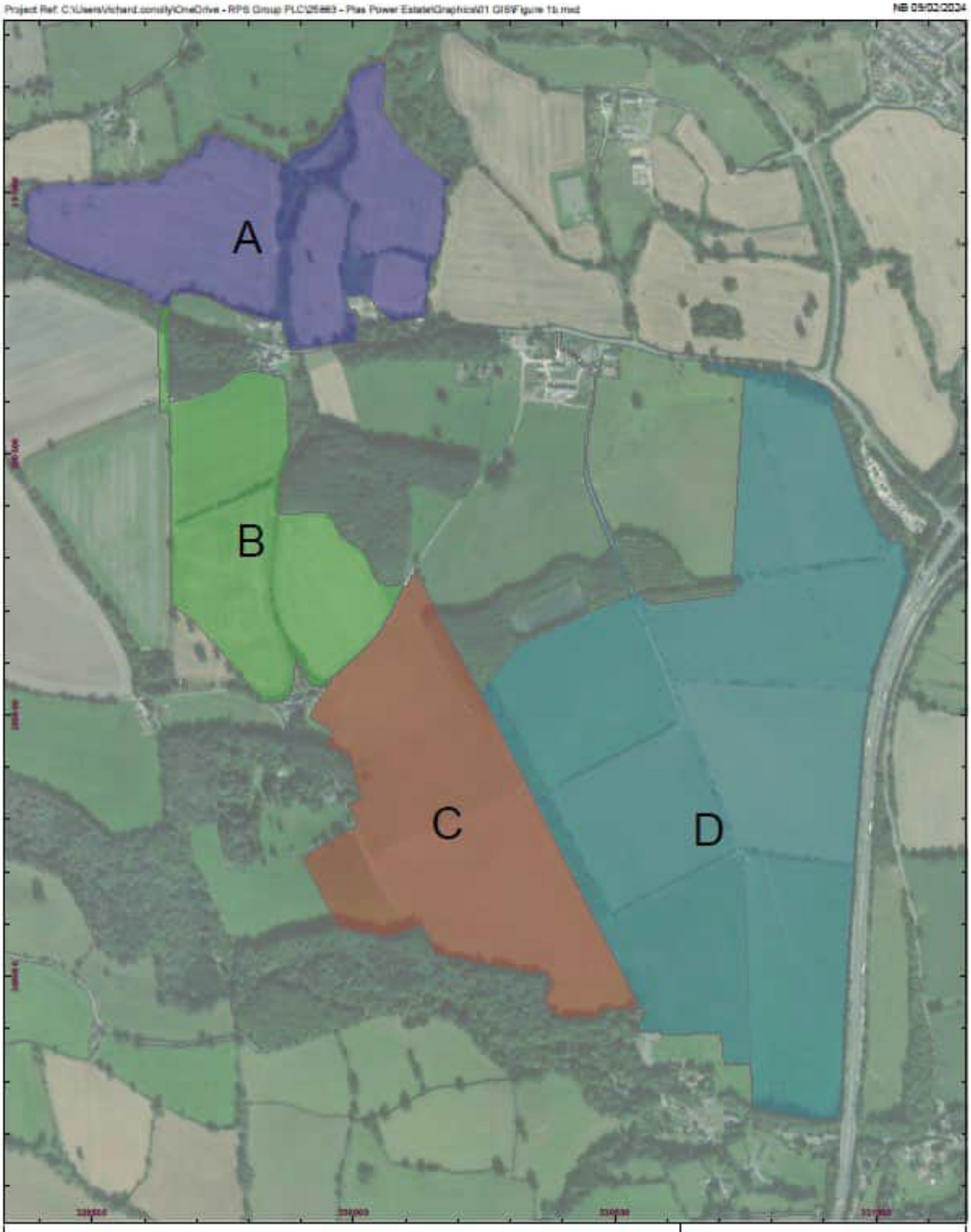
0 260 520 780m

Scale at A4: 1:25,000

Figure 1a

Site Location

Project Ref: C:\Users\richard.cosslyl\OneDrive - RPS Group PLC\25493 - Plas Power Estate\Graphics\01 GIS\Figure 1b.mxd NB 09/02/2024



Site Boundary

N

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Scale at A4: 1:10,000

Figure 1b

Division of the Site into Zones A-D

NB 31/01/2024

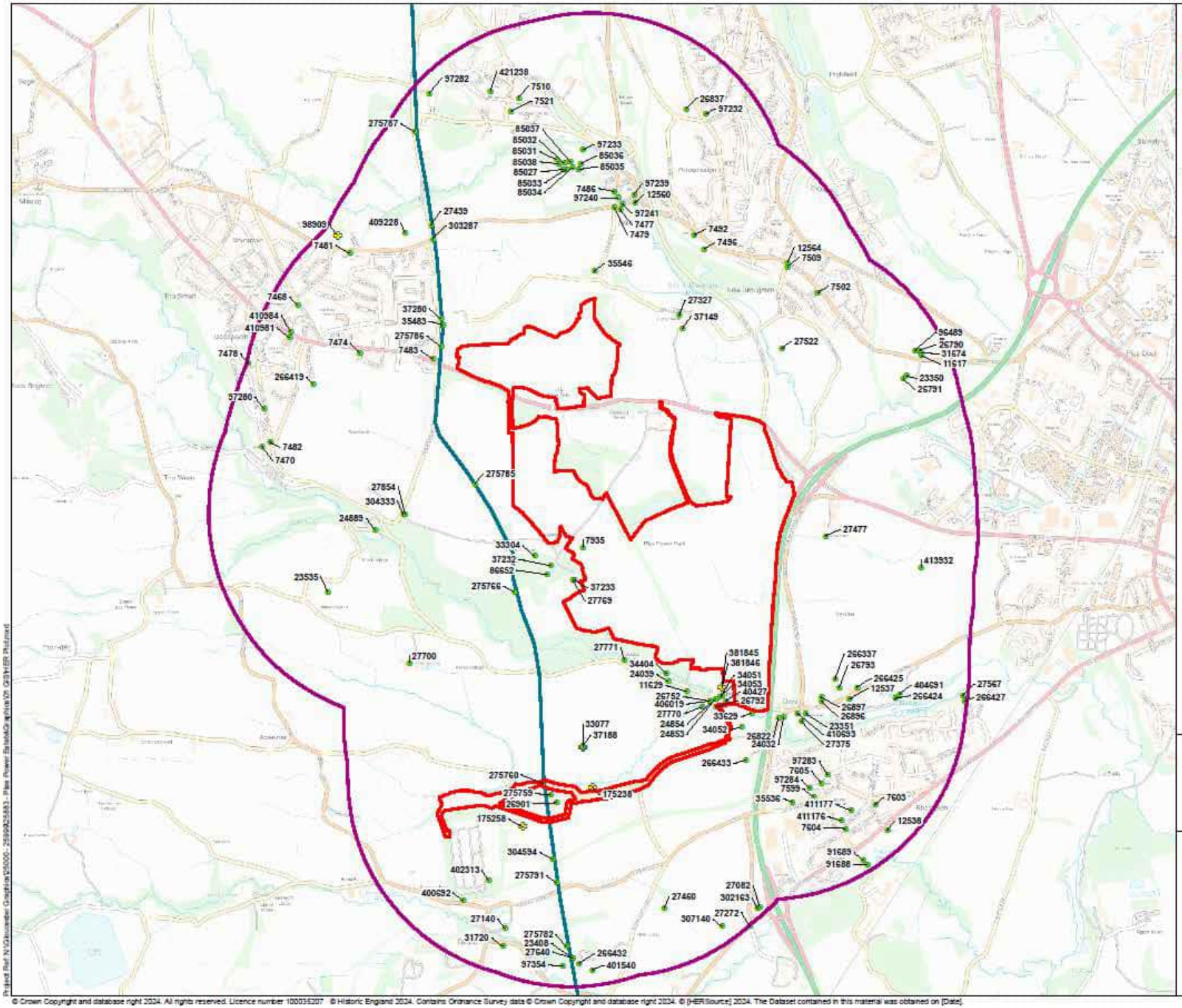
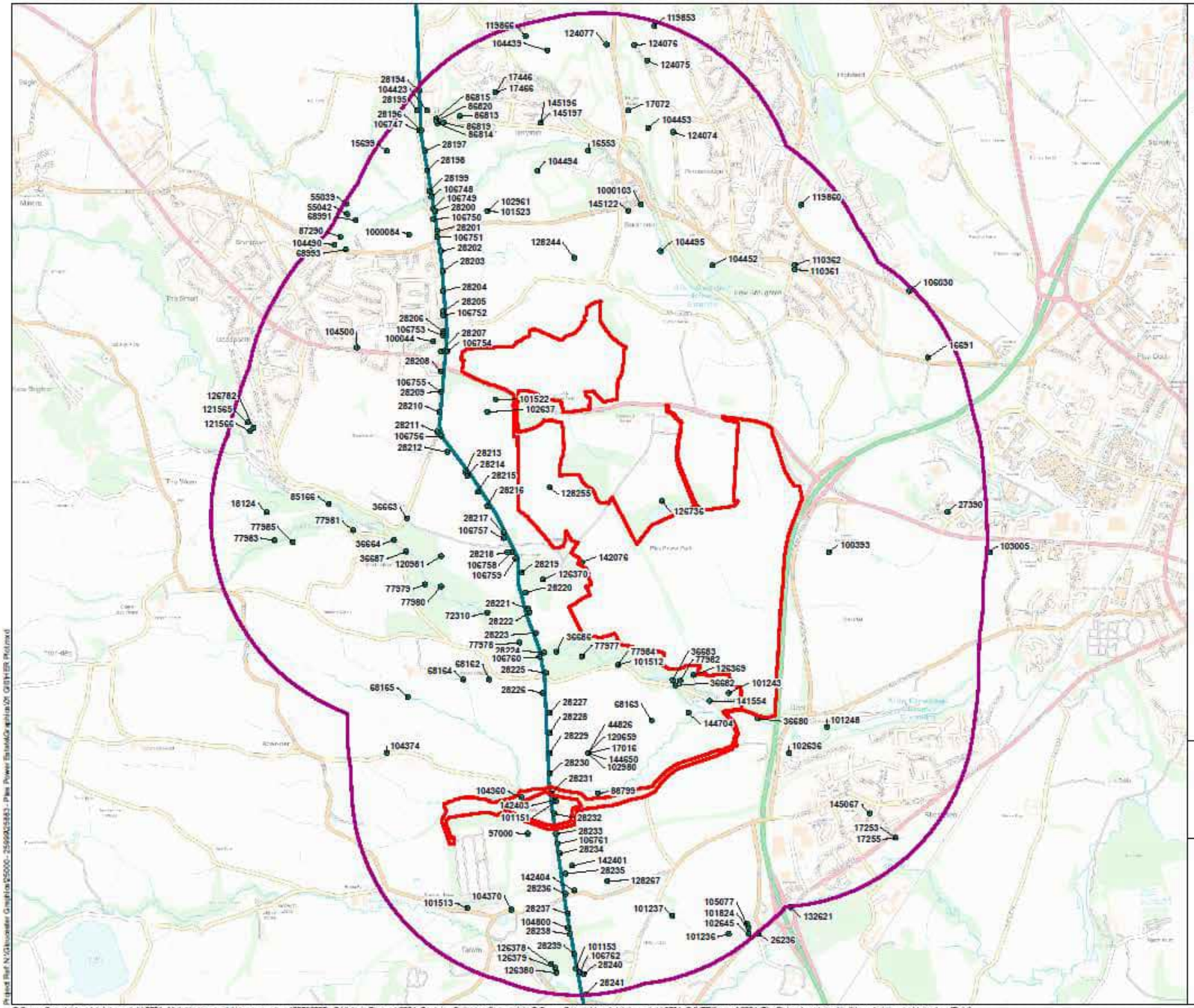


Figure 2a

RCAHMW HER Data

NB 31/01/2024



Legend

- Site Boundary
- 1km search radius

Non-designated Heritage Assets:

- Offa's Dyke
- CPAT Core Data

N

0 75 150 300 450m

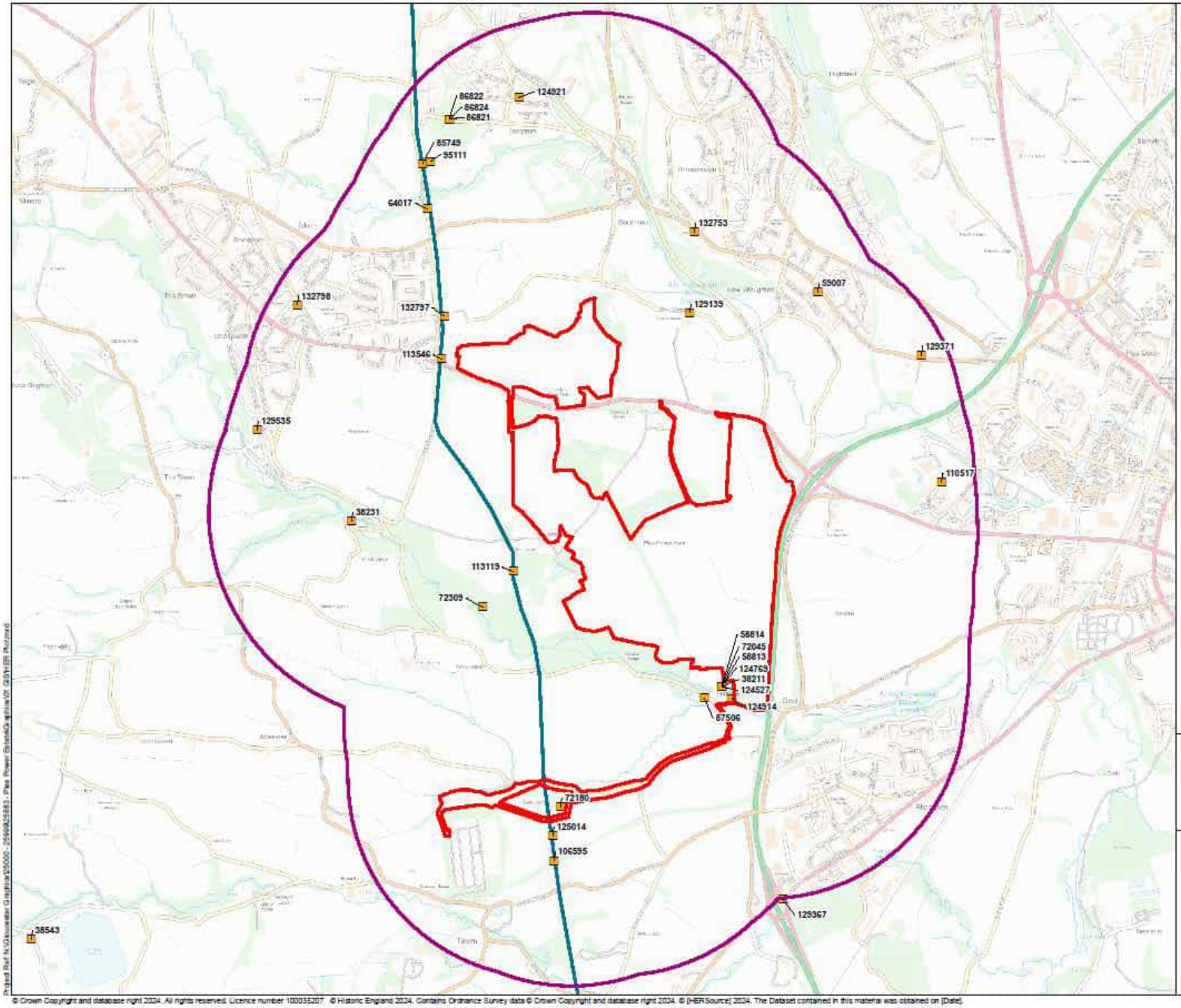
Scale at A3: 1:18,000

rps MARINE COMPLEX EASY

Figure 2b

CPAT Historic Environment Record - Core Data

NB 31/01/2024



Legend

- Site Boundary
- 1km search radius

Non-designated Heritage Assets:

- Offa's Dyke

Previous Archaeological Work:

- CPAT Event Data

N

0 75 150 300 450m

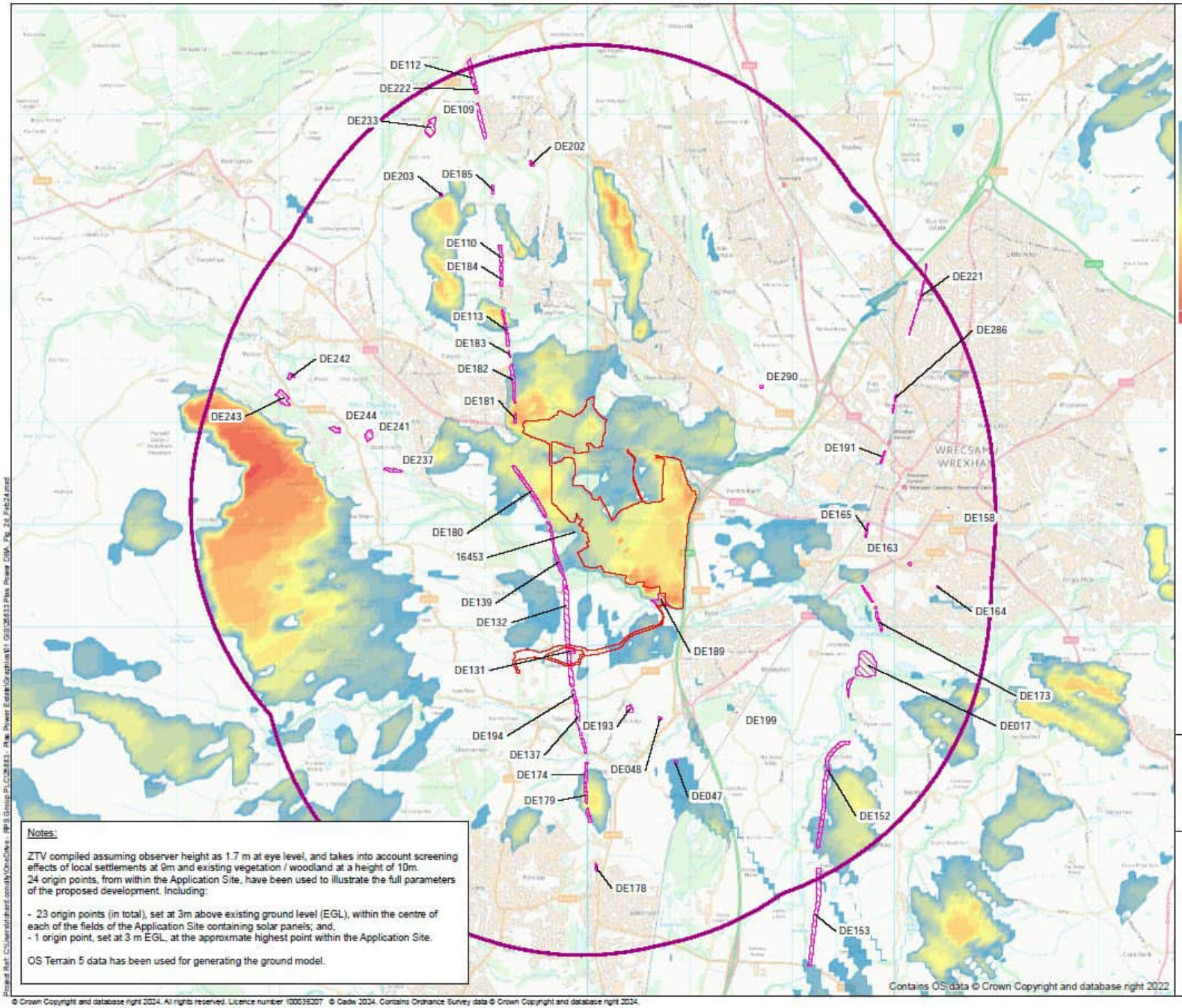
Scale at A3: 1:18,000

MARINE COMPLEX EASY

Figure 2c

CPAT Historic Environment Record - Event Data

NB 09/02/2024



Legend

- Site Boundary
- 3km search radius
- Scheduled Monuments

Low Visibility (up to 1 origin point)

High Visibility (up to 19 origin points)

N

0 250 500 1,000 1,500 m

Scale at A3: 1:35,000

Notes:

ZTV compiled assuming observer height as 1.7 m at eye level, and takes into account screening effects of local settlements at 9m and existing vegetation / woodland at a height of 10m.
24 origin points, from within the Application Site, have been used to illustrate the full parameters of the proposed development. Including:

- 23 origin points (in total), set at 3m above existing ground level (EGL), within the centre of each of the fields of the Application Site containing solar panels; and,
- 1 origin point, set at 3 m EGL, at the approxmate highest point within the Application Site.

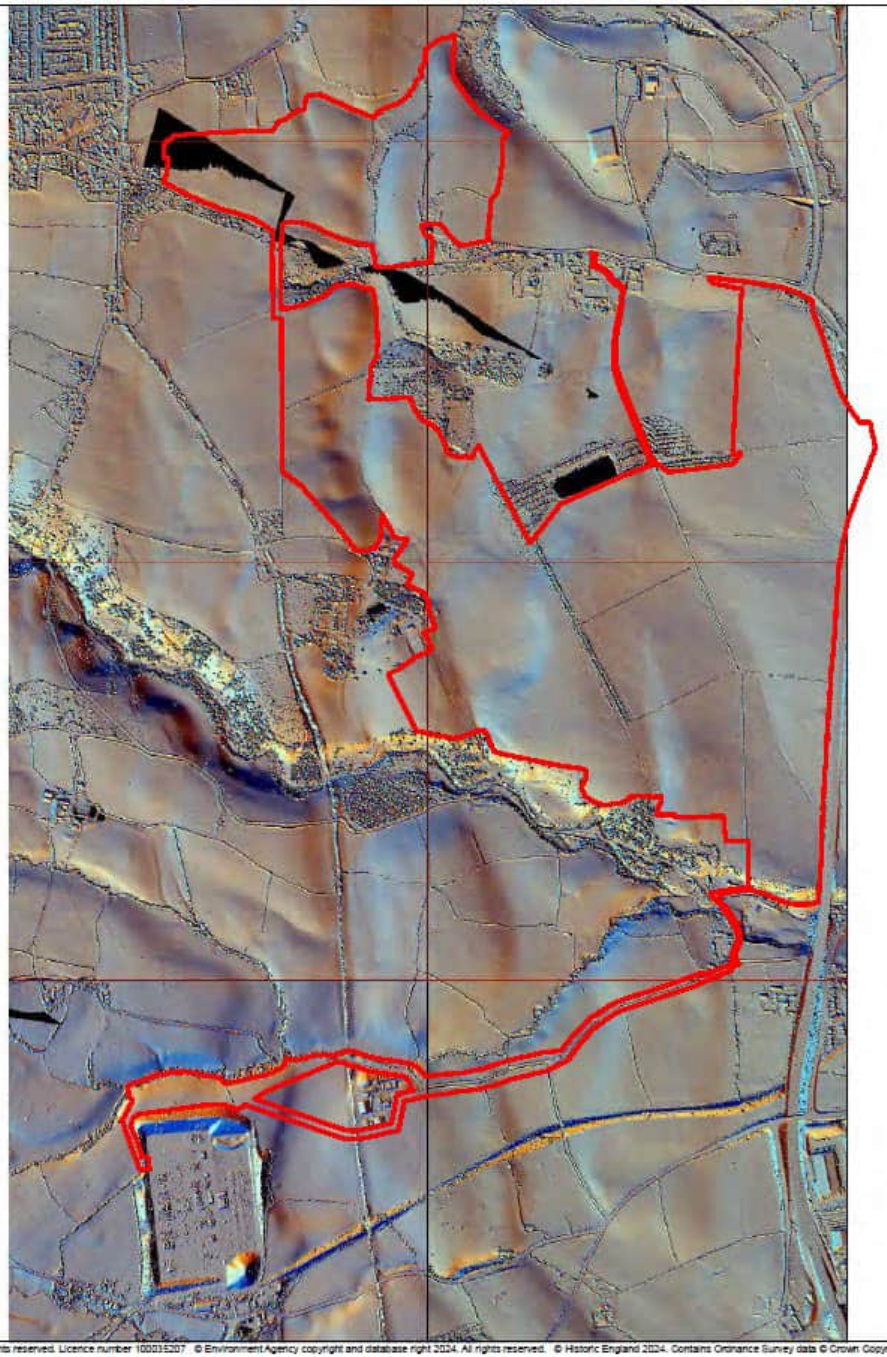
OS Terrain 5 data has been used for generating the ground model.

A TETRA TECH COMPANY

Figure 2d

Scheduled Monuments and the Zone of Theoretical Visibility

NB 31/01/2024



Legend

Site Boundary

LiDAR DATA

Source:
Environment Agency

Data Type: DSM

Resolution: 1m

Processing:
Multi-direction Hillshade

N

0 200 400 m

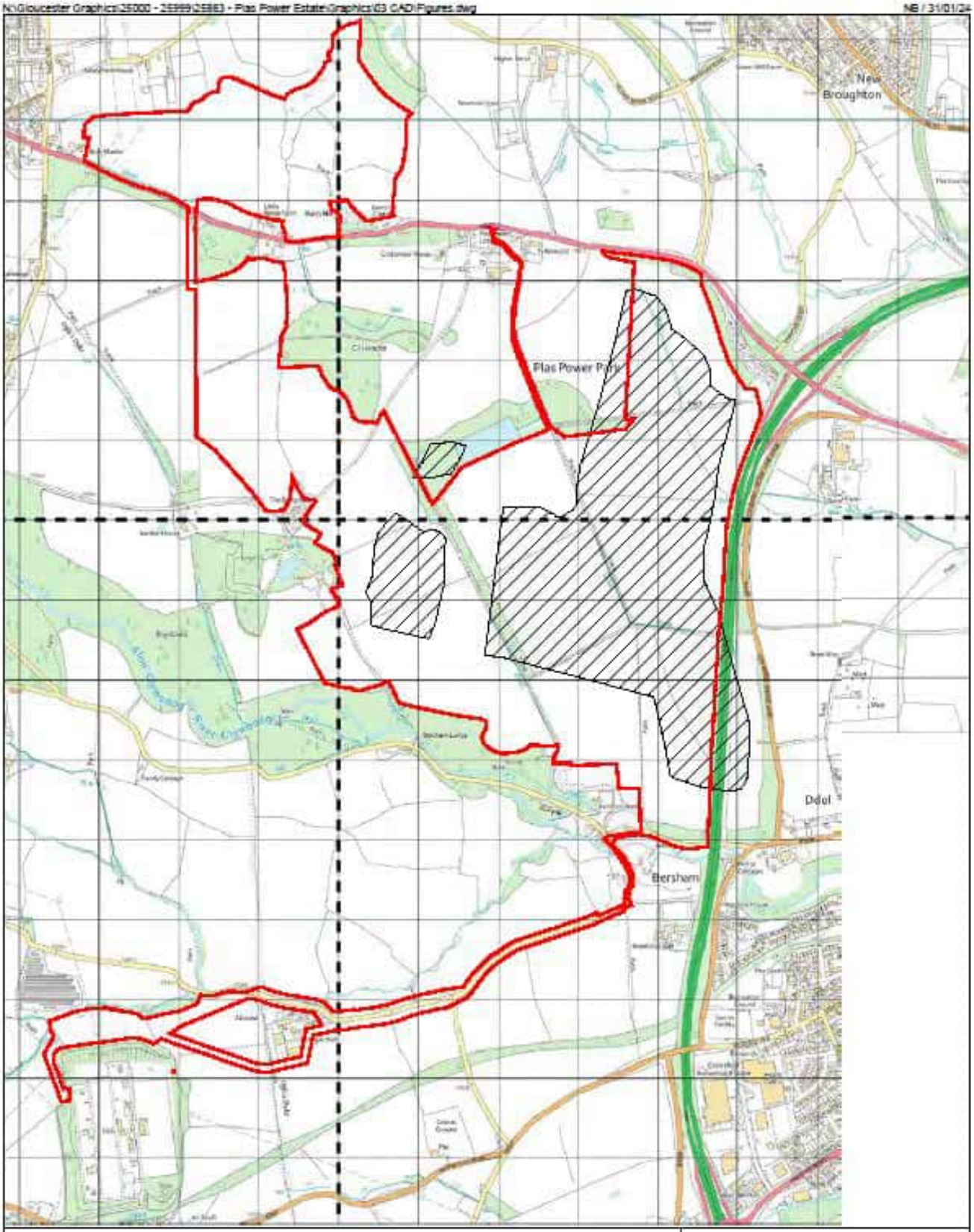
Scale at A3: 1:11,500

rps MARINE COMPLEX EASY

Figure 3

LiDAR Data

N:\Gloucester Graphics\25000 - 25999\25883 - Plas Power Estate\Graphics\03 CAD\Figures.dwg MB / 31/01/24



Site Boundary

Made Ground

N

Not to Scale
Illustrative Only

Figure 4a
Geological map showing extent of 'made ground' within the site, as mapped on the BGS Geoindex Onshore Data

N:\Gloucester Graphics\25000 - 25999\25883 - Pilsi Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24

Site Boundary

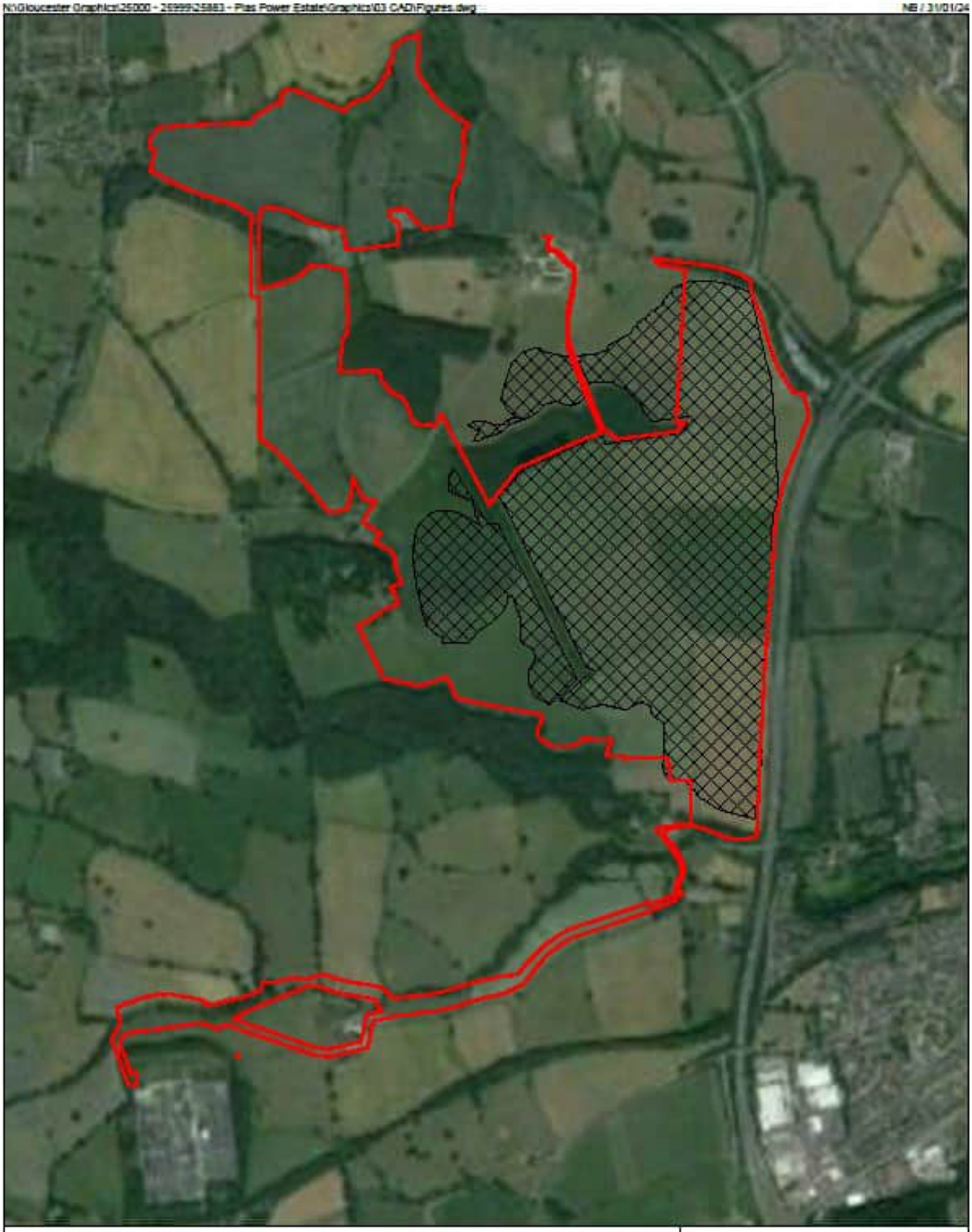
N

Not to Scale
Illustrative Only

Figure 4b

1966 Aerial Photograph showing extent of opencast mining

N:\Gloucester Graphics\25000 - 25999\25883 - Pias Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24



Site Boundary

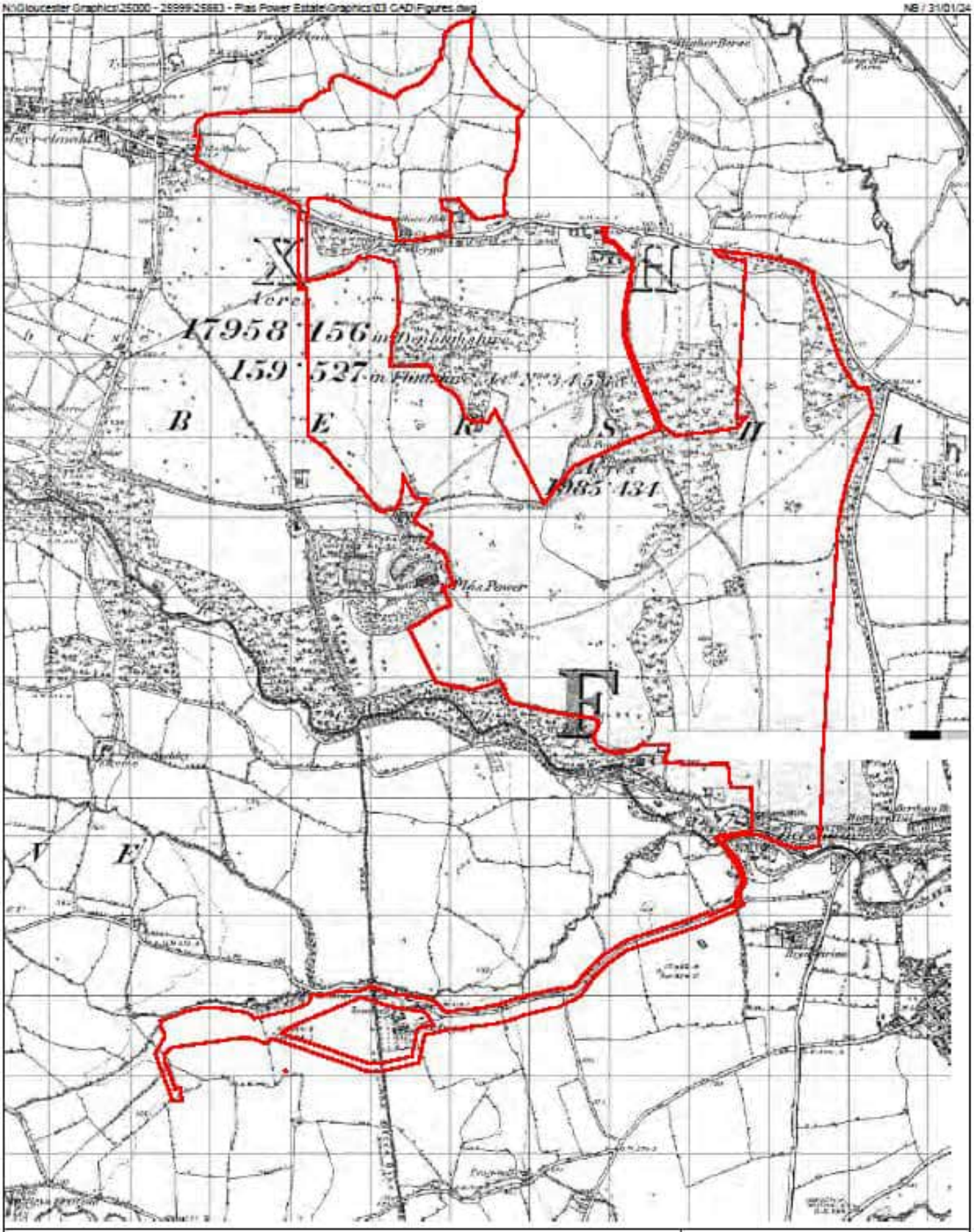
Opencast mining

N

Not to Scale
Illustrative Only

Figure 4c
Google Earth image showing extent of opencast mining on the modern field layout

N:\Gloucester Graphics\25000 - 25999\25883 - Pias Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24



Site Boundary

N

Not to Scale
Illustrative Only

Figure 5

1879 Ordnance Survey Map

N:\Gloucester Graphics\25000 - 25999\25883 - Plas Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24

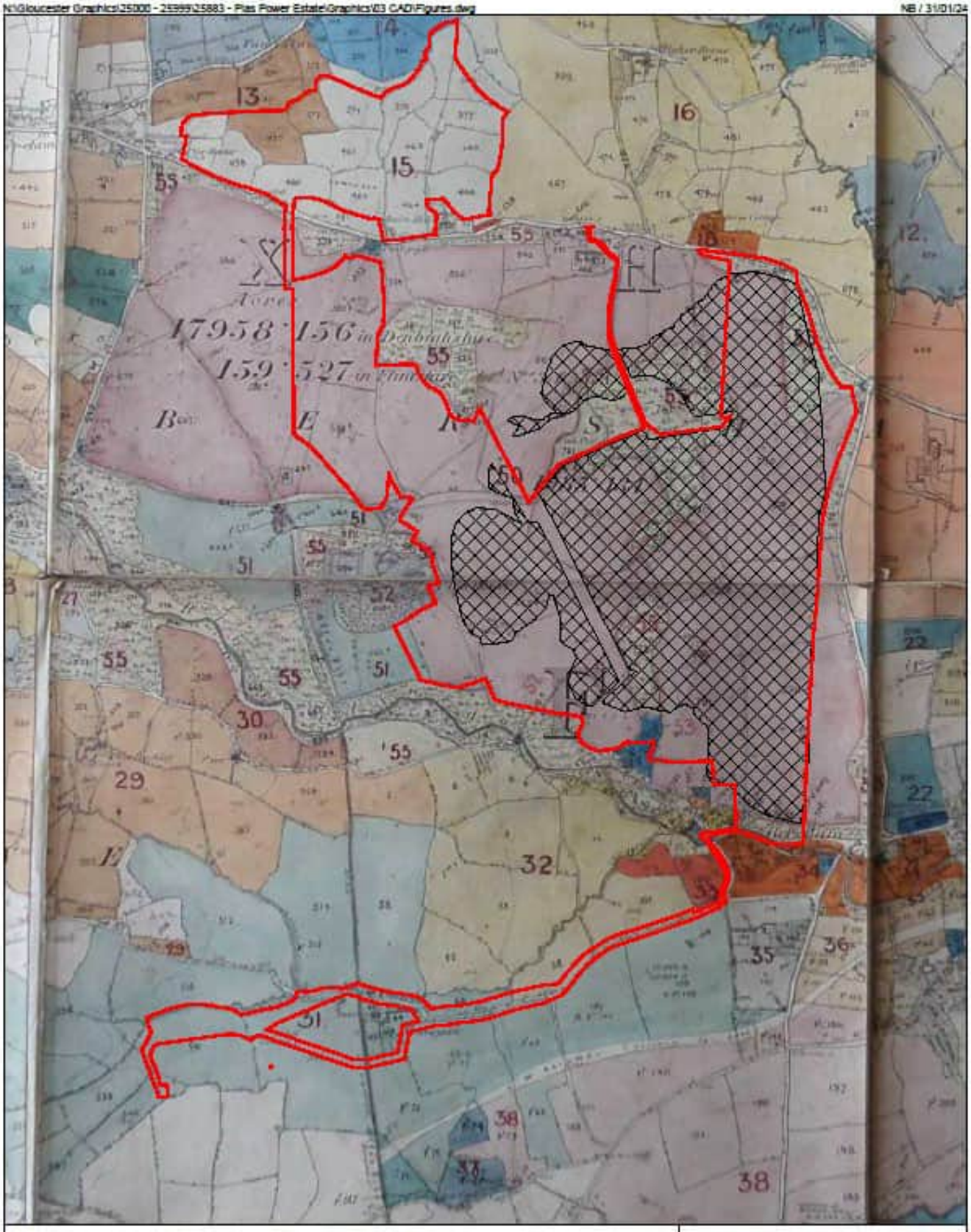
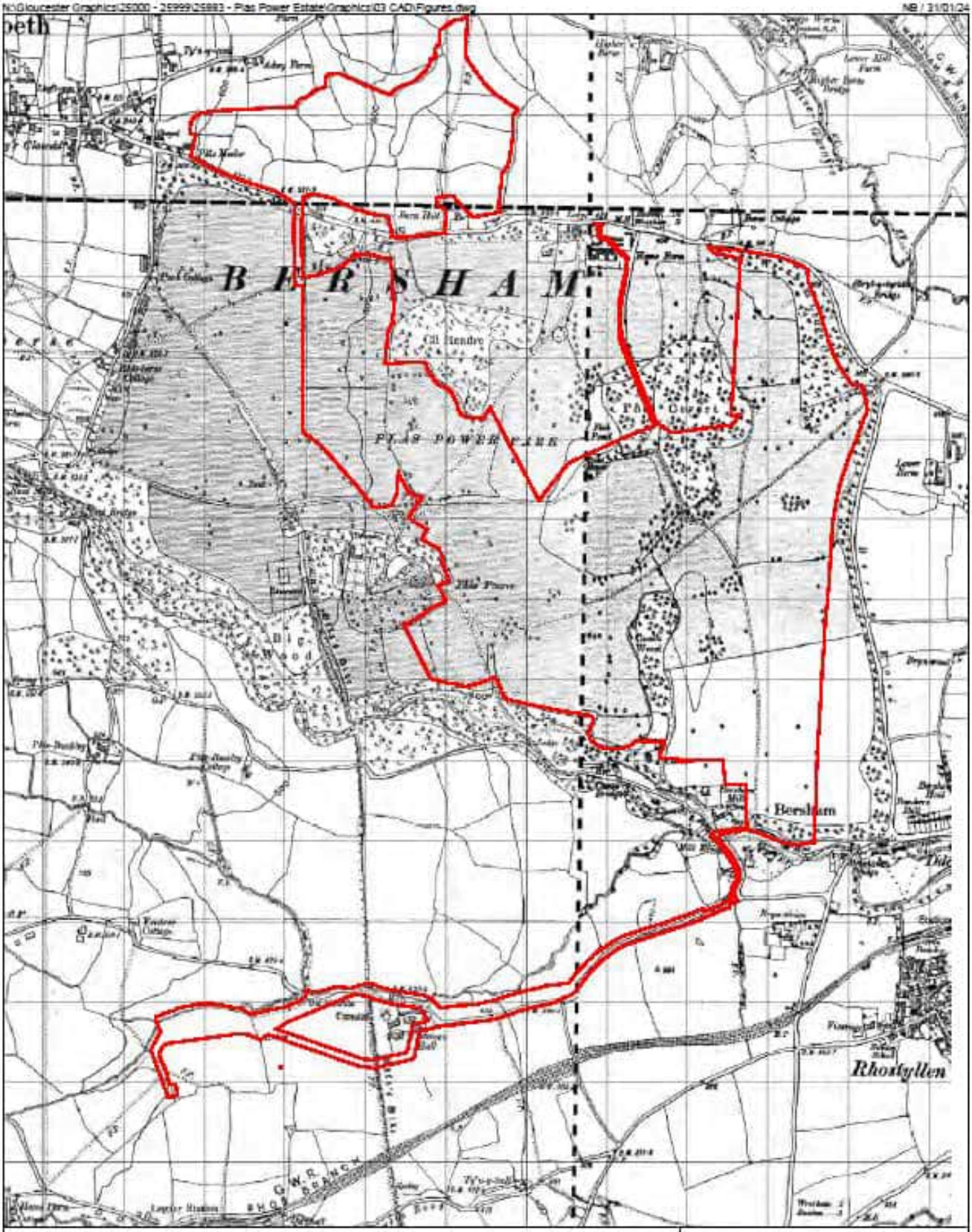


Figure 6

1899 Plas Power Estate Map

N:\Gloucester Graphics\25000 - 25999\25883 - Pilsi Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24



Site Boundary

N

Not to Scale
Illustrative Only

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Figure 7

1938 Ordnance Survey Map

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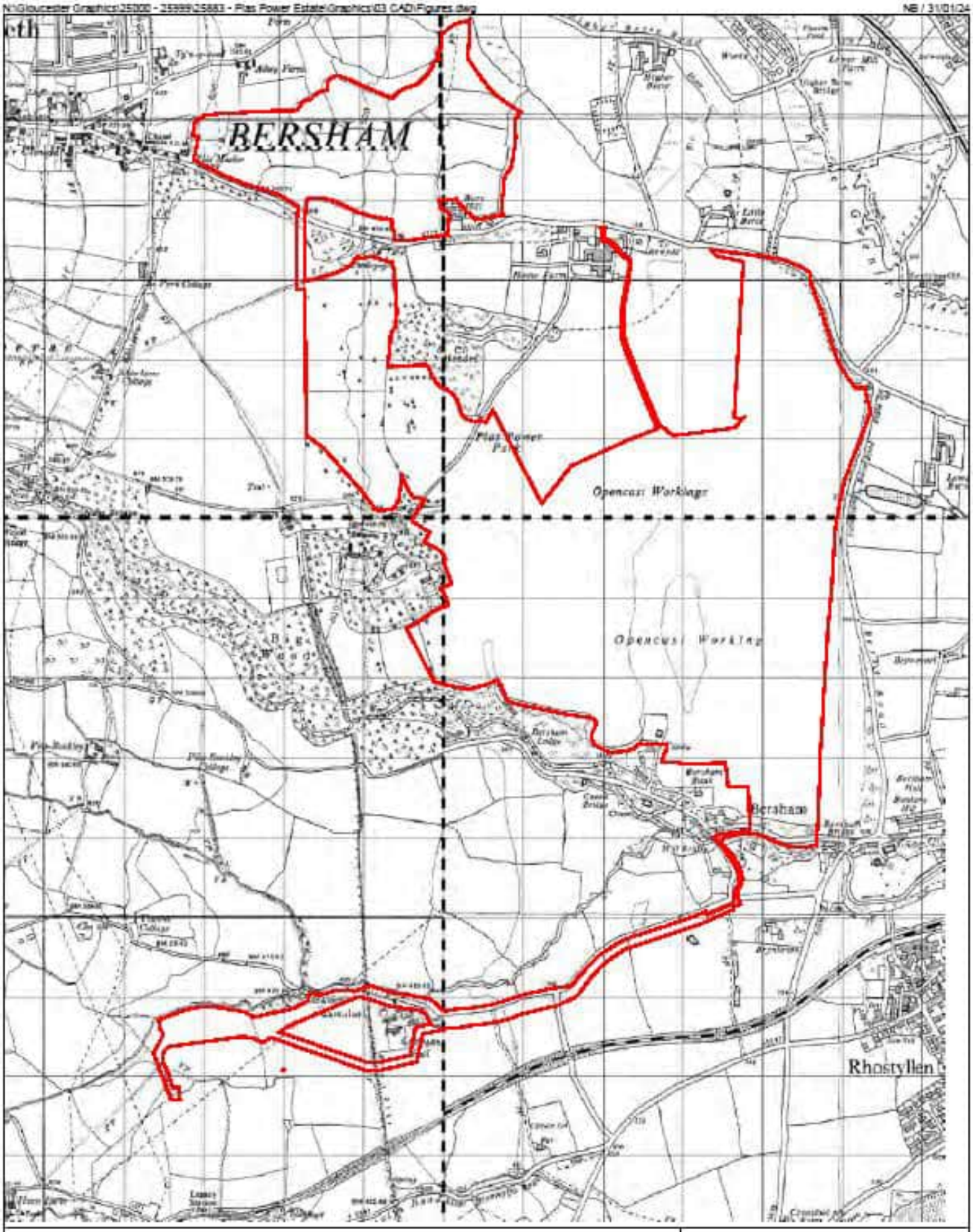

Site Boundary

N

Not to Scale
Illustrative Only

Figure 8

1963-1964 Ordnance Survey Map

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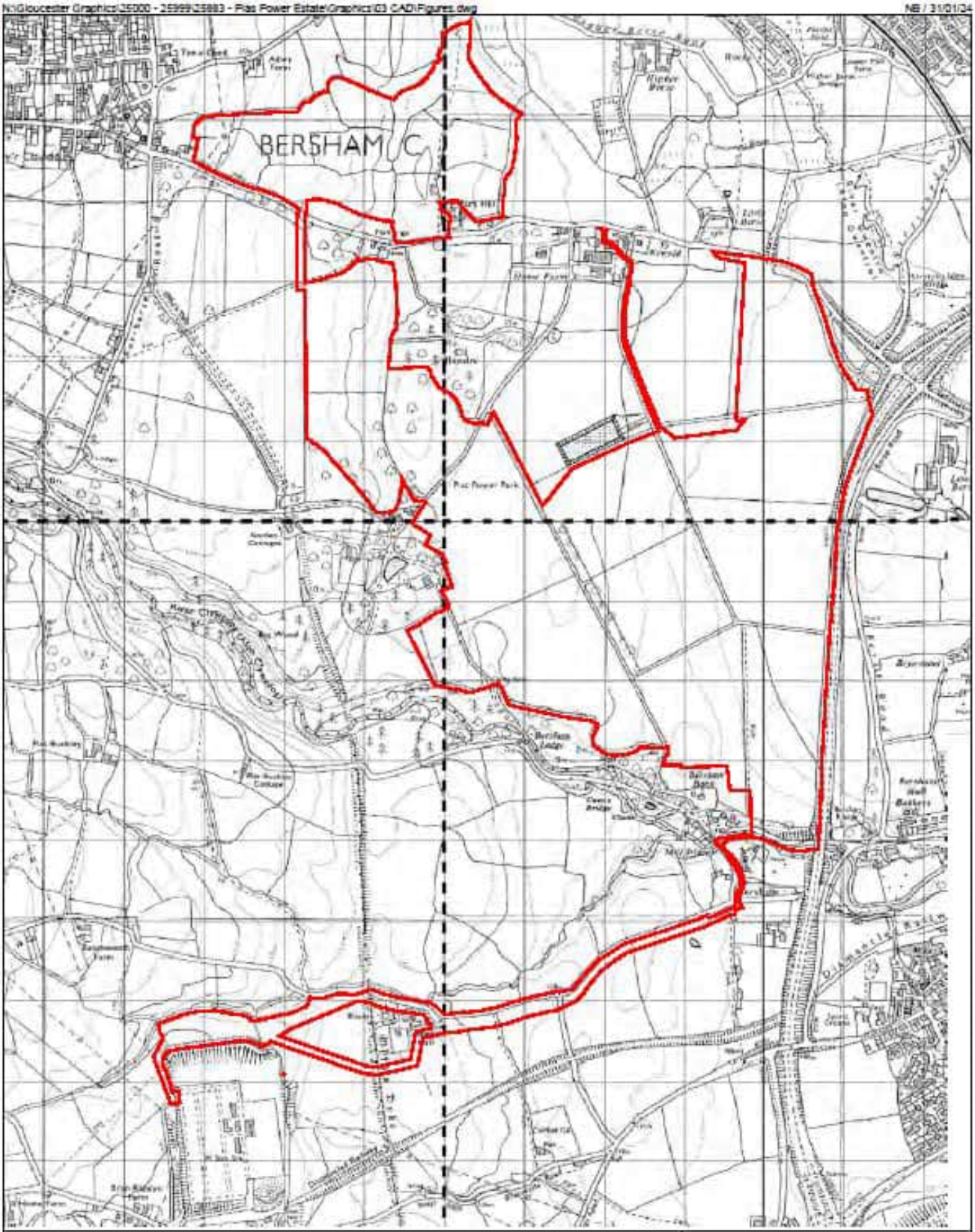


Site Boundary

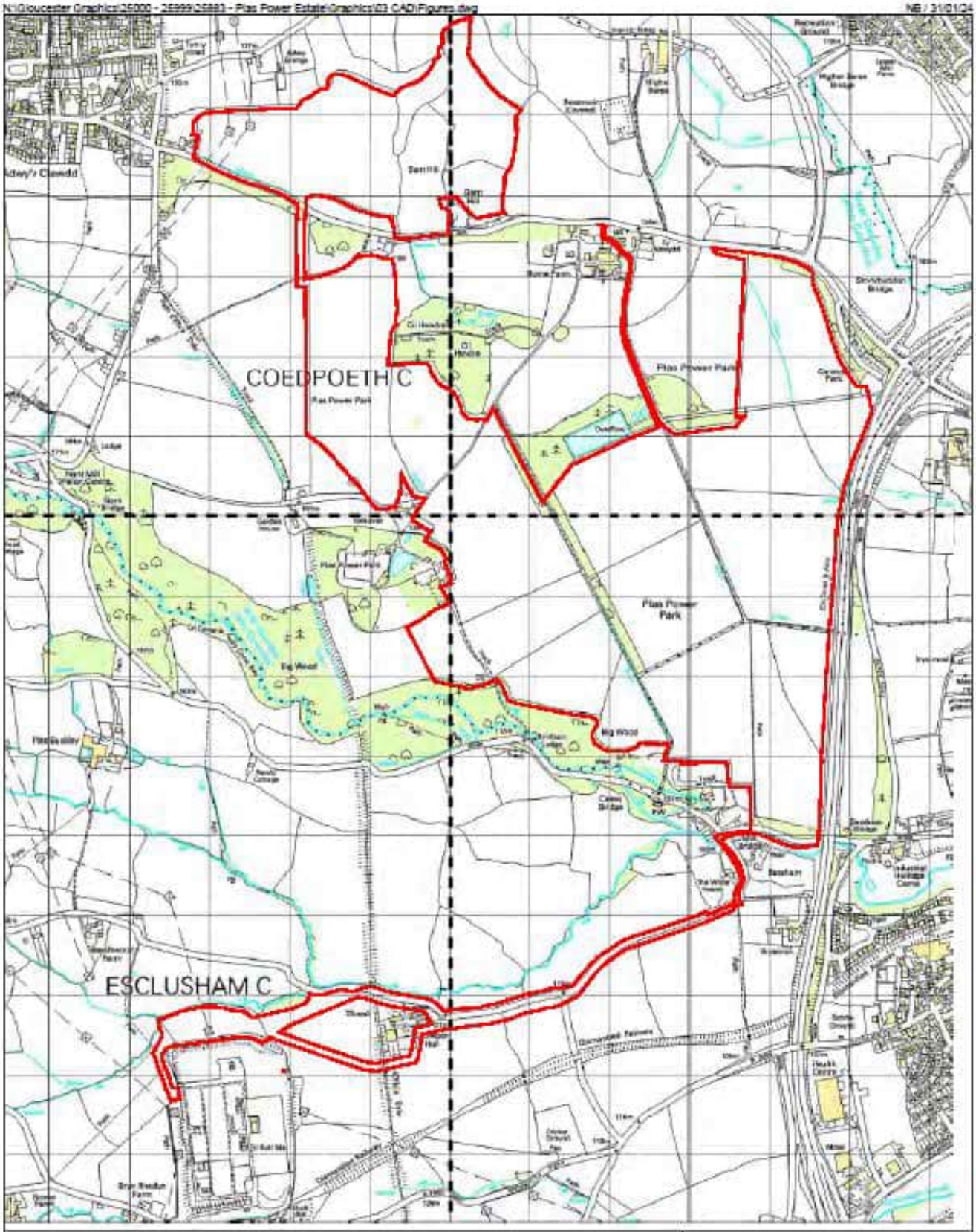
N

Not to Scale
Illustrative Only

Figure 9

1974-1979 Ordnance Survey Map

N:\Gloucester Graphics\25000 - 25999\25883 - Plas Power Estate\Graphics\03 CAD\Figures.dwg NB / 31/01/24



Site Boundary

N

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Figure 10

2000 Ordnance Survey Map

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